The Hydro Effect
-Do the short term hydrological balance affect the prices of future and forward contracts at Nord Pool?

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Sammendrag

Denne oppgaven ser på om fyllingsgraden og tilsiget i Norge, Sverige og Finland har påvirkning på de finansielle kontraktsprisene på Nord Pool. Hoved hypotesen er:

Er den kortsiktige hydrologiske balansen bestående av fyllingsgrad, tilsig og snømengde en god indikator på forskjellen som er mellom spot pris og pris på de finansielle kontraktene på Nord Pool?

Temaene nedbør, fyllingsgrad, tilsig og snømengde i fjellene er hyppig brukt når man diskutere strømpriser. Den elementære modellen for hydroenergi sier at inntekt i spot markedet påvirkes av mengden lagret vann, tilsig og hvor mye vann som brukes i produksjon. Teorien om forholdet mellom spot prisen og prisen på en finansiell kontrakt sier at denne avhenger enten av fordelen ved å ha vann klar til produksjon om det ikke er fare for oversvømmelse i vannmagasinene, eller alternativkostnaden forbundet med oversvømmelse om det er fare for dette. Dette indikerer at det som påvirker inntekten for spot prisene og skal være med å drive prisene i det finansielle markedet, men i varierende grad.

Metoden brukt i denne oppgaven er økonometrisk analyse. Det er totalt brukt tjue ulike modeller, analyser for hver av de fem kontraktstypene; daglig, ukentlig, månedlig, kvartalsvis og årlig.

Analysen viser at de hydrologiske faktorene alene ikke er nok til å forklare forskjellen mellom spot og kontraktspris. De hydrologiske faktorene påvirker også de forskjellige kontraktstypene i forskjellig grad. Den daglige kontrakten virker ikke å bli så mye påvirket, men effekten er større i de ukentlige, månedlige og kvartalsvise kontraktene. Den årlige kontrakten ser heller ikke ut til å bli påvirket i stor grad. Et annet funn er at fyllingsgrad og tilsig ser ut til å påvirke mer enn energimengden i snøen på fjellet, og at fyllingsgrad forklarer mer enn tilsig.

Abstract

This thesis is looking into if reservoir level and inflow for Norway, Sweden and Finland, and the energy equivalent of the snow in the mountains of Norway effects the future and forward prices at Nord Pool. The main thesis is:

Is the short term hydrological balance of reservoir, inflow and snow a good measurement for the adjustment made to the spot price to get the future price?

The theme of rainfall, reservoir levels and how much snow is going to melt in the spring is always a hot subject when talking about electricity prices. The basic hydropower model states that the income at the spot market is affected by stored water, incoming water and how much water is used in production. The theory of spot-future parity states that the future price is a function of the spot price and, either the advantage of holding on to water if no probability of overflow, or the alternative cost of an overflow if there is a probability of this. This indicates that the future price should be a factor of the spot price and the factor that drives this price, but to various degrees.

The method used in this paper is econometric analysis. We have all together twenty models that have been analyzed for each of the five contract types; daily, weekly, monthly, quarterly.

The analysis in the paper show that the hydrological factor alone are not enough to explain the future-spot parity and how future prices are different form spot prices. The hydrological factors also affect the different contracts to different degrees. The daily contract does not seem to be affected much by the observed hydrological factor. The weekly, monthly and quarterly contracts however seems to be affect to a larger degree. The yearly contract again does not seem to be affected that much as it has a longer time span. Another finding is that reservoir level and inflow seems to affect more than the snow in the mountains, and that reservoir level explains more of the price than the inflow.

Contence

Chapter 1, Problem

Relevance

Electricity is one of our basic goods in the developed part of the world. We use it to get heat, light and to power a numerous of other devices we use on a daily basis. In the Nordic countries electricity is traded at Nord Pool spot exchange in a day-ahead-market.

As the Nordic countries have large variations in living conditions through seasons, the inhabitants in these countries are particularly engaged in electricity prices. Especially during the winter time these countries have the need for huge amounts of electricity for heating.

The Nordic power market includes power produced by many technologies. Denmark has lots of wind power, Finland and Sweden has a combination of hydropower and thermal power, and Norway has almost only hydropower. This large fraction of hydropower makes the amount of rain and snow a constant topic in discussing electricity prices. Each year there are reports on how much snow there is in the mountains, what the reservoir level is, and how much rain can there be expected. All these factors are important when it comes to how much electricity can be produced which determine the supply side of the market equilibrium, and hereby affect the price.

Suppliers are the ones that produce the actual electricity, but the consumers that operate at Nord Pool are actually the big electricity companies that sell electricity to private and corporate customers that actually consume the power. These companies buy their electricity both at the spot market, but a large fraction of the power is traded through financial contracts to create predictability for future costs. Financial contracts can also be used by producers to secure future income.

NASDAQ Commodity Exchange owns Nord Pool Spot Exchange, and also offers a broad specter of future- and forward contracts traders in the market use to secure spot prices in the future. The financial market is also open for speculators, which adds liquidity to the market. Most producers and consumers at the spot exchange secure a considerable part of their trades, the price for financial instruments is especially important for consuming companies' ability to turn profits as they deliver electricity to private consumers and other businesses.

As each winter approaches and the fear of high electricity prices drives the attention of all consumers to the hydrological balance, does this affect prices at the financial market as well?

Hypothesis

The theory of hydro economics states the spot prices are affected by the hydrological balance, is there is more water available prices go down if demand is unchanged. The theory behind the spot-future parity states that the price of a future contract is the result of the spot price adjusted for storage costs and convenience yield. Both the storage costs and the convenience yield in hydropower are connected to the available amount of water at any given time. Is the short term hydrological balance of reservoir, inflow and snow a good measurement for the adjustment made to the spot price to get the future price?

- Does an increase in reservoir levels affect prices?
- Does a high inflow of water to reservoirs affect prices?
- Is there an effect of snow in the mountains on the future- and forward prices?
- Are different contracts with different time aspects affected by different hydrological factors?

Chapter 2, Introduction

Hydropower

To produce electricity generators need a primary energy source that can drive the turbines. Hydropower is based on water getting energy from waterfalls by gravity, and the energy can come from both unregulated river flows and regulated dams with limited storage capacity.

Hydropower has several characteristics which defines the market. First of all hydropower has high fixed cost regarding investments, these are also sunk costs that is irreversible when the investment is made. Second, the storage of water is complicated as there is high uncertainty regarding inflow to dams. Third, there are limitations to the grid which means there are limits on how much electricity can be sent from one location to another. Last we have that produced electricity must be equal to consumed electricity at all times as there are no way of storing electricity in the grid. (Førsund 2007)

Hydropower does also have a characteristic that distinguish it from forms of producing electricity, hydropower plants are fairly easy and cheap to shut down and start up compared to thermal energy. This makes hydropower a highly sought after form of producing electricity as this production has to be monitored and adjusted constantly due to the fact that produced electricity must be equal to consumed electricity at all times.

Hydropower model

The basic hydropower model uses these notations:

${e_t}^H$ – Electricity produced from regulated hydropower

${e_t}^R$ – Electricity produced from unregulated hydropower

R_t – Reservoir level at time t

$\bar{R}$ – Reservoir capacity

w_t – Inflow to reservoir

$\bar{e}^H$ – Production capacity for regulated hydropower

First we have the objection function; we want to maximize our earnings.

$$\max \sum_{t=1}^{T} \int_0^{{e_t}^H + {e_t}^R} p(z)dz$$

We also have to consider multiple constraints regarding storage and production. These constraints are:

- Storage constraint $R_t \leq \bar{R}$

  The storage constraint states that there is a maximum reservoir level we need to consider

- Water constraint $R_t = R_{t-1} + w_t - e_t{}^H$

  The water constraint states that the water stored at the end of a period is the sum of storage at the end of last period and the inflow in this period, minus the water used in production this period

- Production constraint $e_t{}^H \leq \bar{e}^H$

  The production constraint states that there is a maximum production capacity to be considered.

From this we get our model which we solve with regards to what conditions we have:

$$\max \sum_{t=1}^{T} \left[\int_{0}^{e_t{}^H + e_t{}^R} p(z)dz \right] - \gamma_t [R_t - \bar{R}] - \lambda_t [R_t - R_{t-1} + w_t - e_t{}^H] - \sum_{t=1}^{T} \rho_t [e_t{}^H - \bar{e}^H]$$

(Førsund 2007)

As Førsund shows in his model electricity prices are highly affected by the access to water, the amount of water stored, and how much water that is added at any given period.

Organization of the Nordic power market

The Nordic Power marked consists of a financial market for futures- and forward contracts, a day-ahead spot marked and an intra-day balancing marked called Elbas. (Spot 2011)

In the day-ahead spot marked buyers and seller has to submit their bids and offers before 12:00 the previous day. After all bids and offers are presented supply and demand curves are made to find the clearing price for each area and time period the following day, results are ready at approximately at 13:00. All countries are divided into areas with its own spot price due to constraints in the power grid. Likewise each day is divided into 24 time periods where the time from 08:00 to 20:00 are peak hours, when consumption is at its highest, and the hours before and after are off-peak. (Spot 2011)

The intraday Elbas market makes for only a fraction of the traded electricity. The main function for this market is to adjustments since consumption rarely s as expected the day ahead. Here only one participant buys or sells electricity according to needs in the market. (Spot 2011)

Futures and forward contracts are traded at NASDAQ OMX at real time. Here both the physical participants and speculators can trade in contracts to try and beat spot prices in the future. Since electricity can't be stored the contracts cash settlements against the system price at the spot exchange. To hedge against difference in area prices there are also Contracts for Difference. (Spot 2011)

Nord Pool and its history

In 1991 the Norwegian government decided to deregulate the electricity market. This meaning the price of electricity should not be decided by the government but be the result of a market consisting of producers and consumers. In 1993 Statnett marked AS was established as an independent company, and in 1995 the framework for an integrated Nordic power market was made. (Commodities 2011)

In 1996 Norway and Sweden established Nord Pool ASA, a joint power exchange for the two countries. The first seasonally based financial forward contracts was introduced in 1997, these contracts had a time horizon of three years. Finland and western Denmark joined the exchange in 1998, and in the same year annual forward contracts was introduced. (Commodities 2011)

The intraday market, Elbas, was first introduced in Finland and Sweden in 1999. The joint Nordic power exchange was completed in 2000 when also Eastern Denmark joined Nord Pool. The same year contracts for difference were introduced, making it possible to hedge for spot prices in a particular area. (Commodities 2011)

In 2001 Nord Pool ASA applied to be a licensed clearing house, and this became official in 2002. This also meant that the clearing house and the spot market were demerged into separate companies. The quarterly and monthly forward contracts were introduced in 2003, and in 2006 the time horizon was extended to 6 years. (Commodities 2011)

In 2008 NASDAQ OMX acquired Nord Pool Clearing ASA, Nord Pool consulting and the international products, and merged them into NASDAQ OMC Commodities AS. In this process Statnett and Svenska

Kräftnett also an option to sell Nord Pool ASA. The next year Norway joined Elbas, and in the summer of 2010 NASDAQ OMX acquired Nord Pool ASA from after the Norwegian and Swedish owners decided to exercise their option to sell.(Commodities 2011)

Futures and forward contracts at Nord Pool

The futures and forward contracts at Nord Pool are both standardized contracts. The contracts have the same specification when it comes to volume and quality (there is no quality difference), but they have different settlements and the delivery periods vary. However all the contracts have cash settlement as electricity is a commodity which cannot be stored. The settlement is calculated against the system price at the spot market throughout the settlement period. (Commodities 2011)

Future contracts include contracts for days and weeks. These contracts have cash settlement both on a daily mark-to-market basis and final spot reference that starts at the expiry date of the contract. Forward contracts are contracts for months, quarters and years. These contracts do not have a realized settlement towards the system price in the trading period, but realizes cash settlement in the delivery period. As it is only settlement process and maturity time that differs for the different future and forward contracts at Nord Pool the other factors in the spot-future parity are the same. (Commodities 2011)

The storage cost for hydropower is connected to the storage of water in reservoirs. A reservoir has high investment costs, but the actual storage costs for water when the reservoir is operative are close to zero. On the other hand a reservoir can only hold a certain amount of water. If this level is exceeded water will be spilled, and the power company will not gain any income from this water. Therefore the cost of carry is equal to the alternative cost, the risk of the reservoir overflowing and water being spilled. (Førsund 2007)

The advantage of having water to produce electricity contracts derives from the fact that electricity prices are highly volatile to natural changes in temperature, day light etc. This gives the holder of water in reservoir the benefit of being able to produce electricity at a time with high prices. (Førsund 2007)

As we know water is essential for the future contracts at Nord Pool due to its high fraction of hydropower energy. Water is mainly stored in reservoirs, but as the Nordic country as a cold climate with snow during the winter water can also be stored as snow in the mountains. The snow will effect both the cost of carry, through the danger of overflow when it melts, and the convenience yield, through water in reservoirs in the spring.

Why trade with futures and forward contracts?

Future and forward contracts are used by different participants for different reasons. A participant that also participates in the physical market uses the financial market to secure the price of electricity in the future. They can spread the risk by investing in different contracts, and usually most of their sold bough electricity is hedged at a previous time. This creates more security, and if luck firms can “beat” the spot price and increase profits. (Hull 2008)

Chapter 3, Theory

Basics for future contracts

Future contracts are mainly financial instruments used to secure prices in the future. The contracts are standardized regarding volume, quality, time and place of delivery, and the go through a clearing house which bears the actual risk and acts like the counterpart in each trade. Forward contracts however, are not standardized, and are entered between seller and buyer without a clearinghouse as an impartial “middle man”. Here the buyer and seller each take on their own risk, and the contract are specified to their wishes instead of being a predetermined standard. (ZVI Bodie 2009)

The time from when a future/forward contract is bought or sold to the settlement period/point starts is called maturity time. During this time the price of the contract can be highly volatile, but theory states that both the volatility and the basis will decrease and get close to zero as the maturity time is running out. (ZVI Bodie 2009)

Basis is the difference in the spot price and the future price. This is often looked at as a premonition of how the spot price will develop in the future. However there are several factor contributing, and the basis vary throughout the maturity time. (ZVI Bodie 2009)

Mark to market

Marking to market is the process where loss and profit is accrued to trades who trade in future contracts. The most common way is that the traders are required to have a margin account with the clearing house. The margin account acts like a security with highly liquid assets, which is a way to secure that the trader can meet obligations brought on by the future contracts. Since there is a possibility of loss both when being long and short in a future contract all traders a required to post this security. (ZVI Bodie 2009)

Each day a future contract is traded a trader either gain profits or have to take a loss. This profit/loss is settled against the margin account, and this is called mark to market. This realization makes it easier to control that traders can met their obligations, and it also makes it easier tax-wise as we can see the profits/losses for each year even though maturity time can stretch over two/several years. If the margin account falls under a certain level set by the clearing house the trader receives a margin call. This level is often given in percentage of the total investment, and varies by how volatile the prices of the contract are. When receiving a margin call the trader have to transfer more assets or the position will be terminated. This ensures that the traders loss are covered, and thereby eliminating the risk of the clearing house. (ZVI Bodie 2009)

Cash and physical delivery

As mentioned before future contracts are standardized regarding volume, quality, time and place of the delivery. This suggests that if we hold a long position in a future contract we have to go to a specified place to pick up a certain amount of a certain quality of a commodity. However this is not always doable as some commodities are not storable. In these cases the future contract has a cash settlement where the trader is paid a profit/has to pay the loss when comparing the amount paid for the contract to the spot price at the settlement period/point. (ZVI Bodie 2009)

Hedging and speculation

Hedger and speculators are the two types of traders that operate in a future market. The hedger is a producer or a consumer that needs to use the future contracts to protect against a rise or fall in spot prices. A speculator on the other hand trades in the market purely with the goal to gain a profit. It can be argued that speculators should not be allowed into the market, but the fact is that they bring liquidity and increase the volume in the market. (ZVI Bodie 2009)

Spot-Future parity

The spot-future parity is derived from the idea that there can be no arbitrage. No arbitrage means that the rate of return on a position in the future market is equal to the rate on other risk-free investments, if this is not the case investors will exploit until the balance is restored. To meet this idea we have four assumptions that must be true for all market participants:

1. The market participants are subject to no transactions costs when they trade
2. The market participants are subject to the same tax rate on all net trading profits
3. The market participants can borrow money at the same risk-free rate of interest as they can lend money
4. The market participants take advantage of arbitrage opportunities as they occur

(Hull 2008)

For our model we will use these notations:

$t - time, 0\ indicates\ today, and\ T\ indicates\ point\ of\ maturity, t = 0,1, \ldots, T$

$F_t - future\ price\ at\ time\ t$

$S_t - Spot\ price\ at\ time\ t$

$r - risk\ free\ intrestrate$

$q - dividend\ yield\ rate$

$u - storage\ costs\ as\ a\ proportion\ of\ the\ spot\ price$

$y - convenience\ yelds$

$c - cost\ of\ carry$

The basic pricing model for future contracts states that future prices increase at a rate equal to r-q with the maturity of the contract. (Hull 2008)

$$F_0 = S_0 e^{(r-q)T}$$

When it comes to future contracts for commodities however we also need to consider the cost of storage as this can be significant and the benefits of holding a commodity as this can be used instantaneously if needed. (Hull 2008)

The storage increases the future price as the holder of a future contract does not need to take the storage costs as a holder of the physical commodity has to. Storage costs as a fraction of the spot price increases the rate at which the future price increase. (Hull 2008)

$$F_0 = S_0 e^{(r+u)T}$$

Convenience yield is the benefit of holding the actual physical commodity. As mentioned holding the physical commodity makes it possible to use it at any time in contrast to a holder of the future contract that has to wait until maturity time is up. During the maturity there are a number of risks the holder of a future contract is exposed to. The biggest risk is that there can be a shortage of the commodity. Crops might fail, environmental factors can affect delivery or the holder of the contract might just run out of commodity before the maturity point. (Hull 2008)

$$F_0 e^{yT} = S_0 e^{(r+u)T}$$

This can be rewritten with the term cost of carry $c = r + u$

$$F_0 = S_0 e^{(c-y)T}$$

Electricity is initially a non-storable commodity, at least for consumers. The producers however can to some extent store the inputs needed in the production. This storage is in hydro energy done through huge reservoirs made by the producers, but also nature stores water during the winter as snow. (Hull 2008)

The construction of reservoirs requires large investment costs, but as soon as the reservoir is finished the marginal cost of storage is equal to zero as long as the reservoir does not overflow. If the reservoir for any reason does overflow the marginal cost of storage equals the alternative cost we get from the overspill, the lost income we could have gained from the water had it been used to produce electricity.

When the risk of overflow during a contracts maturity period is close to zero we get the future-spot parity of:

$$F_0 = S_0 e^{(-y)T}$$

Here *y* goes towards zero when reservoir fillings are high, and becomes positive as people are getting worried about the supply situation. When reservoir fillings get really low *y* increases drastically to keep reservoir levels from dropping to zero.

If there is a risk of overflow however *y* is zero and we get the future-spot parity of:

$$F_0 = S_0 e^{(\Pr obxE(S_T))T}$$

Where $\Pr obxE(S_T)$ is the probability of overflow, in other words the expected marginal cost.

Model

When analyzing datasets we need to identify the properties of our datasets. We have observations over time, but we have multiple observations at each point in time. Even though we are not interested in the effect over time, panel data have certain properties that we need to take into consideration when analyzing the panel data. We will return to these properties later.

Before analyzing the actual data we need to combine our two previous models for future pricing. We have two different models occurring at two different states, if there is not (1) or if there is (2) a probability of overflow.

$$F_0 = S_0 e^{(-y)T} \quad (1)$$

$$F_0 = S_0 e^{(\Pr obxE(S_T))T} \quad (2)$$

We can combine these

$$F_0 = S_0 e^{(\rho[\Pr obxE(S_T)]-[1-\delta]y)T} \qquad \rho = \begin{cases} 0 \; if \; Prob(overflow) = 0 \\ 1 \; if \; Prob(overflow) > 0 \end{cases}$$

We see that if there is not a critical danger of an overflow we get the future spot parity with convenience yield, and likewise if there is a crucial danger of overflow we get the future spot parity with the alternative cost presented with an overflow.

That the convenience yield and alternative cost brought on by the probability of overflow have an exponential form is consistent with the theory that they are not linear in their values. When the reservoir level is high there is not any advantages of stocking water, and at the same time there is not an alternative cost as long as there is not a danger of overflow. However, if reservoir levels are low the advantages of stocking water are high as people are getting scare that the reservoirs may run out, their willingness to pay increases and drive the prices upwards. If there is a probability of overflow the potential cost will increase, and we also get a decrease in the willingness to pay. This means that our variables are more likely to take on an exponential form than to be linear.

In this analysis however we do not want to measure the effect spot price has on the future price, but if the hydrological factors combined with days to maturity can be used as measurement for the convenience yield and the alternative cost with the probability of overflow. We also need to put the equation in a form that is possible to analyze with statistical software. First we make the equation onto log form and then rearrange so that we can combine the future price and the spot price in one term:

$$lnF_0 = lnS_0 + (\rho[\Pr obxE(S_T)] - [1-\delta]y)T$$

$$lnF_0 - lnS_0 = (\rho[\Pr obxE(S_T)] - [1-\delta]y)T \quad \rho = \begin{cases} 0 \; if \; Prob(overflow) = 0 \\ 1 \; if \; Prob(overflow) > 0 \end{cases}$$

As mentioned in the introduction the price of electricity is highly dependent on the variables in our dataset. From the model above we have a wide range of possibilities when it comes to analyzing our data. We have in all seven variables, seven seasonal variables and seven variables for difference, and from these we can create models suitable for analyzing. The different variables are:

$Name - Name\ of\ contract\ , ENOM + type + maturity\ point$

$Date - Date\ of\ observation$

$DTM - Days\ to\ maturity\ (T)$

$FP\ - Price\ of contract\ (future\ or\ forward)$

$SP\ - Spot\ price$

$ARLN - average\ reservoir\ level\ in\ Norway$

$RLN - reservoir\ level\ in\ Norway$

$RN = RLN - ARLN,\ seasonal\ difference$

$ARLS - average\ reservoir\ level\ in\ Sweden$

$RLS - reservoir\ level\ in\ Sweden$

$RS = RLS - ARLS,\ seasonal\ difference$

$ARLF - average\ reservoir\ level\ in\ Finland$

$RLF - reservoir\ level\ in\ Finland$

$RF = RLF - ARLF,\ seasonal\ difference$

$AIN - average\ inflow\ in\ Norway$

$IN - Inflow\ to\ reservoirs\ in\ Norway$

$IFN = IN - AIN,\ seasonal\ difference$

$AIS - average\ inflow\ in\ Sweden$

$IS - Inflow\ to\ reservoirs\ in\ Sweden$

$IFS = IS - AIS,\ seasonal\ difference$

$AIF - average\ inflow\ in\ Finland$

$IF - Inflow\ to\ reservoirs\ in\ Finland$

$IFF = IF - AIF,\ seasonal\ difference$

$AEESN - Average\ Energy\ equivalent\ of\ the\ snow\ in\ Norway$

$EESN - Energy\ equivalent\ of\ the\ snow\ in\ Norway$

$ESN = EESN - AEESN,\ seasonal\ difference$

The variables give us the possibility of analyzing if there is any effect in many different ways. To be able to draw any conclusions we need to analyze the variables separately and in different combinations. We will analyze models for actual observations, seasonal variables and difference variables that are the difference between the actual observation and the seasonal variable. We will also conduct analysis of reservoir level, inflow and snow all together and independently.

We have chosen to analyze the same models for all contracts to be able to get information from each and to compare the different type of contracts. The models we have chosen to analyze are:

- Test for the actual observations, all together and independently

  $lnF_0 - lnS_0 = (RLN + RLS + RLF + IN + IS + IF + EESN)DTM$ ***(1)***

  $lnF_0 - lnS_0 = (RLN + RLS + RLF)DTM$ ***(2)***

  $lnF_0 - lnS_0 = (IN + IS + IF)DTM$ ***(3)***

  $lnF_0 - lnS_0 = (EESN)DTM$ ***(4)***

- *Test for the seasonal variables, all together and independently*

  $lnF_0 - lnS_0 = (ARLN + ARLS + ARLF + AIN + AIS + AIF + AEESN)DTM$ ***(5)***

  $lnF_0 - lnS_0 = (ARLN + ARLS + ARLF)DTM$ ***(6)***

  $lnF_0 - lnS_0 = (AIN + AIS + AIF)DTM$ ***(7)***

  $lnF_0 - lnS_0 = (AEESN)DTM$ ***(8)***

- Test for the actual observations and the seasonal variables, all together and independently

  $lnF_0 - lnS_0 = (ARLN + RLN + ARLS + RLS + ARLF + RLF + AIN + IN + AIS + IS + AIF + IF + AEESN + EESN)DTM$ ***(9)***

  $lnF_0 - lnS_0 = (ARLN + RLN + ARLS + RLS + ARLF + RLF)DTM$ ***(10)***

  $lnF_0 - lnS_0 = (AIN + IN + AIS + IS + AIF + IF)DTM$ ***(11)***

  $lnF_0 - lnS_0 = (AEESN + EESN)DTM$ ***(12)***

- Test for the seasonal difference variables, all together and independently

  $lnF_0 - lnS_0 = (RN + RS + RF + IFN + IFS + IFF + ESN)DTM$ ***(13)***

  $lnF_0 - lnS_0 = (RN + RS + RF)DTM$ ***(14)***

  $lnF_0 - lnS_0 = (IFN + IFS + IFF)DTM$ ***(15)***

  $lnF_0 - lnS_0 = (ESN)DTM$ ***(16)***

- Test for the actual observations and the seasonal difference variables, all together and independently

  $lnF_0 - lnS_0 = (RLN + RLS + RLF + IN + IS + IF + EESN + RN + RS + RF + IFN + IFS + IFF + ESN)DTM$ ***(17)***

  $lnF_0 - lnS_0 = (RLN + RLS + RLF + RN + RS + RF)DTM$ ***(18)***

  $lnF_0 - lnS_0 = (IN + IS + IF + IFN + IFS + IFF)DTM$ ***(19)***

  $lnF_0 - lnS_0 = (EESN + ESN)DTM$ ***(20)***

Now we have defined the form of the models we want to use in our analysis, and stated that we are dealing with panel data. Before we can draw any conclusions from our models we need to test the functional form for our models. The functional form needs to satisfy the following assumptions: (Wooldridge 2009)

1. Linearity and weak dependence
2. No perfect collinearity among the independent variables
3. Zero conditional mean of the disturbances
4. The error terms are homoscedastic
5. No serial correlation

Assumption number one includes to statistical tests. The first thing we need to do with our time series data is to test if we have stationary data or not. If the data are stationary they have the same distribution independently over time. In this analysis we have chosen to conduct a fisher test for analysing stationarity in panel data. (Wooldridge 2009)

$$\begin{Bmatrix} H_0\text{: } Not\ stationary\ data \\ H_1\text{: } Statinary\ data \end{Bmatrix}\ Reject\ H_0\ if\ p_{value} < \alpha$$

Note that this test is for the dataset, not for each model. We want to reject H_0 in this test.

The next part of assumption one is to test if each model is linear in its parameters. To do this we conduct a Ramsey test: (Wooldridge 2009)

$$\begin{Bmatrix} H_0\text{: } Parameters\ are\ linear \\ H_1\text{: } Not\ linear\ parameters \end{Bmatrix}\ Reject\ H_0\ if\ p_{value} < \alpha$$

Assumption two states that there should be no perfect collinearity. To test for this we simply need to look at the estimation of our model and see if any of the variances are equal to zero. If this is the case assumption three does not hold. (Wooldridge 2009)

$$\begin{Bmatrix} H_0\text{: } all\ {\sigma^2}_i \neq 0 \\ H_1\text{: } One\ or\ more\ {\sigma^2}_i = 0 \end{Bmatrix}\ reject\ H_0\ if\ not\ all\ {\sigma^2}_i\ is\ different\ from\ zero$$

Assumption three states zero conditional mean. This means that given any of the dependent values the expected value of the error term will be u. If assumption number four holds we have exogenous explanatory variables, and if it fails we have endogenous explanatory variables. To test assumption four we first predict the residuals, and then test if they are statistically significant different from zero: (Wooldridge 2009)

$$\begin{Bmatrix} H_0: E(\varepsilon|x_i) = 0 \\ H_1: \ E(\varepsilon|x_i) \neq 0 \end{Bmatrix} \ Reject\ H_0\ if\ p_{value} < \alpha$$

Assumption number four does not affect the actual estimates, but it does effect the calculations of T, F and χ statistics. If hetroscedasticity is present we need to use robust standard errors when conducting other tests. Since this is a panel data we choose to estimate with robust standard errors adjusted for clusters. (Wooldridge 2009)

The last assumption states no serial correlation. This states that the error term at time period t-1 should not have any effect on *y* at time period t. To test for this we obtain residuals from our model and then test the lagged residuals in the model. If the residuals are individual statistically significant we do not have serial correlation. (Wooldridge 2009)

$$\begin{Bmatrix} H_0: E(\varepsilon|y_i) = 0 \\ H_1: \ E(\varepsilon|y_i) \neq 0 \end{Bmatrix} \ Reject\ H_0\ if\ p_{value} < \alpha$$

After conducting tests for to see if the assumptions hold we have a set of tests that will help us analyze the effect of our hydrological variables n the prices of future and forward contracts. First we conduct tests for individual significance. We compute T-statistics for all included variables, and compare them to the critical t-value:

$$\left. \begin{matrix} H_0: \beta_i = 0 \\ H_1: \beta_i \neq 0 \end{matrix} \right\} \ Reject\ H_0\ if\ |T_{value}| > T\alpha/_2$$

Further we want to test if the included variables for reservoir level and inflow are jointly significant. To do this we conduct two F-tests, one for all reservoir level variables and one for the inflow variables.

$$\left.\begin{matrix} H_0: \sum \beta_{RLi} = 0 \\ H_1: \sum \beta_{RLi} \neq 0 \end{matrix}\right\} Reject\ H_0\ if\ |F_{value}| > F\alpha_{/2}$$

$$\left.\begin{matrix} H_0: \sum \beta_{Ii} = 0 \\ H_1: \sum \beta_{Ii} \neq 0 \end{matrix}\right\} Reject\ H_0\ if\ |F_{value}| > F_{\alpha}$$

When conducting the tests above we test against a chosen significance level, α. The significance level means setting the acceptable probability of H_0 in fact being true when we chose to reject it. The practical approach is that the rejection of H_0 is correct in (1-α)% of the tests. The models above are tested to see if we can use variables for reservoir level, inflow and energy equivalent of snow in the mountains to represent the value of convenience yield and the alternative cost regarding the danger of overflow. In the analysis we want to minimize the chance of rejecting a model when it is in fact valid, and therefore we choose the significance level of 1%. In the other tests we also want to minimize the chance of rejecting H_0 when it is in fact true. The only time we actually want to reject H_0 is when we are testing for stationary variables, but as we want to be accurate, we use a significance level of 1% when conducting all tests. (Wooldridge 2009)

Another important factor of the panel data is that they need to be balanced in order to carry out the tests with the statistical software. A balanced panel data set is a dataset with the same number of observations each time period. We will return to how we have chosen to keep each dataset balanced in chapter four.

Chapter 4, Datasets

Nord Pool has all together five different future and forward contracts, so in this analysis we have five different datasets. All datasets contains the variables we used to make the models.

The data for reservoir levels, inflow and energy equivalent of the snow has weekly observations. The contracts are traded every work day throughout the year, but in this analysis I have chosen to include the observations for Wednesdays. This is due to the fact the Norwegian energy resources and energy directory releases the number for the reservoir level each Wednesday at 13:00. This number is the focus for most discussions regarding electricity prices both in Norway and to some extend in the whole Nord pool area.

Reservoir Level

The data for the reservoir level is collected from the Norwegian water and natural resource directory, the Swedish energy report and the Finnish environment institute. Reservoir is total water stock in percentage of the maximum water stock. We also have season variables where we found the average reservoir level from 1995 through 2010, with the exception of Finland where we are missing values for the years 1995 and 2001.

As can be seen in figures one, two and three the red line which is the average reservoir level for each country shows that the reservoir level moves in cycles with periods of large inflow followed by periods where reservoirs are drained when producing electricity. The actual reservoir level also follows this path, but deviates to various degrees from the average.

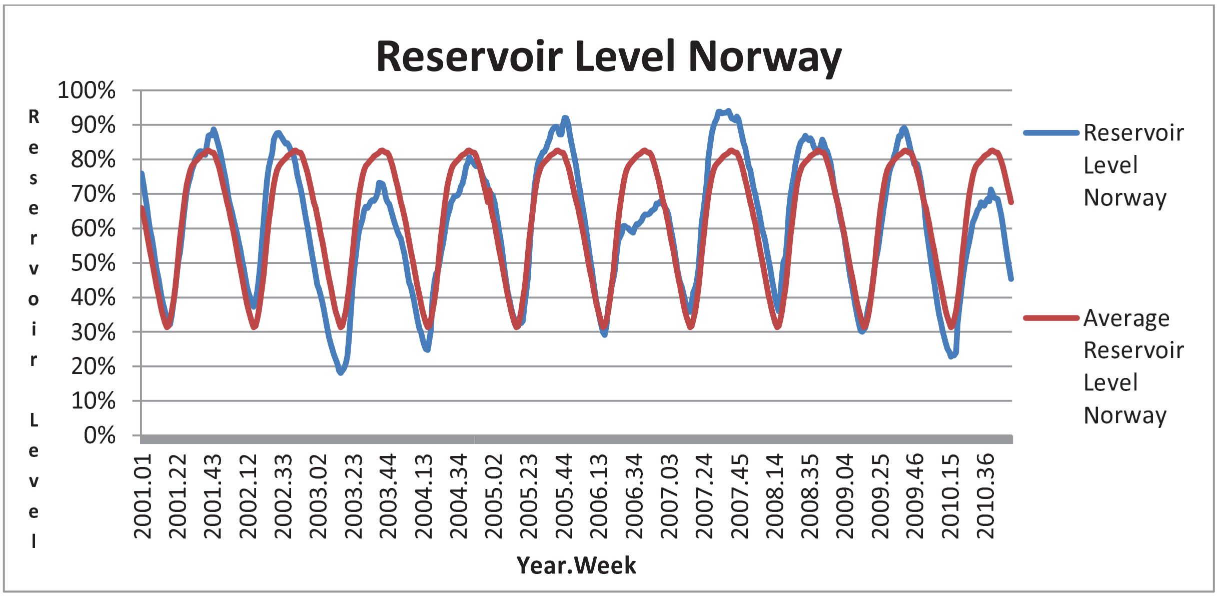

Figure 1: Actual and average reservoir level Norway

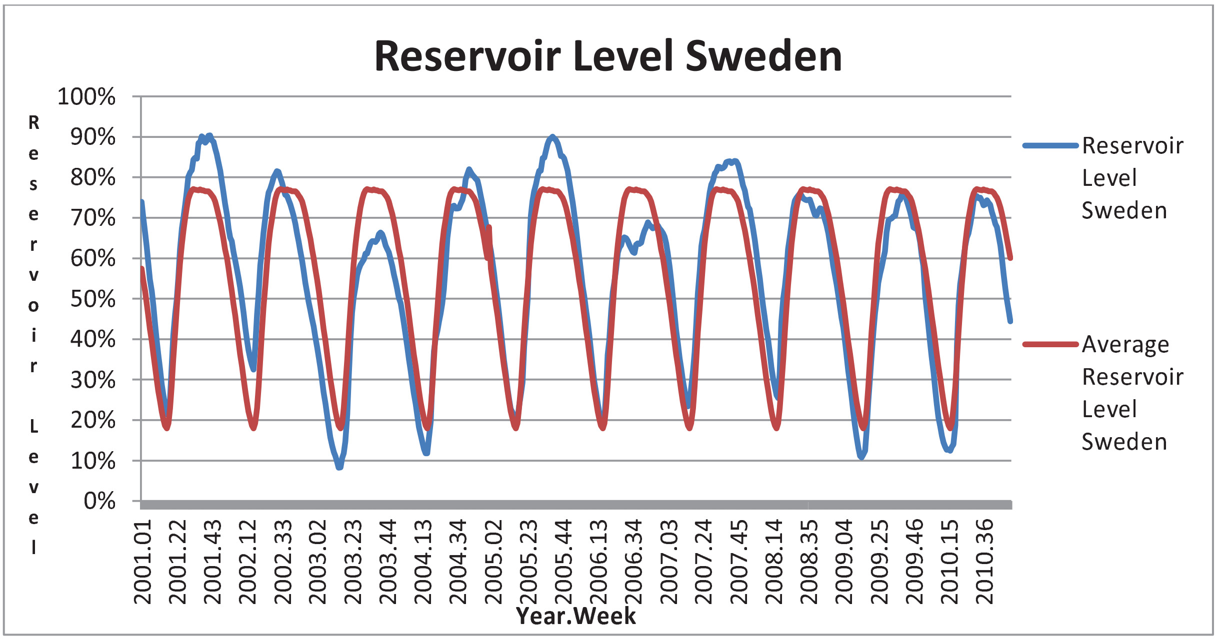

Figure 2: Actual and average reservoir level Sweden

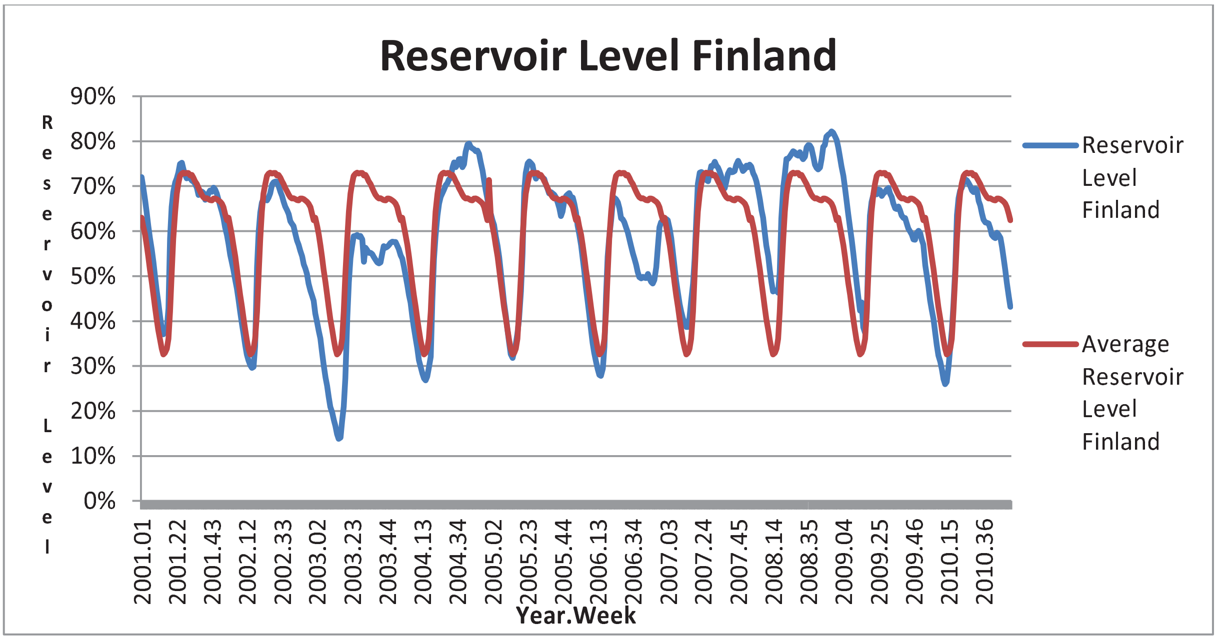

Figure 3: Actual av average reservoir level Finland

Inflow

The data for the inflow is collected from the Norwegian water and natural resource directory, the Swedish energy report and the Finnish environment institute. The inflow is measured in % of the maximum water stock. We also have season variables where we found the average inflow for Norway and Sweden from 1995 through 2010, and for Finland from 2001 through 2010.

In figures four, five and six we see that also the inflow moves in cycles where we have periods with more water coming into the reservoirs followed by periods where the inflow is lower. We see that the actual inflow follow the same cycles as the average, but it deviates more than the reservoir level from its average. This is due to the fact the inflow is highly volatile, where rain and snowmelt deviates quite a lot from a period one year to another period next year.

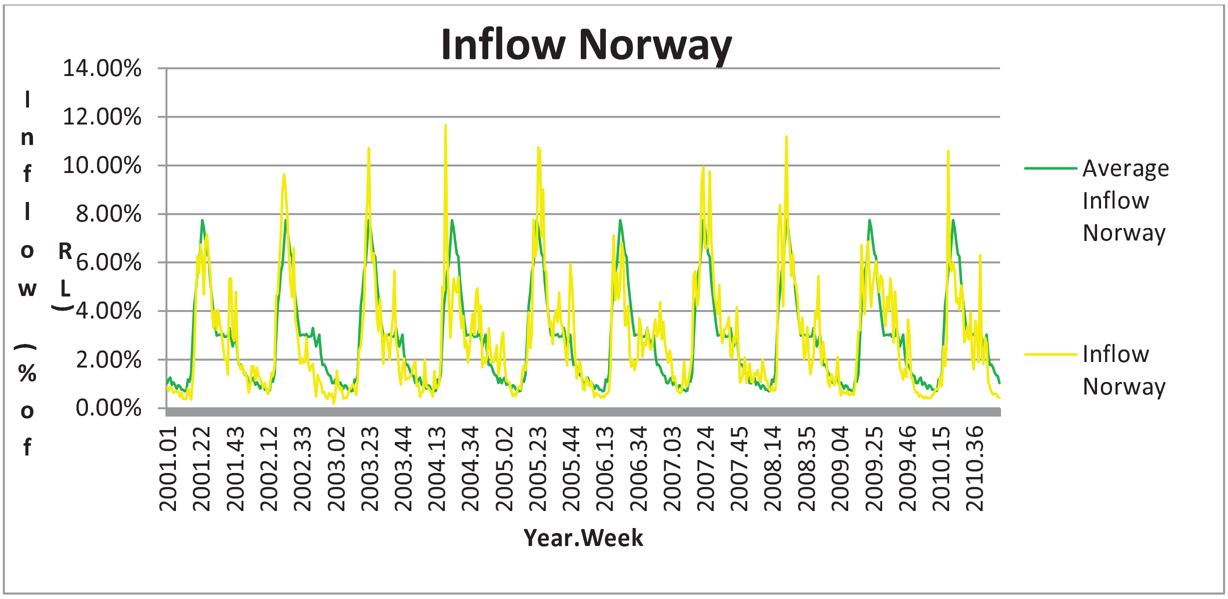

Figure 4: Actual and average Inflow Norway

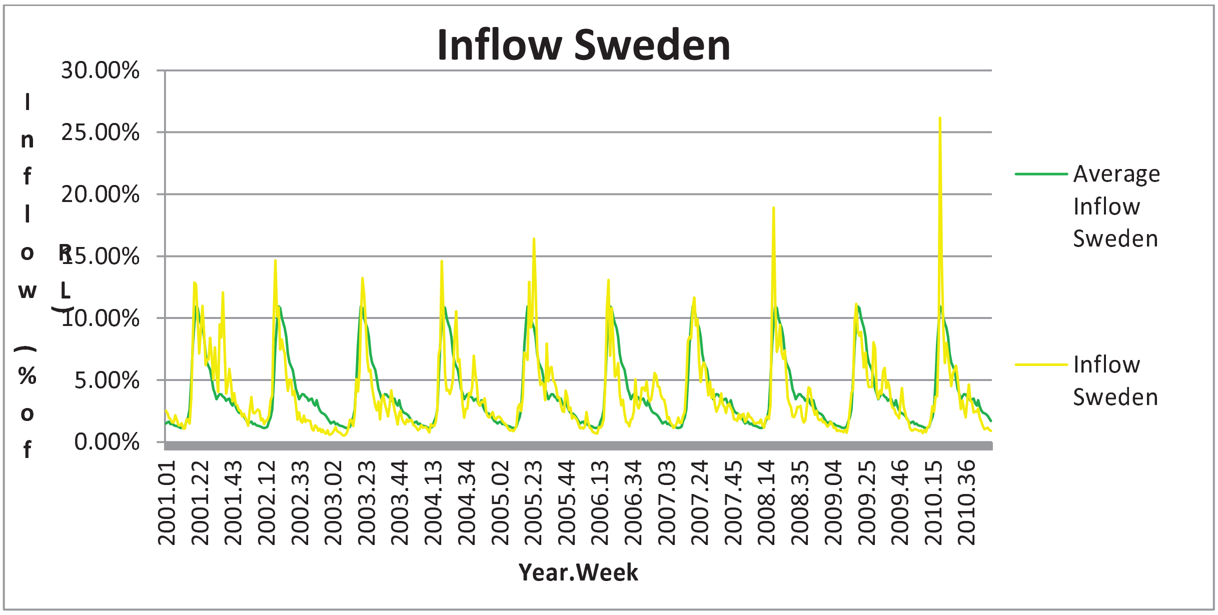

Figure 5: Actual and average inflow Sweden

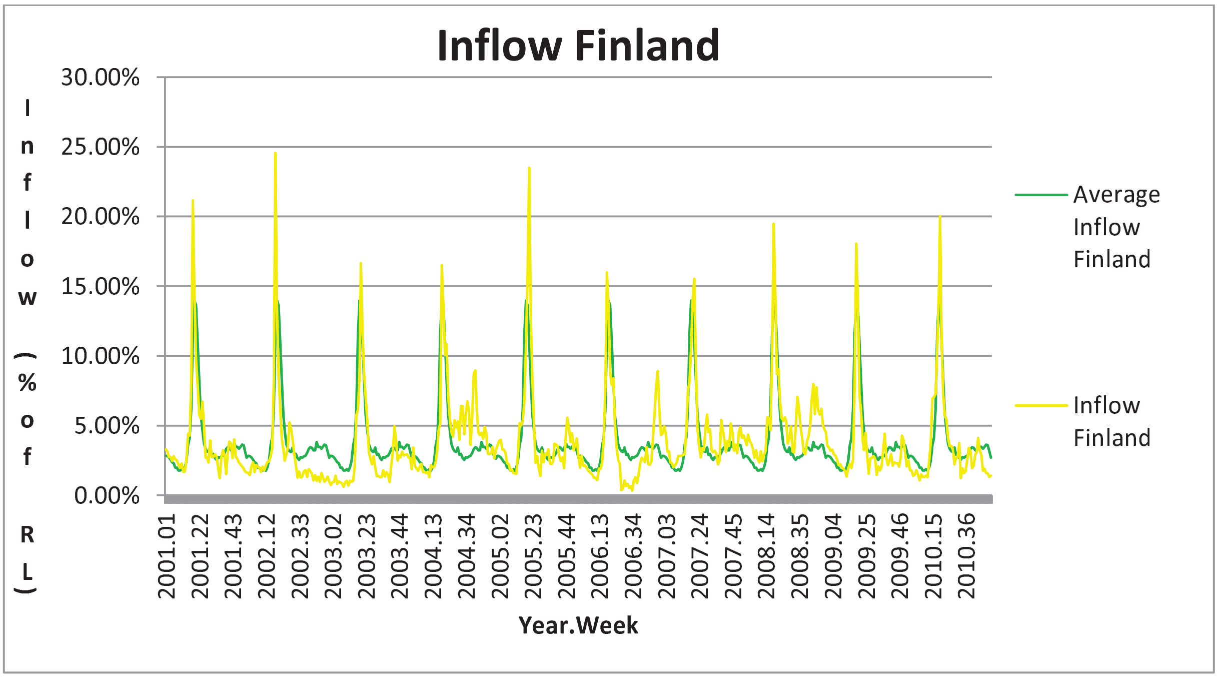

Figure 6: Actual and average inflow Finland

Energy Equivalent of the Snow

The data for the energy equivalent of the snow is provided by the Norwegian Water Resources and Energy Directorate upon request(NVE 2011). The data states approximately how much energy (Gwh) can be produced from the snow that is stored in the mountains in connection to water reservoirs. We also have a season variable which is the average each week from 2001 through 2010 Note that this number tends to be exaggerated.

From figure seven we see that some years have lots of snow and some years have less snow. Note that the difference in energy equivalent also can come from difference in snow quality.

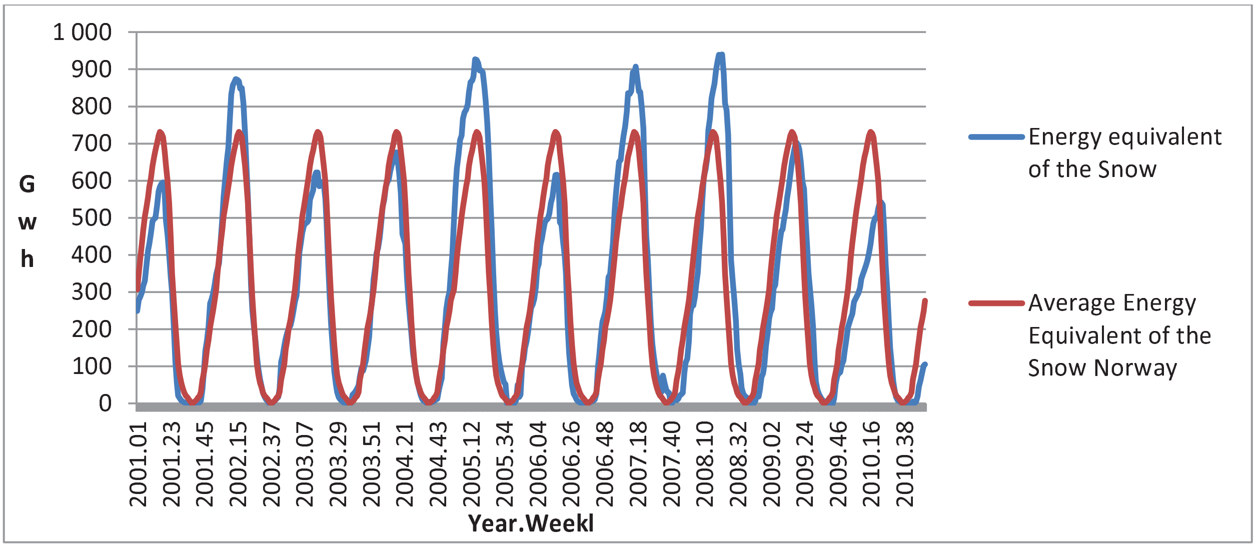

Figure 7: Energy Equivalent of the Snow in Norway

Day

The daily future contracts were traded when Nord Pool was declared an official clearinghouse in 2001. In figure 8 we can see that the price are volatile, but seems to increase at a steady rate from 2001 to the middle of 2008. After this we get a shorter period with a large drop in prices. We should also notice that the last month of 2010 seems to be extreme with prices increasing drastically.

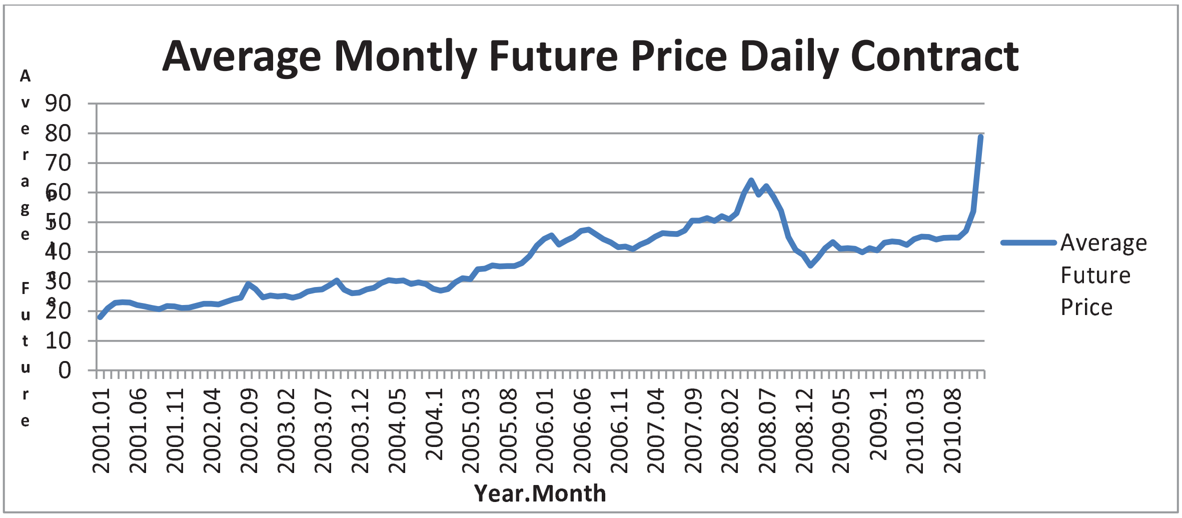

Figure 8: Average Monthly Future price for the Daily contract

At each time in our dataset we at least four weekly contracts traded. To make sure the dataset is balanced we have concentrated on the four contracts that are closest to maturity. This means that in the analysis we have included four observations each Wednesday from 2001 to 2010.

Week

The weekly contracts were also traded when Nord Pool was declared an official clearinghouse in 2001. The weekly contacts are also volatile, but they have more extremes. From 2007 there are also high tops and low bottoms, but the price does not come back down to the level it had in 2007.

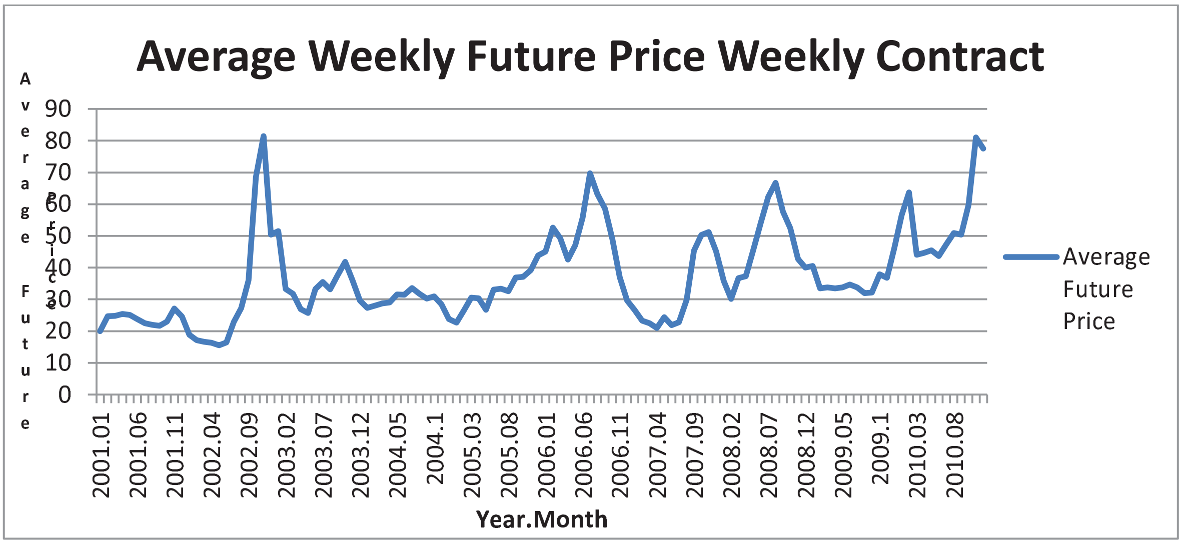

Figure 9: Average Monthly Future price for the Weekly contract

At each time in our dataset we have between four and eight weekly contracts traded. To make sure the dataset is balanced we have concentrated on the four contracts that are closest to maturity. This means that in the analysis we have included four observations each Wednesday from 2001 to 2010.

Month

The monthly contracts were not introduced to the market before July 2003. These contracts seem less volatile from one period to another, and the increase at the end of the period looks like increases in previous periods.

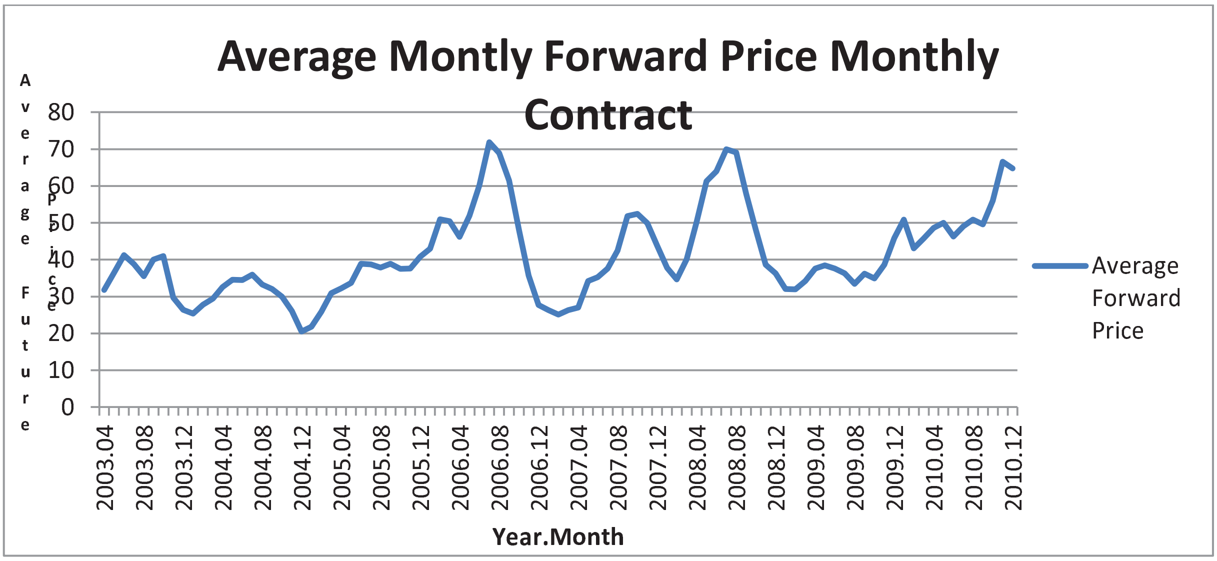

Figure 10: Average Monthly Future price for the Monthly contract

When the contracts where introduced there where fur contract traded at one time, but in September 2003 this increased to at least six contracts traded each day. In the analysis we have concentrated on the time from September 2003 to 2010, and we have used the six contracts closes to maturity.

Quarter

The quarterly contracts, sometimes referred to seasonal contracts, were introduced to the market in 2004. Prices here increases over a longer period of time, decreases over a short period before increasing again.

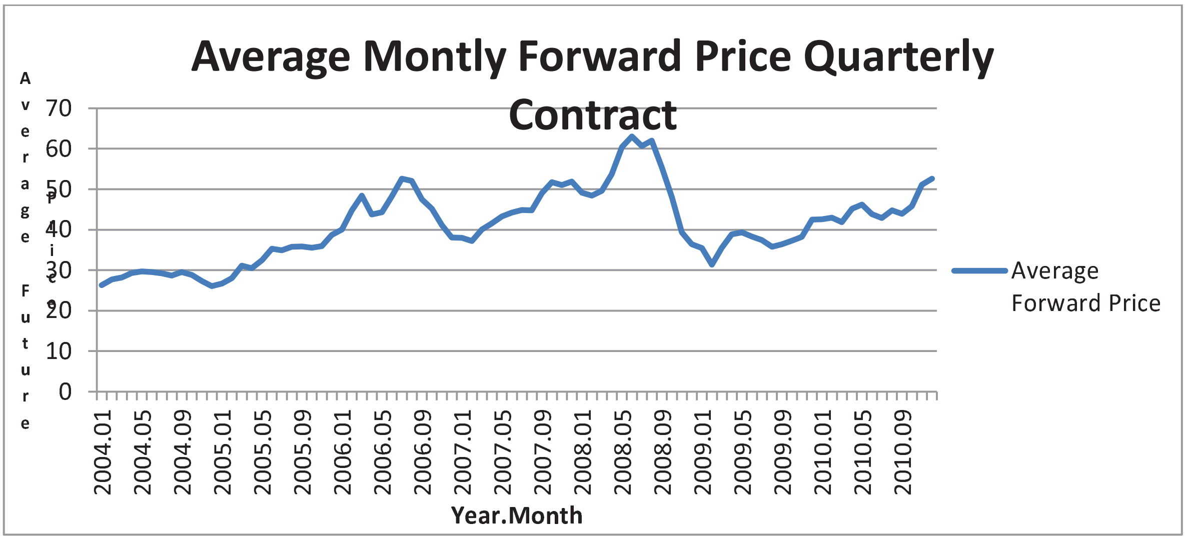

Figure 11: Average Monthly Future price for the Quarterly contract

When the contracts where introduced there where fur contract traded at one time, but from 2005 this increased to eight contracts. In the analysis we have included the eight contracts traded each day from 2005 through 2010.

Year

The yearly contracts were the first ones introduced in 1997, and was then traded when Nord Pool became an official clearinghouse in 2001. Except for one period with decreasing prices the average price for the monthly contracts seems to be increasing steady.

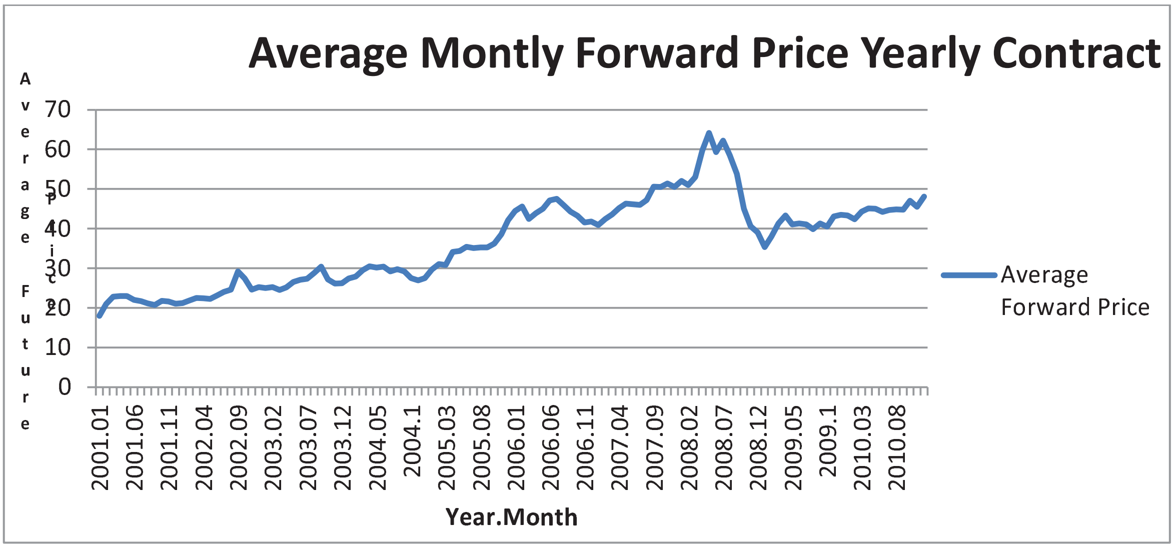

Figure 12: Average Monthly Future price for the Yearly contract

The yearly contracts initially had a three year time horizon, meaning there were three different yearly contracts traded at any given time. In 2006 the time horizon increased to six years, and thereby increasing the number of contracts traded at any given time. To keep the dataset balanced we have included the three contracts closest to maturity from 2001 through 2010.

Chapter 5, Results

When constructing the model we have the variables mentioned above. In the estimation we have marked the variables with numbers:

$Name - Name\ of\ contract\ , ENOM + type + maturity\ point$

$Date - Date\ of\ observation$

$DTM - Days\ to\ maturity\ (T)$

$FP\ - Price\ of contract\ (future\ or\ forward)$

$SP\ - Spot\ price$

$(1) ARLN - average\ reservoir\ level\ in\ Norway$

$(2) RLN - reservoir\ level\ in\ Norway$

$(3) ARLS - average\ reservoir\ level\ in\ Sweden$

$(4) RLS - reservoir\ level\ in\ Sweden$

$(5) ARLF - average\ reservoir\ level\ in\ Finland$

$(6) RLF - reservoir\ level\ in\ Finland$

$(7) AIN - average\ inflow\ in\ Norway$

$(8) IN - Inflow\ to\ reservoirs\ in\ Norway$

$(9) AIS - average\ inflow\ in\ Sweden$

$(10) IS - Inflow\ to\ reservoirs\ in\ Sweden$

$(11) AIF - average\ inflow\ in\ Finland$

$(12) IF - Inflow\ to\ reservoirs\ in\ Finland$

$(13) AEESN - Average\ Energy\ equivalent\ of\ the\ snow\ in\ Norway$

$(14) EESN - Energy\ equivalent\ of\ the\ snow\ in\ Norway$

$(15) RN = RLN - ARLN$

$(16) RS = RLS - ARLS$

$(17) RF = RLF - ARLF$

$(18) IFN = IN - AIN$

$(19) IFS = IS - AIS$

$(20) IFF = IF - AIF$

$(21) ESN = EESN - AEESN$

To be able to calculate for the effect caused by time to maturity (T), and the properties of convenience yield and alternative cost we have created three sets of variables used in the estimation:

$$x(n) = n * DTM$$

Last we created a variable that combined the future price and the spot price on the left side:

$$lnb = lns - lnf$$

Day

All variables in the dataset are stationary, no variables has zero variance.

The models for the actual observations are all linear and do not have serial correlation at the 1% level. The explanatory power is greatest for the model which includes all hydro factors, even though it is low at 4,2%. The joint tests in this model show significance, but the individual tests show only reservoir level for Finland and snow are significant. The model for individual hydrological factors shows only reservoir level as individually significant.

The models for the seasonal variables also have functional forms that satisfy the time series assumptions at the 1% level. Again we see that the joint tests in the model including all hydrological factors show significance. The individual tests fail in three of four models, and it is only in the mdel for reservoir level where we find that Norway and Finland are individually significant. The overall explanatory power of the models is below 5%, and the model for snow does not have explanatory power.

The models which combine the actual observations with the seasonal variables also satisfy the functional form at the 1% level, but have they have an overall low explanatory power under 5%. In the model for all hydrological factors the joint test for actual observation and seasonal variables are significant. The actual observations and the seasonal variables for Norway and Sweden for inflow in all countries are also independently significant in this model. In the model for reservoir level actual observation and seasonal variable for Norway and the seasonal variable for Finland are significant, and the joint tests show significance. In the two other models we have neither individually or jointly significance.

The analysis for the models with difference variables shows that the model for inflow is not linear in its parameters. The model including all hydrological factors has joint significance for the variables, but neither in this model or in the others we have individual significance. More important none of the tests show explanatory power.

Last we have the models combining actual observations and difference variables. These have the same explanatory power as the models combining actual observation with seasonal variables. All models are linear, and none of them has a problem with serial correlation. The model including all hydrological factors has only the difference variable for inflow in Sweden as significant, but the joint tests show significance for the grouping of variables. The model for reservoir level has the actual observation for Finland and the difference variable for Norway and Finland as individually significant, and the joint test show significant in groupings. The model for inflow has no individually significant variables, but the actual observations are jointly significant.

Week

All variables in the dataset are stationary.

The models for actual observations do not hold for the assumptions regarding the functional form. The model including all hydrological factors and the model for inflow are not linear in their parameters, and the models for the individual hydrological factors have all problems with serial correlation. Only the model for inflow has significant variables at the actual observed inflow for Norway are individually significant. In all other models we have neither individual nor joint significance. The explanatory power varies from 24,07% to 3,74%

The models for the seasonal variables have all problems with serial correlation. All the models, except for the model only including inflow, are linear in their parameters. The model including all hydrological factors has the seasonal variable for inflow in Norway and Sweden and the seasonal variable for snow as individually significant, and the joint test show significance for groups.

The models which combine the actual observations with the seasonal variables have an overall larger explanatory power. The model for reservoir level is not linear and this model and the model for snow has a problem with serial correlation. The model for all hydrological facts has the seasonal variable for inflow in Finland as individually significant and the groups for seasonal reservoir and inflow variables as jointly significant. In the model for reservoir level all groups are jointly significant, and the seasonal variables for Norway and Sweden are individually significant. The model for inflow has the seasonal variables as jointly significant and the actual observed inflow for Sweden as individually significant. The model for snow has the seasonal variable as significant.

The analysis for the models with difference variables shows that they are all linear in the parameters, but have an issue with serial correlation. The explanatory power is greatest for the model including all hydrological factors, and in this model we have joint significance. In the model for snow variables are individually significant.

Last we have the models combining actual observations and difference variables. Here we have serial correlation in the models including only one hydrological factor, and the model for reservoir level does is not linear in its parameters. Tests show joint significance in the model for inflow, and in model for snow the difference variable has individual significance. The model that includes all hydrological variables has an explanatory power of 40,12%, and tests show that the difference variables for reservoir level and the actual observations for inflow are jointly significant.

Month

All variables in the dataset are stationary.

The models for the actual observations have either a problem with serial correlation or are not linear in their parameters. The explanatory power varies form 36,91 in the model for all hydrological factors to 2,42% In the model for snow. Also here there are few variables with individual significance, but we have joint significance in our tests.

The models for the seasonal variables are only linear when including all hydrological factors. This model has an explanatory power of 32,9%, and we have joint significance for all variables. The other models has either one or none individually significant variables.

None of the models which combine the actual observations with the seasonal variables are linear in their parameters. They have a higher fraction of individual significance, and the explanatory power reaches form 56,19% to 8,58%

The analysis for the models with difference variables show that all models are linear, but they all have an issue with serial correlation. The models including one hydrological factor each has all or all but one variable individually significant, while the model combining all hydrological factors has the variables for reservoir level jointly significant. The explanatory variable varies from 25,64% to 3,11%

Last we have the models combining actual observations and difference variables. As with the models combining actual observations with seasonal variables they are not linear in their parameters, but the model combining all hydrological factors has an explanatory power over 50%. In this model the variables for difference in reservoir level and snow are individually significant, while the variables for difference in inflow are jointly significant.

Quarter

All variables in the dataset are stationary.

The models for the actual observations do not have serial correlation. The models for all hydrological factors and for snow are not linear in their parameters, and the model for reservoir level does not have explanatory power. The model for inflow has a low explanatory power of 8,58%, and the inflow in Sweden is not individually significant.

The models for the seasonal variables do either lack linear parameters or explanatory power. The models for inflow and snow do not have significant variables, and in the model for reservoir Sweden is not significant. In the model including all hydrological factors the seasonal variables for inflow are individually significant, and all joint tests show significance.

The models which combine the actual observations with the seasonal variables lack linear parameters. The joint tests show significance, and the explanatory power is between 50% and 11%.

The analysis for the models with difference variables show that the model for all hydrological factors is linear, has an explanatory power of 43,02%, has individual significance in all variables except inflow for Finland, has joint significance, but has a problem with serial correlation. The model for reservoir level is also linear in its parameters and has an explanatory power of 40,60%, with only the difference for Finland as not individually significant, but also has an issue with serial correlation.

Last we have the models combining actual observations and difference variables. Again none of the models are linear. The explanatory power varies from 50,4% to 11,64%, but all the models have significant difference variables.

Year

All variables in the dataset are stationary.

The models for the actual observations are linear it the parameters, but we have an issue with serial correlation for the models for reservoir level and snow. The explanatory powers are low, and all tests reject significant variables, both individually and significant.

The models for the seasonal variables are also linear, and only the model for snow has a problem with serial correlation. This model does not have explanatory power either. The other models has low explanatory powers, and all tests reject significant variables, both individually and significant.

The models which combine the actual observations with the seasonal variables do not have a problem with serial correlation. However the model for inflow is not linear in its parameters. All explanatory powers are above 17%, and the model including all hydrological factors has an explanatory power of 51%. Also here all tests reject significant variables, both individually and significant.

The analyses for the models with difference variables show no problem with serial correlation, but the models for reservoir level and inflow are not significant. Explanatory power varies from 43,66% to 13,63%, and all tests reject significant variables, both individually and significant.

Last we have the models combining actual observations and difference variables. Again we do not have an issue with serial correlation, but the model for inflow is not linear in its parameters. The explanatory powers are the same as for the models combining actual observations and seasonal variables. Again all tests reject significant variables, both individually and significant.

Chapter 6, Discussion

So are the future and forward contract prices sensitive to the hydrological factors reservoir level, inflow and energy equivalent of the snow?

For the daily contracts the models has all over little explanatory power for the price effect not caused by the spot price. The models including all hydrological factors seem the best as we have joint significance for all groups. The fact that there is only joint significance and not individual significance suggests that we need to look at the total of the hydrological factors rather that dividing them into countries. The future and forward prices are prices for the whole Nord Pool area, so this makes since. We get the largest explanatory power by combining the actual observations with either the seasonal variables or the difference variable, suggesting that that deviation from the normal drives the prices.

The models for the weekly contracts have a higher explanatory power than for the daily contracts, this might be because there is little uncertainty in the daily contracts regarding hydrological factors and therefore they don't drive the price in the same way as they do for the weekly contracts. Also for the weekly contracts we get the best results for the combined models, but which one we choose has something to say to what variables are jointly significant. However it seems that the variables for reservoir level and inflow are more significant as they are more often statistically significant both jointly and individually in our estimations. Both inflow and reservoir is easier to measure and easier to handle in estimations then the energy equivalent of the snow, which is often overrated.

The models do not have a good fit with the data for the monthly and quarterly contracts, but the fact that we have higher explanatory power and more significant variables both individually and jointly, suggest that they are an important factor in the price setting of the monthly forward contracts. The explanatory powers for all models including all hydrological factors are at least 25%, and they all have joint significance for either reservoir level, inflow or all, this follows with the reasoning for the weekly contract that reservoir level and inflow are easier to handle.

For the yearly contracts our models has a good fit where only four lacks linearity and only three has a problem with serial correlation. The explanatory power is also good for the models combining actual observations with the seasonal variables or difference variables, and the models for only seasonal variables. This again suggests that the deviation from the normal drives the prices. The big problem with the yearly contracts and our models however is the fact the no variables are statistically significant, not jointly nor individually. The yearly contracts has a long life span, and shifts from almost total uncertainty when the contract is first traded to almost total certainty when the contract is close to maturity. However most of the maturity time is in the time span with high uncertainty, and forecasting may very well have more effect on prices than actual observations. The higher explanatory power in our models does on the other hand suggest some effect from actual observations, making it possible that forecasting adjusted for actual observations is likely to drive prices.

There is also numerous other factors that has been uncovered in the analysis, but has not yet been mentioned. With some exceptions each group of models are arranged the same way when it comes to explanatory power. The model including all hydrological factors has the highest explanatory power, and then follows the model for reservoir level, before there is a jump down to the model for inflow and then last the model for snow. This can be reflected into the real world media where reservoir level is a high focus, the rain is a focus when we are hoping for low electricity prices, and snow is only a topic if reservoirs are low or there is so much snow that there is a probability of overflow.

Another factor which we have not calculated for in our models are the psychological factor. Traders use models to help them make decisions, but the models do not eliminate the human factor that is the qualities of the trader. The most important quality is how the trader feel about risk, where a risk seeking trader might have a greater chance of over paying, while a risk averse trader faces the threat of waiting too long and thereby lose money.

In our models we have not considered that we are analyzing a market with basic supply and demand. Our analysis does only look at the supply side, but the demand side does also affect the price. The analysis suggests that the demand side have different preferences than the input factors of hydro energy when they trade future and forward contracts. Included in the demand side are also speculators which trade the contracts purely with the intention of making money. They of course base their trading diction on the factors analyzed above, but might be more open to factors not associated with production as there is no physical delivery.

The last important factor excluded in our analysis is the risk premium. All participants run a risk when conduction trades with the future and forward contracts. If one participant earns on the deal, it follows that the counterpart loses the same amount. Which part pays a risk premium is not easily analyzed, and it may very well shift over time as there is a danger of overflow or a danger of low reservoir levels.

Chapter 7, Conclusion

The models analyzed in this paper do not create at god enough picture of what drives the future and forward prices at Nord Pool. The hydrological factors are a part of the picture that makes up the price of future and forward contracts at Nord Pool. However they are not the entire picture, and the affect different contracts with different timespan to various degrees:

- The daily contract has to short time span, so the uncertainty that separates the future price from the spot price is not determined by observed hydrological factors.
- The weekly, monthly and quarterly contracts has most of their trading periods in a middle time span period where the hydrological factors, in combination with other aspects of the supply and demand market, is a part of the uncertainty. This means that the hydrological factors are affecting the prices in some way.
- The yearly contracts have most of their trading periods at a long time span, and this makes the uncertainty high. It also means that the actual observations of hydrological factors today are not that important when trying to price this uncertainty.

The analysis also strongly suggests that the different hydrological factors affect the prices in various degrees. However it is clear that the joint observations for all countries have more effect than each observation alone. The findings of the individual hydrological factors are:

- Reservoir level alone has higher explanatory power than inflow and snow
- Inflow has higher explanatory power than snow
- The observations for inflow and reservoir level are more often significant in pricing future and forward contracts.

When we see this in the light of the initial hypothesis we see that the short term hydrological balance of reservoir, inflow and snow are not good measurements for the adjustment made to the spot price to get the future and forward prices.

- An increase in reservoir level affects prices
- A high inflow of water affects prices
- There is probably a minimal or no effect of snow in the mountains on the future- and forward prices.
- Different contracts with different time aspects are affected differently by the hydrological factors. They are all affected by the joint hydrological factors in the area, but it is mostly for the three contracts with middle time span.

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Apendix A, Stata Results

Day

```
. xtfisher lnb, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)      =  275.0117
         Prob > chi2  =      0.0000

.
. xtfisher x1, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)      =  472.6370
         Prob > chi2  =      0.0000

.
. xtfisher x2, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)      =  495.5321
         Prob > chi2  =      0.0000

.
. xtfisher x3, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)      =  449.1002
         Prob > chi2  =      0.0000

.
. xtfisher x4, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)      =  451.8426
         Prob > chi2  =      0.0000

.
. xtfisher x5, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)      =  372.9032
         Prob > chi2  =      0.0000

.
. xtfisher x6, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)      =  381.4165
         Prob > chi2  =      0.0000
```

```
.
. xtfisher x7, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)      =  397.6871
         Prob > chi2  =    0.0000

.
. xtfisher x8, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)      =  375.1684
         Prob > chi2  =    0.0000

.
. xtfisher x9, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)      =  370.1892
         Prob > chi2  =    0.0000

.
. xtfisher x10, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)      =  358.8293
         Prob > chi2  =    0.0000

.
. xtfisher x11, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)      =  370.8051
         Prob > chi2  =    0.0000

.
. xtfisher x12, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)      =  377.8199
         Prob > chi2  =    0.0000

.
. xtfisher x13, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)      =  493.9675
         Prob > chi2  =    0.0000
```

```
.
. xtfisher x14, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)      =  505.7895
         Prob > chi2  =      0.0000


.
. xtfisher x15, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)      =  301.0535
         Prob > chi2  =      0.0000


.
. xtfisher x16, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)      =  284.7813
         Prob > chi2  =      0.0000


.
. xtfisher x17, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)      =  259.1397
         Prob > chi2  =      0.0000


.
. xtfisher x18, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)      =  223.5178
         Prob > chi2  =      0.0000


.
. xtfisher x19, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)      =  220.3725
         Prob > chi2  =      0.0000


.
. xtfisher x20, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)      =  299.1259
         Prob > chi2  =      0.0000


.
. xtfisher x21, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root
```



```
         chi2(8)      =  246.2229
         Prob > chi2  =      0.0000
```

```
.
. *1 test actual variables

.
. reg lnb x2 x4 x6 x8 x10 x12 x14,robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0420
                                                       Root MSE      =  .19155

                                    (Std. Err. adjusted for 4 clusters in PD)

             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |   .0116457   .0137063     0.85   0.458    -.0319739    .0552653
          x4 |   .0103048   .0125141     0.82   0.471    -.0295208    .0501303
          x6 |  -.0474883   .0044418   -10.69   0.002    -.0616241   -.0333525
          x8 |  -.1399921   .0750032    -1.87   0.159    -.3786857    .0987014
         x10 |  -.1202128    .026695    -4.50   0.020    -.2051682   -.0352575
         x12 |   .0281882   .0152689     1.85   0.162    -.0204043    .0767807
         x14 |  -.0000145   9.87e-07   -14.74   0.001    -.0000177   -.0000114
       _cons |   .0329395   .0019571    16.83   0.000     .0267113    .0391678
------------------------------------------------------------------------------

.
. test x2 x4 x6

 ( 1)  x2 = 0
 ( 2)  x4 = 0
 ( 3)  x6 = 0

       F(  3,     3) = 3771.13
            Prob > F =    0.0000

.
. test x8 x10 x12

 ( 1)  x8 = 0
 ( 2)  x10 = 0
 ( 3)  x12 = 0

       F(  3,     3) =   48.70
            Prob > F =    0.0048

.
. predict u,r

.
. predict yhat,xb

.
. reg lnb x2 x4 x6 x8 x10 x12 x14 l.u,robust cluster(PD)

Linear regression                                      Number of obs =    2044
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0422
                                                       Root MSE      =  .19175

                                    (Std. Err. adjusted for 4 clusters in PD)

             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |   .0114696   .0140877     0.81   0.475    -.0333636    .0563029
          x4 |   .0105443   .0129781     0.81   0.476    -.0307578    .0518463
          x6 |  -.0475927   .0044269   -10.75   0.002    -.0616809   -.0335044
          x8 |  -.1382922   .0754479    -1.83   0.164    -.3784009    .1018166
         x10 |  -.1219139   .0267795    -4.55   0.020    -.2071381   -.0366896
         x12 |   .0279296   .0157231     1.78   0.174    -.0221084    .0779675
         x14 |  -.0000144   9.60e-07   -15.00   0.001    -.0000175   -.0000113
           u |
         L1. |  -.0176454   .0045386    -3.89   0.030    -.0320891   -.0032017
       _cons |   .0329214   .0020231    16.27   0.001      .026483    .0393599
------------------------------------------------------------------------------
```

```
. gen y2=yhat*yhat

.
. gen y3=y2*yhat

.
. reg lnb x2 x4 x6 x8 x10 x12 x14 y2 y3, robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,      3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0420
                                                       Root MSE      =  .19164

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |   .0098937   .0069385     1.43   0.249    -.0121877    .0319751
          x4 |   .0097327   .0147404     0.66   0.556    -.0371778    .0566432
          x6 |  -.0442399   .0114966    -3.85   0.031    -.0808273   -.0076524
          x8 |  -.1266912   .1296074    -0.98   0.400    -.5391598    .2857773
         x10 |  -.1073766    .025515    -4.21   0.025    -.1885768   -.0261765
         x12 |   .0261177   .0172801     1.51   0.228    -.0288753    .0811107
         x14 |  -.0000137   4.37e-06    -3.13   0.052    -.0000276    2.14e-07
          y2 |  -.7823772   3.922551    -0.20   0.855    -13.26568    11.70093
          y3 |  -1.200107   11.30839    -0.11   0.922    -37.18844    34.78823
       _cons |   .0308836   .0104892     2.94   0.060    -.0024977    .0642648
------------------------------------------------------------------------------

.
. test y2 y3

 ( 1)  y2 = 0
 ( 2)  y3 = 0

       F(  2,     3) =    0.07
            Prob > F =    0.9317
```

```
.
. *2 test actual variables reservoir level

.
. reg lnb x2 x4 x6,robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,      3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0340
                                                       Root MSE      =  .19215

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |   .0436548   .0113139     3.86   0.031     .0076489    .0796606
          x4 |   .0142799   .0122518     1.17   0.328    -.0247109    .0532706
          x6 |  -.0993116   .0037849   -26.24   0.000     -.111357   -.0872663
       _cons |   .0242586   .0073516     3.30   0.046     .0008625    .0476546
------------------------------------------------------------------------------

.
. predict u2,r

.
. predict y2hat,xb

.
. reg lnb x2 x4 x6 l.u2,robust cluster(PD)

Linear regression                                      Number of obs =    2044
                                                       F(  2,      3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0343
                                                       Root MSE      =  .19235

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |   .0440387   .0115847     3.80   0.032     .0071711    .0809063
          x4 |   .0142328   .0124954     1.14   0.337    -.0255331    .0539988
          x6 |   -.099796   .0037661   -26.50   0.000    -.1117813   -.0878107
          u2 |
         L1. |  -.0179147   .0060982    -2.94   0.061    -.0373218    .0014923
       _cons |   .0243975    .007385     3.30   0.046      .000895       .0479
------------------------------------------------------------------------------

.
. gen y22=y2hat*y2hat

.
. gen y23=y22*y2hat

.
. reg lnb x2 x4 x6 y22 y23, robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,      3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0342
                                                       Root MSE      =  .19223

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |   .0497726   .0308582     1.61   0.205    -.0484318    .1479771
          x4 |   .0167199   .0076215     2.19   0.116    -.0075351     .040975
          x6 |  -.1146175   .0380676    -3.01   0.057    -.2357655    .0065306
         y22 |   5.179177   8.873185     0.58   0.600    -23.05926    33.41761
         y23 |    32.2015    44.3388     0.73   0.520    -108.9043    173.3073
       _cons |    .028089   .0041539     6.76   0.007     .0148695    .0413085
------------------------------------------------------------------------------

.
. test y22 y23

 ( 1)  y22 = 0
 ( 2)  y23 = 0

       F(  2,     3) =    1.82
            Prob > F =    0.3039

.
```

```
. *3 test actual variables inflow

.
. reg lnb x8 x10 x12,robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0324
                                                       Root MSE      =  .19231

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x8 |  -.2596316   .0944342    -2.75   0.071    -.5601632    .0409001
         x10 |  -.0910497   .0483498    -1.88   0.156    -.2449205     .062821
         x12 |  -.1247585   .0309809    -4.03   0.028    -.2233535   -.0261634
       _cons |   .0051515    .012892     0.40   0.716    -.0358765    .0461795
------------------------------------------------------------------------------

.
. predict u3, r

.
. predict y3hat,xb

.
. reg lnb x8 x10 x12 l.u3,robust cluster(PD)

Linear regression                                      Number of obs =    2044
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0325
                                                       Root MSE      =  .19253

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x8 |  -.2591145   .0954674    -2.71   0.073    -.5629346    .0447055
         x10 |  -.0916119   .0487682    -1.88   0.157    -.2468142    .0635904
         x12 |  -.1254656   .0313388    -4.00   0.028    -.2251998   -.0257314
          u3 |
         L1. |  -.0131504   .0026466    -4.97   0.016    -.0215732   -.0047277
       _cons |   .0051943   .0130507     0.40   0.717    -.0363388    .0467273
------------------------------------------------------------------------------

.
. gen y32=y3hat*y3hat

.
. gen y33=y32*y3hat

.
. reg lnb x8 x10 x12 y32 y33, robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0332
                                                       Root MSE      =  .19233

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x8 |  -.1826418   .2450945    -0.75   0.510     -.962642    .5973584
         x10 |  -.1062632   .0339238    -3.13   0.052    -.2142237    .0016974
         x12 |  -.1075376   .1135344    -0.95   0.413    -.4688549    .2537797
         y32 |  -4.009901   7.941731    -0.50   0.648    -29.28403    21.26423
         y33 |   -19.0522   20.79003    -0.92   0.427    -85.21536    47.11096
       _cons |   .0041574   .0239808     0.17   0.873    -.0721603    .0804751
------------------------------------------------------------------------------

.
. test y32 y33

 ( 1)  y32 = 0
 ( 2)  y33 = 0

       F(  2,     3) =    9.84
            Prob > F =    0.0481
```

```
. *4 test actual variables snow

.
. reg lnb x14,robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  1,     3) =   13.32
                                                       Prob > F      =  0.0355
                                                       R-squared     =  0.0118
                                                       Root MSE      =  .19426

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x14 |  -.0000252   6.89e-06    -3.65   0.035    -.0000471   -3.22e-06
       _cons |   -.014467   .0175305    -0.83   0.470    -.0702569    .0413229
------------------------------------------------------------------------------

.
. predict u4,r

.
. predict y4hat,xb

.
. reg lnb x14 l.u4,robust cluster(PD)

Linear regression                                      Number of obs =    2044
                                                       F(  2,     3) =  187.29
                                                       Prob > F      =  0.0007
                                                       R-squared     =  0.0120
                                                       Root MSE      =  .19446

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x14 |  -.0000253   6.59e-06    -3.85   0.031    -.0000463   -4.37e-06
          u4 |
         L1. |   .0133086   .0189105     0.70   0.532    -.0468729    .0734901
       _cons |  -.0144188   .0171228    -0.84   0.462    -.0689111    .0400735
------------------------------------------------------------------------------

.
. gen y42=y4hat*y4hat

.
. gen y43=y42*y4hat

.
. reg lnb x14 y42 y43, robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0127
                                                       Root MSE      =  .19426

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x14 |   .0000362   .0000524     0.69   0.539    -.0001305    .0002029
         y42 |  -43.20927   52.02538    -0.83   0.467    -208.7772    122.3587
         y43 |  -207.3436   325.7551    -0.64   0.570    -1244.042    829.3544
       _cons |  -.0129468   .0246301    -0.53   0.636    -.0913307    .0654372
------------------------------------------------------------------------------

.
. test y42 y43

 ( 1)  y42 = 0
 ( 2)  y43 = 0

       F(  2,     3) =    4.14
            Prob > F =    0.1372
```

```
. *5 Test all seasonal variables

.
. reg lnb x1 x3 x5 x7 x9 x11 x13,robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0430
                                                       Root MSE      =  .19145

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |   .4635669   .2953406     1.57   0.215    -.4763386    1.403472
          x3 |  -.7841599   .5597514    -1.40   0.256    -2.565539    .9972189
          x5 |   .3130138   .2760936     1.13   0.339    -.5656392    1.191667
          x7 |  -.6223248   .1533543    -4.06   0.027    -1.110367    -.134283
          x9 |   .6172207   .2189299     2.82   0.067    -.0795118    1.313953
         x11 |  -.4639507   .1590289    -2.92   0.062    -.9700517    .0421503
         x13 |  -.0001697   .0001171    -1.45   0.243    -.0005424     .000203
       _cons |   .0322026   .0050203     6.41   0.008     .0162257    .0481795
------------------------------------------------------------------------------

.
. test x1 x3 x5

 ( 1)  x1 = 0
 ( 2)  x3 = 0
 ( 3)  x5 = 0

       F(  3,     3) =  147.35
            Prob > F =    0.0009

.
. test x7 x9 x11

 ( 1)  x7 = 0
 ( 2)  x9 = 0
 ( 3)  x11 = 0

       F(  3,     3) =  207.15
            Prob > F =    0.0006

.
. predict u5,r

.
. predict y5hat,xb

.
. reg lnb x1 x3 x5 x7 x9 x11 x13 l.u5,robust cluster(PD)

Linear regression                                      Number of obs =    2044
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0433
                                                       Root MSE      =  .19164

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |   .4579341   .3022521     1.52   0.227    -.5039668    1.419835
          x3 |   -.774197   .5726637    -1.35   0.269    -2.596669    1.048275
          x5 |   .3085132   .2823554     1.09   0.354    -.5900679    1.207094
          x7 |  -.6195196   .1554315    -3.99   0.028    -1.114172   -.1248672
          x9 |   .6119133   .2227595     2.75   0.071    -.0970068    1.320833
         x11 |  -.4609145   .1628273    -2.83   0.066    -.9791038    .0572747
         x13 |  -.0001677   .0001197    -1.40   0.256    -.0005487    .0002134
          u5 |
         L1. |  -.0189344    .004538    -4.17   0.025    -.0333762   -.0044925
       _cons |   .0322088   .0051116     6.30   0.008     .0159413    .0484763
------------------------------------------------------------------------------
```

```
. gen y52=y5hat*y5hat

.
. gen y53=y52*y5hat

.
. reg lnb x1 x3 x5 x7 x9 x11 x13 y52 y53, robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,      3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0469
                                                       Root MSE      =  .19114

                                          (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |   1.063889    .488694     2.18   0.118    -.4913535    2.619131
          x3 |  -1.750188   .8601746    -2.03   0.135    -4.487647    .9872712
          x5 |    .675145   .3836616     1.76   0.177    -.5458375    1.896127
          x7 |   -1.64401   .5561056    -2.96   0.060    -3.413787    .1257659
          x9 |   1.608112   .5992049     2.68   0.075     -.298825     3.51505
         x11 |  -1.119688   .3981802    -2.81   0.067    -2.386876    .1474987
         x13 |  -.0003724   .0001794    -2.08   0.130    -.0009433    .0001985
         y52 |   24.03265   11.98012     2.01   0.139    -14.09343    62.15873
         y53 |   100.3879   55.59554     1.81   0.169    -76.54187    277.3178
       _cons |   .0637728   .0087188     7.31   0.005     .0360258    .0915197
------------------------------------------------------------------------------

.
. test y52 y53

 ( 1)  y52 = 0
 ( 2)  y53 = 0

       F(  2,     3) =    2.93
            Prob > F =    0.1968
```

```
. *6 Test all seasonal variables reservoir level

.
. reg lnb x1 x3 x5,robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0359
                                                       Root MSE      =  .19196

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |   .0554501   .0087585     6.33   0.008     .0275765    .0833237
          x3 |    .037024   .0082052     4.51   0.020     .0109113    .0631367
          x5 |  -.1346671   .0033146   -40.63   0.000    -.1452158   -.1241184
       _cons |   .0293607   .0053181     5.52   0.012     .0124361    .0462853
------------------------------------------------------------------------------

.
. predict u6,r

.
. predict y6hat,xb

.
. reg lnb x1 x3 x5 l.u6,robust cluster(PD)

Linear regression                                      Number of obs =    2044
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0363
                                                       Root MSE      =  .19215

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |   .0557126   .0088478     6.30   0.008      .027555    .0838701
          x3 |   .0369322   .0082995     4.45   0.021     .0105196    .0633448
          x5 |  -.1349596    .003341   -40.39   0.000    -.1455923   -.1243268
          u6 |
         L1. |  -.0184328   .0066308    -2.78   0.069     -.039535    .0026695
       _cons |   .0294378   .0053513     5.50   0.012     .0124076     .046468
------------------------------------------------------------------------------

.
. gen y62=y6hat*y6hat

.
. gen y63=y62*y6hat

.
. reg lnb x1 x3 x5 y62 y63, robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  3,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0359
                                                       Root MSE      =  .19206

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |   .0531134   .0206226     2.58   0.082    -.0125169    .1187437
          x3 |   .0366636   .0068217     5.37   0.013      .014954    .0583733
          x5 |  -.1309371   .0262129    -5.00   0.015    -.2143582   -.0475161
         y62 |  -.4877348   4.058743    -0.12   0.912    -13.40447      12.429
         y63 |  -2.010623   19.07844    -0.11   0.923    -62.72673    58.70548
       _cons |   .0286837   .0022434    12.79   0.001     .0215443    .0358231
------------------------------------------------------------------------------

.
. test y62 y63

 ( 1)  y62 = 0
 ( 2)  y63 = 0

       F(  2,     3) =    0.01
            Prob > F =    0.9891
```

```
. *7 Test all seasonal variables inflow

.
. reg lnb x7 x9 x11,robust cluster(PD)

Linear regression                                      Number of obs =     2048
                                                       F(  2,     3) =        .
                                                       Prob > F      =        .
                                                       R-squared     =   0.0380
                                                       Root MSE      =   .19176

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x7 |  -.6533859   .2209367    -2.96   0.060    -1.356505    .0497334
          x9 |   .2854705   .1735839     1.64   0.199    -.2669511     .837892
         x11 |  -.3234885   .0797107    -4.06   0.027    -.5771635   -.0698135
       _cons |   .0164823   .0110718     1.49   0.233    -.0187532    .0517178
------------------------------------------------------------------------------

.
. predict u7,r

.
. predict y7hat,xb

.
. reg lnb x7 x9 x11 l.u7,robust cluster(PD)

Linear regression                                      Number of obs =     2044
                                                       F(  2,     3) =        .
                                                       Prob > F      =        .
                                                       R-squared     =   0.0382
                                                       Root MSE      =   .19196

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x7 |  -.6561085   .2219137    -2.96   0.060    -1.362337      .05012
          x9 |   .2889833   .1737028     1.66   0.195    -.2638166    .8417831
         x11 |  -.3262818   .0798702    -4.09   0.027    -.5804645   -.0720991
          u7 |
         L1. |  -.0183898   .0054089    -3.40   0.042    -.0356034   -.0011761
       _cons |   .0165706   .0112097     1.48   0.236    -.0191037    .0522448
------------------------------------------------------------------------------

.
. gen y72=y7hat*y7hat

.
. gen y73=y72*y7hat

.
. reg lnb x7 x9 x11 y72 y73, robust cluster(PD)

Linear regression                                      Number of obs =     2048
                                                       F(  2,     3) =        .
                                                       Prob > F      =        .
                                                       R-squared     =   0.0390
                                                       Root MSE      =   .19175

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x7 |  -.9972465   .2662034    -3.75   0.033    -1.844424   -.1500685
          x9 |   .3222031   .0838313     3.84   0.031     .0554145    .5889916
         x11 |  -.4926052   .1256565    -3.92   0.030    -.8925001   -.0927102
         y72 |   14.25371   6.782641     2.10   0.126    -7.331684     35.8391
         y73 |   59.13561   25.65205     2.31   0.104    -22.50066    140.7719
       _cons |   .0331869   .0158879     2.09   0.128    -.0173754    .0837492
------------------------------------------------------------------------------

.
. test y72 y73

 ( 1)  y72 = 0
 ( 2)  y73 = 0

       F(  2,     3) =    3.94
            Prob > F =    0.1450
```

```
. *8 Test all seasonal variables snow

.
. reg lnb x13,robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  1,     3) =   10.30
                                                       Prob > F      =  0.0490
                                                       R-squared     =  0.0093
                                                       Root MSE      =   .1945

                                     (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x13 |  -.0000238   7.41e-06    -3.21   0.049    -.0000473   -1.95e-07
       _cons |  -.0155208   .0180418    -0.86   0.453    -.0729378    .0418962
------------------------------------------------------------------------------

.
. predict u8,r

.
. predict y8hat,xb

.
. reg lnb x13 l.u8,robust cluster(PD)

Linear regression                                      Number of obs =    2044
                                                       F(  2,     3) =  220.39
                                                       Prob > F      =  0.0006
                                                       R-squared     =  0.0095
                                                       Root MSE      =   .1947

                                     (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x13 |   -.000024   7.10e-06    -3.38   0.043    -.0000466   -1.38e-06
          u8 |
         L1. |   .0126261   .0180265     0.70   0.534    -.0447424    .0699945
       _cons |  -.0154601   .0176308    -0.88   0.445    -.0715692    .0406489
------------------------------------------------------------------------------

.
. gen y82=y8hat*y8hat

.
. gen y83=y82*y8hat

.
. reg lnb x13 y82 y83, robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0106
                                                       Root MSE      =  .19447

                                     (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x13 |   .0001257   .0000895     1.40   0.255     -.000159    .0004103
         y82 |  -146.3027   99.41384    -1.47   0.237    -462.6819    170.0765
         y83 |   -995.317   707.5558    -1.41   0.254    -3247.075    1256.441
       _cons |   .0073601   .0343149     0.21   0.844    -.1018452    .1165655
------------------------------------------------------------------------------

.
. test y82 y83

 ( 1)  y82 = 0
 ( 2)  y83 = 0

       F(  2,     3) =    1.44
            Prob > F =    0.3637
```

```
. *9 test all actial and season variables

.
. reg lnb x1 x2 x3 x4 x5 x6 x7 x8 x9 x10 x11 x12 x13 x14,robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0484
                                                       Root MSE      =  .19123

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |   .5282377   .2642387     2.00   0.139    -.3126878    1.369163
          x2 |  -.0064145    .001846    -3.47   0.040    -.0122894   -.0005396
          x3 |  -.8871857   .5253589    -1.69   0.190    -2.559112    .7847406
          x4 |   .0178713   .0161945     1.10   0.350    -.0336668    .0694094
          x5 |   .3880064   .2560209     1.52   0.227    -.4267664    1.202779
          x6 |   -.051921   .0023516   -22.08   0.000    -.0594047   -.0444373
          x7 |  -.7727594   .1044266    -7.40   0.005    -1.105091   -.4404275
          x8 |   .0891649   .0481679     1.85   0.161    -.0641269    .2424568
          x9 |   .8136472   .1313369     6.20   0.008     .3956746     1.23162
         x10 |  -.0906862   .0472973    -1.92   0.151    -.2412073    .0598349
         x11 |  -.6420141   .1404801    -4.57   0.020    -1.089084   -.1949438
         x12 |   .1462873   .0069089    21.17   0.000        .1243    .1682747
         x13 |  -.0001536   .0000978    -1.57   0.214    -.0004647    .0001575
         x14 |  -.0000314   .0000115    -2.72   0.072     -.000068    5.31e-06
       _cons |   .0322538    .004978     6.48   0.007     .0164117    .0480959
------------------------------------------------------------------------------

.
. test x1 x2 x3 x4 x5 x6

 ( 1)  x1 = 0
 ( 2)  x2 = 0
 ( 3)  x3 = 0
 ( 4)  x4 = 0
 ( 5)  x5 = 0
 ( 6)  x6 = 0
       Constraint 1 dropped
       Constraint 2 dropped
       Constraint 6 dropped

       F(  3,     3) =   15.98
            Prob > F =    0.0238

.
. test x1 x3 x5

 ( 1)  x1 = 0
 ( 2)  x3 = 0
 ( 3)  x5 = 0

       F(  3,     3) =  214.68
            Prob > F =    0.0005

.
. test x2 x3 x5

 ( 1)  x2 = 0
 ( 2)  x3 = 0
 ( 3)  x5 = 0

       F(  3,     3) =   65.19
            Prob > F =    0.0031

.
. test x7 x8 x9 x10 x11 x12

 ( 1)  x7 = 0
 ( 2)  x8 = 0
 ( 3)  x9 = 0
 ( 4)  x10 = 0
 ( 5)  x11 = 0
 ( 6)  x12 = 0
       Constraint 2 dropped
       Constraint 4 dropped
       Constraint 6 dropped

       F(  3,     3) =   24.62
            Prob > F =    0.0129

.
. test x7 x9 x11

 ( 1)  x7 = 0
 ( 2)  x9 = 0
 ( 3)  x11 = 0

       F(  3,     3) =   24.62
            Prob > F =    0.0129

.
. test x8 x10 x12
```

```
. predict u9,r

.
. predict y9hat,xb

.
. reg lnb x1 x2 x3 x4 x5 x6 x7 x8 x9 x10 x11 x12 x13 x14 l.u9,robust cluster(PD)
```

Linear regression

```
Number of obs =    2044
F(  2,      3) =       .
Prob > F      =       .
R-squared     =  0.0486
Root MSE      =  .19143
```

(Std. Err. adjusted for 4 clusters in PD)

lnb	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
x1	.5234328	.2704946	1.94	0.148	-.3374018	1.384267
x2	-.0062145	.0020169	-3.08	0.054	-.0126331	.000204
x3	-.8789259	.5377194	-1.63	0.201	-2.590189	.8323373
x4	.0178614	.0164069	1.09	0.356	-.0343528	.0700756
x5	.3844166	.262365	1.47	0.239	-.450546	1.219379
x6	-.0521269	.0022345	-23.33	0.000	-.0592382	-.0450156
x7	-.7715081	.105616	-7.30	0.005	-1.107625	-.435391
x8	.0903525	.049028	1.84	0.163	-.0656766	.2463816
x9	.8096754	.1336406	6.06	0.009	.3843713	1.23498
x10	-.0907136	.0484896	-1.87	0.158	-.2450293	.0636021
x11	-.6399019	.14452	-4.43	0.021	-1.099829	-.1799747
x12	.1462445	.0067959	21.52	0.000	.1246169	.1678721
x13	-.0001521	.0001002	-1.52	0.226	-.0004709	.0001667
x14	-.0000312	.0000115	-2.70	0.073	-.0000679	5.51e-06
u9						
L1.	-.0174063	.0033928	-5.13	0.014	-.0282038	-.0066087
_cons	.0322585	.0050614	6.37	0.008	.0161509	.0483662

```
.
. gen y92=y9hat*y9hat

.
. gen y93=y92*y9hat

.
. reg lnb x1 x2 x3 x4 x5 x6 x7 x8 x9 x10 x11 x12 x13 x14 y92 y93, robust cluster(
> PD)
```

Linear regression

```
Number of obs =    2048
F(  2,      3) =       .
Prob > F      =       .
R-squared     =  0.0541
Root MSE      =  .19076
```

(Std. Err. adjusted for 4 clusters in PD)

lnb	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
x1	1.153999	.3239327	3.56	0.038	.1231006	2.184897
x2	-.0204888	.0052872	-3.88	0.030	-.037315	-.0036627
x3	-1.891874	.6023406	-3.14	0.052	-3.80879	.0250428
x4	.0448273	.0171718	2.61	0.080	-.0098209	.0994755
x5	.7996729	.2793286	2.86	0.064	-.0892755	1.688621
x6	-.1070674	.0110639	-9.68	0.002	-.1422777	-.071857
x7	-1.840855	.2720047	-6.77	0.007	-2.706495	-.9752148
x8	.2059353	.0499123	4.13	0.026	.0470922	.3647784
x9	1.917	.3212675	5.97	0.009	.8945832	2.939416
x10	-.2114609	.0516478	-4.09	0.026	-.3758274	-.0470944
x11	-1.396536	.2400403	-5.82	0.010	-2.160452	-.6326211
x12	.3006249	.0221531	13.57	0.001	.2301238	.371126
x13	-.0003273	.0001107	-2.96	0.060	-.0006797	.0000252
x14	-.0000624	.0000126	-4.95	0.016	-.0001026	-.0000223
y92	22.52321	4.801308	4.69	0.018	7.24331	37.80312
y93	92.6216	19.51165	4.75	0.018	30.5268	154.7164
_cons	.0607929	.0033742	18.02	0.000	.0500545	.0715312

```
.
. test y92 y93

 ( 1)  y92 = 0
 ( 2)  y93 = 0

       F(  2,     3) =   11.27
            Prob > F =    0.0403
```

```
. *10 test all actial and season variables reservoir level

.
. reg lnb x1 x2 x3 x4 x5 x6,robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0387
                                                       Root MSE      =  .19183

                                            (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |   .0564619   .0052437    10.77   0.002     .0397742    .0731496
          x2 |   .0008595   .0062033     0.14   0.899     -.018882    .0206011
          x3 |   .0284305   .0138309     2.06   0.132    -.0155857    .0724467
          x4 |   .0034251   .0202142     0.17   0.876    -.0609056    .0677558
          x5 |  -.0884146   .0057855   -15.28   0.001    -.1068266   -.0700027
          x6 |  -.0445562   .0021555   -20.67   0.000     -.051416   -.0376965
       _cons |   .0293277   .0054136     5.42   0.012     .0120992    .0465562
------------------------------------------------------------------------------

.
. test x1 x3 x5

 ( 1)  x1 = 0
 ( 2)  x3 = 0
 ( 3)  x5 = 0

       F(  3,     3) =  223.23
            Prob > F =    0.0005

.
. test x2 x4 x6

 ( 1)  x2 = 0
 ( 2)  x4 = 0
 ( 3)  x6 = 0

       F(  3,     3) =  731.06
            Prob > F =    0.0001

.
. predict u10,r

.
. predict y10hat,xb

.
. reg lnb x1 x2 x3 x4 x5 x6 l.u10,robust cluster(PD)

Linear regression                                      Number of obs =    2044
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0390
                                                       Root MSE      =  .19202

                                            (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |   .0569685   .0054221    10.51   0.002      .039713    .0742239
          x2 |   .0005119   .0063868     0.08   0.941    -.0198137    .0208375
          x3 |   .0282071   .0140216     2.01   0.138     -.016416    .0728302
          x4 |   .0036627   .0205567     0.18   0.870    -.0617578    .0690832
          x5 |  -.0888029   .0057811   -15.36   0.001    -.1072008    -.070405
          x6 |  -.0444514   .0022311   -19.92   0.000    -.0515519   -.0373509
         u10 |
         L1. |  -.0174317   .0055274    -3.15   0.051    -.0350223    .0001589
       _cons |   .0294021   .0054467     5.40   0.012     .0120683     .046736
------------------------------------------------------------------------------
```

```
. gen y102=y10hat*y10hat

.
. gen y103=y102*y10hat

.
. reg lnb x1 x2 x3 x4 x5 x6 y102 y103, robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0391
                                                       Root MSE      =  .19188

                                   (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |   .0348677   .0219911     1.59   0.211     -.035118    .1048533
          x2 |  -.0016078   .0055386    -0.29   0.791     -.019234    .0160184
          x3 |   .0295458   .0164187     1.80   0.170     -.022706    .0817975
          x4 |   .0046485   .0183032     0.25   0.816    -.0536005    .0628975
          x5 |  -.0671037   .0171741    -3.91   0.030    -.1217595   -.0124479
          x6 |  -.0373148   .0150455    -2.48   0.089    -.0851963    .0105668
        y102 |  -.6176323   6.687414    -0.09   0.932    -21.89997     20.6647
        y103 |   8.075343   32.40055     0.25   0.819    -95.03767    111.1884
       _cons |   .0247386   .0007373    33.55   0.000     .0223922    .0270851
------------------------------------------------------------------------------

.
. test y102 y103

 ( 1)  y102 = 0
 ( 2)  y103 = 0

       F(  2,     3) =    6.12
            Prob > F =    0.0874

.
```

```
. *11 test all actial and season variables inflow

.
. reg lnb x7 x8 x9 x10 x11 x12,robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0381
                                                       Root MSE      =  .19189

                                     (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x7 |  -.6547355   .1940202    -3.37   0.043    -1.272194   -.0372766
          x8 |   -.001265   .0367217    -0.03   0.975    -.1181299    .1155999
          x9 |   .3186986    .135473     2.35   0.100    -.1124368     .749834
         x10 |  -.0429777   .0527887    -0.81   0.475    -.2109749    .1250194
         x11 |  -.3177174   .0926298    -3.43   0.042    -.6125067    -.022928
         x12 |   .0043415   .0095777     0.45   0.681    -.0261392    .0348222
       _cons |   .0164766    .011032     1.49   0.232    -.0186322    .0515855
------------------------------------------------------------------------------

.
. test x7 x9 x11

 ( 1)  x7 = 0
 ( 2)  x9 = 0
 ( 3)  x11 = 0

       F(  3,     3) =   27.59
            Prob > F =    0.0110

.
. test x8 x10 x12

 ( 1)  x8 = 0
 ( 2)  x10 = 0
 ( 3)  x12 = 0

       F(  3,     3) =    0.85
            Prob > F =    0.5516

.
. predict u11,r

.
. predict y11hat,xb

.
. reg lnb x7 x8 x9 x10 x11 x12 l.u11,robust cluster(PD)

Linear regression                                      Number of obs =    2044
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0383
                                                       Root MSE      =  .19209

                                     (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x7 |  -.6597921   .1944904    -3.39   0.043    -1.278747    -.040837
          x8 |   .0013648   .0372131     0.04   0.973     -.117064    .1197936
          x9 |    .322523   .1353268     2.38   0.097    -.1081473    .7531934
         x10 |  -.0433797   .0533503    -0.81   0.476    -.2131642    .1264047
         x11 |  -.3207853   .0929239    -3.45   0.041    -.6165106   -.0250601
         x12 |    .004511   .0100133     0.45   0.683    -.0273559    .0363779
         u11 |
         L1. |  -.0180837   .0050724    -3.57   0.038    -.0342262   -.0019412
       _cons |   .0165617   .0111711     1.48   0.235    -.0189896     .052113
------------------------------------------------------------------------------
```

```
. gen y112=y11hat*y11hat

.
. gen y113=y112*y11hat

.
. reg lnb x7 x8 x9 x10 x11 x12 y112 y113, robust cluster(PD)

Linear regression                                      Number of obs =     2048
                                                       F(  2,      3) =        .
                                                       Prob > F      =        .
                                                       R-squared     =   0.0390
                                                       Root MSE      =   .19189

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x7 |  -.9864192   .2406557    -4.10   0.026    -1.752293   -.2205455
          x8 |  -.0037642   .0383019    -0.10   0.928    -.1256579    .1181295
          x9 |   .3761556   .0695098     5.41   0.012     .1549444    .5973668
         x10 |  -.0606712   .0431394    -1.41   0.254      -.19796    .0766176
         x11 |  -.4760506   .1416244    -3.36   0.044    -.9267627   -.0253386
         x12 |   .0103909   .0122518     0.85   0.459    -.0285999    .0493817
        y112 |   13.47614   6.706944     2.01   0.138    -7.868353    34.82062
        y113 |   56.62483   25.15019     2.25   0.110    -23.41429    136.6639
       _cons |   .0318185   .0162507     1.96   0.145    -.0198983    .0835354
------------------------------------------------------------------------------

.
. test y112 y113

 ( 1)  y112 = 0
 ( 2)  y113 = 0

       F(  2,     3) =    5.10
            Prob > F =    0.1083
```

```
. *12 test all actial and season variables snow

.
. reg lnb x13 x14,robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =   13.79
                                                       Prob > F      =  0.0307
                                                       R-squared     =  0.0121
                                                       Root MSE      =  .19428

                                       (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x13 |   .0000126   6.98e-06     1.80   0.170    -9.65e-06    .0000348
         x14 |  -.0000363   6.95e-06    -5.23   0.014    -.0000584   -.0000142
       _cons |  -.0155608   .0180543    -0.86   0.452    -.0730177    .0418962
------------------------------------------------------------------------------

.
. predict u12,r

.
. predict y12hat,xb

.
. reg lnb x13 x14 l.u12,robust cluster(PD)

Linear regression                                      Number of obs =    2044
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0122
                                                       Root MSE      =  .19448

                                       (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x13 |   .0000122   6.88e-06     1.78   0.173    -9.64e-06    .0000341
         x14 |  -.0000362   6.95e-06    -5.21   0.014    -.0000583   -.0000141
         u12 |
         L1. |   .0133849   .0187118     0.72   0.526    -.0461644    .0729343
       _cons |  -.0154958   .0176317    -0.88   0.444    -.0716079    .0406163
------------------------------------------------------------------------------

.
. gen y122=y12hat*y12hat

.
. gen y123=y122*y12hat

.
. reg lnb x13 x14 y122 y123, robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0132
                                                       Root MSE      =  .19426

                                       (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x13 |  -.0000315   .0000179    -1.76   0.177    -.0000884    .0000255
         x14 |   .0000687   .0000514     1.34   0.273    -.0000948    .0002322
        y122 |  -44.10404   37.85275    -1.17   0.328    -164.5684    76.36031
        y123 |  -197.5093    233.837    -0.84   0.460    -941.6831    546.6646
       _cons |  -.0116076   .0243937    -0.48   0.667    -.0892391     .066024
------------------------------------------------------------------------------

.
. test y122 y123

 ( 1)  y122 = 0
 ( 2)  y123 = 0

       F(  2,     3) =   19.65
            Prob > F =    0.0189
```

```
. *13 Test all diff. variables

.
. reg lnb x15 x16 x17 x18 x19 x20 x21,robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0050
                                                       Root MSE      =  .19521

                                      (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x15 |   .0289518   .0168836     1.71   0.185    -.0247793    .0826829
         x16 |  -.0226157   .0116956    -1.93   0.149    -.0598364     .014605
         x17 |  -.0415273   .0077725    -5.34   0.013    -.0662629   -.0167917
         x18 |  -.0547407   .0805402    -0.68   0.545    -.3110555     .201574
         x19 |    .131239   .0815818     1.61   0.206    -.1283907    .3908688
         x20 |   .0762529   .0258485     2.95   0.060    -.0060087    .1585145
         x21 |  -.0000319   .0000125    -2.55   0.084    -.0000718    7.90e-06
       _cons |  -.0341722   .0184599    -1.85   0.161    -.0929198    .0245755
------------------------------------------------------------------------------

.
. test x15 x16 x17

 ( 1)  x15 = 0
 ( 2)  x16 = 0
 ( 3)  x17 = 0

       F(  3,     3) =  433.16
            Prob > F =    0.0002

.
. test x18 x19 x20

 ( 1)  x18 = 0
 ( 2)  x19 = 0
 ( 3)  x20 = 0

       F(  3,     3) =   47.47
            Prob > F =    0.0050

.
. predict u13,r

.
. predict y13hat,xb

.
. reg lnb x15 x16 x17 x18 x19 x20 x21 l.u13,robust cluster(PD)

Linear regression                                      Number of obs =    2044
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0053
                                                       Root MSE      =  .19541

                                      (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x15 |   .0275046   .0180988     1.52   0.226    -.0300939     .085103
         x16 |  -.0214709   .0114773    -1.87   0.158    -.0579967    .0150549
         x17 |  -.0413998   .0077048    -5.37   0.013      -.06592   -.0168795
         x18 |  -.0527115   .0815746    -0.65   0.564    -.3123183    .2068953
         x19 |   .1257684   .0863529     1.46   0.241    -.1490449    .4005817
         x20 |   .0778747   .0275701     2.82   0.066    -.0098657    .1656151
         x21 |  -.0000319   .0000126    -2.53   0.086    -.0000721    8.27e-06
         u13 |
         L1. |    .018717   .0197992     0.95   0.414    -.0442931     .081727
       _cons |  -.0342888   .0182364    -1.88   0.157    -.0923251    .0237475
------------------------------------------------------------------------------
```

```
. gen y132=y13hat*y13hat

.
. gen y133=y132*y13hat

.
. reg lnb x15 x16 x17 x18 x19 x20 x21 y132 y133, robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0120
                                                       Root MSE      =  .19462

                                         (Std. Err. adjusted for 4 clusters in PD)
```

lnb	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
x15	-.0215551	.0203189	-1.06	0.367	-.086219	.0431087
x16	.0133104	.0294562	0.45	0.682	-.0804322	.1070531
x17	.0091748	.0492294	0.19	0.864	-.1474952	.1658449
x18	.0688251	.0108029	6.37	0.008	.0344455	.1032047
x19	-.0417038	.0625726	-0.67	0.553	-.2408376	.15743
x20	-.0517109	.0998215	-0.52	0.640	-.3693876	.2659657
x21	.0000237	.000026	0.91	0.430	-.0000592	.0001066
y132	17.62156	17.72868	0.99	0.394	-38.79901	74.04214
y133	552.7242	91.68972	6.03	0.009	260.9266	844.5218
_cons	-.0253459	.0364305	-0.70	0.537	-.1412841	.0905922

```
.
. test y132 y133

 ( 1)  y132 = 0
 ( 2)  y133 = 0

       F(  2,     3) =   22.69
            Prob > F =    0.0154

.
```

```
.
. *14 Test diff. variables reservoir level

.
. reg lnb x15 x16 x17,robust cluster(PD)

Linear regression                                      Number of obs =     2048
                                                       F(  2,      3) =        .
                                                       Prob > F      =        .
                                                       R-squared     =   0.0021
                                                       Root MSE      =    .1953

                                      (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x15 |   .0095764   .0085625     1.12   0.345    -.0176733    .0368262
         x16 |  -.0156439   .0126318    -1.24   0.304    -.0558441    .0245562
         x17 |  -.0318554   .0068507    -4.65   0.019    -.0536574   -.0100534
       _cons |  -.0349629   .0180621    -1.94   0.148    -.0924444    .0225187
------------------------------------------------------------------------------

.
. predict u14,r

.
. predict y14hat,xb

.
. reg lnb x15 x16 x17 l.u14,robust cluster(PD)

Linear regression                                      Number of obs =     2044
                                                       F(  2,      3) =        .
                                                       Prob > F      =        .
                                                       R-squared     =   0.0026
                                                       Root MSE      =   .19548

                                      (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x15 |   .0083538   .0091306     0.91   0.428    -.0207037    .0374114
         x16 |  -.0152294   .0121868    -1.25   0.300    -.0540131    .0235543
         x17 |  -.0314848   .0066617    -4.73   0.018    -.0526853   -.0102843
         u14 |
         L1. |   .0214851   .0213741     1.01   0.389    -.0465368    .0895069
       _cons |  -.0350688    .017738    -1.98   0.142    -.0915189    .0213813
------------------------------------------------------------------------------

.
. gen y142=y14hat*y14hat

.
. gen y143=y142*y14hat

.
. reg lnb x15 x16 x17 y142 y143, robust cluster(PD)

Linear regression                                      Number of obs =     2048
                                                       F(  2,      3) =        .
                                                       Prob > F      =        .
                                                       R-squared     =   0.0057
                                                       Root MSE      =   .19504

                                      (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x15 |   .0447667   .0283685     1.58   0.213    -.0455144    .1350478
         x16 |  -.1025676   .0453705    -2.26   0.109    -.2469568    .0418217
         x17 |  -.1972492   .0978529    -2.02   0.137    -.5086606    .1141623
        y142 |    282.601   153.3445     1.84   0.163    -205.4095    770.6116
        y143 |   3708.264   1981.304     1.87   0.158    -2597.128    10013.66
       _cons |  -.2150404   .0885288    -2.43   0.093    -.4967786    .0666977
------------------------------------------------------------------------------

.
. test y142 y143

 ( 1)  y142 = 0
 ( 2)  y143 = 0

       F(  2,     3) =    1.78
            Prob > F =    0.3099
```

```
. *15 Test diff. variables inflow

.
. reg lnb x18 x19 x20,robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0004
                                                       Root MSE      =  .19547

                                      (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x18 |  -.1112366   .0513997    -2.16   0.119    -.2748135    .0523402
         x19 |   .0947652   .0716479     1.32   0.278    -.1332504    .3227809
         x20 |  -.0186232   .0040628    -4.58   0.019    -.0315526   -.0056937
       _cons |  -.0336885    .017552    -1.92   0.151    -.0895468    .0221698
------------------------------------------------------------------------------

.
. predict u15,r

.
. predict y15hat,xb

.
. reg lnb x18 x19 x20 l.u15,robust cluster(PD)

Linear regression                                      Number of obs =    2044
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0007
                                                       Root MSE      =  .19566

                                      (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x18 |  -.1107225   .0508907    -2.18   0.118    -.2726794    .0512345
         x19 |   .0904586   .0743675     1.22   0.311    -.1462119    .3271291
         x20 |   -.017614   .0036772    -4.79   0.017    -.0293165   -.0059116
         u15 |
         L1. |   .0193897   .0198652     0.98   0.401    -.0438302    .0826096
       _cons |  -.0337783   .0172515    -1.96   0.145    -.0886802    .0211237
------------------------------------------------------------------------------

.
. gen y152=y15hat*y15hat

.
. gen y153=y152*y15hat

.
. reg lnb x15 x16 x17 y152 y153, robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  3,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0097
                                                       Root MSE      =  .19465

                                      (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x15 |    .021799   .0155956     1.40   0.257    -.0278333    .0714313
         x16 |  -.0089002   .0087844    -1.01   0.386    -.0368559    .0190555
         x17 |  -.0403221   .0037295   -10.81   0.002     -.052191   -.0284532
        y152 |   396.4308   75.89171     5.22   0.014     154.9095    637.9521
        y153 |   8038.733     1757.8     4.57   0.020      2444.63    13632.84
       _cons |  -.1717727   .0077234   -22.24   0.000    -.1963522   -.1471933
------------------------------------------------------------------------------

.
. test y152 y153

 ( 1)  y152 = 0
 ( 2)  y153 = 0

       F(  2,     3) =   45.62
            Prob > F =    0.0057
```

```
. *16 Test diff. variables snow

.
. reg lnb x21,robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  1,     3) =   27.42
                                                       Prob > F      =  0.0136
                                                       R-squared     =  0.0027
                                                       Root MSE      =  .19514

                                     (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x21 |  -.0000364   6.95e-06    -5.24   0.014    -.0000585   -.0000143
       _cons |  -.0339863    .017389    -1.95   0.146    -.0893257    .0213531
------------------------------------------------------------------------------

.
. predict u16,r

.
. predict y16hat,xb

.
. reg lnb x21 l.u16,robust cluster(PD)

Linear regression                                      Number of obs =    2044
                                                       F(  2,     3) =   21.75
                                                       Prob > F      =  0.0164
                                                       R-squared     =  0.0031
                                                       Root MSE      =  .19533

                                     (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x21 |  -.0000364   7.02e-06    -5.18   0.014    -.0000587    -.000014
         u16 |
         L1. |   .0208942   .0204316     1.02   0.382    -.0441282    .0859166
       _cons |  -.0340486   .0170438    -2.00   0.140    -.0882894    .0201923
------------------------------------------------------------------------------

.
. gen y162=y16hat*y16hat

.
. gen y163=y162*y16hat

.
. reg lnb x21 y162 y163, robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0143
                                                       Root MSE      =   .1941

                                     (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x21 |   .0004327   .0001462     2.96   0.060    -.0000326    .0008979
        y162 |  -266.9874   92.02519    -2.90   0.062    -559.8526    25.87786
        y163 |  -1504.239   598.0592    -2.52   0.087     -3407.53    399.0526
       _cons |   .2258855   .0981958     2.30   0.105    -.0866173    .5383884
------------------------------------------------------------------------------

.
. test y162 y163

 ( 1)  y162 = 0
 ( 2)  y163 = 0

       F(  2,     3) =   13.29
            Prob > F =    0.0323
```

```
. *17 test all actual variables and diff. variables

.
. reg lnb x2 x4 x6 x8 x10 x12 x14 x15 x16 x17 x18 x19 x20 x21,robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0484
                                                       Root MSE      =  .19123

                                         (Std. Err. adjusted for 4 clusters in PD)

             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |   .5179542   .2609828     1.98   0.141    -.3126094    1.348518
          x4 |  -.8632192   .5042434    -1.71   0.185    -2.467947    .7415083
          x6 |   .3338772   .2553351     1.31   0.282     -.478713    1.146467
          x8 |  -.6807216   .1235944    -5.51   0.012    -1.074054   -.2873892
         x10 |   .7165293   .1722098     4.16   0.025     .1684808    1.264578
         x12 |  -.4922659   .1398638    -3.52   0.039     -.937375   -.0471569
         x14 |  -.0001838   .0001067    -1.72   0.183    -.0005234    .0001558
         x15 |  -.5243376   .2607051    -2.01   0.138    -1.354018    .3053424
         x16 |   .8810809   .5197107     1.70   0.189    -.7728704    2.535032
         x17 |   -.385821   .2538872    -1.52   0.226    -1.193803    .4221612
         x18 |    .769805   .1032477     7.46   0.005     .4412247    1.098385
         x19 |  -.8071929   .1259147    -6.41   0.008     -1.20791    -.406476
         x20 |   .6385797    .137491     4.64   0.019     .2010219    1.076137
         x21 |   .0001524   .0000967     1.58   0.213    -.0001552    .0004601
       _cons |    .032259   .0049749     6.48   0.007     .0164267    .0480912
------------------------------------------------------------------------------

.
. test x2 x4 x6 x15 x16 x17

 ( 1)  x2 = 0
 ( 2)  x4 = 0
 ( 3)  x6 = 0
 ( 4)  x15 = 0
 ( 5)  x16 = 0
 ( 6)  x17 = 0
       Constraint 3 dropped
       Constraint 4 dropped
       Constraint 6 dropped

       F(  3,     3) =   62.90
            Prob > F =    0.0033

.
. test x2 x4 x6

 ( 1)  x2 = 0
 ( 2)  x4 = 0
 ( 3)  x6 = 0

       F(  3,     3) =  320.21
            Prob > F =    0.0003

.
. test x15 x16 x17

 ( 1)  x15 = 0
 ( 2)  x16 = 0
 ( 3)  x17 = 0

       F(  3,     3) =  235.93
            Prob > F =    0.0005

.
. test x8 x10 x12 x18 x19 x20

 ( 1)  x8 = 0
 ( 2)  x10 = 0
 ( 3)  x12 = 0
 ( 4)  x18 = 0
 ( 5)  x19 = 0
 ( 6)  x20 = 0
       Constraint 1 dropped
       Constraint 3 dropped
       Constraint 5 dropped

       F(  3,     3) =  111.04
            Prob > F =    0.0014

.
. test x8 x10 x12

 ( 1)  x8 = 0
 ( 2)  x10 = 0
 ( 3)  x12 = 0

       F(  3,     3) =   65.06
            Prob > F =    0.0031

.
. test x18 x19 x20
```

```
.
. predict u17,r

.
. predict y17hat,xb

.
. reg lnb x2 x4 x6 x8 x10 x12 x14 x15 x16 x17 x18 x19 x20 x21 l.u17,robust cluste
> r(PD)

Linear regression                                      Number of obs =    2044
                                                       F(  2,      3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0486
                                                       Root MSE      =  .19144

                                     (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |     .51343   .2674217     1.92   0.151    -.3376252    1.364485
          x4 |  -.8551041   .5164193    -1.66   0.196    -2.498581    .7883724
          x6 |    .330137   .2613404     1.26   0.296    -.5015649    1.161839
          x8 |  -.6783557   .1256966    -5.40   0.012    -1.078378   -.2783329
         x10 |   .7126597   .1757195     4.06   0.027     .1534417    1.271878
         x12 |  -.4902687   .1435502    -3.42   0.042    -.9471095   -.0334278
         x14 |  -.0001821   .0001092    -1.67   0.194    -.0005296    .0001653
         x15 |  -.5196093   .2669469    -1.95   0.147    -1.369153    .3299349
         x16 |   .8729543   .5320537     1.64   0.199    -.8202779    2.566186
         x17 |   -.382289   .2602285    -1.47   0.238    -1.210452    .4458744
         x18 |   .7686212   .1044496     7.36   0.005     .4362158    1.101026
         x19 |  -.8033388   .1282122    -6.27   0.008    -1.211367   -.3953104
         x20 |   .6365383   .1415205     4.50   0.021     .1861569     1.08692
         x21 |    .000151   .0000991     1.52   0.225    -.0001643    .0004662
         u17 |
         L1. |  -.0174272   .0033991    -5.13   0.014    -.0282447   -.0066098
       _cons |   .0322635   .0050585     6.38   0.008     .0161653    .0483618
------------------------------------------------------------------------------

.
. gen y172=y17hat*y17hat

.
. gen y173=y172*y17hat

.
. reg lnb x2 x4 x6 x8 x10 x12 x14 x15 x16 x17 x18 x19 x20 x21 y172 y173, robust c
> luster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,      3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0540
                                                       Root MSE      =  .19076

                                     (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |   1.123904   .3154672     3.56   0.038     .1199466    2.127862
          x4 |   -1.83206   .5747503    -3.19   0.050    -3.661172   -.0029476
          x6 |   .6873318   .2711493     2.53   0.085    -.1755864     1.55025
          x8 |  -1.625936   .2645433    -6.15   0.009    -2.467831   -.7840409
         x10 |   1.689012    .308337     5.48   0.012     .7077464    2.670279
         x12 |  -1.086782   .2119849    -5.13   0.014    -1.761413   -.4121516
         x14 |  -.0003868   .0001202    -3.22   0.049    -.0007694   -4.27e-06
         x15 |  -1.144241   .3167023    -3.61   0.036    -2.152129    -.136353
         x16 |   1.876765   .5909854     3.18   0.050    -.0040142    3.757544
         x17 |  -.7942792   .2750065    -2.89   0.063    -1.669473    .0809143
         x18 |   1.830958   .2652134     6.90   0.006     .9869302    2.674985
         x19 |  -1.899799   .3099033    -6.13   0.009     -2.88605   -.9135482
         x20 |   1.386821   .2325021     5.96   0.009     .6468951    2.126746
         x21 |   .0003245   .0001087     2.99   0.058    -.0000213    .0006704
        y172 |   22.44394   4.707875     4.77   0.018     7.461386     37.4265
        y173 |   92.30654    19.1588     4.82   0.017      31.3347    153.2784
       _cons |   .0607047   .0033044    18.37   0.000     .0501886    .0712208
------------------------------------------------------------------------------

.
. test y172 y173

 ( 1)  y172 = 0
 ( 2)  y173 = 0

       F(  2,     3) =   11.61
            Prob > F =    0.0387
```

```
. *18 test all actual variables and diff. variables reservoir level

.
. reg lnb x2 x4 x6 x15 x16 x17,robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0387
                                                       Root MSE      =  .19183

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |   .0572902   .0097383     5.88   0.010     .0262987    .0882817
          x4 |   .0318737   .0102565     3.11   0.053    -.0007671    .0645144
          x6 |   -.132956   .0041681   -31.90   0.000    -.1462207   -.1196913
         x15 |  -.0563907   .0052397   -10.76   0.002    -.0730656   -.0397157
         x16 |  -.0284648   .0138057    -2.06   0.131    -.0724007     .015471
         x17 |   .0883814   .0057894    15.27   0.001     .0699569    .1068059
       _cons |   .0293308   .0054144     5.42   0.012     .0120999    .0465617
------------------------------------------------------------------------------

.
. test x2 x4 x6

 ( 1)  x2 = 0
 ( 2)  x4 = 0
 ( 3)  x6 = 0

       F(  3,     3) = 2792.09
            Prob > F =    0.0000

.
. test x15 x16 x17

 ( 1)  x15 = 0
 ( 2)  x16 = 0
 ( 3)  x17 = 0

       F(  3,     3) =  223.88
            Prob > F =    0.0005

.
. predict u18,r

.
. predict y18hat,xb

.
. reg lnb x2 x4 x6 x15 x16 x17 l.u18,robust cluster(PD)

Linear regression                                      Number of obs =    2044
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0390
                                                       Root MSE      =  .19202

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |   .0574496   .0097855     5.87   0.010     .0263077    .0885914
          x4 |   .0318875    .010331     3.09   0.054    -.0009904    .0647654
          x6 |  -.1332395   .0042114   -31.64   0.000     -.146642   -.1198371
         x15 |  -.0568977    .005417   -10.50   0.002    -.0741371   -.0396583
         x16 |  -.0282413   .0139951    -2.02   0.137     -.07278    .0162974
         x17 |   .0887699   .0057851    15.34   0.001     .0703592    .1071807
         u18 |
         L1. |  -.0174321   .0055273    -3.15   0.051    -.0350226    .0001583
       _cons |   .0294052   .0054476     5.40   0.012     .0120686    .0467417
------------------------------------------------------------------------------
```

```
. gen y182=y18hat*y18hat

.
. gen y183=y182*y18hat

.
. reg lnb x2 x4 x6 x15 x16 x17 y182 y183, robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0391
                                                       Root MSE      =  .19188

                                      (Std. Err. adjusted for 4 clusters in PD)
```

lnb	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
x2	.0332553	.0264195	1.26	0.297	-.0508233	.1173338
x4	.0342097	.0043753	7.82	0.004	.0202856	.0481338
x6	-.104437	.0321196	-3.25	0.047	-.206656	-.0022181
x15	-.0348324	.0220091	-1.58	0.212	-.1048753	.0352104
x16	-.0295718	.0164021	-1.80	0.169	-.0817706	.022627
x17	.0670991	.0171692	3.91	0.030	.0124589	.1217393
y182	-.6135028	6.688817	-0.09	0.933	-21.9003	20.6733
y183	8.094114	32.40672	0.25	0.819	-95.03852	111.2267
_cons	.0247467	.0007376	33.55	0.000	.0223993	.0270941

```
.
. test y182 y183

 ( 1)  y182 = 0
 ( 2)  y183 = 0

       F(  2,     3) =    6.11
            Prob > F =    0.0875
```

```
. *19 test all actual variables and diff. variables inflow

.
. reg lnb x8 x10 x12 x18 x19 x20,robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0381
                                                       Root MSE      =  .19189

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x8 |  -.6560004    .219655    -2.99   0.058    -1.355041    .0430397
         x10 |   .2757207   .1837357     1.50   0.230    -.3090082    .8604496
         x12 |  -.3133758   .0888241    -3.53   0.039    -.5960537   -.0306979
         x18 |   .6547354   .1940203     3.37   0.043     .0372763    1.272195
         x19 |  -.3186984    .135473    -2.35   0.100     -.749834    .1124372
         x20 |   .3177173   .0926298     3.43   0.042     .0229279    .6125067
       _cons |   .0164766    .011032     1.49   0.232    -.0186322    .0515855
------------------------------------------------------------------------------

.
. test x8 x10 x12

 ( 1)  x8 = 0
 ( 2)  x10 = 0
 ( 3)  x12 = 0

       F(  3,     3) = 1007.85
            Prob > F =    0.0001

.
. test x18 x19 x20

 ( 1)  x18 = 0
 ( 2)  x19 = 0
 ( 3)  x20 = 0

       F(  3,     3) =   27.59
            Prob > F =    0.0110

.
. predict u19,r

.
. predict y19hat,xb

.
. reg lnb x8 x10 x12 x18 x19 x20 l.u19,robust cluster(PD)

Linear regression                                      Number of obs =    2044
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0383
                                                       Root MSE      =  .19209

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x8 |  -.6584271   .2206404    -2.98   0.058    -1.360603     .043749
         x10 |   .2791432    .183912     1.52   0.226     -.306147    .8644334
         x12 |  -.3162743   .0890491    -3.55   0.038    -.5996684   -.0328802
         x18 |   .6597919   .1944904     3.39   0.043     .0408366    1.278747
         x19 |  -.3225229   .1353269    -2.38   0.097    -.7531934    .1081476
         x20 |   .3207853   .0929239     3.45   0.041       .02506    .6165106
         u19 |
         L1. |  -.0180837   .0050724    -3.57   0.038    -.0342262   -.0019412
       _cons |   .0165617   .0111711     1.48   0.235    -.0189896     .052113
------------------------------------------------------------------------------
```

```
.
. gen y192=y19hat*y19hat

.
. gen y193=y192*y19hat

.
. reg lnb x8 x10 x12 x18 x19 x20 y192 y193, robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0390
                                                       Root MSE      =  .19189

                                      (Std. Err. adjusted for 4 clusters in PD)
```

lnb	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
x8	-.9901831	.2744014	-3.61	0.037	-1.863451	-.1169153
x10	.3154842	.0954812	3.30	0.046	.0116204	.6193479
x12	-.4656596	.1327427	-3.51	0.039	-.8881061	-.0432131
x18	.9864189	.2406557	4.10	0.026	.2205451	1.752293
x19	-.3761554	.0695098	-5.41	0.012	-.5973665	-.1549442
x20	.4760505	.1416244	3.36	0.044	.0253383	.9267627
y192	13.47613	6.706946	2.01	0.138	-7.868363	34.82063
y193	56.62481	25.1502	2.25	0.110	-23.41434	136.664
_cons	.0318185	.0162507	1.96	0.145	-.0198983	.0835354

```
.
. test y192 y193

 ( 1)  y192 = 0
 ( 2)  y193 = 0

       F(  2,     3) =    5.10
            Prob > F =    0.1083

.
```

```
.
. *20 test all actual variables and diff. variables snow

.
. reg lnb x14 x21,robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =   13.79
                                                       Prob > F      =  0.0307
                                                       R-squared     =  0.0121
                                                       Root MSE      =  .19428

                                   (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x14 |  -.0000238   7.41e-06    -3.20   0.049    -.0000473   -1.61e-07
         x21 |  -.0000126   6.98e-06    -1.80   0.170    -.0000348    9.65e-06
       _cons |  -.0155608   .0180543    -0.86   0.452    -.0730177    .0418962
------------------------------------------------------------------------------

.
. predict u20,r

.
. predict y20hat,xb

.
. reg lnb x14 x21 l.u20,robust cluster(PD)

Linear regression                                      Number of obs =    2044
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0122
                                                       Root MSE      =  .19448

                                   (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x14 |  -.0000239   7.10e-06    -3.37   0.043    -.0000465   -1.34e-06
         x21 |  -.0000122   6.88e-06    -1.78   0.173    -.0000341    9.64e-06
         u20 |
         L1. |   .0133849   .0187118     0.72   0.526    -.0461644    .0729343
       _cons |  -.0154958   .0176317    -0.88   0.444    -.0716079    .0406163
------------------------------------------------------------------------------

.
. gen y202=y20hat*y20hat

.
. gen y203=y202*y20hat

.
. reg lnb x14 x21 y202 y203, robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0132
                                                       Root MSE      =  .19426

                                   (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x14 |   .0000372   .0000345     1.08   0.359    -.0000725     .000147
         x21 |   .0000315   .0000179     1.76   0.177    -.0000255    .0000884
        y202 |  -44.10402   37.85276    -1.17   0.328    -164.5684    76.36035
        y203 |  -197.5091   233.8371    -0.84   0.460    -941.6831    546.6648
       _cons |  -.0116076   .0243937    -0.48   0.667    -.0892391     .066024
------------------------------------------------------------------------------

.
. test y202 y203

 ( 1)  y202 = 0
 ( 2)  y203 = 0

       F(  2,     3) =   19.65
            Prob > F =    0.0189
```

Week

```
. xtfisher lnb, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)       =  307.3450
         Prob > chi2   =      0.0000

.
. xtfisher x1, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)       =  472.6361
         Prob > chi2   =      0.0000

.
. xtfisher x2, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)       =  326.3535
         Prob > chi2   =      0.0000

.
. xtfisher x3, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)       =  449.0930
         Prob > chi2   =      0.0000

.
. xtfisher x4, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)       =  309.9961
         Prob > chi2   =      0.0000

.
. xtfisher x5, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)       =  372.9146
         Prob > chi2   =      0.0000

.
. xtfisher x6, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)       =  267.5229
         Prob > chi2   =      0.0000
```

```
. xtfisher x7, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)      =  397.6871
         Prob > chi2  =      0.0000


.
. xtfisher x8, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)      =  280.1500
         Prob > chi2  =      0.0000


.
. xtfisher x9, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)      =  370.1892
         Prob > chi2  =      0.0000


.
. xtfisher x10, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)      =  258.2565
         Prob > chi2  =      0.0000


.
. xtfisher x11, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)      =  370.8051
         Prob > chi2  =      0.0000


.
. xtfisher x12, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)      =  227.2273
         Prob > chi2  =      0.0000


.
. xtfisher x13, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)      =  493.9675
         Prob > chi2  =      0.0000


.
```

```
Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)      =  310.1591
         Prob > chi2  =      0.0000


.
. xtfisher x15, lags(5)


Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)      =  390.6567
         Prob > chi2  =      0.0000


.
. xtfisher x16, lags(5)


Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)      =  385.4685
         Prob > chi2  =      0.0000


.
. xtfisher x17, lags(5)


Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)      =  361.4644
         Prob > chi2  =      0.0000


.
. xtfisher x18, lags(5)


Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)      =  298.8879
         Prob > chi2  =      0.0000


.
. xtfisher x19, lags(5)


Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)      =  300.7455
         Prob > chi2  =      0.0000


.
. xtfisher x20, lags(5)


Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)      =  324.4936
         Prob > chi2  =      0.0000


.
. xtfisher x21, lags(5)


Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(8)      =  387.6408
         Prob > chi2  =      0.0000
```

```
. *1 test actual variables

.
. reg lnb x2 x4 x6 x8 x10 x12 x14,robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.2407
                                                       Root MSE      =   .3705

                                          (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |   .1418731   .0268532     5.28   0.013     .0564141     .227332
          x4 |  -.1244292   .0237943    -5.23   0.014    -.2001533   -.0487051
          x6 |  -.0334968   .0091114    -3.68   0.035    -.0624934   -.0045002
          x8 |   .3423878   .0731138     4.68   0.018     .1097071    .5750684
         x10 |   .2993209   .0522736     5.73   0.011     .1329632    .4656787
         x12 |  -.2089296   .0359577    -5.81   0.010    -.3233632    -.094496
         x14 |   5.46e-06   2.49e-06     2.19   0.116    -2.47e-06    .0000134
       _cons |   -.408941   .0692251    -5.91   0.010    -.6292462   -.1886358
------------------------------------------------------------------------------

.
. test x2 x4 x6

 ( 1)  x2 = 0
 ( 2)  x4 = 0
 ( 3)  x6 = 0

       F(  3,     3) =   29.13
            Prob > F =    0.0102

.
. test x8 x10 x12

 ( 1)  x8 = 0
 ( 2)  x10 = 0
 ( 3)  x12 = 0

       F(  3,     3) =   14.75
            Prob > F =    0.0266

.
. predict u,r

.
. predict yhat,xb

.
. reg lnb x2 x4 x6 x8 x10 x12 x14 l.u,robust cluster(PD)

Linear regression                                      Number of obs =    2044
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.2621
                                                       Root MSE      =  .36566

                                          (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |    .141981   .0265095     5.36   0.013     .0576161    .2263459
          x4 |  -.1243115   .0233358    -5.33   0.013    -.1985764   -.0500466
          x6 |  -.0353745   .0096259    -3.67   0.035    -.0660086   -.0047405
          x8 |   .3641295   .0800983     4.55   0.020      .109221    .6190381
         x10 |   .2765458   .0399676     6.92   0.006     .1493512    .4037405
         x12 |  -.1873337   .0240433    -7.79   0.004    -.2638501   -.1108174
         x14 |   1.78e-06   3.08e-06     0.58   0.605    -8.03e-06    .0000116
           u |
         L1. |  -.1750743    .050906    -3.44   0.041    -.3370799   -.0130687
       _cons |  -.3874263   .0731569    -5.30   0.013    -.6202442   -.1546084
------------------------------------------------------------------------------
```

```
. gen y2=yhat*yhat

.
. gen y3=y2*yhat

.
. reg lnb x2 x4 x6 x8 x10 x12 x14 y2 y3, robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.2958
                                                       Root MSE      =  .35697

                                  (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |   .0410371    .035632     1.15   0.333    -.0723599    .1544341
          x4 |  -.0390901   .0297548    -1.31   0.280     -.133783    .0556028
          x6 |  -.0057052   .0078306    -0.73   0.519    -.0306256    .0192152
          x8 |   .1639239   .0549258     2.98   0.058    -.0108745    .3387223
         x10 |    .140783   .0696536     2.02   0.136    -.0808859     .362452
         x12 |  -.0993294    .044555    -2.23   0.112    -.2411232    .0424643
         x14 |   2.36e-06   2.77e-06     0.85   0.458    -6.47e-06    .0000112
          y2 |  -1.321397   .4281179    -3.09   0.054    -2.683859    .0410653
          y3 |   1.019059   .7847924     1.30   0.285    -1.478501    3.516619
       _cons |  -.1500632   .1579998    -0.95   0.412    -.6528892    .3527628
------------------------------------------------------------------------------

.
. test y2 y3

 ( 1)  y2 = 0
 ( 2)  y3 = 0

       F(  2,     3) =   97.16
            Prob > F =    0.0019
```

```
. *2 test actual variables reservoir level

.
. reg lnb x2 x4 x6,robust cluster(PD)

Linear regression                               Number of obs =       2048
                                                F(  2,     3) =          .
                                                Prob > F      =          .
                                                R-squared     =     0.0712
                                                Root MSE      =     .40937

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |   .0634692   .0113375     5.60   0.011     .0273881    .0995503
          x4 |  -.0742137   .0130841    -5.67   0.011    -.1158531   -.0325744
          x6 |   .0236948   .0061399     3.86   0.031     .0041548    .0432348
       _cons |  -.4341076   .0781938    -5.55   0.012     -.682955   -.1852601
------------------------------------------------------------------------------

.
. predict u2,r

.
. predict y2hat,xb

.
. reg lnb x2 x4 x6 l.u2,robust cluster(PD)

Linear regression                               Number of obs =       2044
                                                F(  2,     3) =          .
                                                Prob > F      =          .
                                                R-squared     =     0.1148
                                                Root MSE      =     .40011

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |   .0589893   .0111928     5.27   0.013     .0233689    .0946096
          x4 |  -.0695842   .0125005    -5.57   0.011    -.1093664   -.0298021
          x6 |   .0206332   .0062454     3.30   0.046     .0007576    .0405088
          u2 |
         L1. |  -.2203911   .0281325    -7.83   0.004    -.3099214   -.1308608
       _cons |  -.4071052   .0827195    -4.92   0.016    -.6703555    -.143855
------------------------------------------------------------------------------

.
. gen y22=y2hat*y2hat

.
. gen y23=y22*y2hat

.
. reg lnb x2 x4 x6 y22 y23, robust cluster(PD)

Linear regression                               Number of obs =       2048
                                                F(  2,     3) =          .
                                                Prob > F      =          .
                                                R-squared     =     0.0731
                                                Root MSE      =     .40916

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |   .0394478   .0304744     1.29   0.286    -.0575355    .1364311
          x4 |  -.0477893   .0347707    -1.37   0.263    -.1584453    .0628667
          x6 |    .017187   .0102654     1.67   0.193    -.0154819     .049856
         y22 |  -3.540372   4.458962    -0.79   0.485    -17.73078    10.65003
         y23 |   -6.60613   10.09311    -0.65   0.559    -38.72692    25.51466
       _cons |   -.265056   .2238517    -1.18   0.322     -.977452    .4473399
------------------------------------------------------------------------------

.
. test y22 y23

 ( 1)  y22 = 0
 ( 2)  y23 = 0

       F(  2,     3) =    0.36
            Prob > F =    0.7270
```

```
. *3 test actual variables inflow

.
. reg lnb x8 x10 x12,robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.1313
                                                       Root MSE      =  .39591

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x8 |    .351227   .0590005     5.95   0.009     .1634611    .5389929
         x10 |   .0480101   .0116928     4.11   0.026     .0107984    .0852217
         x12 |  -.0484233   .0233486    -2.07   0.130    -.1227291    .0258825
       _cons |  -.3999868   .0264263   -15.14   0.001    -.4840872   -.3158864
------------------------------------------------------------------------------

.
. predict u3, r

.
. predict y3hat,xb

.
. reg lnb x8 x10 x12 l.u3,robust cluster(PD)

Linear regression                                      Number of obs =    2044
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.1683
                                                       Root MSE      =  .38784

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x8 |   .3595444   .0605114     5.94   0.010       .16697    .5521189
         x10 |   .0230343   .0080001     2.88   0.064    -.0024255    .0484942
         x12 |  -.0467371   .0236891    -1.97   0.143    -.1221265    .0286523
          u3 |
         L1. |  -.2083233   .0248749    -8.37   0.004    -.2874862   -.1291604
       _cons |  -.3923029   .0320769   -12.23   0.001    -.4943858     -.29022
------------------------------------------------------------------------------

.
. gen y32=y3hat*y3hat

.
. gen y33=y32*y3hat

.
. reg lnb x8 x10 x12 y32 y33, robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.2112
                                                       Root MSE      =  .37745

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x8 |  -.1238481   .1334558    -0.93   0.422    -.5485639    .3008677
         x10 |   -.021156   .0225796    -0.94   0.418    -.0930142    .0507023
         x12 |  -.0032585   .0328675    -0.10   0.927    -.1078575    .1013404
         y32 |  -2.440824   .0659538   -37.01   0.000    -2.650718   -2.230929
         y33 |   5.594774   1.949199     2.87   0.064    -.6084468      11.798
       _cons |     .21764   .1475172     1.48   0.237    -.2518256    .6871056
------------------------------------------------------------------------------

.
. test y32 y33

 ( 1)  y32 = 0
 ( 2)  y33 = 0

       F(  2,     3) =  695.50
            Prob > F =    0.0001

.
```

```
. *4 test actual variables snow

.
. reg lnb x14,robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  1,     3) =   31.12
                                                       Prob > F      =  0.0114
                                                       R-squared     =  0.0374
                                                       Root MSE      =  .41654

                                     (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x14 |   .0000177   3.18e-06     5.58   0.011     7.62e-06    .0000279
       _cons |  -.3566764   .0129127   -27.62   0.000    -.3977704   -.3155824
------------------------------------------------------------------------------

.
. predict u4,r

.
. predict y4hat,xb

.
. reg lnb x14 l.u4,robust cluster(PD)

Linear regression                                      Number of obs =    2044
                                                       F(  2,     3) =   41.33
                                                       Prob > F      =  0.0066
                                                       R-squared     =  0.0829
                                                       Root MSE      =  .40707

                                     (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x14 |   .0000146   2.68e-06     5.48   0.012     6.13e-06    .0000232
          u4 |
         L1. |  -.2198725   .0251191    -8.75   0.003    -.2998127   -.1399323
       _cons |  -.3444738   .0144074   -23.91   0.000    -.3903246    -.298623
------------------------------------------------------------------------------

.
. gen y42=y4hat*y4hat

.
. gen y43=y42*y4hat

.
. reg lnb x14 y42 y43, robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0931
                                                       Root MSE      =  .40452

                                     (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x14 |  -.0000499   .0000361    -1.38   0.260    -.0001646    .0000649
         y42 |  -38.61231   13.13477    -2.94   0.061    -80.41302    3.188387
         y43 |  -78.56115    24.3634    -3.22   0.048    -156.0964   -1.025931
       _cons |    1.12225   .7104486     1.58   0.212    -1.138714    3.383215
------------------------------------------------------------------------------

.
. test y42 y43

 ( 1)  y42 = 0
 ( 2)  y43 = 0

       F(  2,     3) =    5.27
            Prob > F =    0.1044
```

```
. *5 Test all seasonal variables

.
. reg lnb x1 x3 x5 x7 x9 x11 x13,robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0685
                                                       Root MSE      =  .41037

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |   .1349615   .0237862     5.67   0.011     .0592633    .2106597
          x3 |  -.2355102   .0426207    -5.53   0.012    -.3711482   -.0998721
          x5 |   .1208904   .0226976     5.33   0.013     .0486564    .1931244
          x7 |  -.1722566   .0263531    -6.54   0.007    -.2561238   -.0883895
          x9 |   .0916431   .0056975    16.08   0.001     .0735111    .1097751
         x11 |  -.0713794    .015176    -4.70   0.018    -.1196763   -.0230825
         x13 |  -.0000633   .0000104    -6.06   0.009    -.0000966   -.0000301
       _cons |  -.3004035   .0037621   -79.85   0.000    -.3123762   -.2884307
------------------------------------------------------------------------------

.
. test x1 x3 x5

 ( 1)  x1 = 0
 ( 2)  x3 = 0
 ( 3)  x5 = 0

       F(  3,     3) =  104.26
            Prob > F =    0.0016

.
. test x7 x9 x11

 ( 1)  x7 = 0
 ( 2)  x9 = 0
 ( 3)  x11 = 0

       F(  3,     3) = 5067.02
            Prob > F =    0.0000

.
. predict u5,r

.
. predict y5hat,xb

.
. reg lnb x1 x3 x5 x7 x9 x11 x13 l.u5,robust cluster(PD)

Linear regression                                      Number of obs =    2044
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.1798
                                                       Root MSE      =  .38553

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |   .0624769   .0132729     4.71   0.018     .0202366    .1047172
          x3 |  -.1190887   .0255405    -4.66   0.019    -.2003701   -.0378074
          x5 |   .0771844   .0173865     4.44   0.021     .0218527    .1325161
          x7 |  -.1574476    .031236    -5.04   0.015    -.2568546   -.0580407
          x9 |   .0058725   .0221515     0.27   0.808    -.0646235    .0763686
         x11 |  -.0117633   .0021755    -5.41   0.012    -.0186866     -.00484
         x13 |  -.0000411   7.48e-06    -5.50   0.012     -.000065   -.0000173
          u5 |
         L1. |  -.3465063   .0061496   -56.35   0.000     -.366077   -.3269356
       _cons |  -.3007566   .0051394   -58.52   0.000    -.3171125   -.2844008
------------------------------------------------------------------------------
```

```
. gen y52=y5hat*y5hat

.
. gen y53=y52*y5hat

.
. reg lnb x1 x3 x5 x7 x9 x11 x13 y52 y53, robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,      3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0726
                                                       Root MSE      =  .40967

                                        (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |  -.3927736   .2604357    -1.51   0.229    -1.221596     .436049
          x3 |    .696256   .4585303     1.52   0.226    -.7629919    2.155504
          x5 |  -.3660672    .238717    -1.53   0.223    -1.125771    .3936368
          x7 |    .453145   .3278496     1.38   0.261    -.5902186    1.496509
          x9 |  -.1626285    .155874    -1.04   0.373    -.6586892    .3334323
         x11 |   .1435013   .1158217     1.24   0.303     -.225095    .5120977
         x13 |   .0001914   .0001258     1.52   0.226    -.0002091    .0005919
         y52 |  -14.48724   7.383185    -1.96   0.145    -37.98383    9.009344
         y53 |  -15.38288   7.837678    -1.96   0.144    -40.32587    9.560113
       _cons |   .5864203   .4509794     1.30   0.284    -.8487973    2.021638
------------------------------------------------------------------------------

.
. test y52 y53

 ( 1)  y52 = 0
 ( 2)  y53 = 0

       F(  2,     3) =    1.93
            Prob > F =    0.2897
```

```
. *6 Test all seasonal variables reservoir level

.
. reg lnb x1 x3 x5,robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0594
                                                       Root MSE      =  .41196

                                      (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |   .0033453   .0045847     0.73   0.518    -.0112452    .0179357
          x3 |   .0519006   .0052004     9.98   0.002     .0353507    .0684505
          x5 |  -.0494395   .0093035    -5.31   0.013    -.0790475   -.0198315
       _cons |  -.3080223    .003931   -78.36   0.000    -.3205324   -.2955121
------------------------------------------------------------------------------

.
. predict u6,r

.
. predict y6hat,xb

.
. reg lnb x1 x3 x5 l.u6,robust cluster(PD)

Linear regression                                      Number of obs =    2044
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.1663
                                                       Root MSE      =   .3883

                                      (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |   .0054827   .0081235     0.67   0.548    -.0203698    .0313352
          x3 |   .0491502   .0043839    11.21   0.002     .0351988    .0631016
          x5 |  -.0492741   .0120941    -4.07   0.027     -.087763   -.0107852
          u6 |
         L1. |  -.3371873   .0045852   -73.54   0.000    -.3517794   -.3225952
       _cons |   -.306846   .0043574   -70.42   0.000    -.3207131   -.2929789
------------------------------------------------------------------------------

.
. gen y62=y6hat*y6hat

.
. gen y63=y62*y6hat

.
. reg lnb x1 x3 x5 y62 y63, robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0655
                                                       Root MSE      =  .41083

                                      (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |   .0004191   .0016143     0.26   0.812    -.0047183    .0055565
          x3 |  -.1939535   .0898036    -2.16   0.120    -.4797487    .0918418
          x5 |   .1748859    .079359     2.20   0.115    -.0776698    .4274415
         y62 |  -15.28364   5.881212    -2.60   0.080    -34.00028       3.433
         y63 |  -15.41134   6.143785    -2.51   0.087     -34.9636     4.14093
       _cons |   .6753566   .3793388     1.78   0.173    -.5318688    1.882582
------------------------------------------------------------------------------

.
. test y62 y63

 ( 1)  y62 = 0
 ( 2)  y63 = 0

       F(  2,     3) =    4.03
            Prob > F =    0.1412
```

```
. *7 Test all seasonal variables inflow

.
. reg lnb x7 x9 x11,robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,      3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0264
                                                       Root MSE      =  .41912

                                     (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x7 |    .798671   .1507637     5.30   0.013     .3188738    1.278468
          x9 |  -.7372419   .1469909    -5.02   0.015    -1.205033   -.2694512
         x11 |   .1648388   .0366748     4.49   0.021     .0481234    .2815543
       _cons |  -.2910538   .0068085   -42.75   0.000    -.3127216    -.269386
------------------------------------------------------------------------------

.
. predict u7,r

.
. predict y7hat,xb

.
. reg lnb x7 x9 x11 l.u7,robust cluster(PD)

Linear regression                                      Number of obs =    2044
                                                       F(  2,      3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.1182
                                                       Root MSE      =  .39934

                                     (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x7 |   .8729645   .1864942     4.68   0.018     .2794567    1.466472
          x9 |   -.815294   .1898883    -4.29   0.023    -1.419603   -.2109847
         x11 |   .1860477   .0531926     3.50   0.040     .0167652    .3553302
          u7 |
         L1. |   -.307786   .0051634   -59.61   0.000    -.3242182   -.2913538
       _cons |  -.2898541   .0095619   -30.31   0.000    -.3202843   -.2594239
------------------------------------------------------------------------------

.
. gen y72=y7hat*y7hat

.
. gen y73=y72*y7hat

.
. reg lnb x7 x9 x11 y72 y73, robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,      3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0341
                                                       Root MSE      =  .41768

                                     (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x7 |  -4.114254   .5312886    -7.74   0.004    -5.805051   -2.423457
          x9 |   3.803617   .4860233     7.83   0.004     2.256874    5.350359
         x11 |  -.8397121    .110125    -7.63   0.005    -1.190179   -.4892453
         y72 |  -20.34572   2.689788    -7.56   0.005    -28.90582   -11.78561
         y73 |  -19.54096    2.98893    -6.54   0.007    -29.05307   -10.02885
       _cons |   .9399545   .1573132     5.98   0.009     .4393137    1.440595
------------------------------------------------------------------------------

.
. test y72 y73

 ( 1)  y72 = 0
 ( 2)  y73 = 0

       F(  2,     3) =   47.48
            Prob > F =    0.0054
```

```
. *8 Test all seasonal variables snow

.
. reg lnb x13,robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  1,     3) =   34.76
                                                       Prob > F      =  0.0097
                                                       R-squared     =  0.0389
                                                       Root MSE      =  .41624

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x13 |  -.0000163   2.76e-06    -5.90   0.010    -.0000251   -7.49e-06
       _cons |  -.2055674   .0313771    -6.55   0.007    -.3054231   -.1057116
------------------------------------------------------------------------------

.
. predict u8,r

.
. predict y8hat,xb

.
. reg lnb x13 l.u8,robust cluster(PD)

Linear regression                                      Number of obs =    2044
                                                       F(  2,     3) = 1539.39
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1314
                                                       Root MSE      =  .39616

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x13 |  -.0000151   3.32e-06    -4.53   0.020    -.0000256   -4.48e-06
          u8 |
         L1. |  -.3105743   .0082217   -37.78   0.000    -.3367394   -.2844093
       _cons |  -.2119107   .0396545    -5.34   0.013    -.3381089   -.0857124
------------------------------------------------------------------------------

.
. gen y82=y8hat*y8hat

.
. gen y83=y82*y8hat

.
. reg lnb x13 y82 y83, robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0405
                                                       Root MSE      =  .41609

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x13 |  -.0001519    .000175    -0.87   0.449    -.0007088    .0004049
         y82 |   23.62875   32.41996     0.73   0.519    -79.54602    126.8035
         y83 |   21.19482   30.72218     0.69   0.540    -76.57686    118.9665
       _cons |  -.9972056   1.111104    -0.90   0.436    -4.533234    2.538823
------------------------------------------------------------------------------

.
. test y82 y83

 ( 1)  y82 = 0
 ( 2)  y83 = 0

       F(  2,     3) =    0.56
            Prob > F =    0.6222
```

```
. *9 test all actial and season variables

.
. reg lnb x1 x2 x3 x4 x5 x6 x7 x8 x9 x10 x11 x12 x13 x14,robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.4012
                                                       Root MSE      =  .32958

                                          (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |   .0257637     .00591     4.36   0.022     .0069554    .0445721
          x2 |   .1326303   .0244628     5.42   0.012     .0547787     .210482
          x3 |  -.1732826   .0340721    -5.09   0.015    -.2817151   -.0648501
          x4 |  -.0998424   .0177273    -5.63   0.011    -.1562587   -.0434261
          x5 |   .1162735   .0223337     5.21   0.014     .0451976    .1873494
          x6 |   .0155678   .0030555     5.09   0.015     .0058438    .0252919
          x7 |   .0397044   .0153937     2.58   0.082    -.0092852    .0886939
          x8 |   .1649454    .032264     5.11   0.014      .062267    .2676238
          x9 |  -.3089592   .0648347    -4.77   0.018    -.5152922   -.1026263
         x10 |   .3107002   .0577739     5.38   0.013     .1268378    .4945626
         x11 |   .1200419    .018848     6.37   0.008     .0600591    .1800247
         x12 |  -.2702351   .0520206    -5.19   0.014    -.4357877   -.1046825
         x13 |  -.0000869   .0000159    -5.47   0.012    -.0001375   -.0000364
         x14 |   .0000395   8.05e-06     4.92   0.016     .0000139    .0000652
       _cons |  -.3024509   .0028606  -105.73   0.000    -.3115544   -.2933473
------------------------------------------------------------------------------

.
. test x1 x2 x3 x4 x5 x6

 ( 1)  x1 = 0
 ( 2)  x2 = 0
 ( 3)  x3 = 0
 ( 4)  x4 = 0
 ( 5)  x5 = 0
 ( 6)  x6 = 0
       Constraint 4 dropped
       Constraint 5 dropped
       Constraint 6 dropped

       F(  3,     3) =   22.98
            Prob > F =    0.0143

.
. test x1 x3 x5

 ( 1)  x1 = 0
 ( 2)  x3 = 0
 ( 3)  x5 = 0

       F(  3,     3) =   56.54
            Prob > F =    0.0039

.
. test x2 x3 x5

 ( 1)  x2 = 0
 ( 2)  x3 = 0
 ( 3)  x5 = 0

       F(  3,     3) =   13.17
            Prob > F =    0.0311

.
. test x7 x8 x9 x10 x11 x12

 ( 1)  x7 = 0
 ( 2)  x8 = 0
 ( 3)  x9 = 0
 ( 4)  x10 = 0
 ( 5)  x11 = 0
 ( 6)  x12 = 0
       Constraint 4 dropped
       Constraint 5 dropped
       Constraint 6 dropped

       F(  3,     3) =    9.30
            Prob > F =    0.0498

.
. test x7 x9 x11

 ( 1)  x7 = 0
 ( 2)  x9 = 0
 ( 3)  x11 = 0

       F(  3,     3) =  888.32
            Prob > F =    0.0001

.
. test x8 x10 x12
```

```
. predict u9,r

.
. predict y9hat,xb

.
. reg lnb x1 x2 x3 x4 x5 x6 x7 x8 x9 x10 x11 x12 x13 x14 l.u9,robust cluster(PD)

Linear regression                                      Number of obs =    2044
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.4262
                                                       Root MSE      =  .32302

                                      (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |   .0014108   .0036564     0.39   0.725    -.0102256    .0130471
          x2 |   .1329635   .0234429     5.67   0.011     .0583578    .2075692
          x3 |  -.1316029   .0197577    -6.66   0.007    -.1944808   -.0687251
          x4 |  -.1017496   .0182071    -5.59   0.011    -.1596928   -.0438064
          x5 |   .1016956   .0168103     6.05   0.009     .0481979    .1551934
          x6 |   .0141528    .002072     6.83   0.006     .0075589    .0207468
          x7 |   .0023869   .0125666     0.19   0.861    -.0376056    .0423795
          x8 |   .1934579   .0453652     4.26   0.024     .0490857    .3378301
          x9 |  -.3021122   .0613671    -4.92   0.016    -.4974097   -.1068148
         x10 |   .2904838   .0432297     6.72   0.007     .1529077      .42806
         x11 |   .1224012   .0204784     5.98   0.009     .0572298    .1875726
         x12 |  -.2522657   .0394765    -6.39   0.008    -.3778977   -.1266338
         x13 |  -.0000767   .0000119    -6.43   0.008    -.0001147   -.0000387
         x14 |   .0000361   6.26e-06     5.77   0.010     .0000162    .0000561
          u9 |
         L1. |  -.2083604   .0473865    -4.40   0.022    -.3591653   -.0575554
       _cons |  -.3019874   .0037358   -80.84   0.000    -.3138763   -.2900985
------------------------------------------------------------------------------

.
. gen y92=y9hat*y9hat

.
. gen y93=y92*y9hat

.
. reg lnb x1 x2 x3 x4 x5 x6 x7 x8 x9 x10 x11 x12 x13 x14 y92 y93, robust cluster(
> PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.4482
                                                       Root MSE      =  .31656

                                      (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |  -.0021368   .0028591    -0.75   0.509    -.0112357     .006962
          x2 |   .1256931   .0175977     7.14   0.006     .0696894    .1816968
          x3 |  -.0862545   .0149531    -5.77   0.010     -.133842   -.0386669
          x4 |  -.1030734   .0145496    -7.08   0.006    -.1493767   -.0567701
          x5 |   .0669915   .0116549     5.75   0.010     .0299003    .1040826
          x6 |   .0094184   .0025893     3.64   0.036     .0011782    .0176586
          x7 |   -.016136   .0072015    -2.24   0.111    -.0390543    .0067823
          x8 |   .2671832   .0437816     6.10   0.009     .1278505    .4065159
          x9 |   -.294002    .060112    -4.89   0.016    -.4853052   -.1026988
         x10 |   .3244323   .0479684     6.76   0.007     .1717756     .477089
         x11 |   .1317969   .0183329     7.19   0.006     .0734533    .1901404
         x12 |  -.2809667    .045352    -6.20   0.008    -.4252969   -.1366365
         x13 |  -.0000621   9.49e-06    -6.54   0.007    -.0000923   -.0000319
         x14 |   .0000371   6.14e-06     6.05   0.009     .0000176    .0000567
         y92 |  -1.048833   .3714383    -2.82   0.067    -2.230915    .1332497
         y93 |  -1.092395   .4342612    -2.52   0.087    -2.474408     .289618
       _cons |  -.2514322    .020783   -12.10   0.001     -.317573   -.1852915
------------------------------------------------------------------------------

.
. test y92 y93

 ( 1)  y92 = 0
 ( 2)  y93 = 0

       F(  2,     3) =    4.24
            Prob > F =    0.1337
```

```
. *10 test all actial and season variables reservoir level

.
. reg lnb x1 x2 x3 x4 x5 x6,robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.2079
                                                       Root MSE      =  .37833

                                     (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |  -.0935043    .013991    -6.68   0.007    -.1380299   -.0489786
          x2 |    .096312   .0175658     5.48   0.012     .0404098    .1522141
          x3 |   .1620522   .0262535     6.17   0.009     .0785018    .2456026
          x4 |  -.1080665   .0197344    -5.48   0.012      -.17087    -.045263
          x5 |  -.1033579   .0196916    -5.25   0.013    -.1660252   -.0406905
          x6 |    .062402   .0118791     5.25   0.013     .0245974    .1002066
       _cons |  -.3109087   .0054749   -56.79   0.000    -.3283323   -.2934851
------------------------------------------------------------------------------

.
. test x1 x3 x5

 ( 1)  x1 = 0
 ( 2)  x3 = 0
 ( 3)  x5 = 0

       F(  3,     3) = 2227.59
            Prob > F =    0.0000

.
. test x2 x4 x6

 ( 1)  x2 = 0
 ( 2)  x4 = 0
 ( 3)  x6 = 0

       F(  3,     3) =  592.35
            Prob > F =    0.0001

.
. predict u10,r

.
. predict y10hat,xb

.
. reg lnb x1 x2 x3 x4 x5 x6 l.u10,robust cluster(PD)

Linear regression                                      Number of obs =    2044
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.2646
                                                       Root MSE      =  .36495

                                     (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |  -.0835084   .0081056   -10.30   0.002    -.1093041   -.0577128
          x2 |   .0917716   .0165617     5.54   0.012     .0390648    .1444784
          x3 |   .1509043   .0222966     6.77   0.007     .0799467    .2218619
          x4 |   -.104771   .0189336    -5.53   0.012    -.1650261   -.0445159
          x5 |  -.1000901   .0205618    -4.87   0.017    -.1655271   -.0346532
          x6 |   .0602532   .0104681     5.76   0.010      .026939    .0935674
         u10 |
         L1. |  -.2684024    .019691   -13.63   0.001    -.3310679   -.2057368
       _cons |  -.3103394   .0063298   -49.03   0.000    -.3304835   -.2901953
------------------------------------------------------------------------------
```

```
. gen y102=y10hat*y10hat

.
. gen y103=y102*y10hat

.
. reg lnb x1 x2 x3 x4 x5 x6 y102 y103, robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.2545
                                                       Root MSE      =   .3672

                                     (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |  -.0642161   .0112217    -5.72   0.011    -.0999286   -.0285036
          x2 |   .0660077   .0092185     7.16   0.006     .0366703    .0953452
          x3 |   .1316867   .0185468     7.10   0.006     .0726626    .1907108
          x4 |   -.084035     .01109    -7.58   0.005    -.1193283   -.0487417
          x5 |  -.0990379   .0109169    -9.07   0.003    -.1337803   -.0642956
          x6 |   .0591676   .0069447     8.52   0.003     .0370664    .0812689
        y102 |  -3.838924   1.096009    -3.50   0.039    -7.326913   -.3509346
        y103 |   -5.53957   1.398987    -3.96   0.029    -9.991771   -1.087368
       _cons |  -.1089166   .0675566    -1.61   0.205    -.3239119    .1060786
------------------------------------------------------------------------------

.
. test y102 y103

 ( 1)  y102 = 0
 ( 2)  y103 = 0

       F(  2,     3) =  104.83
            Prob > F =    0.0017

.
```

```
. *11 test all actial and season variables inflow

.
. reg lnb x7 x8 x9 x10 x11 x12,robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.1796
                                                       Root MSE      =  .38503

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x7 |   .1960575   .0603962     3.25   0.048     .0038498    .3882651
          x8 |   .3703396   .0704633     5.26   0.013     .1460939    .5945853
          x9 |  -.2896184   .0585253    -4.95   0.016    -.4758721   -.1033646
         x10 |   .0593038   .0080752     7.34   0.005     .0336049    .0850028
         x11 |  -.0128024   .0297366    -0.43   0.696    -.1074374    .0818326
         x12 |  -.0073843   .0053045    -1.39   0.258    -.0242658    .0094971
       _cons |  -.3348426   .0165653   -20.21   0.000    -.3875608   -.2821243
------------------------------------------------------------------------------

.
. test x7 x9 x11

 ( 1)  x7 = 0
 ( 2)  x9 = 0
 ( 3)  x11 = 0

       F(  3,     3) = 1089.48
            Prob > F =    0.0000

.
. test x8 x10 x12

 ( 1)  x8 = 0
 ( 2)  x10 = 0
 ( 3)  x12 = 0

       F(  3,     3) =   18.58
            Prob > F =    0.0193

.
. predict u11,r

.
. predict y11hat,xb

.
. reg lnb x7 x8 x9 x10 x11 x12 l.u11,robust cluster(PD)

Linear regression                                      Number of obs =    2044
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.2327
                                                       Root MSE      =  .37279

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x7 |    .182583   .0639043     2.86   0.065     -.020789     .385955
          x8 |   .4027667   .0752218     5.35   0.013     .1633775     .642156
          x9 |  -.2758293   .0756636    -3.65   0.036    -.5166247   -.0350338
         x10 |   .0269328   .0057649     4.67   0.019     .0085864    .0452793
         x11 |  -.0286082   .0263039    -1.09   0.356    -.1123192    .0551027
         x12 |  -.0014737    .009273    -0.16   0.884    -.0309846    .0280372
         u11 |
         L1. |  -.2561999   .0244042   -10.50   0.002     -.333865   -.1785348
       _cons |  -.3264909   .0179116   -18.23   0.000    -.3834937   -.2694881
------------------------------------------------------------------------------
```

```
. gen y112=y11hat*y11hat

.
. gen y113=y112*y11hat

.
. reg lnb x7 x8 x9 x10 x11 x12 y112 y113, robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.2221
                                                       Root MSE      =   .3751

                                     (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x7 |  -.0083847   .0995324    -0.08   0.938    -.3251413    .3083719
          x8 |   .2263687   .0264406     8.56   0.003     .1422228    .3105146
          x9 |  -.0213408   .0884904    -0.24   0.825    -.3029567    .2602751
         x10 |   .0654279   .0112983     5.79   0.010     .0294717    .1013842
         x11 |  -.0037408   .0423211    -0.09   0.935    -.1384254    .1309438
         x12 |    -.01235   .0051053    -2.42   0.094    -.0285974    .0038975
        y112 |  -1.571287   .4985058    -3.15   0.051    -3.157755     .015181
        y113 |   -.545712   .1362655    -4.00   0.028    -.9793695   -.1120545
       _cons |   -.211145   .0606466    -3.48   0.040    -.4041497   -.0181403
------------------------------------------------------------------------------

.
. test y112 y113

 ( 1)  y112 = 0
 ( 2)  y113 = 0

       F(  2,     3) =    8.71
            Prob > F =    0.0563

.
```

```
. *12 test all actial and season variables snow

.
. reg lnb x13 x14,robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =   40.63
                                                       Prob > F      =  0.0067
                                                       R-squared     =  0.1133
                                                       Root MSE      =  .39989

                                   (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x13 |  -.0000241   3.44e-06    -7.00   0.006     -.000035   -.0000131
         x14 |   .0000265   4.91e-06     5.39   0.012     .0000108    .0000421
       _cons |  -.2768166   .0125432   -22.07   0.000    -.3167347   -.2368985
------------------------------------------------------------------------------

.
. predict u12,r

.
. predict y12hat,xb

.
. reg lnb x13 x14 l.u12,robust cluster(PD)

Linear regression                                      Number of obs =    2044
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.1744
                                                       Root MSE      =  .38633

                                   (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x13 |  -.0000217   3.47e-06    -6.24   0.008    -.0000327   -.0000106
         x14 |   .0000242   4.42e-06     5.47   0.012     .0000101    .0000382
         u12 |
         L1. |   -.263631   .0142656   -18.48   0.000    -.3090305   -.2182315
       _cons |  -.2794965   .0131618   -21.24   0.000    -.3213832   -.2376097
------------------------------------------------------------------------------

.
. gen y122=y12hat*y12hat

.
. gen y123=y122*y12hat

.
. reg lnb x13 x14 y122 y123, robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.1263
                                                       Root MSE      =  .39715

                                   (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x13 |  -8.77e-06   7.69e-07   -11.41   0.001    -.0000112   -6.33e-06
         x14 |    .000016   2.86e-06     5.61   0.011     6.95e-06    .0000251
        y122 |   .0321644   1.113251     0.03   0.979    -3.510697    3.575026
        y123 |   1.913976   1.562699     1.22   0.308    -3.059229    6.887181
       _cons |  -.2376768   .0367979    -6.46   0.008    -.3547841   -.1205696
------------------------------------------------------------------------------

.
. test y122 y123

 ( 1)  y122 = 0
 ( 2)  y123 = 0

       F(  2,     3) =   14.77
            Prob > F =    0.0280
```

```
. reg lnb x15 x16 x17 x18 x19 x20 x21,robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.3591
                                                       Root MSE      =   .3404

                                  (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x15 |   .1221162   .0208742     5.85   0.010     .0556852    .1885471
         x16 |  -.0856981   .0136696    -6.27   0.008    -.1292008   -.0421954
         x17 |  -.0008239   .0021173    -0.39   0.723    -.0075622    .0059144
         x18 |   .1855929   .0383689     4.84   0.017     .0634858    .3076999
         x19 |   .2433594   .0427062     5.70   0.011     .1074492    .3792695
         x20 |  -.1866711   .0302139    -6.18   0.009    -.2828252   -.0905171
         x21 |   .0000379   6.81e-06     5.56   0.011     .0000162    .0000595
       _cons |  -.1569379   .0323751    -4.85   0.017      -.25997   -.0539058
------------------------------------------------------------------------------

.
. test x15 x16 x17

 ( 1)  x15 = 0
 ( 2)  x16 = 0
 ( 3)  x17 = 0

       F(  3,     3) =  393.94
            Prob > F =    0.0002

.
. test x18 x19 x20

 ( 1)  x18 = 0
 ( 2)  x19 = 0
 ( 3)  x20 = 0

       F(  3,     3) =  463.31
            Prob > F =    0.0002

.
. predict u13,r

.
. predict y13hat,xb

.
. reg lnb x15 x16 x17 x18 x19 x20 x21 l.u13,robust cluster(PD)

Linear regression                                      Number of obs =    2044
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.3768
                                                       Root MSE      =  .33604

                                  (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x15 |   .1197471   .0194632     6.15   0.009     .0578066    .1816875
         x16 |  -.0860069   .0143155    -6.01   0.009    -.1315651   -.0404486
         x17 |   -.002768   .0027949    -0.99   0.395    -.0116627    .0061267
         x18 |   .2169872   .0549286     3.95   0.029     .0421799    .3917945
         x19 |   .2195866   .0345406     6.36   0.008     .1096629    .3295104
         x20 |  -.1690278   .0230589    -7.33   0.005    -.2424114   -.0956442
         x21 |   .0000346   5.07e-06     6.83   0.006     .0000185    .0000508
         u13 |
         L1. |  -.1709837   .0441453    -3.87   0.030    -.3114738   -.0304935
       _cons |  -.1615119   .0401189    -4.03   0.028    -.2891881   -.0338357
------------------------------------------------------------------------------
```

```
. gen y132=y13hat*y13hat

.
. gen y133=y132*y13hat

.
. reg lnb x15 x16 x17 x18 x19 x20 x21 y132 y133, robust cluster(PD)

Linear regression                                  Number of obs =    2048
                                                   F(  2,      3) =       .
                                                   Prob > F      =       .
                                                   R-squared     =  0.3911
                                                   Root MSE      =  .33196

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x15 |   .1260709   .0264422     4.77   0.018       .04192    .2102217
         x16 |  -.0939336   .0183048    -5.13   0.014    -.1521875   -.0356797
         x17 |    .000757   .0011847     0.64   0.568    -.0030131    .0045271
         x18 |   .2465286   .0595046     4.14   0.026     .0571584    .4358988
         x19 |    .275239    .057596     4.78   0.017     .0919429     .458535
         x20 |  -.2080563   .0439796    -4.73   0.018    -.3480189   -.0680937
         x21 |   .0000404   9.37e-06     4.31   0.023     .0000106    .0000702
        y132 |  -.9331397    .306123    -3.05   0.056     -1.90736    .0410805
        y133 |  -1.267408   .5587959    -2.27   0.108    -3.045745    .5109304
       _cons |  -.1127396   .0422725    -2.67   0.076    -.2472697    .0217904
------------------------------------------------------------------------------

.
. test y132 y133

 ( 1)  y132 = 0
 ( 2)  y133 = 0

       F(  2,     3) =    4.80
            Prob > F =    0.1162

.
```

```
. *14 Test diff. variables reservoir level

.
. reg lnb x15 x16 x17,robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,      3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.1461
                                                       Root MSE      =  .39252

                                   (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x15 |   .0725946   .0116414     6.24   0.008     .0355465    .1096426
         x16 |  -.1131884   .0182868    -6.19   0.008    -.1713852   -.0549916
         x17 |   .0745172   .0135657     5.49   0.012     .0313452    .1176892
       _cons |  -.2088794   .0201347   -10.37   0.002    -.2729569    -.144802
------------------------------------------------------------------------------

.
. predict u14,r

.
. predict y14hat,xb

.
. reg lnb x15 x16 x17 l.u14,robust cluster(PD)

Linear regression                                      Number of obs =    2044
                                                       F(  2,      3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.1851
                                                       Root MSE      =   .3839

                                   (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x15 |   .0614928   .0091056     6.75   0.007     .0325146     .090471
         x16 |  -.1058456   .0162642    -6.51   0.007    -.1576055   -.0540858
         x17 |   .0754924   .0134893     5.60   0.011     .0325632    .1184215
         u14 |
         L1. |  -.2170343   .0265641    -8.17   0.004    -.3015731   -.1324955
       _cons |  -.2143466   .0258678    -8.29   0.004    -.2966693   -.1320238
------------------------------------------------------------------------------

.
. gen y142=y14hat*y14hat

.
. gen y143=y142*y14hat

.
. reg lnb x15 x16 x17 y142 y143, robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,      3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.1612
                                                       Root MSE      =  .38923

                                   (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x15 |     .07786   .0113629     6.85   0.006     .0416981     .114022
         x16 |  -.1282917   .0205025    -6.26   0.008    -.1935398   -.0630436
         x17 |    .089163   .0162532     5.49   0.012      .037438    .1408881
        y142 |   -1.48191   .5964136    -2.48   0.089    -3.379965    .4161439
        y143 |  -2.983901   1.281937    -2.33   0.102    -7.063596    1.095794
       _cons |  -.1720526   .0247978    -6.94   0.006    -.2509702   -.0931349
------------------------------------------------------------------------------

.
. test y142 y143

 ( 1)  y142 = 0
 ( 2)  y143 = 0

       F(  2,     3) =    3.14
            Prob > F =    0.1841
```

```
. *15 Test diff. variables inflow

.
. reg lnb x18 x19 x20,robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.1350
                                                       Root MSE      =  .39506

                                        (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x18 |   .2767831    .053038     5.22   0.014     .1079926    .4455736
         x19 |  -.0110043   .0041471    -2.65   0.077    -.0242021    .0021935
         x20 |   .0778899   .0153442     5.08   0.015     .0290578     .126722
       _cons |  -.2446413    .011143   -21.95   0.000    -.2801032   -.2091794
------------------------------------------------------------------------------

.
. predict u15,r

.
. predict y15hat,xb

.
. reg lnb x18 x19 x20 l.u15,robust cluster(PD)

Linear regression                                      Number of obs =    2044
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.1833
                                                       Root MSE      =  .38432

                                        (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x18 |   .2926945   .0577427     5.07   0.015     .1089313    .4764576
         x19 |  -.0439787   .0090206    -4.88   0.016    -.0726862   -.0152712
         x20 |   .1031069   .0202263     5.10   0.015     .0387378     .167476
         u15 |
         L1. |  -.2374937   .0308367    -7.70   0.005    -.3356299   -.1393575
       _cons |  -.2445249   .0147172   -16.61   0.000    -.2913615   -.1976882
------------------------------------------------------------------------------

.
. gen y152=y15hat*y15hat

.
. gen y153=y152*y15hat

.
. reg lnb x15 x16 x17 y152 y153, robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.2545
                                                       Root MSE      =  .36694

                                        (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x15 |   .1013253   .0192029     5.28   0.013      .040213    .1624376
         x16 |    -.11897   .0180921    -6.58   0.007    -.1765473   -.0613927
         x17 |   .0216023   .0038429     5.62   0.011     .0093725    .0338321
        y152 |  -3.551176   1.401365    -2.53   0.085    -8.010945     .908593
        y153 |  -2.827913   1.641931    -1.72   0.183     -8.05327    2.397444
       _cons |   .0112885   .0543659     0.21   0.849    -.1617279    .1843049
------------------------------------------------------------------------------

.
. test y152 y153

 ( 1)  y152 = 0
 ( 2)  y153 = 0

       F(  2,     3) =   29.88
            Prob > F =    0.0105
```

```
. *16 Test diff. variables snow

.
. reg lnb x21,robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  1,     3) =   39.01
                                                       Prob > F      =  0.0083
                                                       R-squared     =  0.1128
                                                       Root MSE      =  .39991

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x21 |   .0000251   4.01e-06     6.25   0.008     .0000123    .0000379
       _cons |  -.2661994   .0078721   -33.82   0.000    -.291252   -.2411468
------------------------------------------------------------------------------

.
. predict u16,r

.
. predict y16hat,xb

.
. reg lnb x21 l.u16,robust cluster(PD)

Linear regression                                      Number of obs =    2044
                                                       F(  2,     3) =  573.60
                                                       Prob > F      =  0.0001
                                                       R-squared     =  0.1754
                                                       Root MSE      =  .38598

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x21 |   .0000226   3.81e-06     5.92   0.010     .0000104    .0000347
         u16 |
         L1. |  -.2672374   .0128813   -20.75   0.000    -.3082313   -.2262434
       _cons |  -.2686156   .0100604   -26.70   0.000    -.3006322   -.2365989
------------------------------------------------------------------------------

.
. gen y162=y16hat*y16hat

.
. gen y163=y162*y16hat

.
. reg lnb x21 y162 y163, robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.1224
                                                       Root MSE      =  .39794

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x21 |   .0000163   3.22e-06     5.06   0.015     6.04e-06    .0000266
        y162 |   .4800278   1.173451     0.41   0.710    -3.254417    4.214473
        y163 |   2.001166   1.854963     1.08   0.360    -3.902153    7.904485
       _cons |   -.243366   .0351227    -6.93   0.006     -.355142     -.13159
------------------------------------------------------------------------------

.
. test y162 y163

 ( 1)  y162 = 0
 ( 2)  y163 = 0

       F(  2,     3) =    8.08
            Prob > F =    0.0619
```

```
. *17 test all actual variables and diff. variables

.
. reg lnb x2 x4 x6 x8 x10 x12 x14 x15 x16 x17 x18 x19 x20 x21,robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,      3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.4012
                                                       Root MSE      =  .32958

                                    (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |   .1576444   .0296668     5.31   0.013     .0632313    .2520575
          x4 |  -.2718131   .0516523    -5.26   0.013    -.4361939   -.1074323
          x6 |   .1312636   .0252004     5.21   0.014     .0510647    .2114626
          x8 |   .2051387   .0442825     4.63   0.019     .0642119    .3460655
         x10 |   .0007585   .0119692     0.06   0.953     -.037333      .03885
         x12 |  -.1496097   .0333627    -4.48   0.021    -.2557848   -.0434347
         x14 |  -.0000471   7.85e-06    -6.00   0.009    -.0000721   -.0000221
         x15 |  -.0249957   .0058611    -4.26   0.024    -.0436483    -.006343
         x16 |   .1719626   .0340132     5.06   0.015     .0637175    .2802077
         x17 |  -.1157132   .0222993    -5.19   0.014    -.1866795   -.0447469
         x18 |  -.0401698   .0154063    -2.61   0.080    -.0891995    .0088598
         x19 |   .3099386   .0647876     4.78   0.017     .1037554    .5161218
         x20 |  -.1205958   .0188368    -6.40   0.008    -.1805428   -.0606488
         x21 |   .0000867   .0000159     5.46   0.012     .0000361    .0001372
       _cons |  -.3024536     .00286  -105.75   0.000    -.3115552   -.2933519
------------------------------------------------------------------------------

.
. test x2 x4 x6 x15 x16 x17

 ( 1)  x2 = 0
 ( 2)  x4 = 0
 ( 3)  x6 = 0
 ( 4)  x15 = 0
 ( 5)  x16 = 0
 ( 6)  x17 = 0
       Constraint 1 dropped
       Constraint 5 dropped
       Constraint 6 dropped

       F(  3,     3) =   12.12
            Prob > F =    0.0349

.
. test x2 x4 x6

 ( 1)  x2 = 0
 ( 2)  x4 = 0
 ( 3)  x6 = 0

       F(  3,     3) =   19.10
            Prob > F =    0.0186

.
. test x15 x16 x17

 ( 1)  x15 = 0
 ( 2)  x16 = 0
 ( 3)  x17 = 0

       F(  3,     3) =   57.96
            Prob > F =    0.0037

.
. test x8 x10 x12 x18 x19 x20

 ( 1)  x8 = 0
 ( 2)  x10 = 0
 ( 3)  x12 = 0
 ( 4)  x18 = 0
 ( 5)  x19 = 0
 ( 6)  x20 = 0
       Constraint 2 dropped
       Constraint 3 dropped
       Constraint 6 dropped

       F(  3,     3) =    9.24
            Prob > F =    0.0503

.
. test x8 x10 x12

 ( 1)  x8 = 0
 ( 2)  x10 = 0
 ( 3)  x12 = 0

       F(  3,     3) =   35.15
            Prob > F =    0.0077

.
. test x18 x19 x20
```

```
. predict u17,r

.
. predict y17hat,xb

.
. reg lnb x2 x4 x6 x8 x10 x12 x14 x15 x16 x17 x18 x19 x20 x21 l.u17,robust cluste
> r(PD)

Linear regression                                      Number of obs =    2044
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.4262
                                                       Root MSE      =  .32302

                                         (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |   .1335124   .0222798     5.99   0.009      .062608    .2044167
          x4 |   -.231879   .0376392    -6.16   0.009    -.3516637   -.1120944
          x6 |   .1152252   .0186797     6.17   0.009     .0557782    .1746722
          x8 |   .1964446   .0364991     5.38   0.013     .0802883    .3126009
         x10 |  -.0128382   .0209517    -0.61   0.583    -.0795159    .0538395
         x12 |  -.1291887   .0193143    -6.69   0.007    -.1906554   -.0677219
         x14 |  -.0000402   5.68e-06    -7.08   0.006    -.0000583   -.0000222
         x15 |  -.0005324   .0036639    -0.15   0.894    -.0121927    .0111278
         x16 |    .130125   .0196907     6.61   0.007     .0674602    .1927897
         x17 |  -.1010887   .0167726    -6.03   0.009    -.1544667   -.0477108
         x18 |  -.0029631   .0126208    -0.23   0.829    -.0431282    .0372021
         x19 |   .3033135   .0613727     4.94   0.016     .1079981    .4986289
         x20 |  -.1230493   .0204884    -6.01   0.009    -.1882525   -.0578462
         x21 |   .0000764   .0000119     6.41   0.008     .0000385    .0001143
         u17 |
         L1. |  -.2083652    .047385    -4.40   0.022    -.3591656   -.0575649
       _cons |  -.3019897   .0037349   -80.86   0.000    -.3138759   -.2901034
------------------------------------------------------------------------------

.
. gen y172=y17hat*y17hat

.
. gen y173=y172*y17hat

.
. reg lnb x2 x4 x6 x8 x10 x12 x14 x15 x16 x17 x18 x19 x20 x21 y172 y173, robust c
> luster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  3,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.4481
                                                       Root MSE      =  .31656

                                         (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |   .1235208    .017173     7.19   0.006     .0688686     .178173
          x4 |  -.1891657   .0293378    -6.45   0.008    -.2825319   -.0957996
          x6 |   .0762674   .0140128     5.44   0.012     .0316725    .1208624
          x8 |   .2509354   .0473713     5.30   0.013     .1001787    .4016922
         x10 |   .0306547   .0167957     1.83   0.165    -.0227967    .0841062
         x12 |   -.149208   .0280033    -5.33   0.013     -.238327    -.060089
         x14 |  -.0000249   3.67e-06    -6.78   0.007    -.0000366   -.0000132
         x15 |   .0021922   .0027931     0.78   0.490    -.0066968    .0110812
         x16 |   .0860796    .014977     5.75   0.010     .0384162     .133743
         x17 |  -.0668578   .0116495    -5.74   0.011    -.1039318   -.0297838
         x18 |   .0162522   .0072767     2.23   0.112    -.0069055    .0394099
         x19 |   .2938111   .0600107     4.90   0.016     .1028302    .4847919
         x20 |  -.1317552   .0182992    -7.20   0.006    -.1899914    -.073519
         x21 |    .000062   9.49e-06     6.53   0.007     .0000318    .0000922
        y172 |  -1.048524   .3713334    -2.82   0.067    -2.230272     .133225
        y173 |  -1.092193   .4341727    -2.52   0.087    -2.473924    .2895384
       _cons |  -.2514534   .0207767   -12.10   0.001    -.3175743   -.1853325
------------------------------------------------------------------------------

.
. test y172 y173

 ( 1)  y172 = 0
 ( 2)  y173 = 0

       F(  2,     3) =    4.24
            Prob > F =    0.1337
```

```
. *18 test all actual variables and diff. variables reservoir level

.
. reg lnb x2 x4 x6 x15 x16 x17,robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.2079
                                                       Root MSE      =  .37833

                                  (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |   .0027908   .0036874     0.76   0.504    -.0089441    .0145258
          x4 |   .0540046   .0065837     8.20   0.004     .0330524    .0749568
          x6 |  -.0409559   .0078252    -5.23   0.014    -.0658593   -.0160525
         x15 |   .0935151   .0139895     6.68   0.007     .0489943     .138036
         x16 |  -.1620661   .0262537    -6.17   0.009    -.2456169   -.0785152
         x17 |   .1033639   .0196935     5.25   0.013     .0406903    .1660374
       _cons |  -.3109053   .0054731   -56.81   0.000     -.328323   -.2934876
------------------------------------------------------------------------------

.
. test x2 x4 x6

 ( 1)  x2 = 0
 ( 2)  x4 = 0
 ( 3)  x6 = 0

       F(  3,     3) =29434.46
            Prob > F =    0.0000

.
. test x15 x16 x17

 ( 1)  x15 = 0
 ( 2)  x16 = 0
 ( 3)  x17 = 0

       F(  3,     3) = 2223.74
            Prob > F =    0.0000

.
. predict u18,r

.
. predict y18hat,xb

.
. reg lnb x2 x4 x6 x15 x16 x17 l.u18,robust cluster(PD)

Linear regression                                      Number of obs =    2044
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.2647
                                                       Root MSE      =  .36495

                                  (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |   .0082453   .0085123     0.97   0.404    -.0188447    .0353353
          x4 |   .0461537   .0035079    13.16   0.001     .0349899    .0573176
          x6 |  -.0398374   .0101076    -3.94   0.029    -.0720043   -.0076705
         x15 |   .0835214   .0081048    10.31   0.002     .0577282    .1093146
         x16 |  -.1509204   .0222974    -6.77   0.007    -.2218807   -.0799601
         x17 |   .1000968   .0205638     4.87   0.017     .0346536    .1655401
         u18 |
         L1. |  -.2684067   .0196914   -13.63   0.001    -.3310736   -.2057398
       _cons |  -.3103346   .0063263   -49.05   0.000    -.3304677   -.2902014
------------------------------------------------------------------------------
```

```
. gen y182=y18hat*y18hat

.
. gen y183=y182*y18hat

.
. reg lnb x2 x4 x6 x15 x16 x17 y182 y183, robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,      3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.2545
                                                       Root MSE      =  .36721

                                          (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |   .0018018   .0025016     0.72   0.523    -.0061593    .0097628
          x4 |   .0476273   .0076308     6.24   0.008     .0233426     .071912
          x6 |  -.0398543   .0039935    -9.98   0.002    -.0525635    -.027145
         x15 |   .0641981    .011226     5.72   0.011     .0284721    .0999241
         x16 |  -.1316539   .0185483    -7.10   0.006    -.1906829   -.0726249
         x17 |   .0990171   .0109146     9.07   0.003      .064282    .1337522
        y182 |  -3.837704   1.095996    -3.50   0.039    -7.325653   -.3497551
        y183 |  -5.537071   1.398808    -3.96   0.029    -9.988703   -1.085439
       _cons |  -.1089701   .0675575    -1.61   0.205    -.3239682    .1060281
------------------------------------------------------------------------------

.
. test y182 y183

 ( 1)  y182 = 0
 ( 2)  y183 = 0

       F(  2,     3) =  105.11
            Prob > F =    0.0017

.
```

```
. *19 test all actual variables and diff. variables inflow

.
. reg lnb x8 x10 x12 x18 x19 x20,robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,      3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.1796
                                                       Root MSE      =  .38503

                                        (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x8 |    .566397   .0894224     6.33   0.008      .281815    .8509789
         x10 |  -.2303144   .0584281    -3.94   0.029    -.4162587   -.0443702
         x12 |  -.0201868   .0328806    -0.61   0.583    -.1248276    .0844541
         x18 |  -.1960574   .0603961    -3.25   0.048    -.3882648     -.00385
         x19 |   .2896183   .0585253     4.95   0.016     .1033648    .4758718
         x20 |   .0128024   .0297366     0.43   0.696    -.0818326    .1074374
       _cons |  -.3348425   .0165653   -20.21   0.000    -.3875608   -.2821243
------------------------------------------------------------------------------

.
. test x8 x10 x12

 ( 1)  x8 = 0
 ( 2)  x10 = 0
 ( 3)  x12 = 0

       F(  3,     3) =  125.37
            Prob > F =    0.0012

.
. test x18 x19 x20

 ( 1)  x18 = 0
 ( 2)  x19 = 0
 ( 3)  x20 = 0

       F(  3,     3) = 1089.49
            Prob > F =    0.0000

.
. predict u19,r

.
. predict y19hat,xb

.
. reg lnb x8 x10 x12 x18 x19 x20 l.u19,robust cluster(PD)

Linear regression                                      Number of obs =    2044
                                                       F(  2,      3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.2327
                                                       Root MSE      =  .37279

                                        (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x8 |   .5853496   .1118959     5.23   0.014     .2292469    .9414524
         x10 |  -.2488963    .079435    -3.13   0.052    -.5016938    .0039011
         x12 |   -.030082    .030266    -0.99   0.394    -.1264019    .0662379
         x18 |  -.1825829   .0639042    -2.86   0.065    -.3859546    .0207888
         x19 |   .2758291   .0756635     3.65   0.036      .035034    .5166243
         x20 |   .0286083   .0263039     1.09   0.356    -.0551025    .1123191
         u19 |
         L1. |  -.2561999   .0244042   -10.50   0.002     -.333865   -.1785348
       _cons |  -.3264909   .0179116   -18.23   0.000    -.3834937   -.2694881
------------------------------------------------------------------------------
```

```
. gen y192=y19hat*y19hat

.
. gen y193=y192*y19hat

.
. reg lnb x8 x10 x12 x18 x19 x20 y192 y193, robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.2221
                                                       Root MSE      =   .3751

                                     (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x8 |    .217984   .0961315     2.27   0.108    -.0879493    .5239173
         x10 |   .0440871   .0898938     0.49   0.657    -.2419952    .3301694
         x12 |  -.0160907   .0466282    -0.35   0.753    -.1644824     .132301
         x18 |   .0083846   .0995324     0.08   0.938    -.3083719    .3251412
         x19 |   .0213409   .0884904     0.24   0.825     -.260275    .3029567
         x20 |   .0037407   .0423211     0.09   0.935    -.1309438    .1384252
        y192 |  -1.571287   .4985057    -3.15   0.051    -3.157755    .0151809
        y193 |  -.5457114   .1362654    -4.00   0.028    -.9793686   -.1120543
       _cons |   -.211145   .0606466    -3.48   0.040    -.4041497   -.0181403
------------------------------------------------------------------------------

.
. test y192 y193

 ( 1)  y192 = 0
 ( 2)  y193 = 0

       F(  2,     3) =    8.71
            Prob > F =    0.0563
```

```
. *20 test all actual variables and diff. variables snow

.
. reg lnb x14 x21,robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =   40.63
                                                       Prob > F      =  0.0067
                                                       R-squared     =  0.1133
                                                       Root MSE      =  .39989

                                          (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x14 |   2.41e-06   1.79e-06     1.35   0.270    -3.28e-06    8.10e-06
         x21 |   .0000241   3.44e-06     7.00   0.006     .0000131     .000035
       _cons |  -.2768166   .0125432   -22.07   0.000    -.3167347   -.2368985
------------------------------------------------------------------------------

.
. predict u20,r

.
. predict y20hat,xb

.
. reg lnb x14 x21 l.u20,robust cluster(PD)

Linear regression                                      Number of obs =    2044
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.1744
                                                       Root MSE      =  .38633

                                          (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x14 |   2.49e-06   1.54e-06     1.62   0.203    -2.39e-06    7.38e-06
         x21 |   .0000217   3.47e-06     6.24   0.008     .0000106    .0000327
         u20 |
         L1. |   -.263631   .0142656   -18.48   0.000    -.3090305   -.2182315
       _cons |  -.2794965   .0131618   -21.24   0.000    -.3213832   -.2376097
------------------------------------------------------------------------------

.
. gen y202=y20hat*y20hat

.
. gen y203=y202*y20hat

.
. reg lnb x14 x21 y202 y203, robust cluster(PD)

Linear regression                                      Number of obs =    2048
                                                       F(  2,     3) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.1263
                                                       Root MSE      =  .39715

                                          (Std. Err. adjusted for 4 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x14 |   7.27e-06   2.40e-06     3.04   0.056    -3.52e-07    .0000149
         x21 |   8.77e-06   7.69e-07    11.41   0.001     6.33e-06    .0000112
        y202 |   .0321644   1.113251     0.03   0.979    -3.510697    3.575026
        y203 |   1.913976   1.562699     1.22   0.308    -3.059229    6.887181
       _cons |  -.2376768   .0367979    -6.46   0.008    -.3547841   -.1205696
------------------------------------------------------------------------------

.
. test y202 y203

 ( 1)  y202 = 0
 ( 2)  y203 = 0

       F(  2,     3) =   14.77
            Prob > F =    0.0280
```

Month

```
. xtfisher lnb, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(12)      =  521.0439
         Prob > chi2   =      0.0000

.
. xtfisher x1, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(12)      =  478.5539
         Prob > chi2   =      0.0000

.
. xtfisher x2, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(12)      =  481.8483
         Prob > chi2   =      0.0000

.
. xtfisher x3, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(12)      =  506.2766
         Prob > chi2   =      0.0000

.
. xtfisher x4, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(12)      =  506.0780
         Prob > chi2   =      0.0000

.
. xtfisher x5, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(12)      =  461.0476
         Prob > chi2   =      0.0000

.
. xtfisher x6, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(12)      =  459.5460
         Prob > chi2   =      0.0000
```

```
. xtfisher x7, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(12)     =  544.1961
         Prob > chi2  =      0.0000

.
. xtfisher x8, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(12)     =  486.8758
         Prob > chi2  =      0.0000

.
. xtfisher x9, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(12)     =  524.0383
         Prob > chi2  =      0.0000

.
. xtfisher x10, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(12)     =  471.8921
         Prob > chi2  =      0.0000

.
. xtfisher x11, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(12)     =  451.6180
         Prob > chi2  =      0.0000

.
. xtfisher x12, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(12)     =  450.7177
         Prob > chi2  =      0.0000

.
. xtfisher x13, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(12)     =  656.8093
         Prob > chi2  =      0.0000
```

```
. xtfisher x14, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(12)     =  625.2351
         Prob > chi2  =     0.0000

.
. xtfisher x15, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(12)     =  447.6786
         Prob > chi2  =     0.0000

.
. xtfisher x16, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(12)     =  351.9869
         Prob > chi2  =     0.0000

.
. xtfisher x17, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(12)     =  397.2518
         Prob > chi2  =     0.0000

.
. xtfisher x18, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(12)     =  301.1371
         Prob > chi2  =     0.0000

.
. xtfisher x19, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(12)     =  318.3473
         Prob > chi2  =     0.0000

.
. xtfisher x20, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(12)     =  363.6403
         Prob > chi2  =     0.0000

.
. xtfisher x21, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(12)     =  318.1910
         Prob > chi2  =     0.0000
```

```
.
. *1 test actual variables

.
. reg lnb x2 x4 x6 x8 x10 x12 x14,robust cluster(PD)

Linear regression                                      Number of obs =    2262
                                                       F(  4,     5) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.3691
                                                       Root MSE      =   .1637

                                    (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |   .0013533   .0010258     1.32   0.244    -.0012836    .0039902
          x4 |   .0027753    .000617     4.50   0.006     .0011893    .0043613
          x6 |   -.005138    .000642    -8.00   0.000    -.0067884   -.0034876
          x8 |   .0513436   .0030875    16.63   0.000      .043407    .0592803
         x10 |  -.0083394   .0014014    -5.95   0.002    -.0119419    -.004737
         x12 |    .008711   .0027877     3.12   0.026     .0015449    .0158771
         x14 |  -7.59e-07   4.12e-07    -1.84   0.125    -1.82e-06    3.00e-07
       _cons |  -.0028314   .0128756    -0.22   0.835    -.0359291    .0302664
------------------------------------------------------------------------------

.
. test x2 x4 x6

 ( 1)  x2 = 0
 ( 2)  x4 = 0
 ( 3)  x6 = 0

       F(  3,     5) =   58.68
            Prob > F =    0.0003

.
. test x8 x10 x12

 ( 1)  x8 = 0
 ( 2)  x10 = 0
 ( 3)  x12 = 0

       F(  3,     5) =   97.34
            Prob > F =    0.0001

.
. predict u,r

.
. predict yhat,xb

.
. reg lnb x2 x4 x6 x8 x10 x12 x14 l.u,robust cluster(PD)

Linear regression                                      Number of obs =    2256
                                                       F(  4,     5) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.3695
                                                       Root MSE      =  .16388

                                    (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |   .0012964   .0010051     1.29   0.254    -.0012873    .0038801
          x4 |   .0028183   .0006477     4.35   0.007     .0011532    .0044833
          x6 |  -.0051333     .00064    -8.02   0.000    -.0067785   -.0034882
          x8 |   .0518707   .0030583    16.96   0.000      .044009    .0597323
         x10 |  -.0087439   .0016216    -5.39   0.003    -.0129123   -.0045755
         x12 |    .008922   .0029408     3.03   0.029     .0013625    .0164815
         x14 |  -7.84e-07   4.23e-07    -1.85   0.123    -1.87e-06    3.05e-07
           u |
         L1. |    -.02998    .025657    -1.17   0.295    -.0959335    .0359734
       _cons |   -.002187   .0126577    -0.17   0.870    -.0347246    .0303506
------------------------------------------------------------------------------
```

```
. gen y2=yhat*yhat

.
. gen y3=y2*yhat

.
. reg lnb x2 x4 x6 x8 x10 x12 x14 y2 y3, robust cluster(PD)

Linear regression                                      Number of obs =    2262
                                                       F(  4,     5) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.3944
                                                       Root MSE      =  .16046

                                          (Std. Err. adjusted for 6 clusters in PD)
```

lnb	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
x2	.002436	.0005938	4.10	0.009	.0009095	.0039625
x4	.0025123	.0005058	4.97	0.004	.0012122	.0038124
x6	-.0064944	.0006605	-9.83	0.000	-.0081922	-.0047966
x8	.0691744	.0058481	11.83	0.000	.0541413	.0842075
x10	-.013396	.0012325	-10.87	0.000	-.0165643	-.0102278
x12	.0111583	.0026898	4.15	0.009	.0042439	.0180727
x14	-6.98e-07	3.65e-07	-1.91	0.114	-1.64e-06	2.39e-07
y2	.0679128	.5996392	0.11	0.914	-1.473509	1.609334
y3	-1.905818	.6297979	-3.03	0.029	-3.524765	-.2868714
_cons	-.0096004	.0110232	-0.87	0.424	-.0379363	.0187356

```
.
. test y2 y3

 ( 1)  y2 = 0
 ( 2)  y3 = 0

       F(  2,     5) =   31.94
            Prob > F =    0.0014
```

```
. *2 test actual variables reservoir level

.
. reg lnb x2 x4 x6,robust cluster(PD)

Linear regression                                      Number of obs =    2262
                                                       F(  3,     5) =   50.41
                                                       Prob > F      =  0.0004
                                                       R-squared     =  0.1576
                                                       Root MSE      =    .189

                                    (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |  -.0047398   .0012529    -3.78   0.013    -.0079604   -.0015192
          x4 |   .0074123   .0010018     7.40   0.001     .0048371    .0099876
          x6 |   -.000924   .0012078    -0.76   0.479    -.0040289    .0021809
       _cons |   -.009591   .0190194    -0.50   0.635    -.0584819    .0392998
------------------------------------------------------------------------------

.
. predict u2,r

.
. predict y2hat,xb

.
. reg lnb x2 x4 x6 l.u2,robust cluster(PD)

Linear regression                                      Number of obs =    2256
                                                       F(  4,     5) =  724.80
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1761
                                                       Root MSE      =  .18717

                                    (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |  -.0037814   .0009764    -3.87   0.012    -.0062915   -.0012714
          x4 |   .0064399   .0008585     7.50   0.001     .0042331    .0086468
          x6 |  -.0009869   .0011411    -0.86   0.427    -.0039203    .0019465
          u2 |
         L1. |   .1543036   .0358377     4.31   0.008       .06218    .2464273
       _cons |  -.0105085    .017545    -0.60   0.575    -.0556095    .0345924
------------------------------------------------------------------------------

.
. gen y22=y2hat*y2hat

.
. gen y23=y22*y2hat

.
. reg lnb x2 x4 x6 y22 y23, robust cluster(PD)

Linear regression                                      Number of obs =    2262
                                                       F(  4,     5) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.1847
                                                       Root MSE      =  .18602

                                    (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |  -.0074547   .0010196    -7.31   0.001    -.0100756   -.0048337
          x4 |   .0112436   .0017609     6.39   0.001     .0067171    .0157701
          x6 |  -.0011829   .0011058    -1.07   0.334    -.0040254    .0016595
         y22 |   .8680357    1.02887     0.84   0.437    -1.776758    3.512829
         y23 |  -17.54398   4.191682    -4.19   0.009    -28.31904   -6.768918
       _cons |  -.0209394   .0193115    -1.08   0.328     -.070581    .0287023
------------------------------------------------------------------------------

.
. test y22 y23

 ( 1)  y22 = 0
 ( 2)  y23 = 0

       F(  2,     5) =   21.82
            Prob > F =    0.0034
```

```
. *3 test actual variables inflow

.
. reg lnb x8 x10 x12,robust cluster(PD)

Linear regression                                      Number of obs =    2262
                                                       F(  3,      5) =   59.15
                                                       Prob > F      =  0.0003
                                                       R-squared     =  0.2685
                                                       Root MSE      =  .17612

                                  (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x8 |   .0503508   .0058288     8.64   0.000     .0353675     .065334
         x10 |  -.0080418   .0040451    -1.99   0.104    -.0184401    .0023565
         x12 |  -.0042305   .0021341    -1.98   0.104    -.0097164    .0012553
       _cons |  -.0401549   .0083485    -4.81   0.005    -.0616155   -.0186944
------------------------------------------------------------------------------

.
. predict u3, r

.
. predict y3hat,xb

.
. reg lnb x8 x10 x12 l.u3,robust cluster(PD)

Linear regression                                      Number of obs =    2256
                                                       F(  4,      5) =  249.00
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.2717
                                                       Root MSE      =  .17598

                                  (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x8 |   .0492053   .0055838     8.81   0.000     .0348518    .0635589
         x10 |  -.0070651   .0039562    -1.79   0.134    -.0172349    .0031048
         x12 |  -.0043878   .0020445    -2.15   0.085    -.0096433    .0008678
          u3 |
         L1. |   .0675479   .0269607     2.51   0.054    -.0017568    .1368526
       _cons |  -.0398552   .0076491    -5.21   0.003    -.0595177   -.0201927
------------------------------------------------------------------------------

.
. gen y32=y3hat*y3hat

.
. gen y33=y32*y3hat

.
. reg lnb x8 x10 x12 y32 y33, robust cluster(PD)

Linear regression                                      Number of obs =    2262
                                                       F(  4,      5) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.3027
                                                       Root MSE      =  .17203

                                  (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x8 |   .0985048   .0103524     9.52   0.000      .071893    .1251166
         x10 |  -.0159701   .0049763    -3.21   0.024    -.0287621   -.0031781
         x12 |  -.0098171   .0015706    -6.25   0.002    -.0138543   -.0057798
         y32 |  -4.548277   .6799567    -6.69   0.001    -6.296161   -2.800393
         y33 |   3.970379   .7914003     5.02   0.004     1.936019    6.004738
       _cons |  -.0754034   .0125085    -6.03   0.002    -.1075575   -.0432494
------------------------------------------------------------------------------

.
. test y32 y33

 ( 1)  y32 = 0
 ( 2)  y33 = 0

       F(  2,     5) =   31.62
            Prob > F =    0.0015
```

```
. *4 test actual variables snow

.
. reg lnb x14,robust cluster(PD)

Linear regression                                      Number of obs =    2262
                                                       F(  1,     5) =    2.54
                                                       Prob > F      =  0.1720
                                                       R-squared     =  0.0242
                                                       Root MSE      =  .20332

                                    (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x14 |  -9.26e-07   5.81e-07    -1.59   0.172    -2.42e-06    5.68e-07
       _cons |   .0794559   .0214147     3.71   0.014     .0244077    .1345041
------------------------------------------------------------------------------

.
. predict u4,r

.
. predict y4hat,xb

.
. reg lnb x14 l.u4,robust cluster(PD)

Linear regression                                      Number of obs =    2256
                                                       F(  2,     5) =   69.39
                                                       Prob > F      =  0.0002
                                                       R-squared     =  0.0584
                                                       Root MSE      =      .2

                                    (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x14 |  -5.52e-07   5.37e-07    -1.03   0.351    -1.93e-06    8.28e-07
          u4 |
         L1. |   .1978945   .0234257     8.45   0.000     .1376769    .2581122
       _cons |   .0685471   .0192139     3.57   0.016     .0191563    .1179379
------------------------------------------------------------------------------

.
. gen y42=y4hat*y4hat

.
. gen y43=y42*y4hat

.
. reg lnb x14 y42 y43, robust cluster(PD)

Linear regression                                      Number of obs =    2262
                                                       F(  3,     5) =  110.35
                                                       Prob > F      =  0.0001
                                                       R-squared     =  0.1166
                                                       Root MSE      =  .19354

                                    (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x14 |   2.16e-06   8.88e-07     2.43   0.059    -1.26e-07    4.44e-06
         y42 |   35.42096   17.07137     2.07   0.093    -8.462403    79.30433
         y43 |   220.5345   232.4352     0.95   0.386    -376.9593    818.0283
       _cons |  -.1997365   .0493448    -4.05   0.010    -.3265815   -.0728916
------------------------------------------------------------------------------

.
. test y42 y43

 ( 1)  y42 = 0
 ( 2)  y43 = 0

       F(  2,     5) =   22.07
            Prob > F =    0.0033
```

```
. *5 Test all seasonal variables

.
. reg lnb x1 x3 x5 x7 x9 x11 x13,robust cluster(PD)

Linear regression                                      Number of obs =    2262
                                                       F(  4,     5) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.3290
                                                       Root MSE      =  .16882

                                       (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |  -.0209254   .0081725    -2.56   0.051    -.0419335    .0000826
          x3 |   .0471239   .0114094     4.13   0.009     .0177952    .0764526
          x5 |  -.0285405   .0034044    -8.38   0.000    -.0372917   -.0197894
          x7 |   -.008234    .012821    -0.64   0.549    -.0411914    .0247233
          x9 |   .0492429   .0160454     3.07   0.028      .007997    .0904888
         x11 |  -.0042229   .0089047    -0.47   0.655    -.0271131    .0186674
         x13 |   8.16e-06   1.98e-06     4.12   0.009     3.06e-06    .0000133
       _cons |   .0276461   .0144405     1.91   0.114    -.0094743    .0647665
------------------------------------------------------------------------------

.
. test x1 x3 x5

 ( 1)  x1 = 0
 ( 2)  x3 = 0
 ( 3)  x5 = 0

       F(  3,     5) =   74.99
            Prob > F =    0.0001

.
. test x7 x9 x11

 ( 1)  x7 = 0
 ( 2)  x9 = 0
 ( 3)  x11 = 0

       F(  3,     5) =  279.50
            Prob > F =    0.0000

.
. predict u5,r

.
. predict y5hat,xb

.
. reg lnb x1 x3 x5 x7 x9 x11 x13 l.u5,robust cluster(PD)

Linear regression                                      Number of obs =    2256
                                                       F(  4,     5) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.3383
                                                       Root MSE      =  .16789

                                       (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |  -.0218854   .0075073    -2.92   0.033    -.0411834   -.0025874
          x3 |   .0493996   .0103892     4.75   0.005     .0226934    .0761058
          x5 |  -.0299453   .0033505    -8.94   0.000    -.0385581   -.0213325
          x7 |  -.0106453   .0134217    -0.79   0.464    -.0451468    .0238563
          x9 |   .0517465   .0160407     3.23   0.023     .0105127    .0929803
         x11 |  -.0043911   .0086675    -0.51   0.634    -.0266717    .0178894
         x13 |   8.60e-06   1.87e-06     4.61   0.006     3.81e-06    .0000134
          u5 |
         L1. |  -.1138092   .0197077    -5.77   0.002    -.1644695   -.0631489
       _cons |   .0279656   .0147437     1.90   0.116    -.0099345    .0658656
------------------------------------------------------------------------------
```

```
. gen y52=y5hat*y5hat

.
. gen y53=y52*y5hat

.
. reg lnb x1 x3 x5 x7 x9 x11 x13 y52 y53, robust cluster(PD)

Linear regression                                      Number of obs =    2262
                                                       F(  4,     5) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.3462
                                                       Root MSE      =  .16673

                                         (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |  -.0423267   .0085679    -4.94   0.004    -.0643513   -.0203021
          x3 |   .0865358   .0129449     6.68   0.001       .05326    .1198117
          x5 |  -.0479357   .0051616    -9.29   0.000     -.061204   -.0346675
          x7 |   .0014698   .0134062     0.11   0.917     -.032992    .0359315
          x9 |   .0331978   .0191575     1.73   0.144    -.0160481    .0824437
         x11 |   .0094395   .0091346     1.03   0.349    -.0140416    .0329207
         x13 |   .0000159   2.22e-06     7.14   0.001     .0000101    .0000216
         y52 |    2.82843    .788526     3.59   0.016     .8014592      4.8554
         y53 |  -8.717011   2.651796    -3.29   0.022    -15.53367   -1.900351
       _cons |   .0334545   .0098544     3.39   0.019     .0081229    .0587861
------------------------------------------------------------------------------

.
. test y52 y53

 ( 1)  y52 = 0
 ( 2)  y53 = 0

       F(  2,     5) =   11.86
            Prob > F =    0.0126
```

```
. *6 Test all seasonal variables reservoir level

.
. reg lnb x1 x3 x5,robust cluster(PD)

Linear regression                                      Number of obs =    2262
                                                       F(  3,     5) =  159.16
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.2161
                                                       Root MSE      =  .18232

                                  (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |  -.0148194   .0025945    -5.71   0.002    -.0214889     -.00815
          x3 |   .0144633   .0036747     3.94   0.011     .0050172    .0239094
          x5 |   .0021263   .0010725     1.98   0.104    -.0006305    .0048832
       _cons |   .0425453    .016232     2.62   0.047     .0008196     .084271
------------------------------------------------------------------------------

.
. predict u6,r

.
. predict y6hat,xb

.
. reg lnb x1 x3 x5 l.u6,robust cluster(PD)

Linear regression                                      Number of obs =    2256
                                                       F(  4,     5) =  200.46
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.2162
                                                       Root MSE      =  .18256

                                  (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |  -.0147356   .0026484    -5.56   0.003    -.0215436   -.0079277
          x3 |   .0143684   .0037402     3.84   0.012     .0047538    .0239829
          x5 |   .0021293   .0010437     2.04   0.097    -.0005535    .0048122
          u6 |
         L1. |   .0190384   .0321462     0.59   0.579    -.0635961    .1016729
       _cons |   .0424362   .0160166     2.65   0.045     .0012643    .0836082
------------------------------------------------------------------------------

.
. gen y62=y6hat*y6hat

.
. gen y63=y62*y6hat

.
. reg lnb x1 x3 x5 y62 y63, robust cluster(PD)

Linear regression                                      Number of obs =    2262
                                                       F(  4,     5) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.2879
                                                       Root MSE      =  .17385

                                  (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |  -.0180267   .0026732    -6.74   0.001    -.0248983   -.0111551
          x3 |   .0190728   .0026331     7.24   0.001     .0123043    .0258414
          x5 |   .0004746   .0015194     0.31   0.767    -.0034311    .0043804
         y62 |   6.495503   .9282611     7.00   0.001     4.109332    8.881674
         y63 |  -20.88994   3.659535    -5.71   0.002    -30.29708   -11.48281
       _cons |    .036267   .0112011     3.24   0.023     .0074736    .0650603
------------------------------------------------------------------------------

.
. test y62 y63

 ( 1)  y62 = 0
 ( 2)  y63 = 0

       F(  2,     5) =   29.27
            Prob > F =    0.0017
```

```
. *7 Test all seasonal variables inflow

.
. reg lnb x7 x9 x11,robust cluster(PD)

Linear regression                                      Number of obs =    2262
                                                       F(  3,     5) =   32.55
                                                       Prob > F      =  0.0010
                                                       R-squared     =  0.2086
                                                       Root MSE      =  .18318

                                      (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x7 |  -.0090799   .0211761    -0.43   0.686    -.0635147    .0453548
          x9 |   .0527473   .0205355     2.57   0.050    -.0000408    .1055354
         x11 |  -.0294454   .0085283    -3.45   0.018    -.0513682   -.0075226
       _cons |  -.0083641   .0095648    -0.87   0.422    -.0329511    .0162229
------------------------------------------------------------------------------

.
. predict u7,r

.
. predict y7hat,xb

.
. reg lnb x7 x9 x11 l.u7,robust cluster(PD)

Linear regression                                      Number of obs =    2256
                                                       F(  4,     5) =   41.55
                                                       Prob > F      =  0.0005
                                                       R-squared     =  0.2091
                                                       Root MSE      =  .18338

                                      (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x7 |  -.0099123   .0205212    -0.48   0.649    -.0626636     .042839
          x9 |   .0534353   .0201922     2.65   0.046     .0015297    .1053409
         x11 |  -.0295982   .0084909    -3.49   0.018    -.0514248   -.0077716
          u7 |
         L1. |   .0289866   .0390224     0.74   0.491    -.0713237    .1292968
       _cons |   -.008079   .0092061    -0.88   0.420    -.0317441     .015586
------------------------------------------------------------------------------

.
. gen y72=y7hat*y7hat

.
. gen y73=y72*y7hat

.
. reg lnb x7 x9 x11 y72 y73, robust cluster(PD)

Linear regression                                      Number of obs =    2262
                                                       F(  4,     5) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.2950
                                                       Root MSE      =  .17297

                                      (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x7 |  -.0365894   .0232891    -1.57   0.177     -.096456    .0232772
          x9 |   .1823333   .0294014     6.20   0.002     .1067545    .2579121
         x11 |  -.1024183   .0118965    -8.61   0.000    -.1329991   -.0718375
         y72 |  -13.71666   2.640835    -5.19   0.003    -20.50514   -6.928177
         y73 |   17.29183   4.942668     3.50   0.017     4.586297    29.99736
       _cons |  -.0386398   .0126393    -3.06   0.028    -.0711302   -.0061494
------------------------------------------------------------------------------

.
. test y72 y73

 ( 1)  y72 = 0
 ( 2)  y73 = 0

       F(  2,     5) =   37.44
            Prob > F =    0.0010
```

```
. *8 Test all seasonal variables snow

.
. reg lnb x13,robust cluster(PD)

Linear regression                                      Number of obs =    2262
                                                       F(  1,     5) =    4.64
                                                       Prob > F      =  0.0837
                                                       R-squared     =  0.0540
                                                       Root MSE      =  .20019

                                    (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x13 |  -1.48e-06   6.86e-07    -2.15   0.084    -3.24e-06    2.85e-07
       _cons |   .0950878   .0239938     3.96   0.011     .0334097    .1567659
------------------------------------------------------------------------------

.
. predict u8,r

.
. predict y8hat,xb

.
. reg lnb x13 l.u8,robust cluster(PD)

Linear regression                                      Number of obs =    2256
                                                       F(  2,     5) =  120.65
                                                       Prob > F      =  0.0001
                                                       R-squared     =  0.0839
                                                       Root MSE      =  .19728

                                    (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x13 |  -1.19e-06   6.32e-07    -1.88   0.119    -2.82e-06    4.37e-07
          u8 |
         L1. |   .1843256   .0226842     8.13   0.000     .1260139    .2426373
       _cons |   .0867874   .0216123     4.02   0.010     .0312312    .1423435
------------------------------------------------------------------------------

.
. gen y82=y8hat*y8hat

.
. gen y83=y82*y8hat

.
. reg lnb x13 y82 y83, robust cluster(PD)

Linear regression                                      Number of obs =    2262
                                                       F(  3,     5) =  118.35
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1346
                                                       Root MSE      =  .19156

                                    (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x13 |   5.26e-07   1.15e-06     0.46   0.666    -2.42e-06    3.48e-06
         y82 |   24.86909   8.732913     2.85   0.036      2.42042    47.31776
         y83 |   15.52356   119.4865     0.13   0.902    -291.6263    322.6734
       _cons |  -.0930379   .0543114    -1.71   0.147    -.2326498     .046574
------------------------------------------------------------------------------

.
. test y82 y83

 ( 1)  y82 = 0
 ( 2)  y83 = 0

       F(  2,     5) =   18.81
            Prob > F =    0.0047
```

```
. *9 test all actial and season variables

.
. reg lnb x1 x2 x3 x4 x5 x6 x7 x8 x9 x10 x11 x12 x13 x14,robust cluster(PD)

Linear regression                                      Number of obs =    2262
                                                       F(  4,     5) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.5619
                                                       Root MSE      =  .13663

                                    (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |  -.0368756   .0078693    -4.69   0.005    -.0571044   -.0166469
          x2 |   .0081106   .0006293    12.89   0.000      .006493    .0097283
          x3 |   .0576028   .0106485     5.41   0.003     .0302299    .0849757
          x4 |   .0032006   .0002656    12.05   0.000     .0025178    .0038834
          x5 |  -.0305737   .0031185    -9.80   0.000    -.0385902   -.0225573
          x6 |   -.003268   .0005827    -5.61   0.002    -.0047659   -.0017701
          x7 |  -.0240236   .0121225    -1.98   0.104    -.0551853    .0071382
          x8 |   .0158953   .0025549     6.22   0.002     .0093278    .0224628
          x9 |   .0410233   .0128489     3.19   0.024     .0079942    .0740524
         x10 |   .0028409   .0025828     1.10   0.321    -.0037983    .0094801
         x11 |  -.0143238   .0084532    -1.69   0.151    -.0360534    .0074058
         x12 |   .0072666   .0017356     4.19   0.009     .0028052     .011728
         x13 |   .0000109   2.20e-06     4.97   0.004     5.28e-06    .0000166
         x14 |   1.29e-07   4.72e-07     0.27   0.796    -1.09e-06    1.34e-06
       _cons |    .024453   .0116056     2.11   0.089    -.0053802    .0542862
------------------------------------------------------------------------------

.
. test x1 x2 x3 x4 x5 x6

 ( 1)  x1 = 0
 ( 2)  x2 = 0
 ( 3)  x3 = 0
 ( 4)  x4 = 0
 ( 5)  x5 = 0
 ( 6)  x6 = 0
       Constraint 4 dropped

       F(  5,     5) =   77.90
            Prob > F =    0.0001

.
. test x1 x3 x5

 ( 1)  x1 = 0
 ( 2)  x3 = 0
 ( 3)  x5 = 0

       F(  3,     5) =   73.36
            Prob > F =    0.0001

.
. test x2 x3 x5

 ( 1)  x2 = 0
 ( 2)  x3 = 0
 ( 3)  x5 = 0

       F(  3,     5) =   88.55
            Prob > F =    0.0001

.
. test x7 x8 x9 x10 x11 x12

 ( 1)  x7 = 0
 ( 2)  x8 = 0
 ( 3)  x9 = 0
 ( 4)  x10 = 0
 ( 5)  x11 = 0
 ( 6)  x12 = 0
       Constraint 2 dropped

       F(  5,     5) =   43.31
            Prob > F =    0.0004

.
. test x7 x9 x11

 ( 1)  x7 = 0
 ( 2)  x9 = 0
 ( 3)  x11 = 0

       F(  3,     5) =   10.08
            Prob > F =    0.0146

.
. test x8 x10 x12

 ( 1)  x8 = 0
 ( 2)  x10 = 0
 ( 3)  x12 = 0

       F(  3,     5) =   14.97
            Prob > F =    0.0062

.
. test x13 x14

 ( 1)  x13 = 0
 ( 2)  x14 = 0

       F(  2,     5) =  545.99
            Prob > F =    0.0000
```

```
. predict u9,r

.
. predict y9hat,xb

.
. reg lnb x1 x2 x3 x4 x5 x6 x7 x8 x9 x10 x11 x12 x13 x14 l.u9,robust cluster(PD)

Linear regression                                      Number of obs =    2256
                                                       F(  4,     5) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.5645
                                                       Root MSE      =  .13641

                                     (Std. Err. adjusted for 6 clusters in PD)

             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |   -.036125   .0076274    -4.74   0.005    -.0557319   -.0165182
          x2 |   .0077552   .0006466    11.99   0.000      .006093    .0094174
          x3 |    .057216   .0100663     5.68   0.002     .0313398    .0830923
          x4 |   .0031628   .0003015    10.49   0.000     .0023877    .0039379
          x5 |  -.0309981   .0029064   -10.67   0.000    -.0384693   -.0235268
          x6 |  -.0028309   .0005957    -4.75   0.005    -.0043622   -.0012997
          x7 |  -.0269299    .012346    -2.18   0.081    -.0586662    .0048064
          x8 |   .0178885   .0022089     8.10   0.000     .0122104    .0235665
          x9 |   .0437989   .0131824     3.32   0.021     .0099124    .0776854
         x10 |   .0017003   .0023036     0.74   0.494    -.0042211    .0076218
         x11 |  -.0151976   .0086118    -1.76   0.138    -.0373349    .0069396
         x12 |   .0074778   .0016978     4.40   0.007     .0031134    .0118421
         x13 |   .0000109   2.11e-06     5.20   0.003     5.54e-06    .0000164
         x14 |   7.61e-09   4.68e-07     0.02   0.988    -1.20e-06    1.21e-06
          u9 |
         L1. |   -.083114   .0207746    -4.00   0.010    -.1365169   -.0297112
       _cons |   .0243212   .0115856     2.10   0.090    -.0054606    .0541031
------------------------------------------------------------------------------

.
. gen y92=y9hat*y9hat

.
. gen y93=y92*y9hat

.
. reg lnb x1 x2 x3 x4 x5 x6 x7 x8 x9 x10 x11 x12 x13 x14 y92 y93, robust cluster(
> PD)

Linear regression                                      Number of obs =    2262
                                                       F(  4,     5) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.5775
                                                       Root MSE      =  .13423

                                     (Std. Err. adjusted for 6 clusters in PD)

             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |  -.0359913   .0052934    -6.80   0.001    -.0495984   -.0223842
          x2 |    .005789   .0007315     7.91   0.001     .0039085    .0076694
          x3 |    .058548   .0068073     8.60   0.000     .0410492    .0760468
          x4 |   .0042952   .0003627    11.84   0.000      .003363    .0052274
          x5 |  -.0324304   .0019382   -16.73   0.000    -.0374126   -.0274481
          x6 |  -.0024684   .0004009    -6.16   0.002    -.0034989   -.0014379
          x7 |  -.0089129   .0125521    -0.71   0.509    -.0411792    .0233535
          x8 |   .0062313   .0017727     3.52   0.017     .0016745    .0107882
          x9 |   .0282971   .0138343     2.05   0.096    -.0072651    .0638592
         x10 |   .0030668   .0026677     1.15   0.302    -.0037906    .0099242
         x11 |  -.0069592   .0091165    -0.76   0.480    -.0303939    .0164755
         x12 |   .0069153   .0011823     5.85   0.002     .0038761    .0099545
         x13 |   .0000111   1.46e-06     7.62   0.001     7.36e-06    .0000148
         x14 |   2.77e-07   4.71e-07     0.59   0.582    -9.34e-07    1.49e-06
         y92 |   .7837187   .0715947    10.95   0.000     .5996786    .9677588
         y93 |   .1455143   .4160646     0.35   0.741    -.9240138    1.215043
       _cons |   .0343247   .0101374     3.39   0.020     .0082655    .0603838
------------------------------------------------------------------------------

.
. test y92 y93

 ( 1)  y92 = 0
 ( 2)  y93 = 0

       F(  2,     5) =  102.34
            Prob > F =    0.0001
```

```
. *10 test all actial and season variables reservoir level

.
. reg lnb x1 x2 x3 x4 x5 x6,robust cluster(PD)

Linear regression                                      Number of obs =    2262
                                                       F(  4,     5) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.4294
                                                       Root MSE      =  .15565

                                   (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |  -.0194841   .0042141    -4.62   0.006    -.0303167   -.0086515
          x2 |   .0068508   .0012683     5.40   0.003     .0035904    .0101112
          x3 |   .0088224   .0045994     1.92   0.113    -.0030006    .0206455
          x4 |   .0050021   .0008602     5.81   0.002     .0027908    .0072133
          x5 |    .002321   .0007765     2.99   0.030     .0003249    .0043171
          x6 |  -.0015401   .0007376    -2.09   0.091    -.0034362    .0003561
       _cons |   .0386153   .0150076     2.57   0.050      .000037    .0771936
------------------------------------------------------------------------------

.
. test x1 x3 x5

 ( 1)  x1 = 0
 ( 2)  x3 = 0
 ( 3)  x5 = 0

       F(  3,     5) =   96.06
            Prob > F =    0.0001

.
. test x2 x4 x6

 ( 1)  x2 = 0
 ( 2)  x4 = 0
 ( 3)  x6 = 0

       F(  3,     5) =  232.12
            Prob > F =    0.0000

.
. predict u10,r

.
. predict y10hat,xb

.
. reg lnb x1 x2 x3 x4 x5 x6 l.u10,robust cluster(PD)

Linear regression                                      Number of obs =    2256
                                                       F(  4,     5) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.4360
                                                       Root MSE      =  .15496

                                   (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |  -.0192751   .0042267    -4.56   0.006    -.0301401   -.0084101
          x2 |   .0073109   .0012901     5.67   0.002     .0039944    .0106273
          x3 |   .0079637   .0044218     1.80   0.132     -.003403    .0193304
          x4 |    .005067   .0008717     5.81   0.002     .0028262    .0073079
          x5 |   .0030099     .00083     3.63   0.015     .0008763    .0051435
          x6 |  -.0021682   .0007213    -3.01   0.030    -.0040224    -.000314
         u10 |
         L1. |   .1102901   .0461511     2.39   0.062    -.0083451    .2289254
       _cons |   .0384646    .014688     2.62   0.047     .0007079    .0762212
------------------------------------------------------------------------------
```

```
. gen y102=y10hat*y10hat

.
. gen y103=y102*y10hat

.
. reg lnb x1 x2 x3 x4 x5 x6 y102 y103, robust cluster(PD)

Linear regression                                      Number of obs =    2262
                                                       F(  4,     5) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.4810
                                                       Root MSE      =  .14851

                                       (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |  -.0133715   .0034632    -3.86   0.012     -.022274   -.0044691
          x2 |   .0023441   .0009039     2.59   0.049     .0000205    .0046678
          x3 |   .0075999   .0039732     1.91   0.114    -.0026135    .0178133
          x4 |    .005411   .0010192     5.31   0.003      .002791     .008031
          x5 |  -.0013385   .0011552    -1.16   0.299    -.0043081    .0016311
          x6 |   .0002262   .0005572     0.41   0.702    -.0012061    .0016585
        y102 |   1.636946   .1870845     8.75   0.000      1.15603    2.117862
        y103 |   1.303025   .5259978     2.48   0.056    -.0490952    2.655146
       _cons |   .0496367   .0129247     3.84   0.012     .0164126    .0828608
------------------------------------------------------------------------------

.
. test y102 y103

 ( 1)  y102 = 0
 ( 2)  y103 = 0

       F(  2,     5) =   38.61
            Prob > F =    0.0009
```

```
. *11 test all actial and season variables inflow

.
. reg lnb x7 x8 x9 x10 x11 x12,robust cluster(PD)

Linear regression                                      Number of obs =    2262
                                                       F(  4,     5) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.3148
                                                       Root MSE      =  .17056

                                    (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x7 |  -.0584184   .0203096    -2.88   0.035    -.1106259   -.006211
          x8 |   .0480135   .0054098     8.88   0.000     .0341072    .0619198
          x9 |   .0660477   .0195061     3.39   0.020     .0159056    .1161898
         x10 |  -.0058914   .0033185    -1.78   0.136    -.0144218     .002639
         x11 |  -.0486493   .0091649    -5.31   0.003    -.0722085   -.0250901
         x12 |   .0109023   .0024907     4.38   0.007     .0044997    .0173049
       _cons |   -.006816   .0096334    -0.71   0.511    -.0315795    .0179476
------------------------------------------------------------------------------

.
. test x7 x9 x11

 ( 1)  x7 = 0
 ( 2)  x9 = 0
 ( 3)  x11 = 0

       F(  3,     5) =   10.90
            Prob > F =    0.0124

.
. test x8 x10 x12

 ( 1)  x8 = 0
 ( 2)  x10 = 0
 ( 3)  x12 = 0

       F(  3,     5) =   92.28
            Prob > F =    0.0001

.
. predict u11,r

.
. predict y11hat,xb

.
. reg lnb x7 x8 x9 x10 x11 x12 l.u11,robust cluster(PD)

Linear regression                                      Number of obs =    2256
                                                       F(  4,     5) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.3150
                                                       Root MSE      =  .17078

                                    (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x7 |  -.0587746   .0200616    -2.93   0.033    -.1103446   -.0072046
          x8 |   .0477728   .0052025     9.18   0.000     .0343994    .0611462
          x9 |   .0663432   .0193306     3.43   0.019     .0166523    .1160341
         x10 |  -.0056374   .0031383    -1.80   0.132    -.0137047    .0024299
         x11 |   -.048643    .009077    -5.36   0.003    -.0719762   -.0253099
         x12 |   .0107736   .0023768     4.53   0.006     .0046638    .0168834
         u11 |
         L1. |   .0207626   .0326133     0.64   0.552    -.0630725    .1045977
       _cons |  -.0067549   .0093449    -0.72   0.502    -.0307768    .0172669
------------------------------------------------------------------------------
```

```
. gen y112=y11hat*y11hat

.
. gen y113=y112*y11hat

.
. reg lnb x7 x8 x9 x10 x11 x12 y112 y113, robust cluster(PD)

Linear regression                                      Number of obs =    2262
                                                       F(  4,     5) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.3587
                                                       Root MSE      =  .16508

                                      (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x7 |  -.0891009   .0200077    -4.45   0.007    -.1405323   -.0376694
          x8 |   .0861669   .0072661    11.86   0.000      .067489    .1048449
          x9 |   .1018128   .0193191     5.27   0.003     .0521515    .1514741
         x10 |  -.0107501   .0038048    -2.83   0.037    -.0205306   -.0009696
         x11 |  -.0740387   .0086312    -8.58   0.000    -.0962258   -.0518516
         x12 |   .0157833   .0023682     6.66   0.001     .0096956     .021871
        y112 |   -3.71895   .5068204    -7.34   0.001    -5.021773   -2.416127
        y113 |   2.937665   .7332999     4.01   0.010     1.052658    4.822673
       _cons |  -.0237019   .0100877    -2.35   0.066    -.0496331    .0022292
------------------------------------------------------------------------------

.
. test y112 y113

 ( 1)  y112 = 0
 ( 2)  y113 = 0

       F(  2,     5) =  149.38
            Prob > F =    0.0000
```

```
. *12 test all actial and season variables snow

.
. reg lnb x13 x14,robust cluster(PD)

Linear regression                                      Number of obs =    2262
                                                       F(  2,     5) =   15.97
                                                       Prob > F      =  0.0067
                                                       R-squared     =  0.0858
                                                       Root MSE      =  .19684

                                   (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x13 |  -4.54e-06   1.02e-06    -4.44   0.007    -7.16e-06   -1.91e-06
         x14 |   3.05e-06   5.40e-07     5.65   0.002     1.66e-06    4.44e-06
       _cons |   .0936507   .0241033     3.89   0.012     .0316911    .1556102
------------------------------------------------------------------------------

.
. predict u12,r

.
. predict y12hat,xb

.
. reg lnb x13 x14 l.u12,robust cluster(PD)

Linear regression                                      Number of obs =    2256
                                                       F(  3,     5) =   50.76
                                                       Prob > F      =  0.0004
                                                       R-squared     =  0.1365
                                                       Root MSE      =  .19157

                                   (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x13 |  -4.81e-06   8.72e-07    -5.52   0.003    -7.05e-06   -2.57e-06
         x14 |   3.72e-06   5.24e-07     7.09   0.001     2.37e-06    5.06e-06
         u12 |
         L1. |   .2482193   .0340531     7.29   0.001     .1606831    .3357555
       _cons |   .0818197   .0214268     3.82   0.012     .0267404     .136899
------------------------------------------------------------------------------

.
. gen y122=y12hat*y12hat

.
. gen y123=y122*y12hat

.
. reg lnb x13 x14 y122 y123, robust cluster(PD)

Linear regression                                      Number of obs =    2262
                                                       F(  4,     5) = 2588.05
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1158
                                                       Root MSE      =  .19367

                                   (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x13 |  -4.24e-06   1.23e-06    -3.46   0.018    -7.40e-06   -1.09e-06
         x14 |   2.93e-06   8.64e-07     3.40   0.019     7.12e-07    5.15e-06
        y122 |   7.207397   1.933699     3.73   0.014     2.236666    12.17813
        y123 |   1.050465   12.63953     0.08   0.937    -31.44049    33.54142
       _cons |   .0425985   .0225888     1.89   0.118    -.0154679     .100665
------------------------------------------------------------------------------

.
. test y122 y123

 ( 1)  y122 = 0
 ( 2)  y123 = 0

       F(  2,     5) =   18.66
            Prob > F =    0.0048
```

```
. *13 Test all diff. variables

.
. reg lnb x15 x16 x17 x18 x19 x20 x21,robust cluster(PD)

Linear regression                                      Number of obs =    2262
                                                       F(  4,      5) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.2564
                                                       Root MSE      =  .17773

                                   (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x15 |   .0061869   .0005925    10.44   0.000     .0046638      .00771
         x16 |    .006426   .0006193    10.38   0.000     .0048341    .0080178
         x17 |  -.0053529   .0015443    -3.47   0.018    -.0093226   -.0013832
         x18 |   .0288528   .0066059     4.37   0.007     .0118719    .0458338
         x19 |  -.0202708   .0068808    -2.95   0.032    -.0379585   -.0025831
         x20 |   .0169038   .0055164     3.06   0.028     .0027235     .031084
         x21 |   2.81e-07   5.59e-07     0.50   0.637    -1.16e-06    1.72e-06
       _cons |   .0587331   .0088749     6.62   0.001     .0359194    .0815467
------------------------------------------------------------------------------

.
. test x15 x16 x17

 ( 1)  x15 = 0
 ( 2)  x16 = 0
 ( 3)  x17 = 0

       F(  3,     5) =  431.29
            Prob > F =    0.0000

.
. test x18 x19 x20

 ( 1)  x18 = 0
 ( 2)  x19 = 0
 ( 3)  x20 = 0

       F(  3,     5) =    9.17
            Prob > F =    0.0178

.
. predict u13,r

.
. predict y13hat,xb

.
. reg lnb x15 x16 x17 x18 x19 x20 x21 l.u13,robust cluster(PD)

Linear regression                                      Number of obs =    2256
                                                       F(  4,      5) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.3462
                                                       Root MSE      =  .16688

                                   (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x15 |   .0079998   .0011324     7.06   0.001     .0050889    .0109107
         x16 |   .0054577    .000882     6.19   0.002     .0031905    .0077249
         x17 |  -.0057545   .0015427    -3.73   0.014      -.00972   -.0017889
         x18 |   .0170526   .0049126     3.47   0.018     .0044244    .0296808
         x19 |  -.0099669   .0058816    -1.69   0.151     -.025086    .0051522
         x20 |   .0117113   .0041424     2.83   0.037     .0010629    .0223597
         x21 |   9.29e-07   5.81e-07     1.60   0.171    -5.65e-07    2.42e-06
         u13 |
         L1. |   .3582501   .0528368     6.78   0.001     .2224287    .4940715
       _cons |   .0636966    .005931    10.74   0.000     .0484505    .0789427
------------------------------------------------------------------------------
```

```
. gen y132=y13hat*y13hat

.
. gen y133=y132*y13hat

.
. reg lnb x15 x16 x17 x18 x19 x20 x21 y132 y133, robust cluster(PD)

Linear regression                                      Number of obs =    2262
                                                       F(  4,     5) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.2842
                                                       Root MSE      =  .17444

                                   (Std. Err. adjusted for 6 clusters in PD)
```

lnb	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
x15	.0050356	.000397	12.69	0.000	.0040152	.006056
x16	.0048207	.0009845	4.90	0.004	.0022899	.0073514
x17	-.0036877	.0009212	-4.00	0.010	-.0060558	-.0013197
x18	.0063472	.00502	1.26	0.262	-.0065571	.0192515
x19	-.0077439	.0033862	-2.29	0.071	-.0164484	.0009605
x20	.010282	.0034002	3.02	0.029	.0015415	.0190225
x21	4.32e-07	5.30e-07	0.81	0.452	-9.31e-07	1.79e-06
y132	1.573538	1.244716	1.26	0.262	-1.626108	4.773183
y133	2.182655	2.736855	0.80	0.461	-4.852655	9.217965
_cons	.0342995	.0095525	3.59	0.016	.009744	.058855

```
.
. test y132 y133

 ( 1)  y132 = 0
 ( 2)  y133 = 0

       F(  2,     5) =    3.93
            Prob > F =    0.0941
```

```
. *14 Test diff. variables reservoir level

.
. reg lnb x15 x16 x17,robust cluster(PD)

Linear regression                                      Number of obs =    2262
                                                       F(  3,     5) =  325.73
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.2228
                                                       Root MSE      =  .18154

                                        (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x15 |    .007834   .0011161     7.02   0.001     .0049648    .0107031
         x16 |   .0054073   .0011001     4.92   0.004     .0025793    .0082352
         x17 |  -.0040834   .0010718    -3.81   0.013    -.0068386   -.0013282
       _cons |   .0688129    .011047     6.23   0.002     .0404156    .0972101
------------------------------------------------------------------------------

.
. predict u14,r

.
. predict y14hat,xb

.
. reg lnb x15 x16 x17 l.u14,robust cluster(PD)

Linear regression                                      Number of obs =    2256
                                                       F(  4,     5) =  303.42
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.3355
                                                       Root MSE      =  .16809

                                        (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x15 |   .0091289   .0016732     5.46   0.003     .0048278      .01343
         x16 |   .0053297   .0012455     4.28   0.008     .0021282    .0085313
         x17 |   -.004737   .0012274    -3.86   0.012    -.0078922   -.0015819
         u14 |
         L1. |   .3808779   .0555846     6.85   0.001     .2379931    .5237627
       _cons |   .0711698   .0075578     9.42   0.000      .051742    .0905977
------------------------------------------------------------------------------

.
. gen y142=y14hat*y14hat

.
. gen y143=y142*y14hat

.
. reg lnb x15 x16 x17 y142 y143, robust cluster(PD)

Linear regression                                      Number of obs =    2262
                                                       F(  4,     5) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.2788
                                                       Root MSE      =  .17495

                                        (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x15 |   .0028745   .0006377     4.51   0.006     .0012351    .0045139
         x16 |   .0020978   .0019303     1.09   0.327    -.0028643    .0070599
         x17 |  -.0012893   .0004666    -2.76   0.040    -.0024888   -.0000898
        y142 |   .8859508   1.115848     0.79   0.463    -1.982427    3.754328
        y143 |   16.40475   3.996302     4.10   0.009     6.131924    26.67757
       _cons |   .0248239   .0120755     2.06   0.095    -.0062171     .055865
------------------------------------------------------------------------------

.
. test y142 y143

 ( 1)  y142 = 0
 ( 2)  y143 = 0

       F(  2,     5) =    8.43
            Prob > F =    0.0250
```

```
. *15 Test diff. variables inflow

.
. reg lnb x18 x19 x20,robust cluster(PD)

Linear regression                                      Number of obs =    2262
                                                       F(  3,     5) =  104.23
                                                       Prob > F      =  0.0001
                                                       R-squared     =  0.0966
                                                       Root MSE      =  .19572

                                    (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x18 |   .0562758   .0058264     9.66   0.000     .0412985    .0712531
         x19 |  -.0267111   .0057038    -4.68   0.005    -.0413731   -.0120491
         x20 |   .0156758   .0036186     4.33   0.007     .0063738    .0249778
       _cons |   .0424452   .0098806     4.30   0.008     .0170463    .0678441
------------------------------------------------------------------------------

.
. predict u15,r

.
. predict y15hat,xb

.
. reg lnb x18 x19 x20 l.u15,robust cluster(PD)

Linear regression                                      Number of obs =    2256
                                                       F(  4,     5) =  103.27
                                                       Prob > F      =  0.0001
                                                       R-squared     =  0.1478
                                                       Root MSE      =  .19036

                                    (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x18 |   .0523595   .0055205     9.48   0.000     .0381687    .0665503
         x19 |  -.0212231   .0053866    -3.94   0.011    -.0350699   -.0073764
         x20 |   .0131518   .0029979     4.39   0.007     .0054454    .0208582
         u15 |
         L1. |    .242074   .0261425     9.26   0.000     .1748727    .3092754
       _cons |   .0440325    .007509     5.86   0.002     .0247301    .0633349
------------------------------------------------------------------------------

.
. gen y152=y15hat*y15hat

.
. gen y153=y152*y15hat

.
. reg lnb x15 x16 x17 y152 y153, robust cluster(PD)

Linear regression                                      Number of obs =    2262
                                                       F(  4,     5) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.2920
                                                       Root MSE      =  .17334

                                    (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x15 |   .0067461   .0005995    11.25   0.000     .0052051    .0082872
         x16 |   .0054744   .0006632     8.25   0.000     .0037697    .0071792
         x17 |  -.0045938   .0010559    -4.35   0.007     -.007308   -.0018797
        y152 |    8.09797   1.695255     4.78   0.005     3.740178    12.45576
        y153 |  -15.93024   3.233981    -4.93   0.004    -24.24345   -7.617023
       _cons |   .0306315   .0069674     4.40   0.007     .0127211    .0485418
------------------------------------------------------------------------------

.
. test y152 y153

 ( 1)  y152 = 0
 ( 2)  y153 = 0

       F(  2,     5) =   12.13
            Prob > F =    0.0121
```

```
. *16 Test diff. variables snow

.
. reg lnb x21,robust cluster(PD)

Linear regression                                      Number of obs =    2262
                                                       F(  1,     5) =   34.87
                                                       Prob > F      =  0.0020
                                                       R-squared     =  0.0311
                                                       Root MSE      =   .2026

                                    (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x21 |   3.01e-06   5.11e-07     5.90   0.002     1.70e-06    4.33e-06
       _cons |   .0501675   .0107498     4.67   0.005     .0225342    .0778007
------------------------------------------------------------------------------

.
. predict u16,r

.
. predict y16hat,xb

.
. reg lnb x21 l.u16,robust cluster(PD)

Linear regression                                      Number of obs =    2256
                                                       F(  2,     5) =   43.42
                                                       Prob > F      =  0.0007
                                                       R-squared     =  0.1140
                                                       Root MSE      =  .19401

                                    (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x21 |   3.77e-06   5.11e-07     7.38   0.001     2.46e-06    5.09e-06
         u16 |
         L1. |   .2964547   .0321292     9.23   0.000     .2138638    .3790455
       _cons |   .0499347   .0076053     6.57   0.001     .0303845    .0694848
------------------------------------------------------------------------------

.
. gen y162=y16hat*y16hat

.
. gen y163=y162*y16hat

.
. reg lnb x21 y162 y163, robust cluster(PD)

Linear regression                                      Number of obs =    2262
                                                       F(  3,     5) =   12.51
                                                       Prob > F      =  0.0092
                                                       R-squared     =  0.0431
                                                       Root MSE      =  .20143

                                    (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x21 |   6.63e-06   2.64e-06     2.51   0.054    -1.62e-07    .0000134
        y162 |   -19.3904   12.19646    -1.59   0.173    -50.74239    11.96158
        y163 |   62.75112   36.60006     1.71   0.147    -31.33233    156.8346
       _cons |   .1022732   .0356492     2.87   0.035      .010634    .1939124
------------------------------------------------------------------------------

.
. test y162 y163

 ( 1)  y162 = 0
 ( 2)  y163 = 0

       F(  2,     5) =    2.07
            Prob > F =    0.2208
```

```
. *17 test all actual variables and diff. variables

.
. reg lnb x2 x4 x6 x8 x10 x12 x14 x15 x16 x17 x18 x19 x20 x21,robust cluster(PD)

Linear regression                                      Number of obs =    2262
                                                       F(  4,     5) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.5619
                                                       Root MSE      =  .13663

                                    (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |  -.0287652   .0074177    -3.88   0.012    -.0478331   -.0096972
          x4 |   .0608036   .0107738     5.64   0.002     .0331086    .0884986
          x6 |  -.0338418   .0032901   -10.29   0.000    -.0422992   -.0253844
          x8 |  -.0081281   .0105171    -0.77   0.475    -.0351632     .018907
         x10 |    .043864    .014863     2.95   0.032     .0056573    .0820706
         x12 |  -.0070571     .00933    -0.76   0.484    -.0310405    .0169264
         x14 |   .0000111   1.74e-06     6.37   0.001     6.60e-06    .0000155
         x15 |   .0368758   .0078693     4.69   0.005     .0166471    .0571044
         x16 |   -.057603   .0106485    -5.41   0.003    -.0849758   -.0302302
         x17 |   .0305738   .0031185     9.80   0.000     .0225574    .0385902
         x18 |   .0240234   .0121225     1.98   0.104    -.0071384    .0551852
         x19 |   -.041023   .0128489    -3.19   0.024    -.0740521   -.0079939
         x20 |   .0143237   .0084532     1.69   0.151     -.007406    .0360533
         x21 |  -.0000109   2.20e-06    -4.97   0.004    -.0000166   -5.28e-06
       _cons |    .024453   .0116056     2.11   0.089    -.0053802    .0542862
------------------------------------------------------------------------------

.
. test x2 x4 x6 x15 x16 x17

 ( 1)  x2 = 0
 ( 2)  x4 = 0
 ( 3)  x6 = 0
 ( 4)  x15 = 0
 ( 5)  x16 = 0
 ( 6)  x17 = 0
       Constraint 5 dropped

       F(  5,     5) =  100.06
            Prob > F =    0.0001

.
. test x2 x4 x6

 ( 1)  x2 = 0
 ( 2)  x4 = 0
 ( 3)  x6 = 0

       F(  3,     5) =  100.30
            Prob > F =    0.0001

.
. test x15 x16 x17

 ( 1)  x15 = 0
 ( 2)  x16 = 0
 ( 3)  x17 = 0

       F(  3,     5) =   73.36
            Prob > F =    0.0001

.
. test x8 x10 x12 x18 x19 x20

 ( 1)  x8 = 0
 ( 2)  x10 = 0
 ( 3)  x12 = 0
 ( 4)  x18 = 0
 ( 5)  x19 = 0
 ( 6)  x20 = 0
       Constraint 1 dropped

       F(  5,     5) =   43.31
            Prob > F =    0.0004

.
. test x8 x10 x12

 ( 1)  x8 = 0
 ( 2)  x10 = 0
 ( 3)  x12 = 0

       F(  3,     5) =   38.93
            Prob > F =    0.0007

.
. test x18 x19 x20

 ( 1)  x18 = 0
 ( 2)  x19 = 0
 ( 3)  x20 = 0

       F(  3,     5) =   10.08
            Prob > F =    0.0146

.
. test x14 x21

 ( 1)  x14 = 0
 ( 2)  x21 = 0

       F(  2,     5) =  546.01
            Prob > F =    0.0000
```

```
. predict u17,r

.
. predict y17hat,xb

.
. reg lnb x2 x4 x6 x8 x10 x12 x14 x15 x16 x17 x18 x19 x20 x21 l.u17,robust cluste
> r(PD)

Linear regression                                      Number of obs =    2256
                                                       F(  4,     5) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.5645
                                                       Root MSE      =  .13641

                                    (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |    -.02837   .0071192    -3.98   0.010    -.0466705   -.0100694
          x4 |    .060379    .010231     5.90   0.002     .0340794    .0866787
          x6 |  -.0338291   .0030994   -10.91   0.000    -.0417963   -.0258619
          x8 |  -.0090413   .0108592    -0.83   0.443    -.0369559    .0188732
         x10 |    .045499   .0151462     3.00   0.030     .0065644    .0844336
         x12 |  -.0077197   .0094257    -0.82   0.450    -.0319494    .0165099
         x14 |    .000011   1.65e-06     6.64   0.001     6.72e-06    .0000152
         x15 |   .0361252   .0076274     4.74   0.005     .0165184     .055732
         x16 |  -.0572163   .0100662    -5.68   0.002    -.0830924   -.0313401
         x17 |   .0309982   .0029064    10.67   0.000      .023527    .0384693
         x18 |   .0269298    .012346     2.18   0.081    -.0048065     .058666
         x19 |  -.0437986   .0131824    -3.32   0.021    -.0776851   -.0099122
         x20 |   .0151975   .0086118     1.76   0.138    -.0069397    .0373347
         x21 |  -.0000109   2.11e-06    -5.20   0.003    -.0000164   -5.54e-06
         u17 |
         L1. |  -.0831141   .0207746    -4.00   0.010    -.1365169   -.0297113
       _cons |   .0243212   .0115856     2.10   0.090    -.0054606    .0541031
------------------------------------------------------------------------------

.
. gen y172=y17hat*y17hat

.
. gen y173=y172*y17hat

.
. reg lnb x2 x4 x6 x8 x10 x12 x14 x15 x16 x17 x18 x19 x20 x21 y172 y173, robust c
> luster(PD)

Linear regression                                      Number of obs =    2262
                                                       F(  4,     5) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.5775
                                                       Root MSE      =  .13423

                                    (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |  -.0302024   .0055724    -5.42   0.003    -.0445266   -.0158782
          x4 |   .0628433   .0069766     9.01   0.000     .0449094    .0807773
          x6 |  -.0348988    .001729   -20.18   0.000    -.0393434   -.0304543
          x8 |  -.0026814   .0112416    -0.24   0.821    -.0315787     .026216
         x10 |   .0313636   .0159826     1.96   0.107    -.0097209    .0724482
         x12 |  -.0000438   .0097291    -0.00   0.997    -.0250532    .0249656
         x14 |   .0000114   1.03e-06    11.05   0.000     8.73e-06     .000014
         x15 |   .0359914   .0052934     6.80   0.001     .0223843    .0495984
         x16 |  -.0585481   .0068073    -8.60   0.000    -.0760468   -.0410495
         x17 |   .0324304   .0019382    16.73   0.000     .0274482    .0374126
         x18 |   .0089127   .0125522     0.71   0.509    -.0233537     .041179
         x19 |  -.0282968   .0138343    -2.05   0.096    -.0638589    .0072652
         x20 |   .0069591   .0091165     0.76   0.480    -.0164755    .0303937
         x21 |  -.0000111   1.46e-06    -7.62   0.001    -.0000148   -7.36e-06
        y172 |   .7837187   .0715942    10.95   0.000     .5996799    .9677576
        y173 |   .1455167   .4160639     0.35   0.741    -.9240096    1.215043
       _cons |   .0343246   .0101375     3.39   0.020     .0082655    .0603838
------------------------------------------------------------------------------

.
. test y172 y173

 ( 1)  y172 = 0
 ( 2)  y173 = 0

       F(  2,     5) =  102.34
            Prob > F =    0.0001
```

```
. *18 test all actual variables and diff. variables reservoir level

.
. reg lnb x2 x4 x6 x15 x16 x17,robust cluster(PD)

Linear regression                                      Number of obs =    2262
                                                       F(  4,     5) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.4294
                                                       Root MSE      =  .15565

                                   (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |  -.0126333   .0032815    -3.85   0.012    -.0210686   -.0041979
          x4 |   .0138245   .0039897     3.47   0.018     .0035686    .0240803
          x6 |   .0007809   .0007918     0.99   0.369    -.0012544    .0028162
         x15 |   .0194841   .0042141     4.62   0.006     .0086515    .0303167
         x16 |  -.0088224   .0045994    -1.92   0.113    -.0206455    .0030006
         x17 |   -.002321   .0007765    -2.99   0.030    -.0043171   -.0003249
       _cons |   .0386153   .0150076     2.57   0.050      .000037    .0771936
------------------------------------------------------------------------------

.
. test x2 x4 x6

 ( 1)  x2 = 0
 ( 2)  x4 = 0
 ( 3)  x6 = 0

       F(  3,     5) =   50.34
            Prob > F =    0.0004

.
. test x15 x16 x17

 ( 1)  x15 = 0
 ( 2)  x16 = 0
 ( 3)  x17 = 0

       F(  3,     5) =   96.06
            Prob > F =    0.0001

.
. predict u18,r

.
. predict y18hat,xb

.
. reg lnb x2 x4 x6 x15 x16 x17 l.u18,robust cluster(PD)

Linear regression                                      Number of obs =    2256
                                                       F(  4,     5) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.4360
                                                       Root MSE      =  .15496

                                   (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |  -.0119642   .0032104    -3.73   0.014    -.0202167   -.0037117
          x4 |   .0130307   .0038042     3.43   0.019     .0032518    .0228097
          x6 |   .0008417   .0006741     1.25   0.267    -.0008911    .0025746
         x15 |   .0192751   .0042267     4.56   0.006     .0084101    .0301401
         x16 |  -.0079637   .0044218    -1.80   0.132    -.0193304     .003403
         x17 |  -.0030099     .00083    -3.63   0.015    -.0051435   -.0008763
         u18 |
         L1. |   .1102901   .0461511     2.39   0.062    -.0083452    .2289254
       _cons |   .0384646    .014688     2.62   0.047     .0007079    .0762212
------------------------------------------------------------------------------
```

```
. gen y182=y18hat*y18hat

.
. gen y183=y182*y18hat

.
. reg lnb x2 x4 x6 x15 x16 x17 y182 y183, robust cluster(PD)

Linear regression                                      Number of obs =    2262
                                                       F(  4,     5) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.4810
                                                       Root MSE      =  .14851

                                     (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |  -.0110274   .0028761    -3.83   0.012    -.0184205   -.0036343
          x4 |   .0130109   .0032467     4.01   0.010     .0046651    .0213568
          x6 |  -.0011123   .0010493    -1.06   0.338    -.0038095    .0015849
         x15 |   .0133715   .0034632     3.86   0.012     .0044691     .022274
         x16 |  -.0075999   .0039732    -1.91   0.114    -.0178133    .0026135
         x17 |   .0013385   .0011552     1.16   0.299    -.0016311    .0043081
        y182 |   1.636946   .1870844     8.75   0.000     1.156031    2.117862
        y183 |   1.303026   .5259977     2.48   0.056    -.0490945    2.655146
       _cons |   .0496367   .0129247     3.84   0.012     .0164126    .0828608
------------------------------------------------------------------------------

.
. test y182 y183

 ( 1)  y182 = 0
 ( 2)  y183 = 0

       F(  2,     5) =   38.61
            Prob > F =    0.0009
```

```
. *19 test all actual variables and diff. variables inflow

.
. reg lnb x8 x10 x12 x18 x19 x20,robust cluster(PD)

Linear regression                                      Number of obs =    2262
                                                       F(  4,     5) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.3148
                                                       Root MSE      =  .17056

                                          (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x8 |   -.010405   .0212498    -0.49   0.645    -.0650294    .0442195
         x10 |   .0601563   .0210209     2.86   0.035     .0061204    .1141922
         x12 |   -.037747   .0087171    -4.33   0.007    -.0601551   -.0153389
         x18 |   .0584184   .0203096     2.88   0.035      .006211    .1106259
         x19 |  -.0660477   .0195061    -3.39   0.020    -.1161898   -.0159056
         x20 |   .0486493   .0091649     5.31   0.003     .0250901    .0722086
       _cons |   -.006816   .0096334    -0.71   0.511    -.0315795    .0179476
------------------------------------------------------------------------------

.
. test x8 x10 x12

 ( 1)  x8 = 0
 ( 2)  x10 = 0
 ( 3)  x12 = 0

       F(  3,     5) =   30.20
            Prob > F =    0.0013

.
. test x18 x19 x20

 ( 1)  x18 = 0
 ( 2)  x19 = 0
 ( 3)  x20 = 0

       F(  3,     5) =   10.90
            Prob > F =    0.0124

.
. predict u19,r

.
. predict y19hat,xb

.
. reg lnb x8 x10 x12 x18 x19 x20 l.u19,robust cluster(PD)

Linear regression                                      Number of obs =    2256
                                                       F(  4,     5) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.3150
                                                       Root MSE      =  .17078

                                          (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x8 |  -.0110018   .0207913    -0.53   0.619    -.0644476    .0424439
         x10 |   .0607058   .0207478     2.93   0.033     .0073719    .1140397
         x12 |  -.0378694   .0086605    -4.37   0.007     -.060132   -.0156069
         x18 |   .0587746   .0200616     2.93   0.033     .0072046    .1103447
         x19 |  -.0663432   .0193306    -3.43   0.019    -.1160341   -.0166523
         x20 |    .048643    .009077     5.36   0.003     .0253098    .0719762
         u19 |
         L1. |   .0207626   .0326133     0.64   0.552    -.0630725    .1045977
       _cons |  -.0067549   .0093449    -0.72   0.502    -.0307768    .0172669
------------------------------------------------------------------------------
```

```
.
. gen y192=y19hat*y19hat

.
. gen y193=y192*y19hat

.
. reg lnb x8 x10 x12 x18 x19 x20 y192 y193, robust cluster(PD)

Linear regression                                      Number of obs =    2262
                                                       F(  4,     5) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.3587
                                                       Root MSE      =  .16508

                                       (Std. Err. adjusted for 6 clusters in PD)
```

lnb	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
x8	-.0029339	.0197854	-0.15	0.888	-.0537938	.047926
x10	.0910627	.0202899	4.49	0.006	.0389058	.1432196
x12	-.0582554	.0081802	-7.12	0.001	-.0792832	-.0372276
x18	.0891009	.0200077	4.45	0.007	.0376694	.1405323
x19	-.1018128	.0193191	-5.27	0.003	-.1514742	-.0521515
x20	.0740387	.0086312	8.58	0.000	.0518516	.0962258
y192	-3.71895	.5068204	-7.34	0.001	-5.021774	-2.416127
y193	2.937665	.7332999	4.01	0.010	1.052658	4.822673
_cons	-.0237019	.0100877	-2.35	0.066	-.0496331	.0022292

```
.
. test y192 y193

 ( 1)  y192 = 0
 ( 2)  y193 = 0

       F(  2,     5) =  149.38
            Prob > F =    0.0000

.
```

```
. *20 test all actual variables and diff. variables snow

.
. reg lnb x14 x21,robust cluster(PD)

Linear regression                                      Number of obs =    2262
                                                       F(  2,     5) =   15.97
                                                       Prob > F      =  0.0067
                                                       R-squared     =  0.0858
                                                       Root MSE      =  .19684

                                      (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x14 |  -1.49e-06   7.04e-07    -2.11   0.088    -3.30e-06    3.21e-07
         x21 |   4.54e-06   1.02e-06     4.44   0.007     1.91e-06    7.16e-06
       _cons |   .0936507   .0241033     3.89   0.012     .0316911    .1556102
------------------------------------------------------------------------------

.
. predict u20,r

.
. predict y20hat,xb

.
. reg lnb x14 x21 l.u20,robust cluster(PD)

Linear regression                                      Number of obs =    2256
                                                       F(  3,     5) =   50.76
                                                       Prob > F      =  0.0004
                                                       R-squared     =  0.1365
                                                       Root MSE      =  .19157

                                      (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x14 |  -1.09e-06   6.41e-07    -1.71   0.149    -2.74e-06    5.54e-07
         x21 |   4.81e-06   8.72e-07     5.52   0.003     2.57e-06    7.05e-06
         u20 |
         L1. |   .2482193   .0340531     7.29   0.001     .1606831    .3357555
       _cons |   .0818197   .0214268     3.82   0.012     .0267404     .136899
------------------------------------------------------------------------------

.
. gen y202=y20hat*y20hat

.
. gen y203=y202*y20hat

.
. reg lnb x14 x21 y202 y203, robust cluster(PD)

Linear regression                                      Number of obs =    2262
                                                       F(  4,     5) = 2588.05
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1158
                                                       Root MSE      =  .19367

                                      (Std. Err. adjusted for 6 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x14 |  -1.31e-06   6.60e-07    -1.99   0.103    -3.01e-06    3.84e-07
         x21 |   4.24e-06   1.23e-06     3.46   0.018     1.09e-06    7.40e-06
        y202 |   7.207396   1.933699     3.73   0.014     2.236665    12.17813
        y203 |   1.050463   12.63953     0.08   0.937    -31.44049    33.54142
       _cons |   .0425986   .0225888     1.89   0.118    -.0154679     .100665
------------------------------------------------------------------------------

.
. test y202 y203

 ( 1)  y202 = 0
 ( 2)  y203 = 0

       F(  2,     5) =   18.66
            Prob > F =    0.0048
```

Quarter

```
. xtfisher lnb, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(16)      =  614.9126
         Prob > chi2   =      0.0000

.
. xtfisher x1, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(16)      =  809.1603
         Prob > chi2   =      0.0000

.
. xtfisher x2, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(16)      =  773.7495
         Prob > chi2   =      0.0000

.
. xtfisher x3, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(16)      =  845.2670
         Prob > chi2   =      0.0000

.
. xtfisher x4, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(16)      =  855.8663
         Prob > chi2   =      0.0000

.
. xtfisher x5, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(16)      =  744.5173
         Prob > chi2   =      0.0000

.
. xtfisher x6, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(16)      =  727.4993
         Prob > chi2   =      0.0000
```

```
. xtfisher x7, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(16)     =  851.2741
         Prob > chi2  =      0.0000

.
. xtfisher x8, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(16)     =  738.5779
         Prob > chi2  =      0.0000

.
. xtfisher x9, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(16)     =  827.2487
         Prob > chi2  =      0.0000

.
. xtfisher x10, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(16)     =  728.7316
         Prob > chi2  =      0.0000

.
. xtfisher x11, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(16)     =  596.9476
         Prob > chi2  =      0.0000

.
. xtfisher x12, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(16)     =  512.1145
         Prob > chi2  =      0.0000

.
. xtfisher x13, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(16)     =  842.3151
         Prob > chi2  =      0.0000
```

```
. xtfisher x14, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(16)     =  719.5916
         Prob > chi2  =      0.0000


.
. xtfisher x15, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(16)     =  427.2065
         Prob > chi2  =      0.0000


.
. xtfisher x16, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(16)     =  418.7913
         Prob > chi2  =      0.0000


.
. xtfisher x17, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(16)     =  500.4986
         Prob > chi2  =      0.0000


.
. xtfisher x18, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(16)     =  312.8978
         Prob > chi2  =      0.0000


.
. xtfisher x19, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(16)     =  376.8111
         Prob > chi2  =      0.0000


.
. xtfisher x20, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(16)     =  383.0151
         Prob > chi2  =      0.0000


.
. xtfisher x21, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(16)     =  365.9931
         Prob > chi2  =      0.0000
```

```
. *1 test actual variables

.
. reg lnb x2 x4 x6 x8 x10 x12 x14,robust cluster(PD)

Linear regression                                      Number of obs =    2472
                                                       F(  6,     7) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.1663
                                                       Root MSE      =  .26785

                                    (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |   .0015685   .0002871     5.46   0.001     .0008895    .0022474
          x4 |  -.0002046   .0002726    -0.75   0.477    -.0008491      .00044
          x6 |  -.0021606   .0002313    -9.34   0.000    -.0027075   -.0016136
          x8 |     .01684    .001346    12.51   0.000     .0136572    .0200227
         x10 |  -.0050429   .0006978    -7.23   0.000    -.0066931   -.0033928
         x12 |    .002963   .0002567    11.54   0.000     .0023559    .0035701
         x14 |   3.76e-07   6.35e-08     5.92   0.001     2.26e-07    5.26e-07
       _cons |   .0266432   .0633091     0.42   0.686    -.1230591    .1763455
------------------------------------------------------------------------------

.
. test x2 x4 x6

 ( 1)  x2 = 0
 ( 2)  x4 = 0
 ( 3)  x6 = 0

       F(  3,     7) =   51.12
            Prob > F =    0.0000

.
. test x8 x10 x12

 ( 1)  x8 = 0
 ( 2)  x10 = 0
 ( 3)  x12 = 0

       F(  3,     7) =   56.31
            Prob > F =    0.0000

.
. predict u,r

.
. predict yhat,xb

.
. reg lnb x2 x4 x6 x8 x10 x12 x14 l.u,robust cluster(PD)

Linear regression                                      Number of obs =    2464
                                                       F(  6,     7) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.1677
                                                       Root MSE      =  .26807

                                    (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |   .0016706   .0002828     5.91   0.001     .0010018    .0023393
          x4 |  -.0003151   .0002606    -1.21   0.266    -.0009314    .0003011
          x6 |  -.0021495   .0002232    -9.63   0.000    -.0026773   -.0016217
          x8 |   .0166757   .0012625    13.21   0.000     .0136905    .0196609
         x10 |  -.0046962   .0005866    -8.01   0.000    -.0060832   -.0033091
         x12 |   .0028247   .0001954    14.46   0.000     .0023627    .0032866
         x14 |   3.63e-07   6.15e-08     5.90   0.001     2.17e-07    5.08e-07
           u |
         L1. |   .0429989   .0272026     1.58   0.158    -.0213251    .1073228
       _cons |   .0243848   .0606058     0.40   0.699    -.1189251    .1676947
------------------------------------------------------------------------------
```

```
. gen y2=yhat*yhat

.
. gen y3=y2*yhat

.
. reg lnb x2 x4 x6 x8 x10 x12 x14 y2 y3, robust cluster(PD)

Linear regression                                      Number of obs =     2472
                                                       F(  6,     7) =        .
                                                       Prob > F      =        .
                                                       R-squared     =   0.1865
                                                       Root MSE      =    .2647

                                     (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |   .0019294   .0002801     6.89   0.000      .001267    .0025917
          x4 |  -.0003056   .0002486    -1.23   0.259    -.0008934    .0002821
          x6 |  -.0026583   .0002804    -9.48   0.000    -.0033214   -.0019953
          x8 |   .0252747    .002604     9.71   0.000     .0191172    .0314323
         x10 |  -.0082477   .0010927    -7.55   0.000    -.0108316   -.0056639
         x12 |    .004091   .0004168     9.82   0.000     .0031054    .0050766
         x14 |   4.96e-07   5.30e-08     9.36   0.000     3.71e-07    6.22e-07
          y2 |  -.7572217   .5265451    -1.44   0.194    -2.002303    .4878597
          y3 |  -1.267625   .8215661    -1.54   0.167     -3.21032    .6750698
       _cons |   .0167497   .0624784     0.27   0.796    -.1309883    .1644877
------------------------------------------------------------------------------

.
. test y2 y3

 ( 1)  y2 = 0
 ( 2)  y3 = 0

       F(  2,     7) =   10.42
            Prob > F =    0.0080
```

```
. *2 test actual variables reservoir level

.
. reg lnb x2 x4 x6,robust cluster(PD)

Linear regression                                      Number of obs =    2472
                                                       F(  3,     7) =    1.69
                                                       Prob > F      =  0.2554
                                                       R-squared     =  0.0091
                                                       Root MSE      =  .29179

                                    (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |   .0002628   .0002529     1.04   0.333    -.0003351    .0008608
          x4 |  -.0001504   .0002164    -0.69   0.510    -.0006622    .0003614
          x6 |   .0000603    .000177     0.34   0.743    -.0003583    .0004789
       _cons |   .0274143   .0633196     0.43   0.678    -.1223127    .1771412
------------------------------------------------------------------------------

.
. predict u2,r

.
. predict y2hat,xb

.
. reg lnb x2 x4 x6 l.u2,robust cluster(PD)

Linear regression                                      Number of obs =    2464
                                                       F(  4,     7) =    4.61
                                                       Prob > F      =  0.0387
                                                       R-squared     =  0.0118
                                                       Root MSE      =  .29187

                                    (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |   .0003928   .0002402     1.64   0.146    -.0001751    .0009607
          x4 |  -.0002585   .0002072    -1.25   0.252    -.0007486    .0002315
          x6 |   .0000394    .000173     0.23   0.826    -.0003698    .0004485
          u2 |
         L1. |    .053768   .0247345     2.17   0.066    -.0047198    .1122558
       _cons |   .0247487   .0598518     0.41   0.692    -.1167782    .1662756
------------------------------------------------------------------------------

.
. gen y22=y2hat*y2hat

.
. gen y23=y22*y2hat

.
. reg lnb x2 x4 x6 y22 y23, robust cluster(PD)

Linear regression                                      Number of obs =    2472
                                                       F(  5,     7) =    1.23
                                                       Prob > F      =  0.3855
                                                       R-squared     =  0.0123
                                                       Root MSE      =  .29143

                                    (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |   .0002892   .0052609     0.05   0.958    -.0121507    .0127292
          x4 |  -.0001957   .0029731    -0.07   0.949    -.0072259    .0068346
          x6 |    .000169   .0011518     0.15   0.887    -.0025546    .0028926
         y22 |  -26.74361   277.6026    -0.10   0.926    -683.1694    629.6822
         y23 |   185.2096   1146.754     0.16   0.876    -2526.434    2896.853
       _cons |   .0630122   .1602316     0.39   0.706    -.3158755    .4418998
------------------------------------------------------------------------------

.
. test y22 y23

 ( 1)  y22 = 0
 ( 2)  y23 = 0

       F(  2,     7) =    0.23
            Prob > F =    0.8015
```

```
. *3 test actual variables inflow

.
. reg lnb x8 x10 x12,robust cluster(PD)

Linear regression                                      Number of obs =    2472
                                                       F(  3,     7) =   21.85
                                                       Prob > F      =  0.0006
                                                       R-squared     =  0.0858
                                                       Root MSE      =  .28026

                                   (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x8 |   .0106165   .0019736     5.38   0.001     .0059496    .0152835
         x10 |  -.0043375   .0009878    -4.39   0.003    -.0066734   -.0020016
         x12 |   .0016637   .0008275     2.01   0.084     -.000293    .0036205
       _cons |  -.0112383   .0435998    -0.26   0.804    -.1143354    .0918588
------------------------------------------------------------------------------

.
. predict u3, r

.
. predict y3hat,xb

.
. reg lnb x8 x10 x12 l.u3,robust cluster(PD)

Linear regression                                      Number of obs =    2464
                                                       F(  4,     7) =   22.27
                                                       Prob > F      =  0.0004
                                                       R-squared     =  0.0865
                                                       Root MSE      =  .28062

                                   (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x8 |   .0106216   .0019269     5.51   0.001     .0060653     .015178
         x10 |  -.0042839     .00103    -4.16   0.004    -.0067194   -.0018483
         x12 |   .0016242   .0008547     1.90   0.099    -.0003969    .0036452
          u3 |
         L1. |   .0303361   .0448641     0.68   0.521    -.0757506    .1364228
       _cons |  -.0114336   .0421816    -0.27   0.794    -.1111772    .0883099
------------------------------------------------------------------------------

.
. gen y32=y3hat*y3hat

.
. gen y33=y32*y3hat

.
. reg lnb x8 x10 x12 y32 y33, robust cluster(PD)

Linear regression                                      Number of obs =    2472
                                                       F(  5,     7) =   87.78
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.0968
                                                       Root MSE      =  .27868

                                   (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x8 |   .0217353   .0063213     3.44   0.011     .0067879    .0366827
         x10 |   -.009051   .0026268    -3.45   0.011    -.0152623   -.0028396
         x12 |   .0031094   .0011468     2.71   0.030     .0003977     .005821
         y32 |   -4.21701   2.777046    -1.52   0.173    -10.78368    2.349659
         y33 |   2.960243   3.696938     0.80   0.450    -5.781627    11.70211
       _cons |  -.0477167   .0454332    -1.05   0.328     -.155149    .0597157
------------------------------------------------------------------------------

.
. test y32 y33

 ( 1)  y32 = 0
 ( 2)  y33 = 0

       F(  2,     7) =    3.08
            Prob > F =    0.1096
```

```
. *4 test actual variables snow

.
. reg lnb x14,robust cluster(PD)

Linear regression                                      Number of obs =    2472
                                                       F(  1,     7) =   11.86
                                                       Prob > F      =  0.0108
                                                       R-squared     =  0.0197
                                                       Root MSE      =   .2901

                                    (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x14 |   2.47e-07   7.16e-08     3.44   0.011     7.73e-08    4.16e-07
       _cons |   .0388297   .0326382     1.19   0.273    -.0383475    .1160068
------------------------------------------------------------------------------

.
. predict u4,r

.
. predict y4hat,xb

.
. reg lnb x14 l.u4,robust cluster(PD)

Linear regression                                      Number of obs =    2464
                                                       F(  2,     7) =    7.84
                                                       Prob > F      =  0.0163
                                                       R-squared     =  0.0205
                                                       Root MSE      =  .29045

                                    (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x14 |   2.54e-07   6.95e-08     3.65   0.008     8.91e-08    4.18e-07
          u4 |
         L1. |   .0287936   .0254788     1.13   0.296    -.0314542    .0890415
       _cons |   .0381767   .0313918     1.22   0.263     -.036053    .1124065
------------------------------------------------------------------------------

.
. gen y42=y4hat*y4hat

.
. gen y43=y42*y4hat

.
. reg lnb x14 y42 y43, robust cluster(PD)

Linear regression                                      Number of obs =    2472
                                                       F(  3,     7) =   12.57
                                                       Prob > F      =  0.0033
                                                       R-squared     =  0.0363
                                                       Root MSE      =  .28774

                                    (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x14 |  -2.09e-06   1.27e-06    -1.65   0.144    -5.10e-06    9.15e-07
         y42 |   101.5999   48.77112     2.08   0.076    -13.72553    216.9252
         y43 |  -307.5591   130.0535    -2.36   0.050    -615.0867   -.0314043
       _cons |  -.0839997   .0702743    -1.20   0.271     -.250172    .0821727
------------------------------------------------------------------------------

.
. test y42 y43

 ( 1)  y42 = 0
 ( 2)  y43 = 0

       F(  2,     7) =    7.42
            Prob > F =    0.0186
```

```
. *5 Test all seasonal variables

.
. reg lnb x1 x3 x5 x7 x9 x11 x13,robust cluster(PD)

Linear regression                                      Number of obs =    2472
                                                       F(  6,     7) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0545
                                                       Root MSE      =  .28525

                                    (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |   .0002011   .0009263     0.22   0.834    -.0019892    .0023914
          x3 |   .0001061   .0016255     0.07   0.950    -.0037375    .0039497
          x5 |  -.0007028   .0006701    -1.05   0.329    -.0022874    .0008819
          x7 |  -.0068183   .0007352    -9.27   0.000    -.0085567   -.0050799
          x9 |   .0149796   .0012279    12.20   0.000     .0120761    .0178832
         x11 |  -.0055662    .000795    -7.00   0.000    -.0074461   -.0036863
         x13 |   9.43e-08   3.57e-07     0.26   0.799    -7.50e-07    9.39e-07
       _cons |   .0842958   .0611223     1.38   0.210    -.0602353     .228827
------------------------------------------------------------------------------

.
. test x1 x3 x5

 ( 1)  x1 = 0
 ( 2)  x3 = 0
 ( 3)  x5 = 0

       F(  3,     7) =   19.08
            Prob > F =    0.0010

.
. test x7 x9 x11

 ( 1)  x7 = 0
 ( 2)  x9 = 0
 ( 3)  x11 = 0

       F(  3,     7) =  113.84
            Prob > F =    0.0000

.
. predict u5,r

.
. predict y5hat,xb

.
. reg lnb x1 x3 x5 x7 x9 x11 x13 l.u5,robust cluster(PD)

Linear regression                                      Number of obs =    2464
                                                       F(  6,     7) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0556
                                                       Root MSE      =  .28555

                                    (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |   .0001191      .0009     0.13   0.898     -.002009    .0022472
          x3 |   .0003214   .0015947     0.20   0.846    -.0034496    .0040923
          x5 |  -.0008502   .0006667    -1.28   0.243    -.0024268    .0007264
          x7 |  -.0070264   .0006783   -10.36   0.000    -.0086303   -.0054226
          x9 |   .0152925   .0011588    13.20   0.000     .0125525    .0180325
         x11 |  -.0056267   .0007863    -7.16   0.000    -.0074861   -.0037673
         x13 |   1.45e-07   3.53e-07     0.41   0.695    -6.91e-07    9.80e-07
          u5 |
         L1. |  -.0366329    .022429    -1.63   0.146    -.0896691    .0164032
       _cons |   .0841453   .0635274     1.32   0.227    -.0660731    .2343637
------------------------------------------------------------------------------
```

```
. gen y52=y5hat*y5hat

.
. gen y53=y52*y5hat

.
. reg lnb x1 x3 x5 x7 x9 x11 x13 y52 y53, robust cluster(PD)

Linear regression                                      Number of obs =    2472
                                                       F(  6,     7) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0760
                                                       Root MSE      =   .2821

                                  (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |   .0008825   .0008988     0.98   0.359    -.0012427    .0030078
          x3 |  -.0011831   .0015718    -0.75   0.476    -.0048999    .0025336
          x5 |   .0000786   .0006707     0.12   0.910    -.0015074    .0016647
          x7 |  -.0148475   .0026604    -5.58   0.001    -.0211384   -.0085566
          x9 |   .0230332   .0037295     6.18   0.000     .0142143    .0318522
         x11 |   -.008806   .0014414    -6.11   0.000    -.0122145   -.0053975
         x13 |  -1.29e-07   3.48e-07    -0.37   0.722    -9.52e-07    6.94e-07
         y52 |   9.508213   2.672681     3.56   0.009     3.188326     15.8281
         y53 |  -39.51874   6.671406    -5.92   0.001     -55.2941   -23.74337
       _cons |   .0341466   .0588373     0.58   0.580    -.1049816    .1732748
------------------------------------------------------------------------------

.
. test y52 y53

 ( 1)  y52 = 0
 ( 2)  y53 = 0

       F(  2,     7) =   24.58
            Prob > F =    0.0007
```

```
. *6 Test all seasonal variables reservoir level

.
. reg lnb x1 x3 x5,robust cluster(PD)

Linear regression                                      Number of obs =    2472
                                                       F(  3,     7) =   25.92
                                                       Prob > F      =  0.0004
                                                       R-squared     =  0.0417
                                                       Root MSE      =  .28695

                                   (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |  -.0021477   .0004064    -5.29   0.001    -.0031086   -.0011868
          x3 |   .0009915   .0004075     2.43   0.045      .000028     .001955
          x5 |   .0012369   .0002664     4.64   0.002     .0006068    .0018669
       _cons |   .0895202   .0604748     1.48   0.182      -.05348    .2325205
------------------------------------------------------------------------------

.
. predict u6,r

.
. predict y6hat,xb

.
. reg lnb x1 x3 x5 l.u6,robust cluster(PD)

Linear regression                                      Number of obs =    2464
                                                       F(  4,     7) =  233.90
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.0419
                                                       Root MSE      =  .28739

                                   (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |  -.0021547   .0004084    -5.28   0.001    -.0031204    -.001189
          x3 |   .0009936   .0004139     2.40   0.047     .0000148    .0019725
          x5 |   .0012426   .0002648     4.69   0.002     .0006165    .0018688
          u6 |
         L1. |  -.0171198    .022333    -0.77   0.468    -.0699289    .0356892
       _cons |   .0896127   .0616153     1.45   0.189    -.0560843    .2353097
------------------------------------------------------------------------------

.
. gen y62=y6hat*y6hat

.
. gen y63=y62*y6hat

.
. reg lnb x1 x3 x5 y62 y63, robust cluster(PD)

Linear regression                                      Number of obs =    2472
                                                       F(  5,     7) =  237.21
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.0536
                                                       Root MSE      =  .28526

                                   (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |   -.001027   .0006478    -1.59   0.157    -.0025588    .0005049
          x3 |    .000294   .0003809     0.77   0.465    -.0006067    .0011947
          x5 |   .0008246   .0005423     1.52   0.172    -.0004577    .0021069
         y62 |   12.71205   2.712541     4.69   0.002     6.297913     19.1262
         y63 |  -45.50966   6.818546    -6.67   0.000    -61.63296   -29.38636
       _cons |   .0181781   .0561679     0.32   0.756    -.1146379    .1509942
------------------------------------------------------------------------------

.
. test y62 y63

 ( 1)  y62 = 0
 ( 2)  y63 = 0

       F(  2,     7) =   28.55
            Prob > F =    0.0004
```

```
. *7 Test all seasonal variables inflow

.
. reg lnb x7 x9 x11,robust cluster(PD)

Linear regression                                      Number of obs =    2472
                                                       F(  3,     7) =   32.08
                                                       Prob > F      =  0.0002
                                                       R-squared     =  0.0458
                                                       Root MSE      =  .28632

                                  (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x7 |  -.0206372   .0090498    -2.28   0.057    -.0420365    .0007621
          x9 |    .024839   .0082514     3.01   0.020     .0053274    .0443506
         x11 |  -.0090996   .0035638    -2.55   0.038    -.0175267   -.0006726
       _cons |    .061793   .0466941     1.32   0.227    -.0486211    .1722071
------------------------------------------------------------------------------

.
. predict u7,r

.
. predict y7hat,xb

.
. reg lnb x7 x9 x11 l.u7,robust cluster(PD)

Linear regression                                      Number of obs =    2464
                                                       F(  4,     7) =  173.19
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.0463
                                                       Root MSE      =  .28673

                                  (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x7 |  -.0209073   .0091248    -2.29   0.056     -.042484    .0006695
          x9 |   .0251287   .0082742     3.04   0.019     .0055634     .044694
         x11 |  -.0091889   .0035946    -2.56   0.038    -.0176888   -.0006891
          u7 |
         L1. |  -.0248085   .0241862    -1.03   0.339    -.0819998    .0323828
       _cons |   .0618525   .0480074     1.29   0.239     -.051667    .1753719
------------------------------------------------------------------------------

.
. gen y72=y7hat*y7hat

.
. gen y73=y72*y7hat

.
. reg lnb x7 x9 x11 y72 y73, robust cluster(PD)

Linear regression                                      Number of obs =    2472
                                                       F(  5,     7) =  278.91
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.0611
                                                       Root MSE      =  .28414

                                  (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x7 |  -.0337307    .014354    -2.35   0.051    -.0676727    .0002112
          x9 |   .0401952   .0153325     2.62   0.034     .0039395    .0764508
         x11 |  -.0138329   .0059481    -2.33   0.053     -.027898    .0002321
         y72 |   1.086576   2.449762     0.44   0.671    -4.706192    6.879343
         y73 |  -13.46489   3.175194    -4.24   0.004    -20.97303   -5.956748
       _cons |   .0585856   .0500447     1.17   0.280    -.0597513    .1769225
------------------------------------------------------------------------------

.
. test y72 y73

 ( 1)  y72 = 0
 ( 2)  y73 = 0

       F(  2,     7) =  133.39
            Prob > F =    0.0000
```

```
. *8 Test all seasonal variables snow

.
. reg lnb x13,robust cluster(PD)

Linear regression                                      Number of obs =    2472
                                                       F(  1,     7) =    0.45
                                                       Prob > F      =  0.5237
                                                       R-squared     =  0.0009
                                                       Root MSE      =  .29287

                                     (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x13 |   6.22e-08   9.27e-08     0.67   0.524    -1.57e-07    2.81e-07
       _cons |   .0642346   .0340183     1.89   0.101    -.0162058     .144675
------------------------------------------------------------------------------

.
. predict u8,r

.
. predict y8hat,xb

.
. reg lnb x13 l.u8,robust cluster(PD)

Linear regression                                      Number of obs =    2464
                                                       F(  2,     7) =    1.30
                                                       Prob > F      =  0.3319
                                                       R-squared     =  0.0018
                                                       Root MSE      =  .29322

                                     (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x13 |   6.77e-08   9.00e-08     0.75   0.477    -1.45e-07    2.81e-07
          u8 |
         L1. |   .0294546   .0215857     1.36   0.215    -.0215876    .0804968
       _cons |   .0638159   .0328986     1.94   0.094     -.013977    .1416088
------------------------------------------------------------------------------

.
. gen y82=y8hat*y8hat

.
. gen y83=y82*y8hat

.
. reg lnb x13 y82 y83, robust cluster(PD)

Linear regression                                      Number of obs =    2472
                                                       F(  3,     7) =    7.06
                                                       Prob > F      =  0.0160
                                                       R-squared     =  0.0055
                                                       Root MSE      =  .29231

                                     (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x13 |  -.0000257    .000013    -1.97   0.089    -.0000566    5.12e-06
         y82 |   5275.248   2582.579     2.04   0.080    -831.5804    11382.08
         y83 |  -22140.97   10446.15    -2.12   0.072    -46842.18    2560.236
       _cons |  -15.82062   7.888791    -2.01   0.085    -34.47464    2.833408
------------------------------------------------------------------------------

.
. test y82 y83

 ( 1)  y82 = 0
 ( 2)  y83 = 0

       F(  2,     7) =    8.46
            Prob > F =    0.0136
```

```
. *9 test all actial and season variables

.
. reg lnb x1 x2 x3 x4 x5 x6 x7 x8 x9 x10 x11 x12 x13 x14,robust cluster(PD)

Linear regression                                      Number of obs =    2472
                                                       F(  6,     7) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.5039
                                                       Root MSE      =  .20692

                                    (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |  -.0124392   .0012654    -9.83   0.000    -.0154314   -.009447
          x2 |   .0037075   .0002838    13.07   0.000     .0030365   .0043785
          x3 |   .0137961   .0017766     7.77   0.000     .0095952    .017997
          x4 |   .0015609   .0003183     4.90   0.002     .0008081   .0023136
          x5 |  -.0066794   .0008911    -7.50   0.000    -.0087864  -.0045724
          x6 |  -.0004951    .000154    -3.22   0.015    -.0008592   -.000131
          x7 |  -.0084134   .0021647    -3.89   0.006    -.0135321  -.0032947
          x8 |   .0066309   .0008991     7.37   0.000     .0045047    .008757
          x9 |   .0050715   .0021085     2.41   0.047     .0000857   .0100572
         x10 |  -.0009059   .0002198    -4.12   0.004    -.0014257  -.0003861
         x11 |   .0007058   .0008059     0.88   0.410    -.0011998   .0026114
         x12 |    .000201   .0004047     0.50   0.635    -.0007561    .001158
         x13 |   2.49e-06   5.57e-07     4.47   0.003     1.17e-06   3.81e-06
         x14 |   4.81e-07   1.64e-07     2.94   0.022     9.43e-08   8.68e-07
       _cons |   .0986701   .0636734     1.55   0.165    -.0518935   .2492338
------------------------------------------------------------------------------

.
. test x1 x2 x3 x4 x5 x6

 ( 1)  x1 = 0
 ( 2)  x2 = 0
 ( 3)  x3 = 0
 ( 4)  x4 = 0
 ( 5)  x5 = 0
 ( 6)  x6 = 0

       F(  6,     7) =  128.38
            Prob > F =    0.0000

.
. test x1 x3 x5

 ( 1)  x1 = 0
 ( 2)  x3 = 0
 ( 3)  x5 = 0

       F(  3,     7) =   51.02
            Prob > F =    0.0000

.
. test x2 x3 x5

 ( 1)  x2 = 0
 ( 2)  x3 = 0
 ( 3)  x5 = 0

       F(  3,     7) =   57.10
            Prob > F =    0.0000

.
. test x7 x8 x9 x10 x11 x12

 ( 1)  x7 = 0
 ( 2)  x8 = 0
 ( 3)  x9 = 0
 ( 4)  x10 = 0
 ( 5)  x11 = 0
 ( 6)  x12 = 0

       F(  6,     7) =   39.83
            Prob > F =    0.0000

.
. test x7 x9 x11

 ( 1)  x7 = 0
 ( 2)  x9 = 0
 ( 3)  x11 = 0

       F(  3,     7) =    8.75
            Prob > F =    0.0091

.
. test x8 x10 x12

 ( 1)  x8 = 0
 ( 2)  x10 = 0
 ( 3)  x12 = 0

       F(  3,     7) =   21.92
            Prob > F =    0.0006

.
. test x13 x14

 ( 1)  x13 = 0
 ( 2)  x14 = 0

       F(  2,     7) =   90.29
            Prob > F =    0.0000
```

```
. predict u9,r

.
. predict y9hat,xb

.
. reg lnb x1 x2 x3 x4 x5 x6 x7 x8 x9 x10 x11 x12 x13 x14 l.u9,robust cluster(PD)

Linear regression                                  Number of obs =     2464
                                                   F(  6,     7) =        .
                                                   Prob > F      =        .
                                                   R-squared     =   0.5184
                                                   Root MSE      =   .20421

                                  (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |  -.0130817    .001322    -9.90   0.000    -.0162078   -.0099556
          x2 |   .0041996   .0004143    10.14   0.000     .0032199    .0051793
          x3 |   .0141923   .0017985     7.89   0.000     .0099395    .0184452
          x4 |   .0011937   .0003559     3.35   0.012     .0003521    .0020353
          x5 |  -.0064417   .0008119    -7.93   0.000    -.0083615   -.0045218
          x6 |  -.0005912   .0001296    -4.56   0.003    -.0008976   -.0002848
          x7 |  -.0060812   .0019596    -3.10   0.017    -.0107149   -.0014475
          x8 |   .0057069   .0006927     8.24   0.000     .0040689    .0073448
          x9 |   .0023823   .0017054     1.40   0.205    -.0016502    .0064148
         x10 |   .0001637   .0003195     0.51   0.624    -.0005918    .0009193
         x11 |   .0014488    .000667     2.17   0.066    -.0001283    .0030259
         x12 |  -.0001928   .0004906    -0.39   0.706    -.0013528    .0009672
         x13 |   2.50e-06   5.16e-07     4.85   0.002     1.28e-06    3.72e-06
         x14 |   4.69e-07   1.46e-07     3.22   0.015     1.25e-07    8.14e-07
          u9 |
         L1. |    .177195   .0428428     4.14   0.004     .0758879    .2785022
       _cons |   .1015262   .0520815     1.95   0.092    -.0216271    .2246794
------------------------------------------------------------------------------

.
. gen y92=y9hat*y9hat

.
. gen y93=y92*y9hat

.
. reg lnb x1 x2 x3 x4 x5 x6 x7 x8 x9 x10 x11 x12 x13 x14 y92 y93, robust cluster(
> PD)

Linear regression                                  Number of obs =     2472
                                                   F(  7,     7) =        .
                                                   Prob > F      =        .
                                                   R-squared     =   0.5177
                                                   Root MSE      =    .2041

                                  (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |  -.0115536   .0015926    -7.25   0.000    -.0153195   -.0077878
          x2 |    .004095   .0004753     8.61   0.000      .002971     .005219
          x3 |   .0119503   .0019658     6.08   0.001     .0073019    .0165987
          x4 |    .001422   .0003759     3.78   0.007     .0005332    .0023109
          x5 |  -.0062473   .0011268    -5.54   0.001    -.0089117   -.0035828
          x6 |  -.0003526   .0001568    -2.25   0.059    -.0007233    .0000182
          x7 |  -.0059382   .0020386    -2.91   0.023    -.0107587   -.0011177
          x8 |   .0042093   .0016351     2.57   0.037     .0003429    .0080758
          x9 |   .0055196   .0019163     2.88   0.024     .0009883     .010051
         x10 |   .0002753   .0004798     0.57   0.584    -.0008593    .0014099
         x11 |   -.000837   .0006155    -1.36   0.216    -.0022925    .0006184
         x12 |     .00052   .0004657     1.12   0.301    -.0005812    .0016212
         x13 |   2.09e-06   5.94e-07     3.52   0.010     6.87e-07    3.50e-06
         x14 |   4.95e-07   1.52e-07     3.25   0.014     1.35e-07    8.55e-07
         y92 |   .5364857   .1098104     4.89   0.002     .2768253    .7961461
         y93 |  -.3632036    .497731    -0.73   0.489    -1.540151    .8137433
       _cons |   .1037898   .0627441     1.65   0.142    -.0445764    .2521559
------------------------------------------------------------------------------

.
. test y92 y93

 ( 1)  y92 = 0
 ( 2)  y93 = 0

       F(  2,     7) =   17.80
            Prob > F =    0.0018
```

```
. *10 test all actial and season variables reservoir level

.
. reg lnb x1 x2 x3 x4 x5 x6,robust cluster(PD)

Linear regression                                      Number of obs =    2472
                                                       F(  6,     7) =   80.01
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.4536
                                                       Root MSE      =   .2168

                                    (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |  -.0063951   .0004796   -13.33   0.000    -.0075292   -.0052609
          x2 |   .0037769   .0003063    12.33   0.000     .0030525    .0045012
          x3 |  -.0001861   .0002236    -0.83   0.433    -.0007149    .0003427
          x4 |   .0018916   .0002918     6.48   0.000     .0012015    .0025816
          x5 |   .0013875   .0002683     5.17   0.001     .0007529     .002022
          x6 |  -.0003751   .0001391    -2.70   0.031     -.000704   -.0000463
       _cons |   .1016779   .0601776     1.69   0.135    -.0406195    .2439753
------------------------------------------------------------------------------

.
. test x1 x3 x5

 ( 1)  x1 = 0
 ( 2)  x3 = 0
 ( 3)  x5 = 0

       F(  3,     7) =   61.82
            Prob > F =    0.0000

.
. test x2 x4 x6

 ( 1)  x2 = 0
 ( 2)  x4 = 0
 ( 3)  x6 = 0

       F(  3,     7) =   66.05
            Prob > F =    0.0000

.
. predict u10,r

.
. predict y10hat,xb

.
. reg lnb x1 x2 x3 x4 x5 x6 l.u10,robust cluster(PD)

Linear regression                                      Number of obs =    2464
                                                       F(  6,     7) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.4750
                                                       Root MSE      =  .21286

                                    (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |  -.0066541   .0004411   -15.08   0.000    -.0076972   -.0056111
          x2 |    .004248   .0004075    10.42   0.000     .0032844    .0052116
          x3 |  -.0000912    .000178    -0.51   0.624    -.0005121    .0003297
          x4 |   .0015919   .0003305     4.82   0.002     .0008104    .0023733
          x5 |   .0014805   .0002543     5.82   0.001     .0008793    .0020818
          x6 |  -.0005043   .0001192    -4.23   0.004    -.0007861   -.0002225
         u10 |
         L1. |   .1990161   .0390138     5.10   0.001      .106763    .2912691
       _cons |   .1044659   .0476555     2.19   0.064    -.0082214    .2171533
------------------------------------------------------------------------------
```

```
. gen y102=y10hat*y10hat

.
. gen y103=y102*y10hat

.
. reg lnb x1 x2 x3 x4 x5 x6 y102 y103, robust cluster(PD)

Linear regression                                      Number of obs =    2472
                                                       F(  6,     7) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.4705
                                                       Root MSE      =   .2135

                                      (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |  -.0065135   .0009675    -6.73   0.000    -.0088013   -.0042256
          x2 |   .0039478   .0005747     6.87   0.000     .0025889    .0053068
          x3 |   .0000342   .0001998     0.17   0.869    -.0004382    .0005066
          x4 |   .0016203   .0003159     5.13   0.001     .0008734    .0023672
          x5 |   .0009713   .0002582     3.76   0.007     .0003608    .0015817
          x6 |  -.0001093   .0001044    -1.05   0.330    -.0003561    .0001376
        y102 |   .6843985   .1286856     5.32   0.001     .3801054    .9886916
        y103 |    -.12201   .6063351    -0.20   0.846    -1.555765    1.311745
       _cons |   .1052314   .0595092     1.77   0.120    -.0354854    .2459482
------------------------------------------------------------------------------

.
. test y102 y103

 ( 1)  y102 = 0
 ( 2)  y103 = 0

       F(  2,     7) =   16.93
            Prob > F =    0.0021
```

```
. *11 test all actial and season variables inflow

.
. reg lnb x7 x8 x9 x10 x11 x12,robust cluster(PD)

Linear regression                                      Number of obs =    2472
                                                       F(  6,     7) =   74.92
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1723
                                                       Root MSE      =  .26683

                                  (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x7 |  -.0477145   .0094779    -5.03   0.002    -.0701263   -.0253027
          x8 |   .0232969   .0018887    12.34   0.000     .0188309    .0277629
          x9 |   .0341763   .0082514     4.14   0.004     .0146647    .0536878
         x10 |  -.0065467   .0007401    -8.85   0.000    -.0082969   -.0047965
         x11 |  -.0131373   .0033028    -3.98   0.005    -.0209471   -.0053275
         x12 |   .0033402   .0005163     6.47   0.000     .0021192    .0045612
       _cons |   .0598895   .0475215     1.26   0.248     -.052481      .17226
------------------------------------------------------------------------------

.
. test x7 x9 x11

 ( 1)  x7 = 0
 ( 2)  x9 = 0
 ( 3)  x11 = 0

       F(  3,     7) =  112.61
            Prob > F =    0.0000

.
. test x8 x10 x12

 ( 1)  x8 = 0
 ( 2)  x10 = 0
 ( 3)  x12 = 0

       F(  3,     7) =   65.01
            Prob > F =    0.0000

.
. predict u11,r

.
. predict y11hat,xb

.
. reg lnb x7 x8 x9 x10 x11 x12 l.u11,robust cluster(PD)

Linear regression                                      Number of obs =    2464
                                                       F(  6,     7) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.1738
                                                       Root MSE      =  .26703

                                  (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x7 |  -.0472544   .0088603    -5.33   0.001    -.0682057   -.0263032
          x8 |    .023397   .0019304    12.12   0.000     .0188323    .0279618
          x9 |   .0334204   .0075552     4.42   0.003     .0155553    .0512855
         x10 |  -.0063371   .0007216    -8.78   0.000    -.0080435   -.0046306
         x11 |  -.0129748   .0030842    -4.21   0.004    -.0202678   -.0056817
         x12 |   .0033089   .0005132     6.45   0.000     .0020953    .0045225
         u11 |
         L1. |   .0455217   .0231772     1.96   0.090    -.0092837    .1003272
       _cons |   .0600797   .0454232     1.32   0.228     -.047329    .1674884
------------------------------------------------------------------------------
```

```
. gen y112=y11hat*y11hat

.
. gen y113=y112*y11hat

.
. reg lnb x7 x8 x9 x10 x11 x12 y112 y113, robust cluster(PD)

Linear regression                                      Number of obs =    2472
                                                       F(  6,     7) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.2112
                                                       Root MSE      =  .26059

                                     (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x7 |  -.0601818   .0099258    -6.06   0.001    -.0836526    -.036711
          x8 |   .0286162   .0033101     8.65   0.000     .0207891    .0364433
          x9 |   .0443604   .0085123     5.21   0.001      .024232    .0644888
         x10 |  -.0082397   .0011407    -7.22   0.000    -.0109371   -.0055423
         x11 |   -.019164   .0034219    -5.60   0.001    -.0272556   -.0110724
         x12 |   .0066778   .0005194    12.86   0.000     .0054495    .0079061
        y112 |   .3824298   .3566844     1.07   0.319    -.4609947    1.225854
        y113 |  -2.216457   .3273876    -6.77   0.000    -2.990606   -1.442308
       _cons |   .0533116   .0474993     1.12   0.299    -.0590065    .1656296
------------------------------------------------------------------------------

.
. test y112 y113

 ( 1)  y112 = 0
 ( 2)  y113 = 0

       F(  2,     7) =   32.07
            Prob > F =    0.0003
```

```
. *12 test all actial and season variables snow

.
. reg lnb x13 x14,robust cluster(PD)

Linear regression                                      Number of obs =    2472
                                                       F(  2,     7) =  157.95
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1164
                                                       Root MSE      =  .27547

                                    (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x13 |  -1.96e-06   1.78e-07   -11.04   0.000    -2.38e-06   -1.54e-06
         x14 |   1.81e-06   1.03e-07    17.55   0.000     1.57e-06    2.06e-06
       _cons |   .0716266   .0342029     2.09   0.075    -.0092503    .1525036
------------------------------------------------------------------------------

.
. predict u12,r

.
. predict y12hat,xb

.
. reg lnb x13 x14 l.u12,robust cluster(PD)

Linear regression                                      Number of obs =    2464
                                                       F(  3,     7) =  272.31
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1183
                                                       Root MSE      =  .27564

                                    (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x13 |  -1.96e-06   1.71e-07   -11.50   0.000    -2.36e-06   -1.56e-06
         x14 |   1.82e-06   1.05e-07    17.31   0.000     1.57e-06    2.06e-06
         u12 |
         L1. |   .0468256   .0292994     1.60   0.154    -.0224565    .1161077
       _cons |   .0710398   .0325285     2.18   0.065    -.0058778    .1479574
------------------------------------------------------------------------------

.
. gen y122=y12hat*y12hat

.
. gen y123=y122*y12hat

.
. reg lnb x13 x14 y122 y123, robust cluster(PD)

Linear regression                                      Number of obs =    2472
                                                       F(  4,     7) =  195.03
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1697
                                                       Root MSE      =  .26715

                                    (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x13 |  -3.06e-06   2.81e-07   -10.90   0.000    -3.73e-06   -2.40e-06
         x14 |   2.97e-06   1.85e-07    16.02   0.000     2.53e-06    3.41e-06
        y122 |  -.6843289   .7945271    -0.86   0.418    -2.563087    1.194429
        y123 |  -5.165944   2.235693    -2.31   0.054    -10.45252    .1206287
       _cons |   .0793833   .0346522     2.29   0.056    -.0025561    .1613228
------------------------------------------------------------------------------

.
. test y122 y123

 ( 1)  y122 = 0
 ( 2)  y123 = 0

       F(  2,     7) =   45.67
            Prob > F =    0.0001
```

```
. *13 Test all diff. variables

.
. reg lnb x15 x16 x17 x18 x19 x20 x21,robust cluster(PD)

Linear regression                                      Number of obs =    2472
                                                       F(  6,     7) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.4302
                                                       Root MSE      =  .22143

                                    (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x15 |   .0032955    .000192    17.17   0.000     .0028416    .0037494
         x16 |   .0016903   .0003257     5.19   0.001     .0009202    .0024603
         x17 |  -.0004574   .0001003    -4.56   0.003    -.0006946   -.0002202
         x18 |   .0079133   .0012462     6.35   0.000     .0049665    .0108602
         x19 |  -.0027517   .0007317    -3.76   0.007    -.0044819   -.0010216
         x20 |   .0003602   .0004297     0.84   0.430    -.0006559    .0013764
         x21 |   5.74e-07   8.08e-08     7.11   0.000     3.83e-07    7.65e-07
       _cons |   .0627539   .0298686     2.10   0.074    -.0078741    .1333818
------------------------------------------------------------------------------

.
. test x15 x16 x17

 ( 1)  x15 = 0
 ( 2)  x16 = 0
 ( 3)  x17 = 0

       F(  3,     7) =   99.24
            Prob > F =    0.0000

.
. test x18 x19 x20

 ( 1)  x18 = 0
 ( 2)  x19 = 0
 ( 3)  x20 = 0

       F(  3,     7) =   24.15
            Prob > F =    0.0005

.
. predict u13,r

.
. predict y13hat,xb

.
. reg lnb x15 x16 x17 x18 x19 x20 x21 l.u13,robust cluster(PD)

Linear regression                                      Number of obs =    2464
                                                       F(  6,     7) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.4669
                                                       Root MSE      =  .21455

                                    (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x15 |   .0040423   .0003086    13.10   0.000     .0033126    .0047721
         x16 |   .0010589   .0003532     3.00   0.020     .0002237    .0018942
         x17 |  -.0004464   .0001022    -4.37   0.003     -.000688   -.0002047
         x18 |   .0056996   .0008729     6.53   0.000     .0036355    .0077637
         x19 |  -.0003008   .0004639    -0.65   0.537    -.0013978    .0007962
         x20 |  -.0003656   .0004616    -0.79   0.454    -.0014571     .000726
         x21 |   5.99e-07   8.01e-08     7.48   0.000     4.09e-07    7.88e-07
         u13 |
         L1. |   .2628856   .0355471     7.40   0.000       .17883    .3469411
       _cons |   .0665062   .0220011     3.02   0.019     .0144819    .1185306
------------------------------------------------------------------------------
```

```
. gen y132=y13hat*y13hat

.
. gen y133=y132*y13hat

.
. reg lnb x15 x16 x17 x18 x19 x20 x21 y132 y133, robust cluster(PD)

Linear regression                                      Number of obs =    2472
                                                       F(  6,     7) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.4333
                                                       Root MSE      =  .22093

                                   (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x15 |   .0035866   .0003886     9.23   0.000     .0026677    .0045055
         x16 |   .0017099   .0005556     3.08   0.018     .0003962    .0030236
         x17 |  -.0003625   .0001078    -3.36   0.012    -.0006174   -.0001076
         x18 |   .0083597   .0029785     2.81   0.026     .0013166    .0154028
         x19 |  -.0026906   .0013198    -2.04   0.081    -.0058114    .0004301
         x20 |   .0003798   .0003895     0.98   0.362    -.0005412    .0013007
         x21 |   5.72e-07   9.12e-08     6.27   0.000     3.56e-07    7.87e-07
        y132 |   .2287593   .3297829     0.69   0.510    -.5510534    1.008572
        y133 |  -.6732213   .8283602    -0.81   0.443    -2.631982    1.285539
       _cons |   .0566831   .0370056     1.53   0.169    -.0308213    .1441874
------------------------------------------------------------------------------

.
. test y132 y133

 ( 1)  y132 = 0
 ( 2)  y133 = 0

       F(  2,     7) =    0.84
            Prob > F =    0.4697
```

```
. *14 Test diff. variables reservoir level

.
. reg lnb x15 x16 x17,robust cluster(PD)

Linear regression                                      Number of obs =    2472
                                                       F(  3,     7) =   63.05
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.4060
                                                       Root MSE      =  .22591

                                  (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x15 |   .0035869   .0002723    13.17   0.000      .002943    .0042308
         x16 |   .0020364   .0002574     7.91   0.000     .0014276    .0026451
         x17 |  -.0003564   .0001188    -3.00   0.020    -.0006372   -.0000756
       _cons |   .0721084   .0293515     2.46   0.044      .002703    .1415137
------------------------------------------------------------------------------

.
. predict u14,r

.
. predict y14hat,xb

.
. reg lnb x15 x16 x17 l.u14,robust cluster(PD)

Linear regression                                      Number of obs =    2464
                                                       F(  4,     7) =   56.47
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.4470
                                                       Root MSE      =  .21834

                                  (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x15 |   .0040963   .0003479    11.77   0.000     .0032736     .004919
         x16 |    .001674   .0002978     5.62   0.001     .0009699    .0023781
         x17 |  -.0003444   .0001011    -3.41   0.011    -.0005834   -.0001054
         u14 |
         L1. |   .2633275   .0321588     8.19   0.000     .1872841     .339371
       _cons |   .0735331   .0217183     3.39   0.012     .0221775    .1248886
------------------------------------------------------------------------------

.
. gen y142=y14hat*y14hat

.
. gen y143=y142*y14hat

.
. reg lnb x15 x16 x17 y142 y143, robust cluster(PD)

Linear regression                                      Number of obs =    2472
                                                       F(  5,     7) =  783.67
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.4095
                                                       Root MSE      =  .22533

                                  (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x15 |   .0039369   .0004617     8.53   0.000     .0028452    .0050286
         x16 |   .0021727   .0005196     4.18   0.004      .000944    .0034014
         x17 |  -.0002431   .0001353    -1.80   0.116    -.0005632    .0000769
        y142 |   .1433521   .3332216     0.43   0.680    -.6445918    .9312959
        y143 |  -.8534776   .8773708    -0.97   0.363     -2.92813    1.221175
       _cons |   .0697201   .0381903     1.83   0.111    -.0205855    .1600258
------------------------------------------------------------------------------

.
. test y142 y143

 ( 1)  y142 = 0
 ( 2)  y143 = 0

       F(  2,     7) =    1.13
            Prob > F =    0.3762
```

```
. *15 Test diff. variables inflow

.
. reg lnb x18 x19 x20,robust cluster(PD)

Linear regression                                      Number of obs =    2472
                                                       F(  3,     7) =   67.93
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1290
                                                       Root MSE      =  .27355

                                     (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x18 |   .0231222   .0020857    11.09   0.000     .0181902    .0280543
         x19 |  -.0073327   .0010401    -7.05   0.000    -.0097921   -.0048733
         x20 |   .0044002    .000529     8.32   0.000     .0031492    .0056511
       _cons |   .0588045   .0315219     1.87   0.104     -.015733    .1333419
------------------------------------------------------------------------------

.
. predict u15,r

.
. predict y15hat,xb

.
. reg lnb x18 x19 x20 l.u15,robust cluster(PD)

Linear regression                                      Number of obs =    2464
                                                       F(  4,     7) =   49.88
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1380
                                                       Root MSE      =  .27259

                                     (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x18 |   .0231999   .0020836    11.13   0.000      .018273    .0281268
         x19 |  -.0065784   .0010247    -6.42   0.000    -.0090014   -.0041554
         x20 |    .004282   .0005223     8.20   0.000      .003047     .005517
         u15 |
         L1. |   .1044017   .0224892     4.64   0.002     .0512231    .1575802
       _cons |   .0592735   .0282317     2.10   0.074    -.0074838    .1260309
------------------------------------------------------------------------------

.
. gen y152=y15hat*y15hat

.
. gen y153=y152*y15hat

.
. reg lnb x15 x16 x17 y152 y153, robust cluster(PD)

Linear regression                                      Number of obs =    2472
                                                       F(  5,     7) =  279.51
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.4255
                                                       Root MSE      =  .22226

                                     (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x15 |   .0034354   .0002524    13.61   0.000     .0028386    .0040322
         x16 |   .0019735   .0002659     7.42   0.000     .0013447    .0026023
         x17 |  -.0002891   .0001132    -2.55   0.038    -.0005567   -.0000214
        y152 |   2.647283   .7243477     3.65   0.008     .9344731    4.360094
        y153 |  -4.080452    1.13658    -3.59   0.009    -6.768037   -1.392868
       _cons |   .0457085   .0312974     1.46   0.188    -.0282982    .1197151
------------------------------------------------------------------------------

.
. test y152 y153

 ( 1)  y152 = 0
 ( 2)  y153 = 0

       F(  2,     7) =    6.68
            Prob > F =    0.0238
```

```
. *16 Test diff. variables snow

.
. reg lnb x21,robust cluster(PD)

Linear regression                                      Number of obs =    2472
                                                       F(  1,     7) =  170.93
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1117
                                                       Root MSE      =  .27615

                                    (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x21 |   1.71e-06   1.31e-07    13.07   0.000     1.40e-06    2.02e-06
       _cons |   .0541556   .0308688     1.75   0.123    -.0188375    .1271488
------------------------------------------------------------------------------

.
. predict u16,r

.
. predict y16hat,xb

.
. reg lnb x21 l.u16,robust cluster(PD)

Linear regression                                      Number of obs =    2464
                                                       F(  2,     7) =  127.16
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1130
                                                       Root MSE      =   .2764

                                    (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x21 |   1.71e-06   1.37e-07    12.56   0.000     1.39e-06    2.04e-06
         u16 |
         L1. |   .0408768   .0296046     1.38   0.210    -.0291269    .1108806
       _cons |   .0540916   .0295811     1.83   0.110    -.0158564    .1240397
------------------------------------------------------------------------------

.
. gen y162=y16hat*y16hat

.
. gen y163=y162*y16hat

.
. reg lnb x21 y162 y163, robust cluster(PD)

Linear regression                                      Number of obs =    2472
                                                       F(  3,     7) =  191.26
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1847
                                                       Root MSE      =  .26466

                                    (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x21 |   3.40e-06   3.84e-07     8.85   0.000     2.49e-06    4.31e-06
        y162 |  -1.866368   1.927172    -0.97   0.365    -6.423407    2.690671
        y163 |  -4.336286   3.478462    -1.25   0.253    -12.56154     3.88897
       _cons |   .0800464   .0332754     2.41   0.047     .0013625    .1587302
------------------------------------------------------------------------------

.
. test y162 y163

 ( 1)  y162 = 0
 ( 2)  y163 = 0

       F(  2,     7) =   21.47
            Prob > F =    0.0010
```

```
. *17 test all actual variables and diff. variables

.
. reg lnb x2 x4 x6 x8 x10 x12 x14 x15 x16 x17 x18 x19 x20 x21,robust cluster(PD)

Linear regression                                      Number of obs =    2472
                                                       F(  6,     7) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.5040
                                                       Root MSE      =   .2069

                                     (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |  -.0087558   .0011165    -7.84   0.000    -.0113959   -.0061156
          x4 |   .0153965    .001991     7.73   0.000     .0106885    .0201046
          x6 |  -.0071881   .0008978    -8.01   0.000    -.0093111   -.0050651
          x8 |  -.0019572   .0017866    -1.10   0.310    -.0061817    .0022674
         x10 |   .0042869   .0019979     2.15   0.069    -.0004375    .0090113
         x12 |   .0008778   .0010178     0.86   0.417    -.0015288    .0032845
         x14 |   2.98e-06   4.30e-07     6.93   0.000     1.96e-06    3.99e-06
         x15 |   .0124617   .0012699     9.81   0.000      .009459    .0154645
         x16 |   -.013834    .001786    -7.75   0.000    -.0180573   -.0096108
         x17 |   .0066942   .0008973     7.46   0.000     .0045725    .0088159
         x18 |   .0086356    .002131     4.05   0.005     .0035965    .0136747
         x19 |  -.0052125   .0020338    -2.56   0.037    -.0100216   -.0004033
         x20 |  -.0006865    .000772    -0.89   0.403    -.0025119    .0011388
         x21 |  -2.50e-06   5.59e-07    -4.46   0.003    -3.82e-06   -1.17e-06
       _cons |   .0986563   .0636765     1.55   0.165    -.0519148    .2492274
------------------------------------------------------------------------------

.
. test x2 x4 x6 x15 x16 x17

 ( 1)  x2 = 0
 ( 2)  x4 = 0
 ( 3)  x6 = 0
 ( 4)  x15 = 0
 ( 5)  x16 = 0
 ( 6)  x17 = 0

       F(  6,     7) =  126.12
            Prob > F =    0.0000

.
. test x2 x4 x6

 ( 1)  x2 = 0
 ( 2)  x4 = 0
 ( 3)  x6 = 0

       F(  3,     7) =   28.27
            Prob > F =    0.0003

.
. test x15 x16 x17

 ( 1)  x15 = 0
 ( 2)  x16 = 0
 ( 3)  x17 = 0

       F(  3,     7) =   51.10
            Prob > F =    0.0000

.
. test x8 x10 x12 x18 x19 x20

 ( 1)  x8 = 0
 ( 2)  x10 = 0
 ( 3)  x12 = 0
 ( 4)  x18 = 0
 ( 5)  x19 = 0
 ( 6)  x20 = 0

       F(  6,     7) =   39.64
            Prob > F =    0.0000

.
. test x8 x10 x12

 ( 1)  x8 = 0
 ( 2)  x10 = 0
 ( 3)  x12 = 0

       F(  3,     7) =   36.89
            Prob > F =    0.0001

.
. test x18 x19 x20

 ( 1)  x18 = 0
 ( 2)  x19 = 0
 ( 3)  x20 = 0

       F(  3,     7) =    9.06
            Prob > F =    0.0083

.
. test x14 x21

 ( 1)  x14 = 0
 ( 2)  x21 = 0

       F(  2,     7) =   89.68
            Prob > F =    0.0000
```

```
. predict u17,r

.
. predict y17hat,xb

.
. reg lnb x2 x4 x6 x8 x10 x12 x14 x15 x16 x17 x18 x19 x20 x21 l.u17,robust cluste
> r(PD)

Linear regression                                     Number of obs =     2464
                                                      F(  6,     7) =        .
                                                      Prob > F      =        .
                                                      R-squared     =   0.5185
                                                      Root MSE      =   .20418

                                       (Std. Err. adjusted for 8 clusters in PD)
```

lnb	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
x2	-.0089061	.0011534	-7.72	0.000	-.0116334	-.0061787
x4	.0154271	.0019754	7.81	0.000	.010756	.0200981
x6	-.0070481	.0008426	-8.36	0.000	-.0090406	-.0050556
x8	-.0005667	.0018253	-0.31	0.765	-.0048828	.0037494
x10	.0026879	.0015957	1.68	0.136	-.0010854	.0064612
x12	.001219	.0008668	1.41	0.202	-.0008305	.0032685
x14	2.98e-06	4.11e-07	7.26	0.000	2.01e-06	3.95e-06
x15	.0131037	.0013283	9.86	0.000	.0099627	.0162447
x16	-.0142319	.0018084	-7.87	0.000	-.0185081	-.0099557
x17	.0064582	.000818	7.90	0.000	.004524	.0083923
x18	.0063231	.0019289	3.28	0.014	.001762	.0108843
x19	-.002544	.0016343	-1.56	0.164	-.0064086	.0013206
x20	-.0014222	.0006367	-2.23	0.061	-.0029277	.0000834
x21	-2.51e-06	5.19e-07	-4.84	0.002	-3.74e-06	-1.28e-06
u17						
L1.	.1772363	.0428438	4.14	0.004	.0759268	.2785458
_cons	.1015142	.0520816	1.95	0.092	-.0216392	.2246676

```
.
. gen y172=y17hat*y17hat

.
. gen y173=y172*y17hat

.
. reg lnb x2 x4 x6 x8 x10 x12 x14 x15 x16 x17 x18 x19 x20 x21 y172 y173, robust c
> luster(PD)

Linear regression                                     Number of obs =     2472
                                                      F(  6,     7) =        .
                                                      Prob > F      =        .
                                                      R-squared     =   0.5178
                                                      Root MSE      =   .20407

                                       (Std. Err. adjusted for 8 clusters in PD)
```

lnb	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
x2	-.0075337	.00125	-6.03	0.001	-.0104895	-.0045778
x4	.0134873	.0022732	5.93	0.001	.008112	.0188626
x6	-.0066372	.0010948	-6.06	0.001	-.009226	-.0040483
x8	-.0018175	.0015855	-1.15	0.289	-.0055665	.0019315
x10	.0057888	.0016652	3.48	0.010	.0018512	.0097263
x12	-.0002909	.000821	-0.35	0.734	-.0022323	.0016506
x14	2.61e-06	4.87e-07	5.36	0.001	1.46e-06	3.76e-06
x15	.0116285	.0016072	7.24	0.000	.0078281	.0154288
x16	-.0120629	.0019899	-6.06	0.001	-.0167682	-.0073576
x17	.0062861	.001136	5.53	0.001	.0036	.0089723
x18	.00608	.0020184	3.01	0.020	.0013073	.0108527
x19	-.005531	.0018654	-2.96	0.021	-.009942	-.0011199
x20	.0008004	.0005914	1.35	0.218	-.000598	.0021987
x21	-2.11e-06	5.99e-07	-3.53	0.010	-3.53e-06	-6.97e-07
y172	.535849	.1097637	4.88	0.002	.2762992	.7953989
y173	-.3659088	.49756	-0.74	0.486	-1.542451	.8106338
_cons	.1037757	.0627467	1.65	0.142	-.0445967	.2521482

```
.
. test y172 y173

 ( 1)  y172 = 0
 ( 2)  y173 = 0

       F(  2,     7) =   17.81
            Prob > F =    0.0018
```

```
. *18 test all actual variables and diff. variables reservoir level

.
. reg lnb x2 x4 x6 x15 x16 x17,robust cluster(PD)

Linear regression                                      Number of obs =    2472
                                                       F(  6,     7) =   80.02
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.4536
                                                       Root MSE      =   .2168

                                    (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |  -.0026183   .0004363    -6.00   0.001    -.0036499   -.0015867
          x4 |   .0017054   .0004282     3.98   0.005     .0006929     .002718
          x6 |   .0010124   .0002597     3.90   0.006     .0003983    .0016265
         x15 |    .006396   .0004797    13.33   0.000     .0052617    .0075303
         x16 |   .0001854   .0002236     0.83   0.434    -.0003434    .0007143
         x17 |  -.0013876   .0002683    -5.17   0.001    -.0020222   -.0007531
       _cons |   .1016835   .0601779     1.69   0.135    -.0406147    .2439817
------------------------------------------------------------------------------

.
. test x2 x4 x6

 ( 1)  x2 = 0
 ( 2)  x4 = 0
 ( 3)  x6 = 0

       F(  3,     7) =   23.04
            Prob > F =    0.0005

.
. test x15 x16 x17

 ( 1)  x15 = 0
 ( 2)  x16 = 0
 ( 3)  x17 = 0

       F(  3,     7) =   61.82
            Prob > F =    0.0000

.
. predict u18,r

.
. predict y18hat,xb

.
. reg lnb x2 x4 x6 x15 x16 x17 l.u18,robust cluster(PD)

Linear regression                                      Number of obs =    2464
                                                       F(  6,     7) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.4750
                                                       Root MSE      =  .21285

                                    (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |  -.0024063    .000376    -6.40   0.000    -.0032955   -.0015172
          x4 |   .0015007   .0003786     3.96   0.005     .0006054     .002396
          x6 |   .0009763   .0002207     4.42   0.003     .0004544    .0014982
         x15 |    .006655   .0004412    15.08   0.000     .0056118    .0076982
         x16 |   .0000906    .000178     0.51   0.626    -.0003303    .0005115
         x17 |  -.0014806   .0002543    -5.82   0.001    -.0020818   -.0008794
         u18 |
         L1. |   .1990155   .0390178     5.10   0.001     .1067531     .291278
       _cons |   .1044726   .0476556     2.19   0.064     -.008215    .2171602
------------------------------------------------------------------------------
```

```
. gen y182=y18hat*y18hat

.
. gen y183=y182*y18hat

.
. reg lnb x2 x4 x6 x15 x16 x17 y182 y183, robust cluster(PD)

Linear regression                                      Number of obs =    2472
                                                       F(  6,     7) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.4706
                                                       Root MSE      =  .21349

                                     (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |  -.0025659   .0005402    -4.75   0.002    -.0038434   -.0012885
          x4 |   .0016546   .0004381     3.78   0.007     .0006187    .0026905
          x6 |   .0008621   .0002858     3.02   0.019     .0001864    .0015378
         x15 |   .0065145   .0009676     6.73   0.000     .0042266    .0088025
         x16 |  -.0000352   .0001998    -0.18   0.865    -.0005077    .0004373
         x17 |  -.0009714   .0002581    -3.76   0.007    -.0015818    -.000361
        y182 |   .6845781   .1286799     5.32   0.001     .3802984    .9888578
        y183 |  -.1216124   .6062648    -0.20   0.847    -1.555201    1.311976
       _cons |   .1052387   .0595095     1.77   0.120    -.0354788    .2459562
------------------------------------------------------------------------------

.
. test y182 y183

 ( 1)  y182 = 0
 ( 2)  y183 = 0

       F(  2,     7) =   16.93
            Prob > F =    0.0021
```

```
. *19 test all actual variables and diff. variables inflow

.
. reg lnb x8 x10 x12 x18 x19 x20,robust cluster(PD)

Linear regression                                      Number of obs =    2472
                                                       F(  6,     7) =   75.37
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1718
                                                       Root MSE      =  .26691

                                      (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x8 |  -.0242453   .0093534    -2.59   0.036    -.0463625   -.0021281
         x10 |   .0274322   .0084729     3.24   0.014      .007397    .0474674
         x12 |  -.0097012   .0035856    -2.71   0.030    -.0181797   -.0012227
         x18 |   .0475456   .0094813     5.01   0.002      .025126    .0699652
         x19 |  -.0339847   .0082513    -4.12   0.004    -.0534959   -.0144735
         x20 |   .0130513   .0033001     3.95   0.005     .0052477    .0208549
       _cons |   .0594513    .047509     1.25   0.251    -.0528896    .1717923
------------------------------------------------------------------------------

.
. test x8 x10 x12

 ( 1)  x8 = 0
 ( 2)  x10 = 0
 ( 3)  x12 = 0

       F(  3,     7) =   34.08
            Prob > F =    0.0002

.
. test x18 x19 x20

 ( 1)  x18 = 0
 ( 2)  x19 = 0
 ( 3)  x20 = 0

       F(  3,     7) =  111.98
            Prob > F =    0.0000

.
. predict u19,r

.
. predict y19hat,xb

.
. reg lnb x8 x10 x12 x18 x19 x20 l.u19,robust cluster(PD)

Linear regression                                      Number of obs =    2464
                                                       F(  6,     7) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.1734
                                                       Root MSE      =  .26709

                                      (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x8 |  -.0236744   .0087233    -2.71   0.030    -.0443018    -.003047
         x10 |   .0268751   .0078715     3.41   0.011      .008262    .0454883
         x12 |  -.0095669   .0033714    -2.84   0.025     -.017539   -.0015949
         x18 |   .0470766   .0088551     5.32   0.001     .0261377    .0680156
         x19 |  -.0332134   .0075457    -4.40   0.003    -.0510561   -.0153708
         x20 |   .0128841   .0030779     4.19   0.004     .0056061    .0201622
         u19 |
         L1. |   .0464186   .0232153     2.00   0.086    -.0084769     .101314
       _cons |   .0596486   .0453699     1.31   0.230    -.0476342    .1669314
------------------------------------------------------------------------------
```

```
. gen y192=y19hat*y19hat

.
. gen y193=y192*y19hat

.
. reg lnb x8 x10 x12 x18 x19 x20 y192 y193, robust cluster(PD)

Linear regression                                      Number of obs =    2472
                                                       F(  6,     7) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.2108
                                                       Root MSE      =  .26066

                                     (Std. Err. adjusted for 8 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x8 |  -.0314375   .0095652    -3.29   0.013    -.0540557   -.0088193
         x10 |   .0359838   .0086778     4.15   0.004     .0154642    .0565034
         x12 |  -.0124106   .0036357    -3.41   0.011    -.0210076   -.0038136
         x18 |   .0601119   .0099407     6.05   0.001     .0366058     .083618
         x19 |  -.0442386   .0085188    -5.19   0.001    -.0643825   -.0240948
         x20 |   .0190933   .0034212     5.58   0.001     .0110034    .0271831
        y192 |   .3728771   .3617583     1.03   0.337    -.4825454      1.2283
        y193 |  -2.210985   .3315849    -6.67   0.000    -2.995058   -1.426911
       _cons |   .0528807   .0474846     1.11   0.302    -.0594024    .1651639
------------------------------------------------------------------------------

.
. test y192 y193

 ( 1)  y192 = 0
 ( 2)  y193 = 0

       F(  2,     7) =   31.84
            Prob > F =    0.0003
```

```
. *20 test all actual variables and diff. variables snow

.
. reg lnb x14 x21,robust cluster(PD)

Linear regression                                      Number of obs =    2472
                                                       F(  2,     7) =  157.95
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1164
                                                       Root MSE      =  .27547

                                    (Std. Err. adjusted for 8 clusters in PD)

             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x14 |  -1.50e-07   1.23e-07    -1.22   0.263    -4.42e-07    1.42e-07
         x21 |   1.96e-06   1.78e-07    11.04   0.000     1.54e-06    2.38e-06
       _cons |   .0716266   .0342029     2.09   0.075    -.0092503    .1525036
------------------------------------------------------------------------------

.
. predict u20,r

.
. predict y20hat,xb

.
. reg lnb x14 x21 l.u20,robust cluster(PD)

Linear regression                                      Number of obs =    2464
                                                       F(  3,     7) =  272.31
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1183
                                                       Root MSE      =  .27564

                                    (Std. Err. adjusted for 8 clusters in PD)

             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x14 |  -1.46e-07   1.20e-07    -1.22   0.264    -4.30e-07    1.38e-07
         x21 |   1.96e-06   1.71e-07    11.50   0.000     1.56e-06    2.36e-06
         u20 |
         L1. |   .0468256   .0292994     1.60   0.154    -.0224565    .1161077
       _cons |   .0710398   .0325285     2.18   0.065    -.0058778    .1479574
------------------------------------------------------------------------------

.
. gen y202=y20hat*y20hat

.
. gen y203=y202*y20hat

.
. reg lnb x14 x21 y202 y203, robust cluster(PD)

Linear regression                                      Number of obs =    2472
                                                       F(  4,     7) =  195.03
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1697
                                                       Root MSE      =  .26715

                                    (Std. Err. adjusted for 8 clusters in PD)

             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x14 |  -9.43e-08   1.20e-07    -0.79   0.458    -3.78e-07    1.90e-07
         x21 |   3.06e-06   2.81e-07    10.90   0.000     2.40e-06    3.73e-06
        y202 |  -.6843288    .794527    -0.86   0.418    -2.563087    1.194429
        y203 |  -5.165943   2.235692    -2.31   0.054    -10.45252    .1206286
       _cons |   .0793833   .0346522     2.29   0.056    -.0025561    .1613228
------------------------------------------------------------------------------

.
. test y202 y203

 ( 1)  y202 = 0
 ( 2)  y203 = 0

       F(  2,     7) =   45.67
            Prob > F =    0.0001
```

Year

```
. xtfisher lnb, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(6)       =  227.4966
         Prob > chi2   =      0.0000


.
. xtfisher x1, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(6)       =  285.7111
         Prob > chi2   =      0.0000


.
. xtfisher x2, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(6)       =  317.6213
         Prob > chi2   =      0.0000


.
. xtfisher x3, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(6)       =  298.5616
         Prob > chi2   =      0.0000


.
. xtfisher x4, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(6)       =  308.8823
         Prob > chi2   =      0.0000


.
. xtfisher x5, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(6)       =  275.5370
         Prob > chi2   =      0.0000


.
. xtfisher x6, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(6)       =  282.2660
         Prob > chi2   =      0.0000
```

```
. xtfisher x7, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(6)      =  294.1965
         Prob > chi2  =      0.0000

.
. xtfisher x8, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(6)      =  279.0134
         Prob > chi2  =      0.0000

.
. xtfisher x9, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(6)      =  279.6077
         Prob > chi2  =      0.0000

.
. xtfisher x10, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(6)      =  262.2707
         Prob > chi2  =      0.0000

.
. xtfisher x11, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(6)      =  252.1105
         Prob > chi2  =      0.0000

.
. xtfisher x12, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(6)      =  245.5669
         Prob > chi2  =      0.0000

.
. xtfisher x13, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(6)      =  361.1272
         Prob > chi2  =      0.0000
```

```
. xtfisher x14, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(6)      =  373.5609
         Prob > chi2  =      0.0000


.
. xtfisher x15, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(6)      =  260.8225
         Prob > chi2  =      0.0000


.
. xtfisher x16, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(6)      =  239.3598
         Prob > chi2  =      0.0000


.
. xtfisher x17, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(6)      =  213.7644
         Prob > chi2  =      0.0000


.
. xtfisher x18, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(6)      =  164.5724
         Prob > chi2  =      0.0000


.
. xtfisher x19, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(6)      =  171.8518
         Prob > chi2  =      0.0000


.
. xtfisher x20, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(6)      =  216.1269
         Prob > chi2  =      0.0000


.
. xtfisher x21, lags(5)

Fisher Test for panel unit root using an augmented Dickey-Fuller test (5 lags)

Ho: unit root

         chi2(6)      =  190.4616
         Prob > chi2  =      0.0000
```

```
. *1 test actual variables

.
. reg lnb x2 x4 x6 x8 x10 x12 x14,robust cluster(PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.1311
                                                       Root MSE      =  .28459

                                   (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |   .0004493   .0002595     1.73   0.226    -.0006673    .0015659
          x4 |   .0002931   .0002434     1.20   0.352    -.0007541    .0013402
          x6 |  -.0009579   .0002558    -3.75   0.064    -.0020583    .0001425
          x8 |   .0091781   .0023076     3.98   0.058    -.0007507    .0191069
         x10 |   -.002922   .0010823    -2.70   0.114    -.0075789    .0017349
         x12 |    .002029   .0005426     3.74   0.065    -.0003054    .0043635
         x14 |   2.05e-07   4.57e-08     4.49   0.046     8.46e-09    4.01e-07
       _cons |  -.0960715   .0811422    -1.18   0.358    -.4451982    .2530552
------------------------------------------------------------------------------

.
. test x2 x4 x6

 ( 1)  x2 = 0
 ( 2)  x4 = 0
 ( 3)  x6 = 0
       Constraint 2 dropped

       F(  2,     2) =   10.37
            Prob > F =    0.0879

.
. test x8 x10 x12

 ( 1)  x8 = 0
 ( 2)  x10 = 0
 ( 3)  x12 = 0
       Constraint 3 dropped

       F(  2,     2) =   31.16
            Prob > F =    0.0311

.
. predict u,r

.
. predict yhat,xb

.
. reg lnb x2 x4 x6 x8 x10 x12 x14 l.u,robust cluster(PD)

Linear regression                                      Number of obs =    1530
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.1411
                                                       Root MSE      =  .28329

                                   (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |   .0003132   .0002771     1.13   0.376    -.0008789    .0015053
          x4 |   .0003754   .0002618     1.43   0.288    -.0007512    .0015021
          x6 |  -.0009123   .0002254    -4.05   0.056    -.0018821    .0000575
          x8 |   .0090508   .0023439     3.86   0.061    -.0010341    .0191357
         x10 |  -.0030195   .0011458    -2.64   0.119    -.0079493    .0019104
         x12 |   .0021124   .0005869     3.60   0.069     -.000413    .0046378
         x14 |   1.81e-07   3.59e-08     5.03   0.037     2.62e-08    3.35e-07
           u |
         L1. |   -.112679   .0212398    -5.31   0.034    -.2040665   -.0212915
       _cons |  -.0837237   .0817637    -1.02   0.414    -.4355246    .2680772
------------------------------------------------------------------------------
```

```
. gen y2=yhat*yhat

.
. gen y3=y2*yhat

.
. reg lnb x2 x4 x6 x8 x10 x12 x14 y2 y3, robust cluster(PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,      2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.1447
                                                       Root MSE      =  .28254

                                      (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |   .0005704   .0002563     2.23   0.156    -.0005324    .0016731
          x4 |   .0002756   .0001897     1.45   0.283    -.0005407    .0010918
          x6 |  -.0011554   .0002581    -4.48   0.046     -.002266   -.0000447
          x8 |   .0126313   .0037648     3.36   0.079    -.0035673    .0288299
         x10 |  -.0040721   .0014715    -2.77   0.110    -.0104036    .0022594
         x12 |   .0025981   .0006083     4.27   0.051    -.0000193    .0052156
         x14 |   2.44e-07   5.30e-08     4.60   0.044     1.56e-08    4.72e-07
          y2 |   -.860957   1.960895    -0.44   0.703    -9.298006    7.576092
          y3 |  -1.043995   1.984817    -0.53   0.651    -9.583975    7.495985
       _cons |  -.1038163   .0905605    -1.15   0.370    -.4934668    .2858341
------------------------------------------------------------------------------

.
. test y2 y3

 ( 1)  y2 = 0
 ( 2)  y3 = 0

       F(  2,     2) =   11.21
            Prob > F =    0.0819
```

```
. *2 test actual variables reservoir level

.
. reg lnb x2 x4 x6,robust cluster(PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,      2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0297
                                                       Root MSE      =  .30033

                                   (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |  -.0002158   .0002889    -0.75   0.533    -.0014587    .0010271
          x4 |   .0002125    .000257     0.83   0.495    -.0008934    .0013184
          x6 |   .0002707   .0000551     4.91   0.039     .0000335    .0005079
       _cons |  -.0796321   .0668727    -1.19   0.356    -.3673619    .2080977
------------------------------------------------------------------------------

.
. predict u2,r

.
. predict y2hat,xb

.
. reg lnb x2 x4 x6 l.u2,robust cluster(PD)

Linear regression                                      Number of obs =    1530
                                                       F(  1,      2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0465
                                                       Root MSE      =   .2981

                                   (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |  -.0004734   .0003252    -1.46   0.283    -.0018728     .000926
          x4 |   .0003991   .0002914     1.37   0.304    -.0008547    .0016529
          x6 |   .0003235   .0000548     5.91   0.027     .0000879    .0005591
          u2 |
         L1. |  -.1375666   .0120667   -11.40   0.008    -.1894855   -.0856477
       _cons |  -.0675868   .0664566    -1.02   0.416    -.3535267     .218353
------------------------------------------------------------------------------

.
. gen y22=y2hat*y2hat

.
. gen y23=y22*y2hat

.
. reg lnb x2 x4 x6 y22 y23, robust cluster(PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,      2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0298
                                                       Root MSE      =  .30051

                                   (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |   -.000189   .0004502    -0.42   0.715    -.0021263    .0017482
          x4 |   .0001925   .0003952     0.49   0.674    -.0015079    .0018929
          x6 |   .0002545   .0001263     2.02   0.181    -.0002889    .0007979
         y22 |   .6316702   13.11283     0.05   0.966     -55.7883    57.05164
         y23 |   3.104251   73.04759     0.04   0.970    -311.1941    317.4026
       _cons |  -.0792731   .1119705    -0.71   0.552    -.5610431    .4024968
------------------------------------------------------------------------------

.
. test y22 y23

 ( 1)  y22 = 0
 ( 2)  y23 = 0

       F(  2,     2) =    0.02
            Prob > F =    0.9804
```

```
. *3 test actual variables inflow

.
. reg lnb x8 x10 x12,robust cluster(PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.1043
                                                       Root MSE      =  .28856

                                     (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x8 |   .0076947    .001669     4.61   0.044     .0005137    .0148757
         x10 |  -.0026403   .0006534    -4.04   0.056    -.0054515    .0001709
         x12 |   .0012783   .0004671     2.74   0.112    -.0007313    .0032879
       _cons |  -.0931585   .0406706    -2.29   0.149    -.2681502    .0818332
------------------------------------------------------------------------------

.
. predict u3, r

.
. predict y3hat,xb

.
. reg lnb x8 x10 x12 l.u3,robust cluster(PD)

Linear regression                                      Number of obs =    1530
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.1196
                                                       Root MSE      =  .28645

                                     (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x8 |    .007365   .0017019     4.33   0.049     .0000424    .0146875
         x10 |   -.002515   .0006659    -3.78   0.063      -.00538      .00035
         x12 |   .0012394   .0005218     2.38   0.141    -.0010056    .0034845
          u3 |
         L1. |  -.1316842   .0276267    -4.77   0.041    -.2505524   -.0128159
       _cons |  -.0898604   .0447282    -2.01   0.182    -.2823104    .1025895
------------------------------------------------------------------------------

.
. gen y32=y3hat*y3hat

.
. gen y33=y32*y3hat

.
. reg lnb x8 x10 x12 y32 y33, robust cluster(PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.1200
                                                       Root MSE      =   .2862

                                     (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x8 |   .0116713   .0024966     4.67   0.043     .0009292    .0224133
         x10 |  -.0037996     .00085    -4.47   0.047    -.0074568   -.0001424
         x12 |   .0015242   .0006872     2.22   0.157    -.0014327    .0044812
         y32 |  -4.190618   2.637345    -1.59   0.253     -15.5382    7.156963
         y33 |   4.303015   4.053527     1.06   0.400     -13.1379    21.74394
       _cons |  -.1034649   .0635836    -1.63   0.245    -.3770432    .1701134
------------------------------------------------------------------------------

.
. test y32 y33

 ( 1)  y32 = 0
 ( 2)  y33 = 0

       F(  2,     2) =    4.51
            Prob > F =    0.1814
```

```
. *4 test actual variables snow

.
. reg lnb x14,robust cluster(PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,     2) =   51.32
                                                       Prob > F      =  0.0189
                                                       R-squared     =  0.0168
                                                       Root MSE      =  .30213

                                     (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x14 |   1.77e-07   2.47e-08     7.16   0.019     7.06e-08    2.83e-07
       _cons |  -.0355338   .0123366    -2.88   0.102    -.0886139    .0175464
------------------------------------------------------------------------------

.
. predict u4,r

.
. predict y4hat,xb

.
. reg lnb x14 l.u4,robust cluster(PD)

Linear regression                                      Number of obs =    1530
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0260
                                                       Root MSE      =  .30109

                                     (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x14 |   1.42e-07   1.89e-08     7.51   0.017     6.04e-08    2.23e-07
          u4 |
         L1. |  -.0999829    .009194   -10.87   0.008    -.1395414   -.0604245
       _cons |  -.0287021   .0114563    -2.51   0.129    -.0779948    .0205905
------------------------------------------------------------------------------

.
. gen y42=y4hat*y4hat

.
. gen y43=y42*y4hat

.
. reg lnb x14 y42 y43, robust cluster(PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0400
                                                       Root MSE      =  .29874

                                     (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x14 |  -2.17e-08   1.73e-07    -0.13   0.912    -7.67e-07    7.24e-07
         y42 |   38.36147   28.45902     1.35   0.310    -84.08782    160.8108
         y43 |  -122.3204   245.3345    -0.50   0.668     -1177.91    933.2689
       _cons |  -.0484704   .0396964    -1.22   0.346    -.2192704    .1223295
------------------------------------------------------------------------------

.
. test y42 y43

 ( 1)  y42 = 0
 ( 2)  y43 = 0

       F(  2,     2) =    4.30
            Prob > F =    0.1888
```

```
. *5 Test all seasonal variables

.
. reg lnb x1 x3 x5 x7 x9 x11 x13,robust cluster(PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0664
                                                       Root MSE      =  .29499

                                   (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |  -.0025076    .000444    -5.65   0.030     -.004418   -.0005973
          x3 |   .0055275   .0009557     5.78   0.029     .0014153    .0096396
          x5 |  -.0033841   .0005821    -5.81   0.028    -.0058887   -.0008795
          x7 |  -.0041645   .0012128    -3.43   0.075    -.0093826    .0010536
          x9 |   .0094284   .0020812     4.53   0.045     .0004739    .0183829
         x11 |  -.0022971   .0004127    -5.57   0.031    -.0040726   -.0005216
         x13 |   1.15e-06   1.72e-07     6.72   0.021     4.15e-07    1.89e-06
       _cons |  -.0120814   .0106786    -1.13   0.375    -.0580278    .0338649
------------------------------------------------------------------------------

.
. test x1 x3 x5

 ( 1)  x1 = 0
 ( 2)  x3 = 0
 ( 3)  x5 = 0
       Constraint 3 dropped

       F(  2,     2) =   17.56
            Prob > F =    0.0539

.
. test x7 x9 x11

 ( 1)  x7 = 0
 ( 2)  x9 = 0
 ( 3)  x11 = 0
       Constraint 1 dropped

       F(  2,     2) =   19.38
            Prob > F =    0.0491

.
. predict u5,r

.
. predict y5hat,xb

.
. reg lnb x1 x3 x5 x7 x9 x11 x13 l.u5,robust cluster(PD)

Linear regression                                      Number of obs =    1530
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.1128
                                                       Root MSE      =  .28793

                                   (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |  -.0028502   .0006076    -4.69   0.043    -.0054647   -.0002357
          x3 |   .0063738   .0012966     4.92   0.039     .0007949    .0119527
          x5 |  -.0039399   .0007765    -5.07   0.037     -.007281   -.0005988
          x7 |  -.0042918   .0011291    -3.80   0.063    -.0091499    .0005663
          x9 |   .0099225    .002205     4.50   0.046     .0004352    .0194097
         x11 |  -.0022766   .0004022    -5.66   0.030    -.0040069   -.0005462
         x13 |   1.32e-06   2.31e-07     5.72   0.029     3.27e-07    2.31e-06
          u5 |
         L1. |  -.2243479   .0269973    -8.31   0.014     -.340508   -.1081877
       _cons |  -.0090809   .0116357    -0.78   0.517    -.0591451    .0409834
------------------------------------------------------------------------------
```

```
. gen y52=y5hat*y5hat

.
. gen y53=y52*y5hat

.
. reg lnb x1 x3 x5 x7 x9 x11 x13 y52 y53, robust cluster(PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,      2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0825
                                                       Root MSE      =  .29262

                                    (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |  -.0062099   .0003245   -19.14   0.003     -.007606   -.0048138
          x3 |    .012469   .0004897    25.46   0.002     .0103622    .0145759
          x5 |   -.006836   .0002645   -25.84   0.001    -.0079742   -.0056978
          x7 |  -.0112121   .0023384    -4.79   0.041    -.0212735   -.0011506
          x9 |   .0181972   .0032104     5.67   0.030      .004384    .0320105
         x11 |  -.0044138   .0009537    -4.63   0.044    -.0085171   -.0003105
         x13 |   2.59e-06   7.94e-08    32.61   0.001     2.25e-06    2.93e-06
         y52 |  -.1640516   .7048005    -0.23   0.838    -3.196564     2.86846
         y53 |  -27.52051   6.245712    -4.41   0.048    -54.39365   -.6473827
       _cons |  -.0152893   .0076488    -2.00   0.184    -.0481996     .017621
------------------------------------------------------------------------------

.
. test y52 y53

 ( 1)  y52 = 0
 ( 2)  y53 = 0

       F(  2,     2) =   24.99
            Prob > F =    0.0385
```

```
. *6 Test all seasonal variables reservoir level

.
. reg lnb x1 x3 x5,robust cluster(PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0359
                                                       Root MSE      =  .29937

                                     (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |   -.001536   .0003581    -4.29   0.050    -.0030768    4.80e-06
          x3 |   .0009042   .0002478     3.65   0.068    -.0001621    .0019704
          x5 |    .000743   .0001345     5.52   0.031     .0001641    .0013219
       _cons |   .0022829   .0019059     1.20   0.354    -.0059176    .0104834
------------------------------------------------------------------------------

.
. predict u6,r

.
. predict y6hat,xb

.
. reg lnb x1 x3 x5 l.u6,robust cluster(PD)

Linear regression                                      Number of obs =    1530
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0656
                                                       Root MSE      =  .29509

                                     (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |  -.0016643   .0004313    -3.86   0.061    -.0035201    .0001916
          x3 |   .0010513   .0003204     3.28   0.082    -.0003275      .00243
          x5 |   .0007303   .0001416     5.16   0.036     .0001212    .0013394
          u6 |
         L1. |  -.1768067   .0181211    -9.76   0.010    -.2547756   -.0988377
       _cons |   .0056889   .0044253     1.29   0.327    -.0133515    .0247293
------------------------------------------------------------------------------

.
. gen y62=y6hat*y6hat

.
. gen y63=y62*y6hat

.
. reg lnb x1 x3 x5 y62 y63, robust cluster(PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0485
                                                       Root MSE      =  .29761

                                     (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |  -.0025676    .000405    -6.34   0.024    -.0043102    -.000825
          x3 |   .0016598   .0002593     6.40   0.024      .000544    .0027756
          x5 |   .0010655   .0001803     5.91   0.027     .0002898    .0018412
         y62 |   11.22132   1.610809     6.97   0.020     4.290571    18.15207
         y63 |  -83.84504    16.3182    -5.14   0.036    -154.0566   -13.63351
       _cons |   .0018804   .0003505     5.36   0.033     .0003722    .0033885
------------------------------------------------------------------------------

.
. test y62 y63

 ( 1)  y62 = 0
 ( 2)  y63 = 0

       F(  2,     2) =   64.36
            Prob > F =    0.0153
```

```
. *7 Test all seasonal variables inflow

.
. reg lnb x7 x9 x11,robust cluster(PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0523
                                                       Root MSE      =  .29681

                                     (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x7 |  -.0114847   .0043626    -2.63   0.119    -.0302556    .0072862
          x9 |   .0153904   .0049178     3.13   0.089    -.0057691    .0365499
         x11 |  -.0058835   .0019435    -3.03   0.094    -.0142456    .0024786
       _cons |  -.0270992   .0155386    -1.74   0.223    -.0939564    .0397581
------------------------------------------------------------------------------

.
. predict u7,r

.
. predict y7hat,xb

.
. reg lnb x7 x9 x11 l.u7,robust cluster(PD)

Linear regression                                      Number of obs =    1530
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0896
                                                       Root MSE      =  .29129

                                     (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x7 |  -.0122539   .0050328    -2.43   0.135    -.0339085    .0094006
          x9 |   .0163533   .0057466     2.85   0.104    -.0083722    .0410787
         x11 |  -.0063128   .0023532    -2.68   0.115    -.0164378    .0038121
          u7 |
         L1. |  -.1988379   .0250131    -7.95   0.015    -.3064605   -.0912154
       _cons |  -.0266349   .0188668    -1.41   0.294    -.1078123    .0545425
------------------------------------------------------------------------------

.
. gen y72=y7hat*y7hat

.
. gen y73=y72*y7hat

.
. reg lnb x7 x9 x11 y72 y73, robust cluster(PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0730
                                                       Root MSE      =  .29375

                                     (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x7 |  -.0173703   .0031133    -5.58   0.031    -.0307658   -.0039748
          x9 |   .0245417   .0043638     5.62   0.030     .0057659    .0433174
         x11 |  -.0089637   .0016279    -5.51   0.031     -.015968   -.0019594
         y72 |  -10.78616   5.816983    -1.85   0.205    -35.81461     14.2423
         y73 |   18.32997   15.86188     1.16   0.367    -49.91817    86.57811
       _cons |   -.025372   .0117381    -2.16   0.163    -.0758769    .0251329
------------------------------------------------------------------------------

.
. test y72 y73

 ( 1)  y72 = 0
 ( 2)  y73 = 0

       F(  2,     2) =   92.03
            Prob > F =    0.0107
```

```
. *8 Test all seasonal variables snow

.
. reg lnb x13,robust cluster(PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,     2) =    0.09
                                                       Prob > F      =  0.7966
                                                       R-squared     =  0.0000
                                                       Root MSE      =  .30469

                                    (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x13 |  -6.09e-09   2.07e-08    -0.29   0.797    -9.53e-08    8.31e-08
       _cons |   -.000649   .0023188    -0.28   0.806    -.0106261    .0093282
------------------------------------------------------------------------------

.
. predict u8,r

.
. predict y8hat,xb

.
. reg lnb x13 l.u8,robust cluster(PD)

Linear regression                                      Number of obs =    1530
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0159
                                                       Root MSE      =  .30265

                                    (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x13 |  -3.09e-08   2.72e-08    -1.14   0.373    -1.48e-07    8.59e-08
          u8 |
         L1. |  -.1271444   .0120937   -10.51   0.009    -.1791792   -.0751095
       _cons |   .0041613   .0012198     3.41   0.076    -.0010872    .0094099
------------------------------------------------------------------------------

.
. gen y82=y8hat*y8hat

.
. gen y83=y82*y8hat

.
. reg lnb x13 y82 y83, robust cluster(PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0048
                                                       Root MSE      =  .30417

                                    (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x13 |  -5.87e-07   1.06e-07    -5.52   0.031    -1.04e-06   -1.30e-07
         y82 |   26225.16   6342.436     4.13   0.054    -1064.137    53514.47
         y83 |    1607335   735665.2     2.18   0.161     -1557977     4772647
       _cons |    .008442   .0054112     1.56   0.259    -.0148404    .0317243
------------------------------------------------------------------------------

.
. test y82 y83

 ( 1)  y82 = 0
 ( 2)  y83 = 0

       F(  2,     2) =   24.25
            Prob > F =    0.0396
```

```
. *9 test all actial and season variables

.
. reg lnb x1 x2 x3 x4 x5 x6 x7 x8 x9 x10 x11 x12 x13 x14,robust cluster(PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.5100
                                                       Root MSE      =  .21419

                                        (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |  -.0101467   .0023577    -4.30   0.050    -.0202912   -2.22e-06
          x2 |   .0029808   .0006432     4.63   0.044     .0002131    .0057484
          x3 |   .0138616   .0031648     4.38   0.048     .0002444    .0274788
          x4 |  -.0004938   .0001275    -3.87   0.061    -.0010423    .0000546
          x5 |  -.0067403   .0013672    -4.93   0.039    -.0126231   -.0008576
          x6 |   .0002415   .0000989     2.44   0.135    -.0001841     .000667
          x7 |  -.0041204   .0004632    -8.89   0.012    -.0061136   -.0021272
          x8 |   .0043494   .0010497     4.14   0.054    -.0001673     .008866
          x9 |   .0007926   .0008019     0.99   0.427    -.0026579    .0042431
         x10 |   .0006806   .0000434    15.70   0.004     .0004941    .0008672
         x11 |   .0005448   .0008049     0.68   0.568    -.0029185    .0040081
         x12 |   .0008439   .0002347     3.60   0.069    -.0001659    .0018536
         x13 |   1.75e-06   3.18e-07     5.50   0.031     3.82e-07    3.12e-06
         x14 |   9.39e-07   2.61e-07     3.60   0.069    -1.84e-07    2.06e-06
       _cons |   -.010847   .0094492    -1.15   0.370    -.0515038    .0298098
------------------------------------------------------------------------------

.
. test x1 x2 x3 x4 x5 x6

 ( 1)  x1 = 0
 ( 2)  x2 = 0
 ( 3)  x3 = 0
 ( 4)  x4 = 0
 ( 5)  x5 = 0
 ( 6)  x6 = 0
       Constraint 1 dropped
       Constraint 4 dropped
       Constraint 5 dropped
       Constraint 6 dropped

       F(  2,     2) =   10.94
            Prob > F =    0.0838

.
. test x1 x3 x5

 ( 1)  x1 = 0
 ( 2)  x3 = 0
 ( 3)  x5 = 0
       Constraint 1 dropped

       F(  2,     2) =   46.36
            Prob > F =    0.0211

.
. test x2 x3 x5

 ( 1)  x2 = 0
 ( 2)  x3 = 0
 ( 3)  x5 = 0
       Constraint 3 dropped

       F(  2,     2) =   10.94
            Prob > F =    0.0838

.
. test x7 x8 x9 x10 x11 x12

 ( 1)  x7 = 0
 ( 2)  x8 = 0
 ( 3)  x9 = 0
 ( 4)  x10 = 0
 ( 5)  x11 = 0
 ( 6)  x12 = 0
       Constraint 1 dropped
       Constraint 3 dropped
       Constraint 4 dropped
       Constraint 6 dropped

       F(  2,     2) =   20.62
            Prob > F =    0.0462

.
. test x7 x9 x11

 ( 1)  x7 = 0
 ( 2)  x9 = 0
 ( 3)  x11 = 0
       Constraint 2 dropped

       F(  2,     2) =   52.40
            Prob > F =    0.0187

.
. test x8 x10 x12

 ( 1)  x8 = 0
 ( 2)  x10 = 0
 ( 3)  x12 = 0
       Constraint 2 dropped

       F(  2,     2) =    8.76
            Prob > F =    0.1025

.
. test x13 x14

 ( 1)  x13 = 0
 ( 2)  x14 = 0

       F(  2,     2) =  818.97
            Prob > F =    0.0012
```

```
. predict u9,r

.
. predict y9hat,xb

.
. reg lnb x1 x2 x3 x4 x5 x6 x7 x8 x9 x10 x11 x12 x13 x14 l.u9,robust cluster(PD)

Linear regression                                      Number of obs =    1530
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.5191
                                                       Root MSE      =  .21246

                                         (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |  -.0101424   .0024251    -4.18   0.053    -.0205768     .000292
          x2 |   .0028861   .0005839     4.94   0.039      .000374    .0053982
          x3 |   .0141262   .0034142     4.14   0.054    -.0005641    .0288165
          x4 |  -.0004747   .0001194    -3.97   0.058    -.0009885    .0000391
          x5 |  -.0070363   .0015408    -4.57   0.045    -.0136659   -.0004067
          x6 |   .0003286    .000077     4.27   0.051    -2.78e-06      .00066
          x7 |  -.0049654   .0006489    -7.65   0.017    -.0077573   -.0021734
          x8 |   .0042758   .0010475     4.08   0.055    -.0002313    .0087828
          x9 |   .0020252   .0007174     2.82   0.106    -.0010613    .0051118
         x10 |   .0004657   .0001425     3.27   0.082    -.0001477     .001079
         x11 |   .0000352   .0008122     0.04   0.969    -.0034596      .00353
         x12 |   .0010514   .0003003     3.50   0.073    -.0002407    .0023435
         x13 |   1.85e-06   3.71e-07     4.99   0.038     2.54e-07    3.45e-06
         x14 |   9.00e-07   2.54e-07     3.55   0.071    -1.92e-07    1.99e-06
          u9 |
         L1. |  -.1402437   .0287709    -4.87   0.040    -.2640349   -.0164526
       _cons |  -.0095109   .0102104    -0.93   0.450    -.0534426    .0344207
------------------------------------------------------------------------------

.
. gen y92=y9hat*y9hat

.
. gen y93=y92*y9hat

.
. reg lnb x1 x2 x3 x4 x5 x6 x7 x8 x9 x10 x11 x12 x13 x14 y92 y93, robust cluster(
> PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.5141
                                                       Root MSE      =  .21344

                                         (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |  -.0111508   .0036977    -3.02   0.095    -.0270606    .0047589
          x2 |   .0032021   .0009324     3.43   0.075    -.0008097    .0072139
          x3 |   .0153217   .0051336     2.98   0.096    -.0067666      .03741
          x4 |     -.0005   .0001277    -3.92   0.059    -.0010495    .0000495
          x5 |  -.0075087   .0024818    -3.03   0.094    -.0181872    .0031697
          x6 |     .00029   .0001504     1.93   0.194    -.0003574    .0009373
          x7 |  -.0039973   .0004935    -8.10   0.015    -.0061208   -.0018738
          x8 |   .0053698   .0022912     2.34   0.144    -.0044884    .0152281
          x9 |   .0005231   .0010484     0.50   0.667    -.0039878     .005034
         x10 |    .000532   .0001644     3.24   0.084    -.0001753    .0012393
         x11 |     .00063    .000856     0.74   0.538    -.0030533    .0043132
         x12 |   .0010159   .0003642     2.79   0.108     -.000551    .0025827
         x13 |   1.96e-06   6.08e-07     3.22   0.084    -6.58e-07    4.58e-06
         x14 |   1.03e-06   3.73e-07     2.76   0.110    -5.76e-07    2.64e-06
         y92 |  -.0682359   .0701224    -0.97   0.433    -.3699484    .2334766
         y93 |  -.4966731   .8338245    -0.60   0.612     -4.08433    3.090984
       _cons |  -.0129637   .0085377    -1.52   0.268    -.0496986    .0237711
------------------------------------------------------------------------------

.
. test y92 y93

 ( 1)  y92 = 0
 ( 2)  y93 = 0

       F(  2,     2) =    1.16
            Prob > F =    0.4632
```

```
. *10 test all actial and season variables reservoir level

.
. reg lnb x1 x2 x3 x4 x5 x6,robust cluster(PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.4006
                                                       Root MSE      =  .23629

                                     (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |  -.0043868   .0009881    -4.44   0.047    -.0086383   -.0001352
          x2 |   .0030588   .0006783     4.51   0.046     .0001401    .0059775
          x3 |   .0011363    .000302     3.76   0.064    -.0001632    .0024359
          x4 |   -.000171   .0000719    -2.38   0.141    -.0004803    .0001384
          x5 |    .000048   .0000959     0.50   0.666    -.0003646    .0004607
          x6 |   .0004964   .0000984     5.04   0.037      .000073    .0009197
       _cons |   .0066344   .0060823     1.09   0.389    -.0195356    .0328045
------------------------------------------------------------------------------

.
. test x1 x3 x5

 ( 1)  x1 = 0
 ( 2)  x3 = 0
 ( 3)  x5 = 0
       Constraint 2 dropped

       F(  2,     2) =   15.66
            Prob > F =    0.0600

.
. test x2 x4 x6

 ( 1)  x2 = 0
 ( 2)  x4 = 0
 ( 3)  x6 = 0
       Constraint 2 dropped

       F(  2,     2) =   17.24
            Prob > F =    0.0548

.
. predict u10,r

.
. predict y10hat,xb

.
. reg lnb x1 x2 x3 x4 x5 x6 l.u10,robust cluster(PD)

Linear regression                                      Number of obs =    1530
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.4121
                                                       Root MSE      =   .2343

                                     (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |   -.004404   .0010132    -4.35   0.049    -.0087637   -.0000444
          x2 |   .0029809   .0006393     4.66   0.043     .0002301    .0057316
          x3 |   .0012975   .0003755     3.46   0.075     -.000318    .0029131
          x4 |  -.0002422   .0000889    -2.73   0.112    -.0006246    .0001401
          x5 |  -.0000459   .0000639    -0.72   0.547    -.0003208    .0002291
          x6 |   .0006031   .0000941     6.41   0.024     .0001981    .0010081
         u10 |
         L1. |   -.138139   .0194134    -7.12   0.019    -.2216679   -.0546101
       _cons |   .0082556   .0076916     1.07   0.395    -.0248388      .04135
------------------------------------------------------------------------------
```

```
. gen y102=y10hat*y10hat

.
. gen y103=y102*y10hat

.
. reg lnb x1 x2 x3 x4 x5 x6 y102 y103, robust cluster(PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,      2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.4021
                                                       Root MSE      =  .23614

                                     (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |  -.0046344   .0017428    -2.66   0.117    -.0121332    .0028644
          x2 |    .003187    .001114     2.86   0.104     -.001606      .00798
          x3 |   .0012464   .0005845     2.13   0.167    -.0012686    .0037613
          x4 |  -.0001713   .0000967    -1.77   0.218    -.0005872    .0002446
          x5 |  -.0000574   .0000656    -0.87   0.474    -.0003397    .0002249
          x6 |   .0006024    .000214     2.82   0.106    -.0003183     .001523
        y102 |   .1212491   .0452917     2.68   0.116    -.0736252    .3161234
        y103 |  -.2971837   1.062232    -0.28   0.806    -4.867598     4.27323
       _cons |   .0100096   .0062548     1.60   0.251    -.0169026    .0369218
------------------------------------------------------------------------------

.
. test y102 y103

 ( 1)  y102 = 0
 ( 2)  y103 = 0

       F(  2,     2) =    4.07
            Prob > F =    0.1972
```

```
. *11 test all actial and season variables inflow

.
. reg lnb x7 x8 x9 x10 x11 x12,robust cluster(PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.1858
                                                       Root MSE      =  .27539

                                  (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x7 |  -.0240995   .0068199    -3.53   0.072    -.0534432    .0052442
          x8 |   .0143216   .0033682     4.25   0.051    -.0001707    .0288138
          x9 |   .0165504   .0050151     3.30   0.081     -.005028    .0381288
         x10 |   -.002278   .0006885    -3.31   0.080    -.0052403    .0006844
         x11 |  -.0108104   .0027374    -3.95   0.059    -.0225886    .0009679
         x12 |   .0048048   .0009229     5.21   0.035     .0008338    .0087757
       _cons |  -.0254956   .0148593    -1.72   0.228    -.0894298    .0384386
------------------------------------------------------------------------------

.
. test x7 x9 x11

 ( 1)  x7 = 0
 ( 2)  x9 = 0
 ( 3)  x11 = 0
       Constraint 3 dropped

       F(  2,     2) =    9.33
            Prob > F =    0.0968

.
. test x8 x10 x12

 ( 1)  x8 = 0
 ( 2)  x10 = 0
 ( 3)  x12 = 0
       Constraint 3 dropped

       F(  2,     2) =   33.78
            Prob > F =    0.0288

.
. predict u11,r

.
. predict y11hat,xb

.
. reg lnb x7 x8 x9 x10 x11 x12 l.u11,robust cluster(PD)

Linear regression                                      Number of obs =    1530
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.2022
                                                       Root MSE      =  .27294

                                  (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x7 |  -.0245768   .0072024    -3.41   0.076    -.0555663    .0064128
          x8 |   .0138528   .0032293     4.29   0.050    -.0000419    .0277475
          x9 |   .0175578   .0056594     3.10   0.090    -.0067926    .0419083
         x10 |  -.0022709   .0007179    -3.16   0.087    -.0053599    .0008182
         x11 |   -.011326    .003065    -3.70   0.066    -.0245138    .0018618
         x12 |   .0049474   .0009669     5.12   0.036      .000787    .0091078
         u11 |
         L1. |  -.1434048   .0183409    -7.82   0.016    -.2223192   -.0644904
       _cons |  -.0246622   .0166768    -1.48   0.277    -.0964166    .0470922
------------------------------------------------------------------------------
```

```
. gen y112=y11hat*y11hat

.
. gen y113=y112*y11hat

.
. reg lnb x7 x8 x9 x10 x11 x12 y112 y113, robust cluster(PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,      2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.2371
                                                       Root MSE      =  .26675

                                   (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x7 |  -.0295715   .0067831    -4.36   0.049    -.0587566   -.0003863
          x8 |   .0199639   .0042467     4.70   0.042     .0016918    .0382359
          x9 |   .0184686   .0046442     3.98   0.058    -.0015138     .038451
         x10 |  -.0027316   .0007915    -3.45   0.075    -.0061373    .0006742
         x11 |   -.012285   .0025118    -4.89   0.039    -.0230925   -.0014775
         x12 |   .0065816   .0010471     6.29   0.024     .0020763     .011087
        y112 |  -1.471135   .7598279    -1.94   0.192     -4.74041    1.798141
        y113 |   -.171372   .3107594    -0.55   0.637    -1.508462    1.165718
       _cons |  -.0391129   .0180197    -2.17   0.162    -.1166457    .0384198
------------------------------------------------------------------------------

.
. test y112 y113

 ( 1)  y112 = 0
 ( 2)  y113 = 0

       F(  2,     2) =  241.95
            Prob > F =    0.0041
```

```
. *12 test all actial and season variables snow

.
. reg lnb x13 x14,robust cluster(PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.1787
                                                       Root MSE      =  .27622

                                    (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x13 |  -1.83e-06   4.40e-07    -4.17   0.053    -3.73e-06    5.91e-08
         x14 |   1.83e-06   4.19e-07     4.36   0.049     2.50e-08    3.63e-06
       _cons |  -.0003071   .0022393    -0.14   0.903    -.0099418    .0093277
------------------------------------------------------------------------------

.
. predict u12,r

.
. predict y12hat,xb

.
. reg lnb x13 x14 l.u12,robust cluster(PD)

Linear regression                                      Number of obs =    1530
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.1790
                                                       Root MSE      =  .27651

                                    (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x13 |  -1.84e-06   4.43e-07    -4.15   0.053    -3.74e-06    6.78e-08
         x14 |   1.83e-06   4.15e-07     4.40   0.048     4.21e-08    3.62e-06
         u12 |
         L1. |  -.0201593   .0332214    -0.61   0.606    -.1630993    .1227808
       _cons |   .0003219   .0030487     0.11   0.926    -.0127957    .0134396
------------------------------------------------------------------------------

.
. gen y122=y12hat*y12hat

.
. gen y123=y122*y12hat

.
. reg lnb x13 x14 y122 y123, robust cluster(PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.2196
                                                       Root MSE      =  .26944

                                    (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x13 |  -2.80e-06   5.02e-07    -5.56   0.031    -4.96e-06   -6.34e-07
         x14 |   2.78e-06   4.78e-07     5.81   0.028     7.22e-07    4.83e-06
        y122 |   .4046085    .220562     1.83   0.208     -.544393     1.35361
        y123 |  -5.248198   1.634523    -3.21   0.085    -12.28098    1.784585
       _cons |   .0033745    .001283     2.63   0.119    -.0021459     .008895
------------------------------------------------------------------------------

.
. test y122 y123

 ( 1)  y122 = 0
 ( 2)  y123 = 0

       F(  2,     2) =    5.21
            Prob > F =    0.1609
```

```
. *13 Test all diff. variables

.
. reg lnb x15 x16 x17 x18 x19 x20 x21,robust cluster(PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.4366
                                                       Root MSE      =  .22916

                                   (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x15 |   .0028822   .0006046     4.77   0.041     .0002809    .0054834
         x16 |  -.0004454   .0001286    -3.46   0.074    -.0009986    .0001078
         x17 |   .0001677   .0000886     1.89   0.199    -.0002135    .0005489
         x18 |   .0055573   .0014118     3.94   0.059    -.0005172    .0116319
         x19 |  -.0013973   .0005307    -2.63   0.119    -.0036809    .0008863
         x20 |   .0015506   .0003501     4.43   0.047     .0000441    .0030572
         x21 |   9.71e-07   2.68e-07     3.62   0.068    -1.82e-07    2.12e-06
       _cons |   .0219707   .0075224     2.92   0.100    -.0103956    .0543371
------------------------------------------------------------------------------

.
. test x15 x16 x17

 ( 1)  x15 = 0
 ( 2)  x16 = 0
 ( 3)  x17 = 0
       Constraint 2 dropped

       F(  2,     2) =   27.34
            Prob > F =    0.0353

.
. test x18 x19 x20

 ( 1)  x18 = 0
 ( 2)  x19 = 0
 ( 3)  x20 = 0
       Constraint 3 dropped

       F(  2,     2) =   20.00
            Prob > F =    0.0476

.
. predict u13,r

.
. predict y13hat,xb

.
. reg lnb x15 x16 x17 x18 x19 x20 x21 l.u13,robust cluster(PD)

Linear regression                                      Number of obs =    1530
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.4372
                                                       Root MSE      =  .22933

                                   (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x15 |   .0029133    .000594     4.90   0.039     .0003577     .005469
         x16 |   -.000454   .0001261    -3.60   0.069    -.0009964    .0000884
         x17 |   .0001484   .0000952     1.56   0.260    -.0002614    .0005582
         x18 |   .0055113   .0014115     3.90   0.060     -.000562    .0115846
         x19 |   -.001276   .0006423    -1.99   0.185    -.0040397    .0014877
         x20 |   .0014975    .000405     3.70   0.066    -.0002451    .0032401
         x21 |   9.72e-07   2.59e-07     3.75   0.064    -1.43e-07    2.09e-06
         u13 |
         L1. |   .0255233   .0453425     0.56   0.630    -.1695696    .2206163
       _cons |   .0223713   .0074808     2.99   0.096     -.009816    .0545587
------------------------------------------------------------------------------
```

```
. gen y132=y13hat*y13hat

.
. gen y133=y132*y13hat

.
. reg lnb x15 x16 x17 x18 x19 x20 x21 y132 y133, robust cluster(PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,      2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.4453
                                                       Root MSE      =  .22752

                                   (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x15 |   .0032147   .0009939     3.23   0.084    -.0010617    .0074912
         x16 |  -.0006055   .0002037    -2.97   0.097     -.001482     .000271
         x17 |   .0003246    .000155     2.09   0.171    -.0003423    .0009916
         x18 |   .0048312   .0024488     1.97   0.187    -.0057052    .0153677
         x19 |  -.0006531   .0007416    -0.88   0.471     -.003844    .0025379
         x20 |    .001347   .0005695     2.37   0.142    -.0011034    .0037974
         x21 |   9.45e-07   3.84e-07     2.46   0.133    -7.09e-07    2.60e-06
        y132 |   .4296539   .0605893     7.09   0.019      .168959    .6903487
        y133 |  -.2346582   1.114206    -0.21   0.853    -5.028698    4.559382
       _cons |   .0081576   .0022282     3.66   0.067    -.0014296    .0177448
------------------------------------------------------------------------------

.
. test y132 y133

 ( 1)  y132 = 0
 ( 2)  y133 = 0

       F(  2,     2) =   26.20
            Prob > F =    0.0368
```

```
. *14 Test diff. variables reservoir level

.
. reg lnb x15 x16 x17,robust cluster(PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.3701
                                                       Root MSE      =  .24198

                                    (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x15 |   .0032127   .0007114     4.52   0.046     .0001516    .0062738
         x16 |  -.0002325   .0000984    -2.36   0.142    -.0006558    .0001908
         x17 |    .000371   .0000704     5.27   0.034     .0000681    .0006739
       _cons |   .0256769   .0081687     3.14   0.088      -.00947    .0608239
------------------------------------------------------------------------------

.
. predict u14,r

.
. predict y14hat,xb

.
. reg lnb x15 x16 x17 l.u14,robust cluster(PD)

Linear regression                                      Number of obs =    1530
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.3732
                                                       Root MSE      =  .24169

                                    (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x15 |    .003207   .0006995     4.58   0.044     .0001971    .0062168
         x16 |  -.0002713   .0001136    -2.39   0.139    -.0007599    .0002172
         x17 |   .0003938   .0000675     5.83   0.028     .0001032    .0006844
         u14 |
         L1. |  -.0580686   .0142987    -4.06   0.056    -.1195908    .0034535
       _cons |   .0262424   .0090583     2.90   0.101    -.0127323     .065217
------------------------------------------------------------------------------

.
. gen y142=y14hat*y14hat

.
. gen y143=y142*y14hat

.
. reg lnb x15 x16 x17 y142 y143, robust cluster(PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.3749
                                                       Root MSE      =  .24121

                                    (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x15 |   .0031625   .0011018     2.87   0.103     -.001578     .007903
         x16 |  -.0002641   .0001404    -1.88   0.201    -.0008683    .0003402
         x17 |    .000501   .0001801     2.78   0.109    -.0002738    .0012757
        y142 |   .4761651   .0203048    23.45   0.002     .3888008    .5635295
        y143 |   .4218255   .9251132     0.46   0.693    -3.558615    4.402266
       _cons |   .0121393   .0020053     6.05   0.026     .0035113    .0207674
------------------------------------------------------------------------------

.
. test y142 y143

 ( 1)  y142 = 0
 ( 2)  y143 = 0

       F(  2,     2) =  289.11
            Prob > F =    0.0034
```

```
. *15 Test diff. variables inflow

.
. reg lnb x18 x19 x20,robust cluster(PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,      2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.1363
                                                       Root MSE      =  .28335

                                     (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x18 |   .0153809   .0036108     4.26   0.051    -.0001551    .0309168
         x19 |  -.0043394   .0011283    -3.85   0.061    -.0091942    .0005155
         x20 |   .0055052   .0010891     5.06   0.037     .0008194     .010191
       _cons |  -.0016957   .0021404    -0.79   0.511    -.0109051    .0075136
------------------------------------------------------------------------------

.
. predict u15,r

.
. predict y15hat,xb

.
. reg lnb x18 x19 x20 l.u15,robust cluster(PD)

Linear regression                                      Number of obs =    1530
                                                       F(  1,      2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.1385
                                                       Root MSE      =  .28335

                                     (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x18 |   .0152579   .0035235     4.33   0.049     .0000973    .0304184
         x19 |  -.0044289   .0012103    -3.66   0.067    -.0096363    .0007785
         x20 |   .0055802   .0011502     4.85   0.040     .0006312    .0105291
         u15 |
         L1. |  -.0517033   .0257488    -2.01   0.182    -.1624914    .0590849
       _cons |  -.0017472   .0023155    -0.75   0.529    -.0117098    .0082154
------------------------------------------------------------------------------

.
. gen y152=y15hat*y15hat

.
. gen y153=y152*y15hat

.
. reg lnb x15 x16 x17 y152 y153, robust cluster(PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,      2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.3817
                                                       Root MSE      =  .23989

                                     (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x15 |   .0032943   .0007428     4.44   0.047     .0000985    .0064901
         x16 |  -.0002939   .0001042    -2.82   0.106    -.0007422    .0001545
         x17 |   .0004029   .0000798     5.05   0.037     .0000596    .0007462
        y152 |   1.359316   .4357825     3.12   0.089    -.5157052    3.234336
        y153 |  -1.341301   .5825888    -2.30   0.148    -3.847978    1.165376
       _cons |   .0117486   .0031791     3.70   0.066    -.0019301    .0254273
------------------------------------------------------------------------------

.
. test y152 y153

 ( 1)  y152 = 0
 ( 2)  y153 = 0

       F(  2,     2) = 5363.23
            Prob > F =    0.0002
```

```
. *16 Test diff. variables snow

.
. reg lnb x21,robust cluster(PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,     2) =   19.04
                                                       Prob > F      =  0.0487
                                                       R-squared     =  0.1787
                                                       Root MSE      =  .27613

                                    (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x21 |   1.83e-06   4.19e-07     4.36   0.049     2.54e-08    3.63e-06
       _cons |  -.0013408   .0021174    -0.63   0.591    -.0104511    .0077694
------------------------------------------------------------------------------

.
. predict u16,r

.
. predict y16hat,xb

.
. reg lnb x21 l.u16,robust cluster(PD)

Linear regression                                      Number of obs =    1530
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.1790
                                                       Root MSE      =  .27643

                                    (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x21 |   1.83e-06   4.15e-07     4.40   0.048     4.15e-08    3.62e-06
         u16 |
         L1. |   -.019567   .0304112    -0.64   0.586    -.1504157    .1112818
       _cons |   -.001454   .0021896    -0.66   0.575    -.0108749    .0079668
------------------------------------------------------------------------------

.
. gen y162=y16hat*y16hat

.
. gen y163=y162*y16hat

.
. reg lnb x21 y162 y163, robust cluster(PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.2195
                                                       Root MSE      =  .26937

                                    (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x21 |   2.77e-06   4.73e-07     5.86   0.028     7.38e-07    4.81e-06
        y162 |   .3506806   .1260733     2.78   0.109     -.191769    .8931302
        y163 |  -5.184976    1.50684    -3.44   0.075    -11.66839    1.298435
       _cons |   .0010732   .0023305     0.46   0.690    -.0089539    .0111004
------------------------------------------------------------------------------

.
. test y162 y163

 ( 1)  y162 = 0
 ( 2)  y163 = 0

       F(  2,     2) =    8.11
            Prob > F =    0.1098
```

```
. *17 test all actual variables and diff. variables

.
. reg lnb x2 x4 x6 x8 x10 x12 x14 x15 x16 x17 x18 x19 x20 x21,robust cluster(PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.5101
                                                       Root MSE      =  .21418

                                     (Std. Err. adjusted for 3 clusters in PD)
```

lnb	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
x2	-.0071979	.0017371	-4.14	0.054	-.014672	.0002761
x4	.013412	.0030588	4.38	0.048	.000251	.026573
x6	-.0065101	.001373	-4.74	0.042	-.0124179	-.0006024
x8	.0002852	.0006734	0.42	0.713	-.0026121	.0031825
x10	.0013777	.000838	1.64	0.242	-.0022277	.0049832
x12	.0014304	.0009138	1.57	0.258	-.0025015	.0053624
x14	2.70e-06	5.81e-07	4.65	0.043	1.99e-07	5.20e-06
x15	.0101789	.0023646	4.30	0.050	4.74e-06	.020353
x16	-.0139057	.0031739	-4.38	0.048	-.0275619	-.0002496
x17	.0067525	.0013697	4.93	0.039	.0008593	.0126458
x18	.0040694	.000431	9.44	0.011	.0022148	.005924
x19	-.0006952	.0008295	-0.84	0.490	-.0042642	.0028738
x20	-.0005892	.0008147	-0.72	0.545	-.0040944	.002916
x21	-1.76e-06	3.20e-07	-5.50	0.032	-3.14e-06	-3.82e-07
_cons	-.0108401	.0094422	-1.15	0.370	-.0514665	.0297863

```
.
. test x2 x4 x6 x15 x16 x17

 ( 1)  x2 = 0
 ( 2)  x4 = 0
 ( 3)  x6 = 0
 ( 4)  x15 = 0
 ( 5)  x16 = 0
 ( 6)  x17 = 0
       Constraint 1 dropped
       Constraint 2 dropped
       Constraint 3 dropped
       Constraint 4 dropped

       F(  2,     2) =   45.19
            Prob > F =    0.0216

.
. test x2 x4 x6

 ( 1)  x2 = 0
 ( 2)  x4 = 0
 ( 3)  x6 = 0
       Constraint 3 dropped

       F(  2,     2) =   68.05
            Prob > F =    0.0145

.
. test x15 x16 x17

 ( 1)  x15 = 0
 ( 2)  x16 = 0
 ( 3)  x17 = 0
       Constraint 1 dropped

       F(  2,     2) =   45.19
            Prob > F =    0.0216

.
. test x8 x10 x12 x18 x19 x20

 ( 1)  x8 = 0
 ( 2)  x10 = 0
 ( 3)  x12 = 0
 ( 4)  x18 = 0
 ( 5)  x19 = 0
 ( 6)  x20 = 0
       Constraint 1 dropped
       Constraint 2 dropped
       Constraint 5 dropped
       Constraint 6 dropped

       F(  2,     2) =   78.55
            Prob > F =    0.0126

.
. test x8 x10 x12

 ( 1)  x8 = 0
 ( 2)  x10 = 0
 ( 3)  x12 = 0
       Constraint 1 dropped

       F(  2,     2) = 1100.91
            Prob > F =    0.0009

.
. test x18 x19 x20

 ( 1)  x18 = 0
 ( 2)  x19 = 0
 ( 3)  x20 = 0
       Constraint 3 dropped

       F(  2,     2) =   89.46
            Prob > F =    0.0111

.
. test x14 x21

 ( 1)  x14 = 0
 ( 2)  x21 = 0

       F(  2,     2) =  635.63
            Prob > F =    0.0016
```

```
. predict u17,r

.
. predict y17hat,xb

.
. reg lnb x2 x4 x6 x8 x10 x12 x14 x15 x16 x17 x18 x19 x20 x21 l.u17,robust cluste
> r(PD)

Linear regression                                      Number of obs =    1530
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.5192
                                                       Root MSE      =  .21246

                                        (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |  -.0072884   .0018608    -3.92   0.059    -.0152946    .0007179
          x4 |   .0136963   .0033164     4.13   0.054    -.0005731    .0279656
          x6 |  -.0067193   .0015201    -4.42   0.048    -.0132599   -.0001787
          x8 |  -.0006364   .0006673    -0.95   0.441    -.0035074    .0022347
         x10 |   .0023978   .0007674     3.12   0.089    -.0009043    .0056998
         x12 |   .0011279   .0009256     1.22   0.347    -.0028547    .0051105
         x14 |   2.76e-06   6.25e-07     4.41   0.048     6.88e-08    5.45e-06
         x15 |   .0101747   .0024325     4.18   0.053    -.0002914    .0206408
         x16 |  -.0141709   .0034241    -4.14   0.054    -.0289035    .0005616
         x17 |    .007049   .0015435     4.57   0.045     .0004079    .0136901
         x18 |   .0049179   .0006192     7.94   0.015     .0022537    .0075821
         x19 |  -.0019312   .0007282    -2.65   0.118    -.0050642    .0012018
         x20 |  -.0000791   .0008208    -0.10   0.932    -.0036107    .0034525
         x21 |  -1.86e-06   3.73e-07    -4.98   0.038    -3.46e-06   -2.54e-07
         u17 |
         L1. |  -.1401945   .0287504    -4.88   0.040    -.2638975   -.0164916
       _cons |  -.0095036   .0102016    -0.93   0.450    -.0533974    .0343902
------------------------------------------------------------------------------

.
. gen y172=y17hat*y17hat

.
. gen y173=y172*y17hat

.
. reg lnb x2 x4 x6 x8 x10 x12 x14 x15 x16 x17 x18 x19 x20 x21 y172 y173, robust c
> luster(PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.5141
                                                       Root MSE      =  .21343

                                        (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |  -.0079855    .002795    -2.86   0.104    -.0200113    .0040404
          x4 |   .0148731   .0050474     2.95   0.098    -.0068442    .0365904
          x6 |  -.0072325   .0023815    -3.04   0.093    -.0174792    .0030143
          x8 |   .0014364   .0021885     0.66   0.579    -.0079801    .0108529
         x10 |   .0009476   .0012571     0.75   0.530    -.0044614    .0063566
         x12 |   .0016926   .0011921     1.42   0.291    -.0034365    .0068216
         x14 |   3.00e-06   9.86e-07     3.04   0.093    -1.24e-06    7.24e-06
         x15 |   .0111877    .003713     3.01   0.095    -.0047883    .0271636
         x16 |  -.0153728   .0051554    -2.98   0.096    -.0375545    .0068089
         x17 |   .0075238   .0024892     3.02   0.094    -.0031865     .018234
         x18 |   .0039359   .0004625     8.51   0.014      .001946    .0059258
         x19 |  -.0004127   .0010949    -0.38   0.742    -.0051237    .0042984
         x20 |  -.0006804   .0008766    -0.78   0.519     -.004452    .0030911
         x21 |  -1.97e-06   6.13e-07    -3.21   0.085    -4.61e-06    6.67e-07
        y172 |  -.0677094    .069615    -0.97   0.433    -.3672383    .2318196
        y173 |  -.4966709   .8341538    -0.60   0.612    -4.085745    3.092403
       _cons |  -.0129478   .0085321    -1.52   0.268    -.0496587     .023763
------------------------------------------------------------------------------

.
. test y172 y173

 ( 1)  y172 = 0
 ( 2)  y173 = 0

       F(  2,     2) =    1.14
            Prob > F =    0.4666
```

```
. *18 test all actual variables and diff. variables reservoir level

.
. reg lnb x2 x4 x6 x15 x16 x17,robust cluster(PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.4006
                                                       Root MSE      =  .23628

                                   (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |  -.0013281   .0003154    -4.21   0.052     -.002685    .0000289
          x4 |   .0009654   .0002531     3.81   0.062    -.0001235    .0020544
          x6 |   .0005444   .0001061     5.13   0.036      .000088    .0010008
         x15 |   .0043875   .0009882     4.44   0.047     .0001354    .0086395
         x16 |  -.0011368   .0003021    -3.76   0.064    -.0024366     .000163
         x17 |  -.0000481   .0000959    -0.50   0.666    -.0004608    .0003646
       _cons |   .0066388   .0060869     1.09   0.389    -.0195511    .0328287
------------------------------------------------------------------------------

.
. test x2 x4 x6

 ( 1)  x2 = 0
 ( 2)  x4 = 0
 ( 3)  x6 = 0
       Constraint 3 dropped

       F(  2,     2) =   55.28
            Prob > F =    0.0178

.
. test x15 x16 x17

 ( 1)  x15 = 0
 ( 2)  x16 = 0
 ( 3)  x17 = 0
       Constraint 2 dropped

       F(  2,     2) =   15.65
            Prob > F =    0.0601

.
. predict u18,r

.
. predict y18hat,xb

.
. reg lnb x2 x4 x6 x15 x16 x17 l.u18,robust cluster(PD)

Linear regression                                      Number of obs =    1530
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.4122
                                                       Root MSE      =  .23429

                                   (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |  -.0014233   .0003776    -3.77   0.064    -.0030481    .0002015
          x4 |   .0010554   .0003131     3.37   0.078    -.0002918    .0024026
          x6 |   .0005572   .0001129     4.94   0.039     .0000716    .0010429
         x15 |   .0044048   .0010134     4.35   0.049     .0000447    .0087649
         x16 |  -.0012981   .0003755    -3.46   0.074     -.002914    .0003177
         x17 |   .0000459   .0000639     0.72   0.547    -.0002291    .0003208
         u18 |
         L1. |  -.1381865   .0194263    -7.11   0.019    -.2217711    -.054602
       _cons |   .0082612   .0076983     1.07   0.396    -.0248621    .0413845
------------------------------------------------------------------------------
```

```
. gen y182=y18hat*y18hat

.
. gen y183=y182*y18hat

.
. reg lnb x2 x4 x6 x15 x16 x17 y182 y183, robust cluster(PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.4022
                                                       Root MSE      =  .23613

                                     (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x2 |  -.0014475   .0006331    -2.29   0.150    -.0041714    .0012764
          x4 |   .0010751   .0004988     2.16   0.164     -.001071    .0032212
          x6 |    .000545   .0002067     2.64   0.119    -.0003444    .0014344
         x15 |   .0046353    .001743     2.66   0.117    -.0028644     .012135
         x16 |  -.0012469   .0005846    -2.13   0.167     -.003762    .0012683
         x17 |   .0000572   .0000657     0.87   0.475    -.0002253    .0003398
        y182 |   .1210432   .0452684     2.67   0.116    -.0737308    .3158173
        y183 |  -.2974024   1.062301    -0.28   0.806    -4.868116    4.273311
       _cons |   .0100114   .0062574     1.60   0.251    -.0169118    .0369347
------------------------------------------------------------------------------

.
. test y182 y183

 ( 1)  y182 = 0
 ( 2)  y183 = 0

       F(  2,     2) =    4.07
            Prob > F =    0.1973
```

```
. *19 test all actual variables and diff. variables inflow

.
. reg lnb x8 x10 x12 x18 x19 x20,robust cluster(PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.1855
                                                       Root MSE      =  .27544

                                       (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x8 |   -.009693    .003796    -2.55   0.125    -.0260257    .0066397
         x10 |   .0141832   .0044438     3.19   0.086    -.0049371    .0333034
         x12 |   -.005966   .0018783    -3.18   0.086    -.0140479    .0021159
         x18 |   .0240069   .0068202     3.52   0.072     -.005338    .0533517
         x19 |  -.0164625   .0050176    -3.28   0.082    -.0380517    .0051266
         x20 |   .0107796   .0027389     3.94   0.059    -.0010049     .022564
       _cons |  -.0258165   .0150553    -1.71   0.229    -.0905941     .038961
------------------------------------------------------------------------------

.
. test x8 x10 x12

 ( 1)  x8 = 0
 ( 2)  x10 = 0
 ( 3)  x12 = 0
       Constraint 3 dropped

       F(  2,     2) =   18.05
            Prob > F =    0.0525

.
. test x18 x19 x20

 ( 1)  x18 = 0
 ( 2)  x19 = 0
 ( 3)  x20 = 0
       Constraint 3 dropped

       F(  2,     2) =    9.36
            Prob > F =    0.0966

.
. predict u19,r

.
. predict y19hat,xb

.
. reg lnb x8 x10 x12 x18 x19 x20 l.u19,robust cluster(PD)

Linear regression                                      Number of obs =    1530
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.2019
                                                       Root MSE      =    .273

                                       (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x8 |  -.0106333   .0042792    -2.48   0.131    -.0290453    .0077787
         x10 |   .0151922   .0050539     3.01   0.095     -.006553    .0369374
         x12 |  -.0063373   .0021702    -2.92   0.100    -.0156748    .0030002
         x18 |   .0244778   .0072034     3.40   0.077    -.0065159    .0554716
         x19 |  -.0174631    .005661    -3.08   0.091    -.0418205    .0068943
         x20 |   .0112925   .0030659     3.68   0.066    -.0018989    .0244838
         u19 |
         L1. |  -.1430972   .0183186    -7.81   0.016    -.2219157   -.0642786
       _cons |  -.0249885   .0169026    -1.48   0.277    -.0977146    .0477375
------------------------------------------------------------------------------
```

```
. gen y192=y19hat*y19hat

.
. gen y193=y192*y19hat

.
. reg lnb x8 x10 x12 x18 x19 x20 y192 y193, robust cluster(PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.2368
                                                       Root MSE      =  .26679

                                      (Std. Err. adjusted for 3 clusters in PD)
```

lnb	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
x8	-.0095827	.0033826	-2.83	0.105	-.0241371	.0049716
x10	.0157107	.0040851	3.85	0.061	-.0018661	.0332874
x12	-.0056869	.0016077	-3.54	0.071	-.0126045	.0012306
x18	.0295529	.0067901	4.35	0.049	.0003375	.0587683
x19	-.0184491	.0046536	-3.96	0.058	-.0384721	.0015738
x20	.0122796	.0025138	4.88	0.039	.0014636	.0230957
y192	-1.476474	.7645283	-1.93	0.193	-4.765974	1.813026
y193	-.1663776	.3159369	-0.53	0.651	-1.525744	1.192989
_cons	-.0393375	.0181451	-2.17	0.162	-.1174096	.0387347

```
.
. test y192 y193

 ( 1)  y192 = 0
 ( 2)  y193 = 0

       F(  2,     2) =  262.71
            Prob > F =    0.0038
```

```
. *20 test all actual variables and diff. variables snow

.
. reg lnb x14 x21,robust cluster(PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.1787
                                                       Root MSE      =  .27622

                                    (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x14 |  -5.41e-09   2.10e-08    -0.26   0.820    -9.56e-08    8.48e-08
         x21 |   1.83e-06   4.40e-07     4.17   0.053    -5.91e-08    3.73e-06
       _cons |  -.0003071   .0022393    -0.14   0.903    -.0099418    .0093277
------------------------------------------------------------------------------

.
. predict u20,r

.
. predict y20hat,xb

.
. reg lnb x14 x21 l.u20,robust cluster(PD)

Linear regression                                      Number of obs =    1530
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.1790
                                                       Root MSE      =  .27651

                                    (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x14 |  -9.32e-09   2.78e-08    -0.33   0.770    -1.29e-07    1.10e-07
         x21 |   1.84e-06   4.43e-07     4.15   0.053    -6.78e-08    3.74e-06
         u20 |
         L1. |  -.0201593   .0332214    -0.61   0.606    -.1630993    .1227808
       _cons |   .0003219   .0030487     0.11   0.926    -.0127957    .0134396
------------------------------------------------------------------------------

.
. gen y202=y20hat*y20hat

.
. gen y203=y202*y20hat

.
. reg lnb x14 x21 y202 y203, robust cluster(PD)

Linear regression                                      Number of obs =    1533
                                                       F(  1,     2) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.2196
                                                       Root MSE      =  .26944

                                    (Std. Err. adjusted for 3 clusters in PD)
------------------------------------------------------------------------------
             |               Robust
         lnb |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         x14 |  -1.83e-08   2.64e-08    -0.69   0.561    -1.32e-07    9.54e-08
         x21 |   2.80e-06   5.02e-07     5.56   0.031     6.34e-07    4.96e-06
        y202 |   .4046083    .220562     1.83   0.208    -.5443932     1.35361
        y203 |  -5.248198   1.634523    -3.21   0.085    -12.28098    1.784586
       _cons |   .0033745    .001283     2.63   0.119    -.0021459    .0088949
------------------------------------------------------------------------------

.
. test y202 y203

 ( 1)  y202 = 0
 ( 2)  y203 = 0

       F(  2,     2) =    5.21
            Prob > F =    0.1609
```