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ANALYSIS OF 1998 CARBON DIOXIDE EMISSIONS

[Combine with Excel charts in Technical Paper2.xls]

I. Introduction

Historically, carbon dioxide emissions grow at roughly three-quarters of the rate at which GDP grows. As Figure 1 shows, 1997 and 1998 appear anomalous when viewed in the context of this historical trend. While GDP grew 3.9% in 1997 and 1998, the CO₂ growth rate fell from 3.5% in 1996 to 1.3% in 1997 and 0.3% in 1998. In short, the U.S. economy experienced a high rate of economic growth with a concomitant reduction in the CO₂ growth rate in 1997 and 1998.

A variety of factors other than changes in aggregate output may influence CO₂ emissions. These include:

- Structural change. The U.S. economy continues to experience a shift in output away from traditionally energy-intensive manufacturing sectors towards service and high-tech industries.
- Weather. Colder winters increase the demand for heating fuels and hotter summers increase the demand of electricity for cooling. Because heating on a cold day is more energy-intensive than cooling on a hot day, on balance, a warmer year tends to reduce energy use.
- Energy prices. Sharp energy price increases stimulate energy efficiency and reduce CO₂ emissions while sharp energy price decreases can result in higher energy consumption and CO₂ emissions.
- Technological change. Technological improvements can result in reducing the energy consumption necessary to generate a unit of output. Higher energy prices can accelerate the diffusion of more energy-efficient technologies, and government programs aimed at promoting energy efficiency may also facilitate technology diffusion.

One can see the influences of some subset of these factors in the fact that CO₂ emissions grow, on average, at a slower rate than real GDP. One obvious, recent trend is the explosion of growth in the Hi-Tech sectors resulting, in part, from tremendous improvements in quality rather than the number of products produced.¹ The open question is why CO₂ emissions grew even slower than normal? Long-term trends have certainly had an effect, but researchers must distinguish between recent innovations in this trend from the continuation of pre-existing patterns.

¹ The quality improvements in central processing units provide a typical example. The energy required to produce a 486 processor is probably roughly the same as the energy required to produce a Pentium processor. Because the Pentium processor makes more calculations per second than the 486, the industry will record more value added even if the number of processors sold in each year (and the price) remains the same. By producing a better product, the industry grows without consuming more energy. For an analysis of this trend in relation to the recent upturn in productivity, see Robert Gordon, "Has the 'New Economy' Rendered the Productivity Slowdown Obsolete?", Northwestern working paper, June 14, 1999 revision.

We construct an estimation of the trend in CO₂ emissions and non-hi-tech output and ask whether deviations from trend in output can predict deviations from trend in CO₂ emissions accounting for weather conditions and end-use energy prices. The use of non-hi-tech output will account for the shift of output towards the hi-tech-industries. Using data from 1960-1997, we estimate the model and predict the level of CO₂ emissions in 1998.² If the economy experienced deviations from the long-term trend in 1998, then our prediction should prove inaccurate unless additional deviations exactly offset the original change – an unlikely event. We interpret an accurate prediction of the 1998 CO₂ level as evidence that the historical relationship between the variables has not changed.

The ability to distinguish easily between long-term trends and recent innovations using current data distinguishes our method from those using input-output tables or index decompositions (like the DIVISIA index). Using these latter methods, researchers can look over various time periods and distinguish between the effects of technological change, shifts in the allocation of output, and changes in overall output. Calculating year to year changes and then distinguishing between long-term and short-term changes, however, can prove time consuming, data intensive, and may require data not yet available for 1998.

Our results suggest that the relationship between output, energy prices, the weather, and CO₂ emissions remains the same. The slowdown in the CO₂ growth rate relative to GDP growth in 1998 reflects changes in the structure of output (specifically, growth in the hi-tech industries) and the effects of a relatively mild 1998 winter following a cold 1996 winter. Section II contains the description of our preferred model and in Section III, we describe the model's ability to predict 1998 CO₂ emissions. Section IV checks the robustness of our results by altering a variety of assumptions. Finally, we conclude in Section V.

II. A Model Explaining CO₂ Emissions Trends

We used the Energy Information Administration's estimates of total U.S. CO₂ emissions from fossil fuel combustion. Fossil fuel combustion-related CO₂ emissions are 98% of total U.S. CO₂ emissions. To construct Non-Hi-Tech GDP, we took the annual averages of the Federal Reserve's Hi-Tech Industrial Production Index and scaled the output estimates using the value of output from the 1992 Census of Manufacturing.³ Subtracting this from the BEA's estimate of real GDP provides an estimate of Non-Hi-Tech GDP. The Fed only provides an estimate of the hi-tech IP index from 1967 to the present, but in 1967, hi-tech output accounted for less than 0.2% of real GDP. We set hi-tech output equal to zero prior to 1967 and assume that deviations of less than 0.2% of GDP will not significantly bias our estimates.

To determine trend growth rates for Non-Hi-Tech GDP, we calculated the annual growth rate necessary to move from the 1981:3 to the 1990:3 levels of output. We chose these quarters because of their proximity to the July 1981 and July 1990 peaks in total real GDP⁴. We make

² We exclude 1998 from the estimation of our model to judge the out of sample predictions of historical trends in effect before 1998. The inclusion of 1998 does not significantly change the results we present in later sections.

³ The Federal Reserve defines high-tech industries to include semi-conductors, communications, and computers. We use this definition as the basis for our high-tech and non-high-tech aggregations.

⁴ We chose these estimates for the two peaks using the official NBER business cycle dates.

three key assumptions by using this calculation. First, we assume that the 1981:3 and the 1990:3 data points represent similar points on the business cycle. Second, we assume that the process generating the GDP statistic is sufficiently similar to the process generating the non-hi-tech GDP statistic that points representing peaks from the former are also peaks of the latter. Third, we assume these trends do not change over the period considered. This method generates a trend growth rate for Non-Hi-Tech GDP of 2.808%

The trend growth rate for CO₂ emissions is much harder to estimate. EIA only provides annual data, a much coarser scale than the monthly estimates of the business cycle fluctuations. Further, the intuitive links between the cyclical fluctuations in CO₂ emissions and real GDP are not as strong as that between Total GDP and Non-Hi-Tech GDP. Estimates of the trend growth rate using yearly CO₂ emissions for various peaks range from less than zero to 3.94%. Consistent with our methodology for estimating the trend growth rate of Non-Hi-Tech GDP, we use the 0.773% average growth rate necessary to move from the 1981 level to the 1990 level. We check the severity of this assumption in Section IV where we analyze the effects of different possible trend growth rates on our primary result.⁵

To depict the effects of the weather on CO₂ emissions, we used annual population-weighted heating and cooling days calculated by the Department of Energy. Note that winter weather is more important than summer weather in terms of energy use, because the U.S. is a “cold” country. Thus, a heating day results in more energy consumption than a cooling day.

We also included measures of current and lagged changes in residential electricity prices from the previous year. Since the dependent variable represents a measure of output, we also need to control for potential simultaneity problems. We accomplished this by using changes in net summer capacity, changes in the number of electric utilities, and changes in the proportion of coal used as input for instruments.

Using two-stage least squares, we then regressed deviations from trend in carbon emissions on deviations from trend in Non-Hi-Tech GDP, changes in heating days from the previous year, changes in cooling days, and current and lagged changes in residential electricity prices. The first column of Table 2 lists the variables, resulting coefficients, and standard errors of this model. The marginal significance of contemporaneous electricity prices and lagged electricity prices results from the high serial correlation in electricity prices. The magnitudes of the estimates are relatively high and both are jointly significant (standard F-stat of 9.4).

Figure 2 depicts the predicted and actual emissions growth rates and Figure 3 depicts the predicted and actual emissions levels. From visual comparison, the new model does a good job of predicting both carbon emission levels and growth rates. Over the period 1962 – 1997, the model’s predictions deviate, on average, 12.6 MMTC or 1.0% from the actual emissions values. To provide some context for these deviations, EIA has revised its estimate of the 1990 emissions

⁵ An astute reader may wonder why the trend growth rate of CO₂ measures less than a third of the trend growth rate of GDP (about 3%) when the growth rate of CO₂ emissions averages 0.75 the growth rate of GDP. The 0.75 estimate relates the raw growth rates of the two statistics (or the percent change from previous year) while the trend change makes up only one part of these year-to-year changes. The relationship between the raw growth rates does not identify a relationship between the trend rates.

level seven times from 1992 – 1998. From the first estimate to the most recent estimate, the reported 1990 emissions level has changed by 15.4 MMTC (1.1%).

III. Applying the Model to Explain 1998 CO₂ Emissions

In 1998, GDP grew 3.9% but Non-Hi-Tech GDP only grew 2.4%, below its 2.8% trend. Because non-hi-tech output fell below trend by \$29.3 billion (1992 dollars), 1998 CO₂ emissions fell below its level predicted from trend (1491.0 MMTC) by 5.98 MMTC. 1998 had 11% fewer heating days, and 15% more cooling days than 1997. The warm Winter pushed 1998 CO emissions 14.6 MMTC further below trend while the hot Summer brought the level 2.43 MMTC closer to trend, yielding a net weather effect of 12.2 MMTC. Electricity prices in 1998 averaged 7.4 cents per kilowatt, a decrease of only 1.3% from 1997. This small reduction in prices increased CO₂ emissions, reducing the total deviation of 1998 CO₂ emissions from trend by 7.88 MMTC.

EIA has reported 1998 CO₂ emissions at 1,484 million metric tons of carbon (MMTC). Given non-hi-tech GDP, the value of the weather statistics, and energy price measures, our model estimates 1998 CO₂ emissions would have been 1,485 MMTC, or 0.1% more than actual emissions. This suggests that 1998 CO₂ emissions simply followed their historical trends.

So, why did the growth of emission slow between 1997 and 1998? A cold 1996 Winter followed by an average 1997 Winter, and finally the warm 1998 Winter. In 1998, changes in current and lagged residential electricity prices fell less than one-third of a standard deviation from their historical mean. Non-Hi-Tech GDP deviated only slightly more than one standard deviation from its mean. Changes in heating and cooling days, however, deviated by almost 2 standard deviations from their mean changes with less heating days than average and more cooling days. In 1997, every variable fell within one standard deviation of its historical mean. In 1996, deviation in Non-Hi-Tech GDP from trend was within \$500 million of the 1998 deviation from trend and changes in energy prices both fell within one standard deviation of their historical mean. The weather patterns in 1996 were reversed from 1998. Changes in heating days were about one standard deviation above their historical trend while changes in cooling days were one standard deviation below. This suggests that the reduction in the growth rate of CO₂ emissions growth from 1997 to 1998 resulted primarily from weather patterns.

IV. A Robust Result

To check the robustness of our primary result, we allowed the model to vary over three dimensions. First, we used a variety of energy price measures. Second, we varied the trend growth rate of CO₂ emissions. Finally, we tried a completely different method for estimating the trend growth patterns of CO₂ and Non-Hi-Tech GDP. In each case, the models accurately estimate the 1998 CO₂ emission level.

We added the variables for weather to the model to control for unusual climactic changes like those in 1998. To include them, however, requires the inclusion of a measure of energy prices faced by those making decisions to heat or cool buildings. Without the additional variable, high energy-prices might mitigate the effects of unusually hot or cold years or low

energy prices might magnify the effects of slight variations in temperature. Ideally we would use a measure of energy prices faced by all end-users for the generation of heat and the use of air conditioners, but we could not find such an index. Residential electricity prices seem to provide a decent proxy, but other price measures may provide additional information.

As alternatives, we used the EIA's composite fossil fuel price index, a measure of average annual oil prices, average annual coal prices, and commercial electricity prices. The fossil fuel prices have the advantage of accounting for the major sources of power, but because these prices are intermediate to the final energy prices that determine consumption, they may not correlate well with the ideal measure. Further, energy prices fell in 1998 relative to 1997, but the magnitude of this decrease depends on the measure of prices. Residential electricity prices only decreased from 7.5 cents per kilowatt-hour to 7.4 cents. The EIA's composite fossil fuel price index, on the other hand, fell 22%. Since the model relies on the yearly changes in prices, the estimation of the coefficient on residential energy prices will prove far less important than the estimate of the coefficient on the fossil fuel price index.

Table 2 shows the model with each energy-price measure in three combinations: current energy-prices only, lagged energy-prices only, and both current and lagged energy-prices. The coefficients on deviations from trend in Non-Hi-Tech GDP and changes in heating days seem robust. Most estimates fall in the ranges of 0.2-0.3 and 0.025-0.035 respectively. In the fossil fuel price regressions, the current prices of fossil fuels never prove significant, even at the 10% level. This may reflect the fact that lagged prices are more important than current prices, that companies engage in short-term fuel switching, or that our instruments proved insufficient to generate variation independent of the error term. Despite these short comings, each model predicts 1998 emissions levels within 0.9% of the actual level.

Our second alternative tests the sensitivity of the model to the estimated trend growth rate in CO₂ emissions. As we mentioned previously, the trend growth rate in CO₂ emissions proves difficult to estimate with the available data. In this test, we ask how well the model would predict 1998 emissions if the actual trend growth rate in CO₂ emissions differed from our estimated value. Specifically, we chose values for the trend growth rate in the range of 0.0% to 9.0% and re-estimated our preferred model from Section II. If the model generated wildly incorrect estimates for 1998 emissions for all trend growth rates other than 0.773% then we could reasonably conclude that the accurate 1998 emissions level prediction resulted from our unique trend growth rate estimate. On the other hand, if the model estimates 1998 emissions for a wide range of trend growth rates, then the actual estimate of 0.773% becomes less important. As long as the true trend growth rate lies within the range of estimates generating an accurate prediction, our conclusions remain valid.

Figure 4 relates the 1998 predicted level to the posited trend growth rate for CO₂ emissions. The ability to accurately predict 1998 levels is surprisingly robust. CO₂ emissions would have to grow at an annual rate of about 7% (over twice the trend growth rate of Non-Hi-Tech GDP and Total GDP) for the model to misestimate 1998 CO₂ emissions by more than 1%. This means that in order for someone to disagree with our conclusions because they do not

believe our 0.773% estimate, that person would have to believe that the true trend growth rate lay at least below 0.0% or above 7.0%.⁶

As a more radical test of the trend growth rate model, we estimated the model described in Section II, but with a different structure for the trend path of CO₂ emissions and Non-Hi-Tech GDP. Instead of positing a trend growth rate, we estimated the trend path by regressing each of the variables independently on the difference between the date of the observation and 1949 and the square of that difference. Intuitively, this creates a measure of the variables' path over time independent of any other variable. We then take the deviations of the variables from this trend path and perform the same deviation on deviation regression as in Section II. Table 3 shows the results for trend regressions and Table 4 depicts the results for the deviation on deviation regression.

Three interesting features of this model emerge. First, the trend regressions suggest that CO₂ emissions were following a concave path even before 1998. Second, none of the variables in the deviations on deviations regressions prove significant except deviations from trend of Non-Hi-Tech GDP. Finally, the estimated disturbance terms from the deviations regression exhibit serial correlation, something that the model from Section II did not exhibit. As before, however, the model predicts 1998 CO₂ emissions to be 1473.5 only 0.71% below the actual level.

V. Conclusion

Our models allow for two changes from the historical relationship between GDP and CO₂ emissions. First, we look for a relationship between Non-Hi-Tech GDP and CO₂ emissions, allowing for the fact that much of the recent growth in the hi-tech industries has come from quality improvements rather than absolute increases in the number of physical products produced. Second, we allow for yearly changes in weather conditions while controlling for end-use energy prices. The data suggests that rapid growth in the hi-tech sectors combined with a mild 1998 winter can explain the recent divergence between total GDP growth rates and the growth rates of carbon dioxide without consideration of short-term changes in technology and other changes in sectoral patterns. This result proves robust to a number of changes in the model's specification.

⁶ The Bayesian model of beliefs provides another useful interpretation. This sensitivity analysis generates a function relating true trend CO₂ growth rates to the misestimate of 1998 CO₂ emissions. A Bayesian statistician with a prior distribution over the actual CO₂ trend growth rate could then integrate this function over his or her prior to develop an "expected deviation of the model". Similarly, a substantial mass of this prior distribution would have to lie outside of [0,7.0] for this Bayesian individual to disagree with our results.

Figure 1:
Comprison of GDP and CO₂ Emission Growth Rates

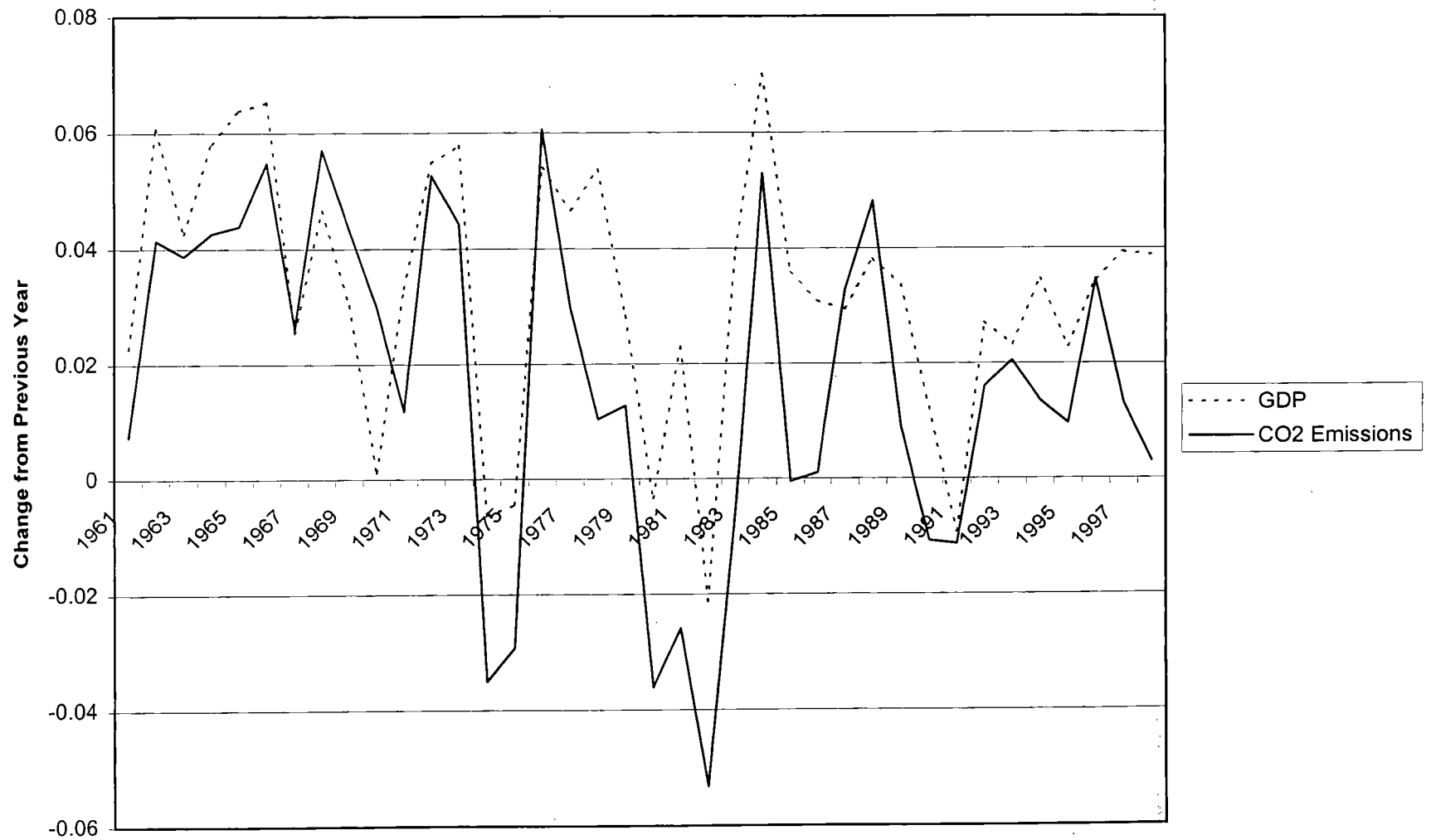


Figure 2:
Predicted vs. Actual CO₂ Emission Growth Rates

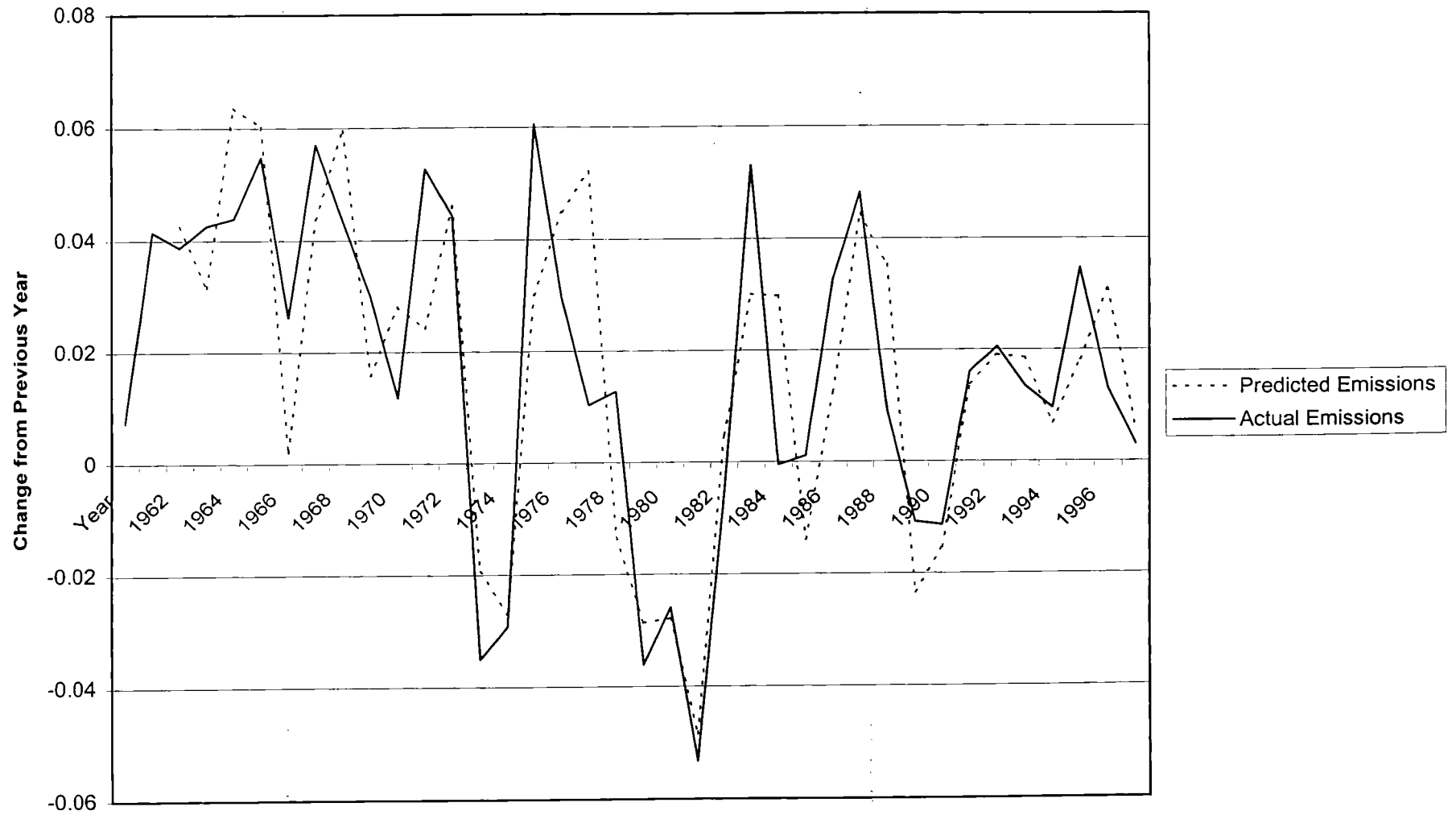


Figure 3:
Predicted vs. Actual CO₂ Emissions Levels

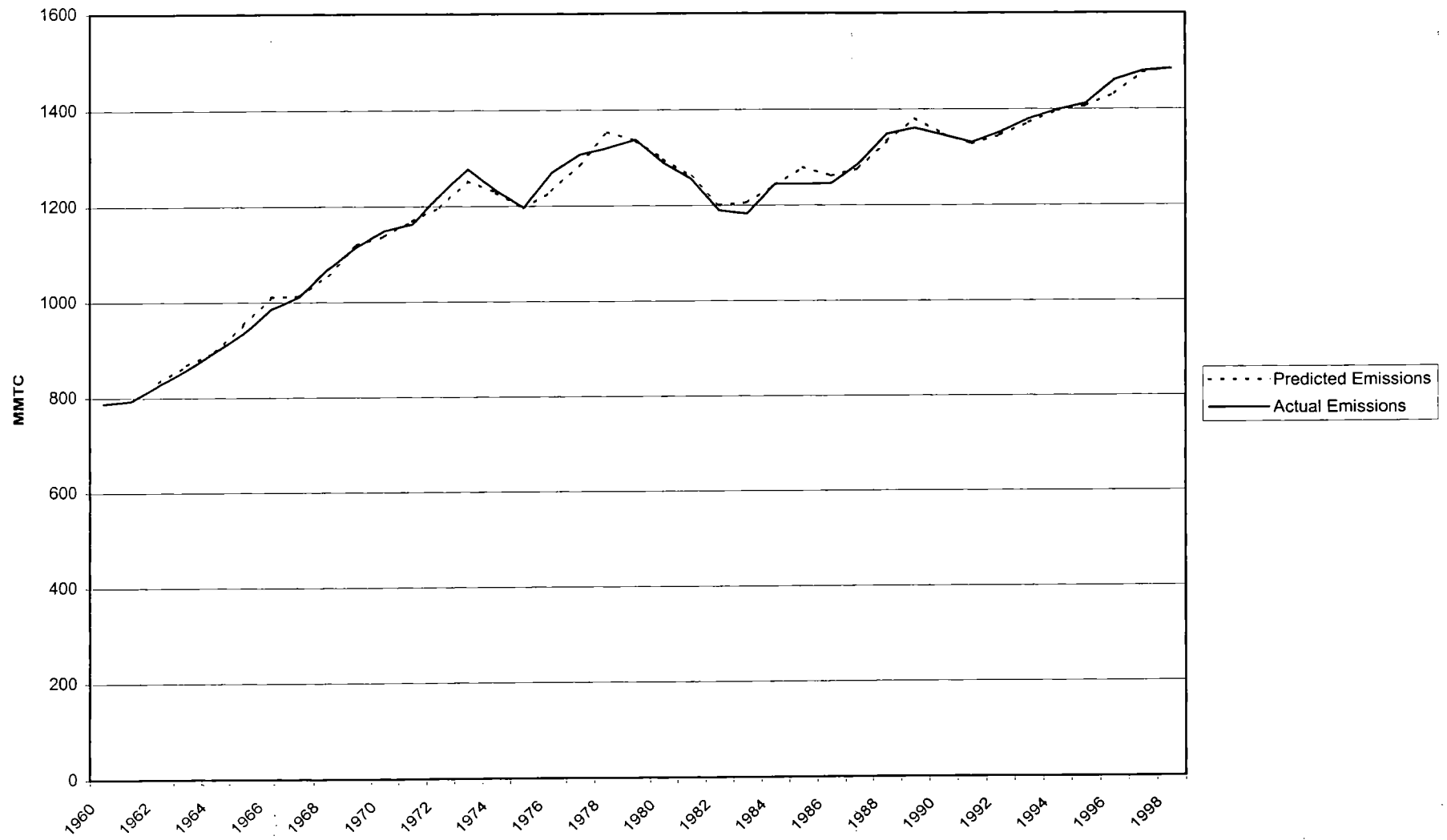


Figure 4:
Sensitivity of Estimate to CO₂ Trend Growth Rate

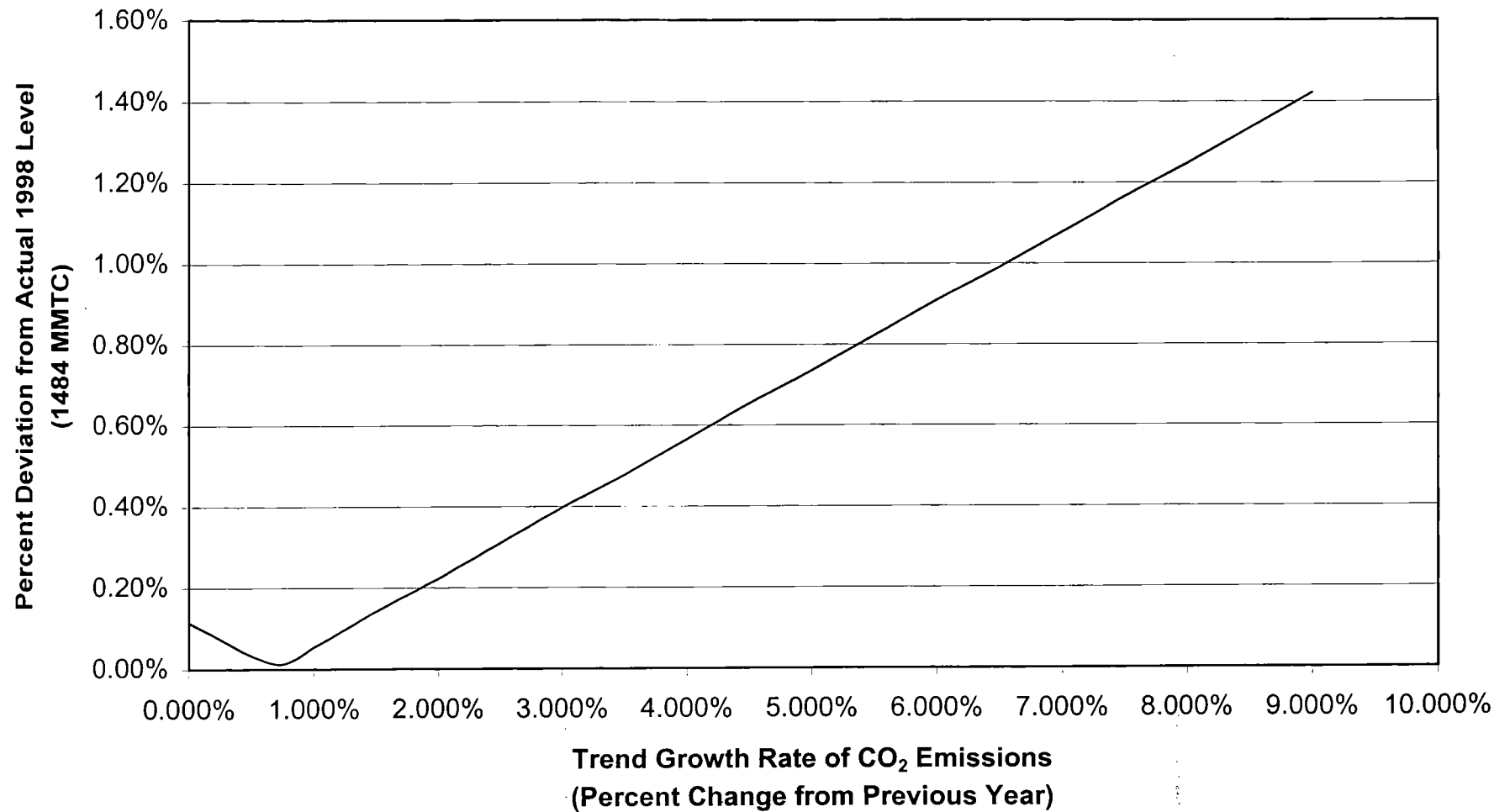


Table 1:
Summary Statistics

Variable (Units of Measurement)	Mean	Standard Deviation	Minimum	Maximum
Primary Variables				
CO ₂ Emissions (MMTC) ¹	9.49	34.5	-76.6	63.3
Non-Hi-Tech GDP (Millions \$1992) ¹	0.469	94.9	-236	192
Heating-Degree Days ²	-4.92	216	-710	353
Cooling-Degree Days ²	-1.35	105	-291	256
Energy Prices				
Residential Electricity Prices (\$1992 Cents per Kilowatt Hour) ²	-0.1	0.339	-0.700	1.00
Commercial Electricity Prices (\$1992 Cents per Kilowatt Hour) ²	-0.0946	0.330	-0.600	1.00
Fossil Fuel Price Index (\$1992 per BTU) ²	0.0108	0.321	-1.15	0.82
Coal Prices (\$1992 per BTU) ²	-0.00189	0.144	-0.130	0.74
Gas Prices (\$1992 per BTU) ²	0.0362	0.235	-0.71	0.49
Oil Prices (\$1992 per BTU) ²	0.0143	0.816	-2.61	2.22
Instruments for Electricity Prices				
Number of Electric Utilities ²	64.0	42.5	-54	137
Proportion of Coal Used as an Input to Electricity Generators ²	0.00105	0.0144	-0.0297	0.0361
Net Summer Capacity (Million Kilowatts) ²	14.7	9.75	2	43.8
Instruments for Fossil Fuel Prices				
Number of Oil Refineries ²	-3.92	10.5	-43	14
Capacity of Oil Refineries (Millions of Barrels per Day) ²	0.152	0.465	-1.03	1.16
Transmission Loss for Natural Gas (Trillion Cubic Feet) ²	0.0114	0.0297	-0.04	0.05
Surface Productivity for Coal Mines (Short Tons per Miner Hours) ²	-0.364	3.33	-20.0	0.810
Underground Productivity for Coal Mines (Short Tons per Miner Hours) ²	-0.473	3.29	-19.91	0.26

1 Measured as deviation from the trend. Trend CO₂ growth rate is 0.773% and Trend Non-Hi-Tech GDP growth rate is 2.808%.

2 Measured as a change in level from previous year.

Table 2:

Deviations of CO2 From Trend Regression on Deviations of Non-Hi-Tech GDP

Variable	Measure of Energy Prices														
	Residential Electricity ¹			Commercial Electricity ¹			Fossil Fuel Index ²			Oil Prices ²			Coal Prices ³		
Dependent Variable: Deviations of CO2 Emissions															
Deviations of Non-Hitek GDP	0.204*** (0.0497)	0.262*** (0.0153)	0.179*** (0.0485)	0.207*** (0.0467)	0.260 *** (0.0365)	0.195*** (0.0433)	0.258*** (0.0475)	0.250*** (0.413)	0.295*** (0.0466)	0.259*** (0.0501)	0.255*** (0.0448)	0.290*** (0.0437)	0.391* (0.200)	0.279*** (0.0410)	0.185 (0.116)
Changes in Heating-Degree Days	0.0284* (0.0149)	0.0251** (0.0312)	0.0246 (0.0158)	0.0319** (0.0150)	0.0334** (0.0166)	0.0304** (0.0149)	0.0252 (0.0199)	0.0252 (0.0175)	0.0279 (0.0165)	0.0308 (0.0209)	0.0256 (0.0182)	0.0313 (0.0198)	0.0294 (0.0445)	0.0276 (0.0186)	0.0305 (0.0297)
Changes in Cooling-Degree Days	0.0136 (0.0307)	0.0251 (0.0312)	0.00726 (0.0330)	0.0115 (0.0313)	0.0235 (0.0337)	0.00804 (0.0311)	0.0271 (0.0417)	0.0179 (0.0360)	0.0300 (0.0412)	0.0292 (0.0428)	0.0162 (0.0373)	0.0310 (0.0409)	0.122 (0.180)	0.0226 (0.038)	-0.0470 (0.0926)
Current Energy Prices	-38.2 (25.0)		-58.8*** (19.4)	-42.0 (26.2)		-54.6*** (18.1)	31.3 (28.4)		19.4 (25.2)	10.4 (10.4)		7.70 (9.59)	335 (522)		-228 (226)
Lagged Energy Prices	-20.3 (13.8)	-36.3*** (9.39)		-12.1 (15.0)	-30.7*** (10.5)		-35.0 (17.2)	-23.8 (12.2)		-8.32 (6.11)	-6.37 (5.20)		-120 (187)	-7.47 (27.0)	
Constant	3.80 (3.43)	6.02* (3.26)	3.66 (3.78)	4.48 (3.45)	6.653 (3.52)	4.39 (3.49)	9.64 (4.09)	9.85 (3.60)	9.32 (4.01)	9.58** (4.16)	9.69 (3.73)	9.44** (3.95)	9.81 (9.11)	9.53 (3.81)	9.06 (6.09)
Sample Size	36	36	37	36	36	37	36	36	37	36	36	37	36	36	37
1998 Predicted Level	1484.6	1484.2	1484.0	1484.8	1480.2	1486.5	1475.1	1484.8	1475.8	1474.1	1485.1	1473.8	1489.7	1482.5	1477.4
% Deviation of Actual 1998 level	0.04%	0.01%	0.00%	0.05%	0.26%	0.17%	0.60%	0.05%	0.55%	0.67%	0.07%	0.69%	0.38%	0.10%	0.44%

1 Instrumented for current values using changes in the number of electric utilities, changes in the proportion of coal used as input, changes in net summer capacity

2 Instrumented for current values using changes in the number of oil refineries and changes in the capacity of oil refineries

3 Instrumented for current values using the productivity of surface coal production and the productivity of underground coal production

* Significant at the 10% Level

** Significant at the 5% Level

*** Significant at the 1% Level

Table 3:
Regressions on Time Variable

Independent Variable	Dependent Variable	
	Non-Hi-Tech GDP	CO ₂ Emissions
t	108.67*** (6.1952)	33.956*** (3.9146)
t ²	0.39104** (0.15406)	-0.47769*** (0.097349)
Constant	2175.7*** (52.393)	776.02*** (33.106)

** Significant at the 5% Level

*** Significant at the 1% Level

Table 4:
Deviations from trend CO₂ on Deviations from Trend Non-Hi-Tech GDP

Dependent Variable: Deviations of CO ₂ Emissions*	
Variable	Coefficient (Stand Error)
Deviations of Non-Hitek GDP	0.325** (0.0651)
Changes in Heating-Degree Days	0.0251 (0.0196)
Changes in Cooling-Degree Days	0.0123 (0.0313)
Current Energy Prices	10.4 (28.4)
Lagged Energy Prices	16.7 (16.9)
Constant	3.68 (6.03)

Note: Current electricity prices are instrumented with chages in the number electric utilities, changes in the proportion of coal used as an input, and changes in the net summer capacity using 2SLS

*Estimated with 2SLS using the Newey-West estimator to construct the variance estimates

** Significant at the 5% Level

Correlation coefficient estimated at 0.955 (0.073)

Maninten1.log

```
/* I was interested in looking at the effects of:
> Different ways of measuring manufacturing output -- bea index vs. asm index f
> or 1992
> Different heating and cooling measures
> Potential effect of lagged investment
> Importance of instruments
>
> I've concluded that the measures of manufacturing output are not different en
> ough to
> substantially change the results. So, from now on I'll use the asm for the b
> ase year.
> Heating and cooling measure don't matter. So, if included, I'll include the
> year totals.
> While I have not done a formal Hausman test, endogeneity does seem to be a pr
> oblem.
> Lag values do not seem to predict energy intensity of output. In the future
> , I will not
> include them.
>
> */
.
. gen asminten = rmanengy/manasmip
(11 missing values generated)

. gen beainten = rmanengy/manbeaip
(11 missing values generated)

.
. sort year

. gen l1maninv = rmaninv[_n - 1]
(11 missing values generated)

. gen l2maninv = rmaninv[_n - 2]
(11 missing values generated)

. gen l3maninv = rmaninv[_n - 3]
(12 missing values generated)

. gen l4maninv = rmaninv[_n - 4]
(13 missing values generated)

. gen l5maninv = rmaninv[_n - 5]
(14 missing values generated)

. gen l6maninv = rmaninv[_n - 6]
(15 missing values generated)

.
. /* w/o instruments w/o correcting for autocorrelation */
.
. newey asminten manasmip htdgyear cldgyear ffppcomr eleprinr rmaninv if year >
> = 1959 & year <= 1996, lag(1) t(year)
```

Regression with Newey-West standard errors
maximum lag : 1

Number of obs	=	37
F(5, 30)	=	26.52
Prob > F	=	0.0000

Maninten1.log

asminten	Coef.	Newey-West Std. Err.	t	P> t	[95% Conf. Interval]	
manasmip	-.0000294	3.60e-06	-8.181	0.000	-.0000368	-.0000221
htdgyear	2.28e-06	5.14e-06	0.443	0.661	-8.22e-06	.0000128
cldgyear	-.0000102	.0000119	-0.863	0.395	-.0000345	.000014
ffppcomr	.007521	.0020711	3.631	0.001	.0032913	.0117507
eleprinr	-.0070067	.0019391	-3.613	0.001	-.0109668	-.0030466
rmaninv	-9.74e-08	2.51e-08	-3.886	0.001	-1.49e-07	-4.62e-08
_cons	.1053441	.0350432	3.006	0.005	.0337764	.1769119

```
. newey beainten manbeaip htdgyear cldgyear ffppcomr eleprinr rmaninv if year >
> = 1959 & year <= 1996, lag(1) t(year)
```

Regression with Newey-West standard errors	Number of obs =	37
maximum lag : 1	F(5, 30) =	26.47
	Prob > F =	0.0000

beainten	Coef.	Newey-West Std. Err.	t	P> t	[95% Conf. Interval]	
manbeaip	-.0000414	5.07e-06	-8.174	0.000	-.0000518	-.0000311
htdgyear	2.73e-06	6.10e-06	0.447	0.658	-9.73e-06	.0000152
cldgyear	-.0000121	.0000141	-0.860	0.397	-.0000409	.0000167
ffppcomr	.0089282	.0024597	3.630	0.001	.0039049	.0139515
eleprinr	-.0083217	.002304	-3.612	0.001	-.013027	-.0036164
rmaninv	-1.16e-07	2.98e-08	-3.883	0.001	-1.76e-07	-5.48e-08
_cons	.1248986	.0415788	3.004	0.005	.0399834	.2098138

```
. newey asminten manasmip htdgsemy cldgmyoc ffppcomr eleprinr rmaninv if year >
> = 1959 & year <= 1996, lag(1) t(year)
```

Regression with Newey-West standard errors	Number of obs =	37
maximum lag : 1	F(5, 30) =	25.95
	Prob > F =	0.0000

asminten	Coef.	Newey-West Std. Err.	t	P> t	[95% Conf. Interval]	
manasmip	-.0000294	3.56e-06	-8.280	0.000	-.0000367	-.0000222
htdgsemy	3.00e-06	4.82e-06	0.623	0.538	-6.84e-06	.0000128
cldgmyoc	-9.21e-06	9.74e-06	-0.945	0.352	-.0000291	.0000107
ffppcomr	.0075515	.0020859	3.620	0.001	.0032916	.0118115
eleprinr	-.0070362	.0019524	-3.604	0.001	-.0110234	-.0030489
rmaninv	-9.73e-08	2.52e-08	-3.867	0.001	-1.49e-07	-4.59e-08
_cons	.1003138	.0303099	3.310	0.002	.0384127	.1622149

Maninten1.log

```
. newey beainten manbeaip htdgsemy cldgmyoc ffppcomr eleprinr rmaninv if year >
> = 1959 & year <= 1996, lag(1) t(year)
```

```
Regression with Newey-West standard errors      Number of obs =      37
maximum lag : 1                                F( 5,      30) =     25.90
                                              Prob > F      =     0.0000
```

beainten	Coef.	Newey-West Std. Err.	t	P> t	[95% Conf. Interval]	
manbeaip	-.0000415	5.01e-06	-8.272	0.000	-.0000517	-.0000312
htdgsemy	3.59e-06	5.72e-06	0.628	0.535	-8.09e-06	.0000153
cldgmyoc	-.0000109	.0000116	-0.943	0.353	-.0000345	.0000127
ffppcomr	.0089642	.0024772	3.619	0.001	.0039051	.0140234
eleprinr	-.0083564	.0023198	-3.602	0.001	-.0130941	-.0036188
rmaninv	-1.16e-07	2.99e-08	-3.865	0.001	-1.77e-07	-5.45e-08
_cons	.1189388	.0359678	3.307	0.002	.0454828	.1923947

```
.
. newey asminten manasmip htdgyear cldgyear ffppcomr eleprinr llmaninv if year
> >= 1959 & year <= 1996, lag(1) t(year)
```

```
Regression with Newey-West standard errors      Number of obs =      37
maximum lag : 1                                F( 6,      30) =     25.11
                                              Prob > F      =     0.0000
```

asminten	Coef.	Newey-West Std. Err.	t	P> t	[95% Conf. Interval]	
manasmip	-.0000437	6.92e-06	-6.316	0.000	-.0000578	-.0000296
htdgyear	1.19e-06	5.58e-06	0.213	0.833	-.0000102	.0000126
cldgyear	-6.75e-06	.0000108	-0.624	0.538	-.0000289	.0000154
ffppcomr	.005305	.0022677	2.339	0.026	.0006738	.0099363
eleprinr	-.0053723	.0021617	-2.485	0.019	-.0097871	-.0009576
llmaninv	.0001937	.0001074	1.803	0.081	-.0000257	.0004131
_cons	.1016881	.0364166	2.792	0.009	.0273154	.1760608

```
.
. newey beainten manbeaip htdgyear cldgyear ffppcomr eleprinr llmaninv if year
> >= 1959 & year <= 1996, lag(1) t(year)
```

```
Regression with Newey-West standard errors      Number of obs =      37
maximum lag : 1                                F( 6,      30) =     25.12
                                              Prob > F      =     0.0000
```

beainten	Coef.	Newey-West Std. Err.	t	P> t	[95% Conf. Interval]	
manbeaip	-.0000616	9.75e-06	-6.323	0.000	-.0000815	-.0000417
htdgyear	1.44e-06	6.62e-06	0.217	0.830	-.0000121	.000015
cldgyear	-7.97e-06	.0000129	-0.620	0.540	-.0000342	.0000183
ffppcomr	.0062898	.0026933	2.335	0.026	.0007894	.0117903

Maninten1.log

```

eleprinr | -.0063776 .0025671 -2.484 0.019 -.0116203 -.0011349
llmaninv | .000231 .0001275 1.812 0.080 -.0000294 .0004914
_cons | .1205292 .0432189 2.789 0.009 .0322645 .2087939
-----

```

```

. newey asminten manasmip htdgsemy cldgmyoc ffppcomr eleprinr llmaninv if year
> >= 1959 & year <= 1996, lag(1) t(year)

```

```

Regression with Newey-West standard errors      Number of obs =      37
maximum lag : 1                                F( 6, 30) =      25.11
                                              Prob > F =      0.0000

```

```

-----
asminten |          Coef.      Newey-West      t      P>|t|      [95% Conf. Interval]
-----+-----
manasmip | -.0000438      6.94e-06      -6.311      0.000      -.000058      -.0000296
htdgsemy | 1.78e-06      5.36e-06       0.332      0.742      -9.16e-06      .0000127
cldgmyoc | -6.55e-06      9.20e-06      -0.712      0.482      -.0000253      .0000122
ffppcomr | .0052949      .0022868       2.315      0.028      .0006246      .0099651
eleprinr | -.0053696      .0021784      -2.465      0.020      -.0098184      -.0009208
llmaninv | .0001956      .0001087       1.800      0.082      -.0000263      .0004175
_cons | .0982754      .0327684       2.999      0.005      .0313534      .1651974
-----

```

```

. newey beainten manbeaip htdgsemy cldgmyoc ffppcomr eleprinr llmaninv if year
> >= 1959 & year <= 1996, lag(1) t(year)

```

```

Regression with Newey-West standard errors      Number of obs =      37
maximum lag : 1                                F( 6, 30) =      25.13
                                              Prob > F =      0.0000

```

```

-----
beainten |          Coef.      Newey-West      t      P>|t|      [95% Conf. Interval]
-----+-----
manbeaip | -.0000618      9.78e-06      -6.318      0.000      -.0000817      -.0000418
htdgsemy | 2.14e-06      6.36e-06       0.336      0.739      -.0000108      .0000151
cldgmyoc | -7.74e-06      .0000109      -0.708      0.484      -.0000301      .0000146
ffppcomr | .0062775      .002716       2.311      0.028      .0007308      .0118242
eleprinr | -.006374      .002587      -2.464      0.020      -.0116573      -.0010907
llmaninv | .0002333      .000129       1.809      0.080      -.0000301      .0004967
_cons | .1164915      .038895       2.995      0.005      .0370573      .1959257
-----

```

```

. newey asminten manasmip htdgyear cldgyear ffppcomr eleprinr l2maninv if year
> >= 1959 & year <= 1996, lag(1) t(year)

```

```

Regression with Newey-West standard errors      Number of obs =      37
maximum lag : 1                                F( 6, 30) =      41.81
                                              Prob > F =      0.0000

```

```

-----
|          Newey-West

```

Maninten1.log

asminten	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
manasmip	-.0000447	7.11e-06	-6.292	0.000	-.0000593	-.0000302
htdgyear	8.01e-08	5.90e-06	0.014	0.989	-.000012	.0000121
cldgyear	-6.62e-06	.0000113	-0.584	0.564	-.0000298	.0000165
ffppcomr	.0049337	.0023371	2.111	0.043	.0001608	.0097067
eleprinr	-.0052411	.002091	-2.507	0.018	-.0095114	-.0009707
l2maninv	.0002123	.000113	1.879	0.070	-.0000185	.0004432
_cons	.1067367	.0393134	2.715	0.011	.0264481	.1870253

```
.
. newey beainten manbeaip htdgyear cldgyear ffppcomr eleprinr l2maninv if year
> >= 1959 & year <= 1996, lag(1) t(year)
```

```
Regression with Newey-West standard errors          Number of obs =          37
maximum lag : 1                                     F( 6, 30) =          41.91
                                                    Prob > F          =          0.0000
```

beainten	Coef.	Newey-West Std. Err.	t	P> t	[95% Conf. Interval]	
manbeaip	-.0000631	.000001	-6.291	0.000	-.0000836	-.0000426
htdgyear	1.12e-07	7.00e-06	0.016	0.987	-.0000142	.0000144
cldgyear	-7.82e-06	.0000135	-0.581	0.566	-.0000353	.0000197
ffppcomr	.0058461	.0027753	2.106	0.044	.0001781	.0115141
eleprinr	-.0062206	.0024824	-2.506	0.018	-.0112903	-.001151
l2maninv	.0002533	.0001345	1.884	0.069	-.0000213	.0005279
_cons	.1265497	.0466676	2.712	0.011	.0312417	.2218577

```
.
. newey asminten manasmip htdgsemy cldgmyoc ffppcomr eleprinr l2maninv if year
> >= 1959 & year <= 1996, lag(1) t(year)
```

```
Regression with Newey-West standard errors          Number of obs =          37
maximum lag : 1                                     F( 6, 30) =          42.13
                                                    Prob > F          =          0.0000
```

asminten	Coef.	Newey-West Std. Err.	t	P> t	[95% Conf. Interval]	
manasmip	-.0000449	7.04e-06	-6.377	0.000	-.0000593	-.0000305
htdgsemy	5.43e-07	5.63e-06	0.097	0.924	-.000011	.000012
cldgmyoc	-7.60e-06	9.49e-06	-0.801	0.429	-.000027	.0000118
ffppcomr	.004887	.0023504	2.079	0.046	.0000868	.0096872
eleprinr	-.0052069	.0021184	-2.458	0.020	-.0095333	-.0008805
l2maninv	.0002163	.0001134	1.907	0.066	-.0000153	.0004478
_cons	.104993	.0350259	2.998	0.005	.0334605	.1765254

```
.
. newey beainten manbeaip htdgsemy cldgmyoc ffppcomr eleprinr l2maninv if year
> >= 1959 & year <= 1996, lag(1) t(year)
```

Maninten1.log

Regression with Newey-West standard errors
maximum lag : 1

Number of obs = 37
F(6, 30) = 42.24
Prob > F = 0.0000

beainten	Coef.	Newey-West Std. Err.	t	P> t	[95% Conf. Interval]	
manbeaip	-.0000633	9.93e-06	-6.376	0.000	-.0000836	-.000043
htdgsemy	6.62e-07	6.68e-06	0.099	0.922	-.000013	.0000143
cldgmyoc	-8.99e-06	.0000113	-0.798	0.431	-.000032	.000014
ffppcomr	.0057906	.0027912	2.075	0.047	.0000902	.0114911
eleprinr	-.0061797	.0025151	-2.457	0.020	-.0113163	-.0010432
l2maninv	.000258	.0001349	1.913	0.065	-.0000175	.0005334
_cons	.1245034	.0415804	2.994	0.005	.0395849	.2094219

.

.

. /*****

> *** w/o instruments correcting for ar-1

> *****/

.

. prais asminten manasmip htdgyear cldgyear ffppcomr eleprinr rmaninv if year >

> = 1959 & year <= 1996, t(year)

Iteration 0: rho = 0.0000

Iteration 1: rho = 0.6484

Iteration 2: rho = 0.7370

Iteration 3: rho = 0.7517

Iteration 4: rho = 0.7551

(Prais-Winsten regression)

Source	SS	df	MS	Number of obs =	37
Model	.00100214	6	.000167023	F(6, 30) =	13.77
Residual	.000363997	30	.000012133	Prob > F =	0.0000
				R-squared =	0.7336
				Adj R-squared =	0.6803
Total	.001366137	36	.000037948	Root MSE =	.00348

asminten	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
manasmip	-.0000417	7.50e-06	-5.559	0.000	-.000057	-.0000264
htdgyear	8.50e-06	2.08e-06	4.082	0.000	4.24e-06	.0000127
cldgyear	7.24e-06	5.69e-06	1.272	0.213	-4.38e-06	.0000188
ffppcomr	-.0006151	.0023338	-0.264	0.794	-.0053813	.0041511
eleprinr	.0018731	.0021768	0.860	0.396	-.0025726	.0063187
rmaninv	4.17e-09	3.59e-08	0.116	0.908	-6.91e-08	7.75e-08
_inter	.0413227	.0109685	3.767	0.001	.0189219	.0637234
rho	0.7560	0.0799	9.466	0.000	0.5939	0.9181

Durbin-Watson statistic (original) 0.664594

Durbin-Watson statistic (transformed) 1.599604

Maninten1.log

```
.
. prais beainten manbeaip htdgyear cldgyear ffppcomr eleprinr rmaninv if year >
> = 1959 & year <= 1996, t(year)
```

```
Iteration 0: rho = 0.0000
Iteration 1: rho = 0.6494
Iteration 2: rho = 0.7372
Iteration 3: rho = 0.7519
Iteration 4: rho = 0.7552
```

(Prais-Winsten regression)

Source	SS	df	MS	Number of obs =	37
Model	.001412282	6	.00023538	F(6, 30) =	13.76
Residual	.000513143	30	.000017105	Prob > F =	0.0000
				R-squared =	0.7335
				Adj R-squared =	0.6802
				Root MSE =	.00414
Total	.001925425	36	.000053484		

beainten	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
manbeaip	-.0000588	.0000106	-5.559	0.000	-.0000804 -.0000372
htdgyear	.0000101	2.47e-06	4.087	0.000	5.05e-06 .0000151
cldgyear	8.61e-06	6.75e-06	1.275	0.212	-5.18e-06 .0000224
ffppcomr	-.0007164	.002771	-0.259	0.798	-.0063756 .0049429
eleprinr	.0022022	.0025848	0.852	0.401	-.0030766 .0074811
rmaninv	4.91e-09	4.26e-08	0.115	0.909	-8.21e-08 9.20e-08
_inter	.0490586	.0130257	3.766	0.001	.0224566 .0756607
rho	0.7561	0.0798	9.469	0.000	0.5940 0.9182

Durbin-Watson statistic (original) 0.662813

Durbin-Watson statistic (transformed) 1.598089

```
.
. prais asminten manasmip htdgsemy cldgmyoc ffppcomr eleprinr rmaninv if year >
> = 1959 & year <= 1996, t(year)
```

```
Iteration 0: rho = 0.0000
Iteration 1: rho = 0.6479
Iteration 2: rho = 0.7398
Iteration 3: rho = 0.7561
Iteration 4: rho = 0.7602
Iteration 5: rho = 0.7613
```

(Prais-Winsten regression)

Source	SS	df	MS	Number of obs =	37
Model	.000978983	6	.000163164	F(6, 30) =	13.30
Residual	.00036799	30	.000012266	Prob > F =	0.0000
				R-squared =	0.7268
				Adj R-squared =	0.6722
				Root MSE =	.0035
Total	.001346972	36	.000037416		

asminten	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]

Maninten1.log

manasmip		-.0000418	7.68e-06	-5.446	0.000	-.0000575	-.0000261
htdgsemy		8.90e-06	2.12e-06	4.198	0.000	4.57e-06	.0000132
cldgmyoc		4.09e-06	5.50e-06	0.744	0.462	-7.14e-06	.0000153
ffppcomr		-.0009131	.0023283	-0.392	0.698	-.0056681	.0038419
eleprinr		.0023424	.0021416	1.094	0.283	-.0020314	.0067162
rmaninv		2.35e-09	3.60e-08	0.065	0.948	-7.12e-08	7.59e-08
_inter		.0425728	.0110464	3.854	0.001	.0200129	.0651326

rho		0.7616	0.0781	9.746	0.000	0.6030	0.9203

Durbin-Watson statistic (original) 0.664646
Durbin-Watson statistic (transformed) 1.598837

```
.
. prais beainten manbeaip htdgsemy cldgmyoc ffppcomr eleprinr rmaninv if year >
> = 1959 & year <= 1996, t(year)
Iteration 0: rho = 0.0000
Iteration 1: rho = 0.6489
Iteration 2: rho = 0.7400
Iteration 3: rho = 0.7562
Iteration 4: rho = 0.7603
Iteration 5: rho = 0.7614
```

(Prais-Winsten regression)

Source		SS	df	MS	Number of obs =	37

Model		.001379705	6	.000229951	F(6, 30) =	13.30
Residual		.000518779	30	.000017293	Prob > F =	0.0000

Total		.001898484	36	.000052736	R-squared =	0.7267

					Adj R-squared =	0.6721
					Root MSE =	.00416

beainten		Coef.	Std. Err.	t	P> t	[95% Conf. Interval]

manbeaip		-.0000589	.0000108	-5.446	0.000	-.000081 - .0000368
htdgsemy		.0000106	2.52e-06	4.203	0.000	5.44e-06 .0000157
cldgmyoc		4.87e-06	6.53e-06	0.746	0.462	-8.47e-06 .0000182
ffppcomr		-.0010707	.0027645	-0.387	0.701	-.0067166 .0045752
eleprinr		.00276	.002543	1.085	0.286	-.0024335 .0079534
rmaninv		2.75e-09	4.27e-08	0.064	0.949	-8.45e-08 9.00e-08
_inter		.0505494	.0131177	3.854	0.001	.0237595 .0773393

rho		0.7617	0.0781	9.749	0.000	0.6031 0.9203

Durbin-Watson statistic (original) 0.662886
Durbin-Watson statistic (transformed) 1.597174

```
.
. prais asminten manasmip htdgyear cldgyear ffppcomr eleprinr llmaninv if year
> >= 1959 & year <= 1996, t(year)
Iteration 0: rho = 0.0000
Iteration 1: rho = 0.7772
Iteration 2: rho = 0.7662
Iteration 3: rho = 0.7623
```

Maninten1.log

Iteration 4: rho = 0.7610

(Prais-Winsten regression)

Source	SS	df	MS	Number of obs =	37
Model	.000983141	6	.000163857	F(6, 30) =	13.48
Residual	.000364755	30	.000012159	Prob > F =	0.0000
				R-squared =	0.7294
				Adj R-squared =	0.6753
Total	.001347896	36	.000037442	Root MSE =	.00349

asminten	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
manasmip	-.0000408	7.96e-06	-5.126	0.000	-.0000571	-.0000245
htdgyear	8.42e-06	2.16e-06	3.898	0.001	4.01e-06	.0000128
cldgyear	7.21e-06	5.66e-06	1.274	0.212	-4.35e-06	.0000188
ffppcomr	-.0006053	.0022953	-0.264	0.794	-.0052928	.0040823
eleprinr	.0019771	.0022774	0.868	0.392	-.0026739	.0066281
llmaninv	-.000016	.0000988	-0.162	0.873	-.0002177	.0001857
_inter	.0416035	.0113724	3.658	0.001	.0183779	.0648291
rho	0.7606	0.0786	9.674	0.000	0.6010	0.9202

Durbin-Watson statistic (original) 0.448359

Durbin-Watson statistic (transformed) 1.591598

```
.
. prais beainten manbeaip htdgyear cldgyear ffppcomr eleprinr llmaninv if year
> >= 1959 & year <= 1996, t(year)
Iteration 0: rho = 0.0000
Iteration 1: rho = 0.7778
Iteration 2: rho = 0.7662
Iteration 3: rho = 0.7621
Iteration 4: rho = 0.7607
```

(Prais-Winsten regression)

Source	SS	df	MS	Number of obs =	37
Model	.001387237	6	.000231206	F(6, 30) =	13.49
Residual	.000514183	30	.000017139	Prob > F =	0.0000
				R-squared =	0.7296
				Adj R-squared =	0.6755
Total	.00190142	36	.000052817	Root MSE =	.00414

beainten	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
manbeaip	-.0000576	.0000112	-5.139	0.000	-.0000805	-.0000347
htdgyear	.00001	2.56e-06	3.908	0.000	4.78e-06	.0000153
cldgyear	8.58e-06	6.72e-06	1.276	0.212	-5.15e-06	.0000223
ffppcomr	-.0007006	.0027249	-0.257	0.799	-.0062656	.0048645
eleprinr	.0023114	.0027027	0.855	0.399	-.0032082	.0078311
llmaninv	-.0000176	.0001172	-0.150	0.882	-.000257	.0002217
_inter	.0493528	.013497	3.657	0.001	.0217883	.0769173

Maninten1.log

rho	0.7603	0.0787	9.658	0.000	0.6005	0.9201
-----	--------	--------	-------	-------	--------	--------

Durbin-Watson statistic (original) 0.447487
Durbin-Watson statistic (transformed) 1.588922

```
. prais asminten manasmip htdgsemy cldgmyoc ffppcomr eleprinr llmaninv if year
> >= 1959 & year <= 1996, t(year)
Iteration 0: rho = 0.0000
Iteration 1: rho = 0.7775
Iteration 2: rho = 0.7694
Iteration 3: rho = 0.7664
Iteration 4: rho = 0.7653
```

(Prais-Winsten regression)

Source	SS	df	MS	Number of obs =	37
Model	.000965846	6	.000160974	F(6, 30) =	13.10
Residual	.000368538	30	.000012285	Prob > F =	0.0000
Total	.001334384	36	.000037066	R-squared =	0.7238
				Adj R-squared =	0.6686
				Root MSE =	.0035

asminten	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
manasmip	-.0000412	8.08e-06	-5.100	0.000	-.0000577 -.0000247
htdgsemy	8.84e-06	2.20e-06	4.007	0.000	4.33e-06 .0000133
cldgmyoc	4.09e-06	5.48e-06	0.747	0.461	-7.11e-06 .0000153
ffppcomr	-.0009119	.0022878	-0.399	0.693	-.0055842 .0037603
eleprinr	.0024226	.002243	1.080	0.289	-.0021582 .0070034
llmaninv	-.000011	.0000994	-0.111	0.913	-.0002139 .000192
_inter	.0427987	.0114265	3.746	0.001	.0194627 .0661348
rho	0.7649	0.0772	9.904	0.000	0.6081 0.9217

Durbin-Watson statistic (original) 0.447738
Durbin-Watson statistic (transformed) 1.589051

```
. prais beainten manbeaip htdgsemy cldgmyoc ffppcomr eleprinr llmaninv if year
> >= 1959 & year <= 1996, t(year)
Iteration 0: rho = 0.0000
Iteration 1: rho = 0.7781
Iteration 2: rho = 0.7694
Iteration 3: rho = 0.7662
Iteration 4: rho = 0.7650
```

(Prais-Winsten regression)

Source	SS	df	MS	Number of obs =	37
Model	.001362881	6	.000227147	F(6, 30) =	13.12
Residual	.000519506	30	.000017317	Prob > F =	0.0000
				R-squared =	0.7240
				Adj R-squared =	0.6688

Maninten1.log

Total | .001882387 36 .000052289 Root MSE = .00416

beainten	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
manbeaip	-.0000582	.0000114	-5.113	0.000	-.0000814	-.0000349
htdgsemy	.0000105	2.62e-06	4.018	0.000	5.17e-06	.0000159
cldgmyoc	4.87e-06	6.51e-06	0.747	0.461	-8.43e-06	.0000182
ffppcomr	-.0010655	.002716	-0.392	0.698	-.0066124	.0044814
eleprinr	.002841	.0026619	1.067	0.294	-.0025953	.0082773
l1maninv	-.0000117	.0001179	-0.099	0.922	-.0002525	.0002292
_inter	.0507764	.0135604	3.744	0.001	.0230824	.0784704
rho	0.7646	0.0773	9.887	0.000	0.6076	0.9216

Durbin-Watson statistic (original) 0.446820

Durbin-Watson statistic (transformed) 1.586158

```
.
. prais asminten manasmip htdgyear cldgyear ffppcomr eleprinr l2maninv if year
> >= 1959 & year <= 1996, t(year)
Iteration 0: rho = 0.0000
Iteration 1: rho = 0.7389
Iteration 2: rho = 0.7467
Iteration 3: rho = 0.7488
```

(Prais-Winsten regression)

Source	SS	df	MS	Number of obs =	37
Model	.001023127	6	.000170521	F(6, 30) =	14.10
Residual	.000362731	30	.000012091	Prob > F =	0.0000
Total	.001385857	36	.000038496	R-squared =	0.7383
				Adj R-squared =	0.6859
				Root MSE =	.00348

asminten	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
manasmip	-.0000421	7.83e-06	-5.383	0.000	-.0000581	-.0000262
htdgyear	8.58e-06	2.02e-06	4.247	0.000	4.46e-06	.0000127
cldgyear	7.35e-06	5.72e-06	1.285	0.209	-4.33e-06	.000019
ffppcomr	-.0005424	.0022657	-0.239	0.812	-.0051695	.0040847
eleprinr	.0016855	.0021337	0.790	0.436	-.0026721	.0060431
l2maninv	.0000191	.000094	0.203	0.840	-.0001729	.0002111
_inter	.0405783	.0109425	3.708	0.001	.0182309	.0629258
rho	0.7493	0.0819	9.148	0.000	0.5830	0.9156

Durbin-Watson statistic (original) 0.505155

Durbin-Watson statistic (transformed) 1.573984

```
.
. prais beainten manbeaip htdgyear cldgyear ffppcomr eleprinr l2maninv if year
> >= 1959 & year <= 1996, t(year)
Iteration 0: rho = 0.0000
```

Maninten1.log

Iteration 1: rho = 0.7392
 Iteration 2: rho = 0.7467
 Iteration 3: rho = 0.7487

(Prais-Winsten regression)

Source	SS	df	MS	Number of obs =	37
Model	.001442654	6	.000240442	F(6, 30) =	14.11
Residual	.000511275	30	.000017042	Prob > F =	0.0000
				R-squared =	0.7383
				Adj R-squared =	0.6860
Total	.001953929	36	.000054276	Root MSE =	.00413

beainten	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
manbeaip	-.0000594	.000011	-5.388	0.000	-.000082	-.0000369
htdgyear	.0000102	2.40e-06	4.253	0.000	5.30e-06	.0000151
cldgyear	8.75e-06	6.79e-06	1.289	0.207	-5.12e-06	.0000226
ffppcomr	-.0006303	.0026898	-0.234	0.816	-.0061236	.004863
eleprinr	.001976	.0025328	0.780	0.441	-.0031967	.0071488
l2maninv	.0000235	.0001116	0.210	0.835	-.0002045	.0002514
_inter	.0481543	.0129894	3.707	0.001	.0216263	.0746823
rho	0.7493	0.0819	9.143	0.000	0.5829	0.9156

Durbin-Watson statistic (original) 0.504824
 Durbin-Watson statistic (transformed) 1.572556

```
.
. prais asminten manasmip htdgsemy cldgmyoc ffppcomr eleprinr l2maninv if year
> >= 1959 & year <= 1996, t(year)
Iteration 0: rho = 0.0000
Iteration 1: rho = 0.7374
Iteration 2: rho = 0.7531
Iteration 3: rho = 0.7575
Iteration 4: rho = 0.7588
```

(Prais-Winsten regression)

Source	SS	df	MS	Number of obs =	37
Model	.000987236	6	.000164539	F(6, 30) =	13.43
Residual	.000367595	30	.000012253	Prob > F =	0.0000
				R-squared =	0.7287
				Adj R-squared =	0.6744
Total	.001354831	36	.000037634	Root MSE =	.0035

asminten	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
manasmip	-.0000419	8.01e-06	-5.227	0.000	-.0000582	-.0000255
htdgsemy	8.94e-06	2.07e-06	4.326	0.000	4.72e-06	.0000132
cldgmyoc	4.10e-06	5.50e-06	0.745	0.462	-7.13e-06	.0000153
ffppcomr	-.0008773	.0022611	-0.388	0.701	-.0054951	.0037405
eleprinr	.002266	.0020927	1.083	0.288	-.0020078	.0065398
l2maninv	6.26e-06	.0000939	0.067	0.947	-.0001855	.000198

Maninten1.log

_inter	.0422735	.0110616	3.822	0.001	.0196827	.0648642
rho	0.7592	0.0789	9.618	0.000	0.5989	0.9194

Durbin-Watson statistic (original) 0.508862
Durbin-Watson statistic (transformed) 1.591421

```
.
. prais beainten manbeaip htdgsemy cldgmyoc ffppcomr eleprinr l2maninv if year
> >= 1959 & year <= 1996, t(year)
Iteration 0: rho = 0.0000
Iteration 1: rho = 0.7376
Iteration 2: rho = 0.7531
Iteration 3: rho = 0.7574
Iteration 4: rho = 0.7587
```

(Prais-Winsten regression)

Source	SS	df	MS	Number of obs =	37
Model	.001392057	6	.000232009	F(6, 30) =	13.43
Residual	.000518171	30	.000017272	Prob > F =	0.0000
Total	.001910228	36	.000053062	R-squared =	0.7287
				Adj R-squared =	0.6745
				Root MSE =	.00416

beainten	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
manbeaip	-.0000591	.0000113	-5.232	0.000	-.0000821 -.000036
htdgsemy	.0000106	2.45e-06	4.333	0.000	5.62e-06 .0000156
cldgmyoc	4.88e-06	6.53e-06	0.747	0.461	-8.46e-06 .0000182
ffppcomr	-.0010288	.0026845	-0.383	0.704	-.0065114 .0044537
eleprinr	.0026662	.0024842	1.073	0.292	-.0024073 .0077396
l2maninv	8.18e-06	.0001115	0.073	0.942	-.0002196 .0002359
_inter	.0501762	.0131306	3.821	0.001	.0233599 .0769924
rho	0.7591	0.0790	9.614	0.000	0.5988 0.9194

Durbin-Watson statistic (original) 0.508512
Durbin-Watson statistic (transformed) 1.589813

```
.
.
. /*****
> *** W/ instruments w/o correcting for serial correlation
> *****/
.
. gen clpropw = coprowes/coprotot
. gen clprope = coproeas/coprotot
. gen copropsf = coprosur/coprotot
. gen copropug = copround/coprotot
```

Maninten1.log

```
. reg ffppcomr numrefin refinca netsumca extralos cpvtyund cpvtysur cpvtytot c
> lpropw clprope copropsf copropug asminten manasmip htdgyear cldgyear rmaninv
> if year >= 1959 & year <= 1996
```

Source	SS	df	MS	Number of obs =	38
Model	26.7533269	16	1.67208293	F(16, 21) =	13.40
Residual	2.62122345	21	.124820164	Prob > F =	0.0000
				R-squared =	0.9108
				Adj R-squared =	0.8428
Total	29.3745504	37	.793906766	Root MSE =	.3533

ffppcomr	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
numrefin	-.0013773	.014988	-0.092	0.928	-.0325464	.0297919
refinca	.2639674	.3772033	0.700	0.492	-.5204698	1.048405
netsumca	-.002867	.0074272	-0.386	0.703	-.0183127	.0125787
extralos	2.175037	2.465021	0.882	0.388	-2.951255	7.301328
cpvtyund	.0900194	.4179751	0.215	0.832	-.7792073	.9592462
cpvtysur	-.1468609	.4219334	-0.348	0.731	-1.024319	.7305976
cpvtytot	-.0822911	.7016464	-0.117	0.908	-1.541445	1.376862
clpropw	-675.0436	1595.79	-0.423	0.677	-3993.671	2643.583
clprope	-682.9632	1594.392	-0.428	0.673	-3998.682	2632.756
copropsf	.1391355	852.4871	0.000	1.000	-1772.705	1772.983
copropug	.5343382	853.7841	0.001	1.000	-1775.007	1776.076
asminten	12.419	34.18344	0.363	0.720	-58.66936	83.50735
manasmip	-.0040082	.0023182	-1.729	0.098	-.0088291	.0008128
htdgyear	-.000184	.0005549	-0.332	0.744	-.001338	.0009701
cldgyear	-.0007329	.0011456	-0.640	0.529	-.0031154	.0016496
rmaninv	7.36e-06	4.28e-06	1.718	0.100	-1.55e-06	.0000163
_cons	684.8838	1962.194	0.349	0.731	-3395.722	4765.49

```
. predict fosshat
(11 missing values generated)
```

```
. reg eleprinr numrefin refinca netsumca extralos cpvtyund cpvtysur cpvtytot c
> lpropw clprope copropsf copropug asminten manasmip htdgyear cldgyear rmaninv
> if year >= 1959 & year <= 1996
```

Source	SS	df	MS	Number of obs =	37
Model	35.9552684	16	2.24720428	F(16, 20) =	28.34
Residual	1.58581441	20	.079290721	Prob > F =	0.0000
				R-squared =	0.9578
				Adj R-squared =	0.9240
Total	37.5410828	36	1.04280786	Root MSE =	.28159

eleprinr	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
numrefin	-.0110733	.0119519	-0.926	0.365	-.0360046	.0138579
refinca	.2884914	.3012034	0.958	0.350	-.3398079	.9167906
netsumca	-.0021242	.0059608	-0.356	0.725	-.0145582	.0103097
extralos	.6454312	2.047562	0.315	0.756	-3.625708	4.916571

Maninten1.log

```

cpvtyund | .3040577 .3417426 0.890 0.384 -.4088049 1.01692
cpvtysur | -.3257385 .3450981 -0.944 0.356 -1.045601 .3941235
cpvtytot | -.5702145 .5730721 -0.995 0.332 -1.765622 .6251929
  clpropw | -475.5223 1279.282 -0.372 0.714 -3144.057 2193.013
  clprope | -486.479 1278 -0.381 0.707 -3152.341 2179.383
copropsf | 992.0509 796.5105 1.245 0.227 -669.4408 2653.543
copropug | 996.3341 797.3508 1.250 0.226 -666.9105 2659.579
asminten | -13.05833 29.38809 -0.444 0.662 -74.36081 48.24415
manasmip | -.0034852 .0018844 -1.850 0.079 -.007416 .0004455
htdgyear | 2.16e-06 .0004585 0.005 0.996 -.0009542 .0009586
cldgyear | -.0002287 .0009149 -0.250 0.805 -.0021373 .0016798
  rmaninv | 4.93e-06 3.44e-06 1.434 0.167 -2.24e-06 .0000121
    _cons | -499.1704 1588.813 -0.314 0.757 -3813.377 2815.036

```

```

.
. predict electhat
(11 missing values generated)

```

```

.
. newey asminten manasmip htdgyear cldgyear fosshat electhat rmaninv if year >=
> 1959 & year <= 1996, lag(1) t(year)

```

```

Regression with Newey-West standard errors      Number of obs =      38
maximum lag : 1                                F( 5, 31) =      63.79
                                              Prob > F      =      0.0000

```

```

-----
asminten |           Newey-West
          |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-----+-----
manasmip | -0.0000287   3.10e-06    -9.255  0.000    -0.000035  -0.0000224
htdgyear |  2.13e-06    4.72e-06     0.452  0.655    -7.49e-06   .0000118
cldgyear | -0.0000108   .0000115    -0.940  0.354    -0.0000344 .0000127
  fosshat |  .0106233    .0022305     4.763  0.000    .0060742   .0151724
electhat | -0.0095693   .0017598    -5.438  0.000    -0.0131584 -.0059802
  rmaninv | -1.11e-07    2.29e-08    -4.830  0.000    -1.57e-07  -6.40e-08
    _cons |  .1127042    .0343925     3.277  0.003    .0425602   .1828481

```

```

.
. newey beainten manbeaip htdgyear cldgyear fosshat electhat rmaninv if year >=
> 1959 & year <= 1996, lag(1) t(year)

```

```

Regression with Newey-West standard errors      Number of obs =      38
maximum lag : 1                                F( 5, 31) =      63.53
                                              Prob > F      =      0.0000

```

```

-----
beainten |           Newey-West
          |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-----+-----
manbeaip | -0.0000404   4.37e-06    -9.239  0.000    -0.0000493 -.0000315
htdgyear |  2.56e-06    5.60e-06     0.457  0.651    -8.86e-06   .000014
cldgyear | -0.0000129   .0000137    -0.940  0.355    -0.0000408 .0000151
  fosshat |  .0126128    .0026485     4.762  0.000    .0072113   .0180144
electhat | -0.0113646   .0020899    -5.438  0.000    -0.015627  -.0071023

```

Maninten1.log

```

rmaninv | -1.32e-07  2.72e-08  -4.827  0.000  -1.87e-07  -7.59e-08
_cons   | .1336492   .0408176   3.274  0.003   .0504012   .2168973

```

```

.
. newey asminten manasmip htdgsemy cldgmyoc fosshat electthat rmaninv if year >=
> 1959 & year <= 1996, lag(1) t(year)

```

```

Regression with Newey-West standard errors      Number of obs =      38
maximum lag : 1                                F( 5, 31) =      62.85
                                              Prob > F      =      0.0000

```

```

-----
asminten |           Newey-West
          | Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-----+-----
manasmip | -0.0000287  3.11e-06   -9.226  0.000   -0.000035  -0.0000223
htdgsemy |  2.97e-06  4.29e-06    0.692  0.494   -5.79e-06  .0000117
cldgmyoc | -0.0000101  9.55e-06   -1.057  0.299   -0.0000296  9.38e-06
fosshat  |  .0106756  .0022332    4.780  0.000   .0061209  .0152302
electthat | -0.0096118  .0017623   -5.454  0.000   -0.0132059 -0.0060176
rmaninv  | -1.11e-07  2.34e-08   -4.743  0.000   -1.59e-07  -6.33e-08
_cons    |  .1074386  .0292882    3.668  0.001   .047705  .1671722
-----

```

```

.
. newey beainten manbeaip htdgsemy cldgmyoc fosshat electthat rmaninv if year >=
> 1959 & year <= 1996, lag(1) t(year)

```

```

Regression with Newey-West standard errors      Number of obs =      38
maximum lag : 1                                F( 5, 31) =      62.61
                                              Prob > F      =      0.0000

```

```

-----
beainten |           Newey-West
          | Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-----+-----
manbeaip | -0.0000404  4.38e-06   -9.210  0.000   -0.0000493 -0.0000314
htdgsemy |  3.56e-06  5.10e-06    0.698  0.490   -6.83e-06  .000014
cldgmyoc | -0.000012  .0000114   -1.057  0.299   -0.0000352  .0000112
fosshat  |  .0126748  .0026516    4.780  0.000   .0072669  .0180827
electthat | -0.0114149  .0020927   -5.455  0.000   -0.0156829 -0.0071468
rmaninv  | -1.32e-07  2.78e-08   -4.740  0.000   -1.89e-07  -7.51e-08
_cons    |  .1273969  .0347604    3.665  0.001   .0565025  .1982912
-----

```

```

.
. newey asminten manasmip htdgyear cldgyear fosshat electthat llmaninv if year >
> = 1959 & year <= 1996, lag(1) t(year)

```

```

Regression with Newey-West standard errors      Number of obs =      38
maximum lag : 1                                F( 6, 31) =      42.52
                                              Prob > F      =      0.0000

```

```

-----
asminten |           Newey-West
          | Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-----+-----

```

Maninten1.log

```
-----+-----
manasmip | -.0000392 8.10e-06 -4.842 0.000 -.0000557 -.0000227
htdgyear | 7.84e-07 5.40e-06 0.145 0.885 -.0000102 .0000118
cldgyear | -9.81e-06 .0000108 -0.910 0.370 -.0000318 .0000122
fosshat | .0081137 .0029447 2.755 0.010 .0021079 .0141195
electthat | -.0074197 .0025449 -2.916 0.007 -.01261 -.0022294
llmaninv | .0001285 .0001198 1.072 0.292 -.0001158 .0003727
_cons | .1122493 .0373471 3.006 0.005 .0360793 .1884192
-----+-----
```

```
.
. newey beainten manbeaip htdgyear cldgyear fosshat electthat llmaninv if year >
> = 1959 & year <= 1996, lag(1) t(year)
```

```
Regression with Newey-West standard errors          Number of obs =      38
maximum lag : 1                                     F( 6, 31) =      42.48
                                                    Prob > F      =      0.0000
```

```
-----+-----
beainten |          Newey-West
          Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-----+-----
manbeaip | -.0000553   .0000114    -4.846  0.000    -.0000786   -.000032
htdgyear | 9.63e-07   6.41e-06     0.150  0.881    -.0000121   .000014
cldgyear | -.0000116   .0000128    -0.908  0.371    -.0000378   .0000145
fosshat | .0096155   .0034997     2.748  0.010    .0024779   .0167531
electthat | -.0088019   .003024    -2.911  0.007    -.0149694   -.0026345
llmaninv | .0001539   .0001423     1.082  0.288    -.0001363   .0004441
_cons | .1330392   .0443323     3.001  0.005    .0426229   .2234556
-----+-----
```

```
.
. newey asminten manasmip htdgsemy cldgmyoc fosshat electthat llmaninv if year >
> = 1959 & year <= 1996, lag(1) t(year)
```

```
Regression with Newey-West standard errors          Number of obs =      38
maximum lag : 1                                     F( 6, 31) =      42.73
                                                    Prob > F      =      0.0000
```

```
-----+-----
asminten |          Newey-West
          Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-----+-----
manasmip | -.0000393   8.12e-06    -4.838  0.000    -.0000559   -.0000227
htdgsemy | 1.50e-06   5.09e-06     0.295  0.770    -8.87e-06   .0000119
cldgmyoc | -9.50e-06   9.14e-06    -1.039  0.307    -.0000281   9.15e-06
fosshat | .0081234   .0029452     2.758  0.010    .0021166   .0141301
electthat | -.0074285   .0025433    -2.921  0.006    -.0126157   -.0022414
llmaninv | .0001298   .000121     1.073  0.291    -.0001169   .0003766
_cons | .1079087   .033156     3.255  0.003    .0402867   .1755308
-----+-----
```

```
.
. newey beainten manbeaip htdgsemy cldgmyoc fosshat electthat llmaninv if year >
> = 1959 & year <= 1996, lag(1) t(year)
```

```
Regression with Newey-West standard errors          Number of obs =      38
```

Maninten1.log

maximum lag : 1

F(6, 31) = 42.70
Prob > F = 0.0000

		Newey-West				[95% Conf. Interval]	
beainten	Coef.	Std. Err.	t	P> t			
manbeaip	-.0000554	.0000115	-4.842	0.000	-.0000788	-.0000321	
htdgsemy	1.82e-06	6.04e-06	0.301	0.766	-.0000105	.0000141	
cldgmyoc	-.0000113	.0000109	-1.037	0.308	-.0000334	.0000109	
fosshat	.0096268	.0035002	2.750	0.010	.0024881	.0167655	
electhat	-.0088122	.0030221	-2.916	0.007	-.0149758	-.0026486	
l1maninv	.0001556	.0001437	1.083	0.287	-.0001375	.0004486	
_cons	.1278893	.0393635	3.249	0.003	.0476069	.2081717	

.
. newey asminten manasmip htdgyear cldgyear fosshat electhat l2maninv if year >
> = 1959 & year <= 1996, lag(1) t(year)

Regression with Newey-West standard errors
maximum lag : 1

Number of obs = 37
F(6, 30) = 51.30
Prob > F = 0.0000

		Newey-West				[95% Conf. Interval]	
asminten	Coef.	Std. Err.	t	P> t			
manasmip	-.0000405	8.66e-06	-4.680	0.000	-.0000582	-.0000228	
htdgyear	-2.95e-07	5.53e-06	-0.053	0.958	-.0000116	.000011	
cldgyear	-6.57e-06	.0000112	-0.589	0.560	-.0000293	.0000162	
fosshat	.0075102	.0032527	2.309	0.028	.0008673	.0141531	
electhat	-.0070479	.0026997	-2.611	0.014	-.0125614	-.0015344	
l2maninv	.0001386	.0001299	1.067	0.294	-.0001267	.0004039	
_cons	.1134847	.0384507	2.951	0.006	.0349578	.1920115	

.
. newey beainten manbeaip htdgyear cldgyear fosshat electhat l2maninv if year >
> = 1959 & year <= 1996, lag(1) t(year)

Regression with Newey-West standard errors
maximum lag : 1

Number of obs = 37
F(6, 30) = 51.30
Prob > F = 0.0000

		Newey-West				[95% Conf. Interval]	
beainten	Coef.	Std. Err.	t	P> t			
manbeaip	-.0000572	.0000122	-4.681	0.000	-.0000822	-.0000323	
htdgyear	-3.30e-07	6.57e-06	-0.050	0.960	-.0000137	.0000131	
cldgyear	-7.76e-06	.0000132	-0.586	0.562	-.0000348	.0000193	
fosshat	.0088912	.0038636	2.301	0.028	.0010008	.0167816	
electhat	-.0083559	.0032061	-2.606	0.014	-.0149037	-.0018081	
l2maninv	.0001662	.0001546	1.075	0.291	-.0001496	.0004819	
_cons	.1345192	.045651	2.947	0.006	.0412875	.227751	

Maninten1.log

```
.
. newey asminten manasmip htdgsemy cldgmyoc fosshat electthat l2maninv if year >
> = 1959 & year <= 1996, lag(1) t(year)
```

```
Regression with Newey-West standard errors      Number of obs =      37
maximum lag : 1                                F( 6, 30) =      52.68
                                              Prob > F      =      0.0000
```

		Newey-West				
asminten	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
manasmip	-.0000407	8.62e-06	-4.721	0.000	-.0000583	-.0000231
htdgsemy	2.43e-07	5.22e-06	0.046	0.963	-.0000104	.0000109
cldgmyoc	-7.31e-06	9.39e-06	-0.779	0.442	-.0000265	.0000119
fosshat	.0074427	.0032466	2.292	0.029	.0008123	.0140732
electthat	-.0069994	.0027109	-2.582	0.015	-.0125357	-.001463
l2maninv	.0001429	.0001303	1.096	0.282	-.0001233	.0004091
_cons	.111089	.0338655	3.280	0.003	.0419265	.1802516

```
.
. newey beainten manbeaip htdgsemy cldgmyoc fosshat electthat l2maninv if year >
> = 1959 & year <= 1996, lag(1) t(year)
```

```
Regression with Newey-West standard errors      Number of obs =      37
maximum lag : 1                                F( 6, 30) =      52.70
                                              Prob > F      =      0.0000
```

		Newey-West				
beainten	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
manbeaip	-.0000574	.0000122	-4.722	0.000	-.0000823	-.0000326
htdgsemy	3.08e-07	6.20e-06	0.050	0.961	-.0000124	.000013
cldgmyoc	-8.65e-06	.0000112	-0.776	0.444	-.0000314	.0000141
fosshat	.0088113	.0038563	2.285	0.030	.0009357	.0166868
electthat	-.008298	.0032194	-2.577	0.015	-.014873	-.001723
l2maninv	.0001712	.0001551	1.104	0.278	-.0001455	.0004879
_cons	.1317012	.0402129	3.275	0.003	.0495756	.2138269

```
.
. newey asminten manasmip htdgyear cldgyear fosshat electthat rmaninv llmaninv i
> f year >= 1959 & year <= 1996, lag(1) t(year)
```

```
Regression with Newey-West standard errors      Number of obs =      38
maximum lag : 1                                F( 6, 30) =      53.55
                                              Prob > F      =      0.0000
```

		Newey-West				
asminten	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
manasmip	-.0000349	7.24e-06	-4.825	0.000	-.0000497	-.0000202
htdgyear	2.72e-06	4.87e-06	0.559	0.580	-7.22e-06	.0000127

Maninten1.log

```

cldgyear | -9.75e-06 .0000112 -0.874 0.389 -.0000326 .000013
fosshat | .0092434 .0026763 3.454 0.002 .0037777 .0147091
electthat | -.0087967 .0020269 -4.340 0.000 -.0129362 -.0046572
rmaninv | -1.08e-07 2.31e-08 -4.661 0.000 -1.55e-07 -6.04e-08
llmaninv | .0001067 .0001133 0.941 0.354 -.0001248 .0003382
_cons | .1058454 .035401 2.990 0.006 .033547 .1781438
-----

```

```

. newey asminten manasmip htdgyear cldgyear fosshat electthat rmaninv llmaninv l
> 2maninv l3maninv if year >= 1959 & year <= 1996, lag(1) t(year)

```

```

Regression with Newey-West standard errors          Number of obs =      36
maximum lag : 1                                   F( 8, 26) =      74.08
                                                Prob > F      =      0.0000

```

```

-----
asminten |           Newey-West
          |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-----+-----
manasmip | -0.0000463   .0000113    -4.092  0.000    -0.0000695   -0.000023
htdgyear | 1.03e-06     5.46e-06     0.189  0.852    -0.0000102    .0000123
cldgyear | -9.99e-06    .0000135    -0.738  0.467    -0.0000378    .0000178
fosshat | .0061808     .0036683     1.685  0.104    -0.0013595    .0137212
electthat | -.0067091    .0028405    -2.362  0.026    -0.0125478    -.0008705
rmaninv | -7.58e-08     2.91e-08    -2.602  0.015    -1.36e-07    -1.59e-08
llmaninv | .0001347     .0001118     1.206  0.239    -0.000095    .0003644
l2maninv | -.0000443    .0000994    -0.446  0.660    -0.0002486    .00016
l3maninv | .0001763     .0001096     1.608  0.120    -0.000049    .0004015
_cons | .109344      .0401038     2.727  0.011     .0269094     .1917785
-----

```

```

. newey asminten manasmip htdgyear cldgyear fosshat electthat rmaninv llmaninv l
> 2maninv l3maninv l4maninv if year >= 1959 & year <= 1996, lag(1) t(year)

```

```

Regression with Newey-West standard errors          Number of obs =      35
maximum lag : 1                                   F( 9, 24) =      88.29
                                                Prob > F      =      0.0000

```

```

-----
asminten |           Newey-West
          |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-----+-----
manasmip | -0.0000511   .0000126    -4.070  0.000    -0.000077    -0.0000252
htdgyear | 4.63e-07     5.29e-06     0.087  0.931    -0.0000105    .0000114
cldgyear | -0.000011    .0000127    -0.867  0.395    -0.0000373    .0000152
fosshat | .005366      .0036187     1.483  0.151    -0.0021027    .0128347
electthat | -.0063134    .0030767    -2.052  0.051    -0.0126633    .0000366
rmaninv | -7.00e-08     3.63e-08    -1.932  0.065    -1.45e-07     4.78e-09
llmaninv | .0001276     .0001217     1.048  0.305    -0.0001236    .0003788
l2maninv | -7.40e-06     .0001016    -0.073  0.942    -0.000217    .0002022
l3maninv | .0001062     .0001374     0.773  0.447    -0.0001774    .0003899
l4maninv | .0001174     .0001044     1.125  0.272    -0.000098    .0003327
_cons | .1122943     .0385806     2.911  0.008     .0326678     .1919208
-----

```

Maninten1.log

```
.
. newey asminten manasmip htdgyear cldgyear fosshat electthat rmaninv llmaninv l
> 2maninv l3maninv l4maninv if year >= 1959 & year <= 1996, lag(1) t(year)
```

Regression with Newey-West standard errors
maximum lag : 1

Number of obs = 35
F(9, 24) = 88.29
Prob > F = 0.0000

asminten	Coef.	Newey-West Std. Err.	t	P> t	[95% Conf. Interval]	
manasmip	-.0000511	.0000126	-4.070	0.000	-.000077	-.0000252
htdgyear	4.63e-07	5.29e-06	0.087	0.931	-.0000105	.0000114
cldgyear	-.000011	.0000127	-0.867	0.395	-.0000373	.0000152
fosshat	.005366	.0036187	1.483	0.151	-.0021027	.0128347
electthat	-.0063134	.0030767	-2.052	0.051	-.0126633	.0000366
rmaninv	-7.00e-08	3.63e-08	-1.932	0.065	-1.45e-07	4.78e-09
llmaninv	.0001276	.0001217	1.048	0.305	-.0001236	.0003788
l2maninv	-7.40e-06	.0001016	-0.073	0.942	-.000217	.0002022
l3maninv	.0001062	.0001374	0.773	0.447	-.0001774	.0003899
l4maninv	.0001174	.0001044	1.125	0.272	-.000098	.0003327
_cons	.1122943	.0385806	2.911	0.008	.0326678	.1919208

```
.
. newey asminten manasmip htdgyear cldgyear fosshat electthat rmaninv llmaninv l
> 2maninv l3maninv l4maninv l5maninv if year >= 1959 & year <= 1996, lag(1) t(y
> ear)
```

Regression with Newey-West standard errors
maximum lag : 1

Number of obs = 34
F(10, 22) = 96.74
Prob > F = 0.0000

asminten	Coef.	Newey-West Std. Err.	t	P> t	[95% Conf. Interval]	
manasmip	-.0000497	.0000142	-3.494	0.002	-.0000792	-.0000202
htdgyear	-3.84e-07	6.27e-06	-0.061	0.952	-.0000134	.0000126
cldgyear	-.0000105	.0000123	-0.852	0.404	-.000036	.000015
fosshat	.0050681	.004092	1.239	0.229	-.0034182	.0135545
electthat	-.0057593	.003241	-1.777	0.089	-.0124807	.0009621
rmaninv	-6.16e-08	3.58e-08	-1.719	0.100	-1.36e-07	1.27e-08
llmaninv	.0000871	.0001373	0.634	0.532	-.0001976	.0003718
l2maninv	.0000154	.0001004	0.153	0.880	-.0001929	.0002236
l3maninv	.0000791	.0001418	0.558	0.582	-.000215	.0003732
l4maninv	.0001592	.0001563	1.018	0.320	-.000165	.0004834
l5maninv	-.0000518	.0001393	-0.372	0.713	-.0003407	.0002371
_cons	.1159103	.0431033	2.689	0.013	.0265194	.2053011

```
.
. newey asminten manasmip htdgyear cldgyear fosshat electthat rmaninv llmaninv l
> 2maninv l3maninv l4maninv l5maninv l6maninv if year >= 1959 & year <= 1996, l
> ag(1) t(year)
```

Maninten1.log

Regression with Newey-West standard errors
maximum lag : 1

Number of obs = 33
F(11, 20) = 108.22
Prob > F = 0.0000

asminten	Coef.	Newey-West Std. Err.	t	P> t	[95% Conf. Interval]	
manasmip	-.000052	.0000152	-3.417	0.003	-.0000838	-.0000203
htdgyear	1.87e-06	5.93e-06	0.315	0.756	-.0000105	.0000142
cldgyear	-8.35e-06	.0000134	-0.625	0.539	-.0000362	.0000195
fosshat	.0037278	.003906	0.954	0.351	-.00442	.0118756
electhat	-.0046765	.0033055	-1.415	0.173	-.0115717	.0022186
rmaninv	-5.12e-08	4.03e-08	-1.271	0.218	-1.35e-07	3.29e-08
l1maninv	.0000716	.000147	0.487	0.632	-.0002351	.0003782
l2maninv	-3.69e-06	.0001138	-0.032	0.974	-.0002411	.0002338
l3maninv	.0000924	.0001443	0.640	0.529	-.0002086	.0003934
l4maninv	.0001213	.0001554	0.781	0.444	-.0002028	.0004454
l5maninv	-.0000362	.00015	-0.241	0.812	-.0003491	.0002767
l6maninv	.0000457	.0001539	0.297	0.770	-.0002753	.0003667
_cons	.1030211	.0409044	2.519	0.020	.017696	.1883463

.
.
.

end of do-file

. log close

```

. /*****
> *** This is the final model for manufacturing energy intensity of output ...
> *****/
.
.
. replace manbeaip = manbeaip/1000
(50 real changes made)

. gen asminten = rmanengy/manasmip
(11 missing values generated)

. gen beainten = rmanengy/manbeaip
(11 missing values generated)

. gen clpropw = coprowes/coprotot

. gen clprope = coproeas/coprotot

. gen copropsf = coprosur/coprotot

. gen copropug = copround/coprotot

. gen electp2 = eleprinr*eleprinr
(11 missing values generated)

. gen ffppcom2 = ffppcomr*ffppcomr

.
. sort year

. gen l1manwgs = manwages[_n-1]
(1 missing value generated)

. gen l2manwgs = manwages[_n-1]
(1 missing value generated)

. gen l1govpur = govpurch[_n -1 ]
(1 missing value generated)

. gen l1rinv = rmaninv[_n - 1]
(11 missing values generated)

. gen l2rinv = rmaninv[_n - 2]
(11 missing values generated)

.
. reg beainten caputil numrefin refinca netsumca extralos cpvtyund cpvtysur cp
> vtytot clpropw clprope copropsf copropug manasmip l2rinv realgdp htdgyear cld
> gyear l2manwgs l1govpur if year >= 1959 & year <= 1996

```

Source	SS	df	MS
Model	6444.18348	19	339.167552
Residual	90.0369688	17	5.29629228

Number of obs	=	37
F(19, 17)	=	64.04
Prob > F	=	0.0000
R-squared	=	0.9862
Adj R-squared	=	0.9708

Manintenf.log 210999

Total | 6534.22045 36 181.506124 Root MSE = 2.3014

beainten	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
caputil	-.4384524	.2380081	-1.842	0.083	-.9406057	.0637009
numrefin	-.0190192	.1020684	-0.186	0.854	-.2343646	.1963262
refincap	.8505657	2.688001	0.316	0.756	-4.820621	6.521753
netsumca	-.0443318	.0666613	-0.665	0.515	-.1849748	.0963112
extralos	34.76982	17.0175	2.043	0.057	-1.133979	70.67361
cpvtyund	2.077772	3.587568	0.579	0.570	-5.491333	9.646878
cpvtysur	-2.008297	3.633073	-0.553	0.588	-9.673411	5.656817
cpvtytot	-5.840297	7.444495	-0.785	0.444	-21.54681	9.866214
clpropw	-931.5769	10772.43	-0.086	0.932	-23659.41	21796.26
clprope	-902.7541	10764.69	-0.084	0.934	-23614.26	21808.75
copropsf	13340.74	6830.531	1.953	0.067	-1070.424	27751.9
copropug	.13297.8	6839.695	1.944	0.069	-1132.697	27728.29
manasmip	.0587068	.0528796	1.110	0.282	-.0528593	.1702729
l2rinv	-.0387121	.1116224	-0.347	0.733	-.2742149	.1967906
realgdp	-.0215765	.0155673	-1.386	0.184	-.0544207	.0112677
htdgyear	-.0020156	.0040984	-0.492	0.629	-.0106624	.0066312
cldgyear	-.0111879	.0093382	-1.198	0.247	-.0308897	.0085139
l2manwgs	-1.660574	5.451003	-0.305	0.764	-13.16118	9.840036
llgovpur	.0665302	.027516	2.418	0.027	.0084766	.1245838
_cons	-12280.46	13018.33	-0.943	0.359	-39746.74	15185.82

.
. predict intenhat
(12 missing values generated)

.
. reg ffppcomr caputil numrefin refincap netsumca extralos cpvtyund cpvtysur cp
> vtytot clpropw clprope copropsf copropug manasmip l2rinv realgdp htdgyear cld
> gyear l2manwgs llgovpur if year >= 1959 & year <= 1996

Source	SS	df	MS	Number of obs = 37		
Model	27.2603681	19	1.43475622	F(19, 17) = 14.13		
Residual	1.72573495	17	.101513821	Prob > F = 0.0000		
Total	28.9861031	36	.805169529	R-squared = 0.9405		
				Adj R-squared = 0.8739		
				Root MSE = .31861		

ffppcomr	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
caputil	.0260625	.032951	0.791	0.440	-.043458	.095583
numrefin	.0038957	.0141308	0.276	0.786	-.0259178	.0337091
refincap	.1617304	.3721398	0.435	0.669	-.6234159	.9468767
netsumca	.0157408	.0092289	1.706	0.106	-.0037305	.0352121
extralos	2.6282	2.355985	1.116	0.280	-2.342493	7.598894
cpvtyund	.5491641	.49668	1.106	0.284	-.4987392	1.597067
cpvtysur	-.6215011	.50298	-1.236	0.233	-1.682696	.439694
cpvtytot	1.016267	1.030652	0.986	0.338	-1.158217	3.190752
clpropw	860.0226	1491.386	0.577	0.572	-2286.527	4006.573
clprope	868.2402	1490.315	0.583	0.568	-2276.049	4012.529
copropsf	-110.441	945.6515	-0.117	0.908	-2105.591	1884.709

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```

copropug | -111.7986   946.9202   -0.118   0.907   -2109.626   1886.028
manasmip |  .0012003   .0073209    0.164   0.872    -.0142454   .0166461
  l2rinv |  .0065518   .0154535    0.424   0.677    -.0260523   .039156
  realgdp | -.0013665   .0021552   -0.634   0.534    -.0059136   .0031806
htdgyear |  .0001464   .0005674    0.258   0.799    -.0010507   .0013435
cldgyear |  .0007159   .0012928    0.554   0.587    -.0020117   .0034435
l2manwgs | -1.047492   .7546629   -1.388   0.183    -2.639691   .5447078
llgovpur | -.0065701   .0038094   -1.725   0.103    -.0146073   .0014671
  _cons | -749.4693   1802.32    -0.416   0.683   -4552.032   3053.094
-----

```

```

.
. predict fosshat
(12 missing values generated)

```

```

.
. reg ffppcom2 caputil numrefin refinap netsumca extralos cpvtyund cpvtysur cp
> vtytot clpropw clprope copropsf copropug manasmip l2rinv realgdp htdgyear cld
> gyear l2manwgs llgovpur if year >= 1959 & year <= 1996

```

Source	SS	df	MS	Number of obs =	37
Model	632.509055	19	33.2899503	F(19, 17) =	9.84
Residual	57.5365102	17	3.3845006	Prob > F =	0.0000
				R-squared =	0.9166
				Adj R-squared =	0.8234
Total	690.045565	36	19.1679324	Root MSE =	1.8397

ffppcom2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
caputil	.20798	.1902625	1.093	0.290	-.1934387 .6093987
numrefin	.0055164	.0815929	0.068	0.947	-.1666296 .1776625
refinap	1.462083	2.148774	0.680	0.505	-3.071435 5.9956
netsumca	.0873408	.0532887	1.639	0.120	-.0250885 .1997701
extralos	19.44692	13.6037	1.430	0.171	-9.25439 48.14823
cpvtyund	2.483292	2.867883	0.866	0.399	-3.567412 8.533996
cpvtysur	-2.956609	2.90426	-1.018	0.323	-9.084062 3.170843
cpvtytot	5.142857	5.951091	0.864	0.400	-7.412847 17.69856
clpropw	3480.696	8611.422	0.404	0.691	-14687.82 21649.21
clprope	3536.559	8605.234	0.411	0.686	-14618.9 21692.02
copropsf	-968.7358	5460.291	-0.177	0.861	-12488.94 10551.47
copropug	-977.5777	5467.617	-0.179	0.860	-12513.24 10558.09
manasmip	.0113583	.0422716	0.269	0.791	-.0778271 .1005437
l2rinv	.0324283	.0892304	0.363	0.721	-.1558314 .220688
realgdp	-.0102555	.0124445	-0.824	0.421	-.036511 .016
htdgyear	.0010324	.0032762	0.315	0.757	-.0058798 .0079446
cldgyear	.0048923	.0074649	0.655	0.521	-.0108572 .0206418
l2manwgs	-8.375303	4.357503	-1.922	0.072	-17.56883 .8182258
llgovpur	-.0298836	.0219961	-1.359	0.192	-.0762914 .0165241
_cons	-2512.464	10406.79	-0.241	0.812	-24468.86 19443.94

```

.
. predict fosshat2
(12 missing values generated)

```

Manintenf.log 210999

```
. reg eleprinr caputil numrefin refinca netsumca extralos cpvtyund cpvtysur cp
> vtytot clpropw clprope copropsf copropug manasmip l2rinv realgdp htdgyear cld
> gyear l2manwgs llgovpur if year >= 1959 & year <= 1996
```

Source	SS	df	MS	Number of obs =	37
Model	36.9002811	19	1.94212006	F(19, 17) =	51.52
Residual	.64080172	17	.037694219	Prob > F =	0.0000
				R-squared =	0.9829
				Adj R-squared =	0.9639
Total	37.5410828	36	1.04280786	Root MSE =	.19415

eleprinr	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
caputil	.0066567	.0200791	0.332	0.744	-.0357064	.0490198
numrefin	-.0048844	.0086108	-0.567	0.578	-.0230516	.0132828
refinca	.1149726	.2267675	0.507	0.619	-.3634651	.5934102
netsumca	.011843	.0056237	2.106	0.050	-.0000221	.023708
extralos	-1.49853	1.435646	-1.044	0.311	-4.527477	1.530418
cpvtyund	.7637063	.3026575	2.523	0.022	.1251547	1.402258
cpvtysur	-.7875463	.3064965	-2.570	0.020	-1.434197	-.1408951
cpvtytot	1.052728	.6280391	1.676	0.112	-.2723191	2.377774
clpropw	732.1519	908.7929	0.806	0.432	-1185.234	2649.537
clprope	727.3781	908.1399	0.801	0.434	-1188.63	2643.386
copropsf	68.54657	576.2433	0.119	0.907	-1147.22	1284.314
copropug	71.16039	577.0164	0.123	0.903	-1146.238	1288.559
manasmip	.0014395	.0044611	0.323	0.751	-.0079725	.0108516
l2rinv	.0055279	.0094168	0.587	0.565	-.0143398	.0253956
realgdp	-.0020357	.0013133	-1.550	0.140	-.0048065	.0007351
htdgyear	-.0000582	.0003458	-0.168	0.868	-.0007876	.0006713
cldgyear	.0002673	.0007878	0.339	0.739	-.0013948	.0019294
l2manwgs	.1209432	.4598623	0.263	0.796	-.8492815	1.091168
llgovpur	-.0049708	.0023213	-2.141	0.047	-.0098684	-.0000732
_cons	-788.508	1098.264	-0.718	0.483	-3105.642	1528.626

```
. predict electthat
(12 missing values generated)
```

```
. reg electp2 caputil numrefin refinca netsumca extralos cpvtyund cpvtysur cpv
> .tytot clpropw clprope copropsf copropug manasmip l2rinv realgdp htdgyear cldg
> year l2manwgs llgovpur if year >= 1959 & year <= 1996
```

Source	SS	df	MS	Number of obs =	37
Model	3786.9844	19	199.314968	F(19, 17) =	28.72
Residual	117.969149	17	6.93936168	Prob > F =	0.0000
				R-squared =	0.9698
				Adj R-squared =	0.9360
Total	3904.95355	36	108.470932	Root MSE =	2.6343

electp2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
caputil	.1086725	.2724367	0.399	0.695	-.4661186	.6834637
numrefin	-.0959521	.1168328	-0.821	0.423	-.3424479	.1505436

Manintenf.log 210999

refincap		2.159179	3.076828	0.702	0.492	-4.332361	8.650719
netsumca		.1243114	.076304	1.629	0.122	-.036676	.2852988
extralos		-4.658814	19.47914	-0.239	0.814	-45.7562	36.43857
cpvtyund		7.193135	4.106519	1.752	0.098	-1.470863	15.85713
cpvtysur		-7.616119	4.158607	-1.831	0.085	-16.39001	1.157776
cpvtytot		10.81525	8.521362	1.269	0.221	-7.163254	28.79375
clpropw		9296.073	12330.69	0.754	0.461	-16719.41	35311.55
clprope		9254.861	12321.83	0.751	0.463	-16741.92	35251.65
copropsf		-1586.128	7818.587	-0.203	0.842	-18081.9	14909.65
copropug		-1553.101	7829.077	-0.198	0.845	-18071.01	14964.81
manasmip		.0137196	.0605287	0.227	0.823	-.1139849	.141424
l2rinv		.0753375	.1277689	0.590	0.563	-.1942314	.3449063
realgdp		-.02433	.0178192	-1.365	0.190	-.0619252	.0132652
htdgyear		.0001333	.0046912	0.028	0.978	-.0097642	.0100309
cldgyear		.0048552	.0106889	0.454	0.655	-.0176965	.0274069
l2manwgs		-.1405094	6.239506	-0.023	0.982	-13.30472	13.0237
llgovpur		-.0516512	.0314962	-1.640	0.119	-.1181025	.0148
_cons		-7610.353	14901.47	-0.511	0.616	-39049.7	23829

.
. predict electht2
(12 missing values generated)

.
. reg manbeaip caputil numrefin refincap netsumca extralos cpvtyund cpvtysur cp
> vtytot clpropw clprope copropsf copropug manasmip l2rinv realgdp htdgyear cld
> gyear l2manwgs llgovpur if year >= 1959 & year <= 1996

Source	SS	df	MS	Number of obs =	37
Model	2.29331391	19	.120700732	F(19, 17) =	.
Residual	1.1007e-06	17	6.4746e-08	Prob > F	= 0.0000
				R-squared	= 1.0000
				Adj R-squared	= 1.0000
				Root MSE	= .00025

manbeaip	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
caputil	.0000472	.0000263	1.793	0.091	-8.34e-06 .0001027
numrefin	-4.74e-06	.0000113	-0.420	0.680	-.0000286 .0000191
refincap	.0004802	.0002972	1.616	0.125	-.0001468 .0011073
netsumca	8.14e-06	7.37e-06	1.104	0.285	-7.41e-06 .0000237
extralos	-.0018335	.0018816	-0.974	0.343	-.0058032 .0021363
cpvtyund	.0003714	.0003967	0.936	0.362	-.0004655 .0012082
cpvtysur	-.0003674	.0004017	-0.915	0.373	-.0012149 .0004801
cpvtytot	.0023387	.0008231	2.841	0.011	.0006021 .0040753
clpropw	-1.449146	1.191063	-1.217	0.240	-3.96207 1.063778
clprope	-1.441042	1.190208	-1.211	0.243	-3.95216 1.070077
copropsf	-.4855747	.7552241	-0.643	0.529	-2.078958 1.107809
copropug	-.4807588	.7562373	-0.636	0.533	-2.07628 1.114762
manasmip	.0008287	5.85e-06	141.744	0.000	.0008164 .0008411
l2rinv	3.17e-06	.0000123	0.257	0.800	-.0000229 .0000292
realgdp	2.03e-06	1.72e-06	1.182	0.254	-1.60e-06 5.67e-06
htdgyear	4.39e-07	4.53e-07	0.969	0.346	-5.17e-07 1.40e-06
cldgyear	4.06e-07	1.03e-06	0.393	0.699	-1.77e-06 2.58e-06
l2manwgs	.0005609	.0006027	0.931	0.365	-.0007107 .0018324

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```

llgovpur | -8.14e-06  3.04e-06  -2.675  0.016  -.0000146  -1.72e-06
_cons |  1.912092  1.439384   1.328  0.202  -1.124743  4.948926

```

```

. predict maniphath
(12 missing values generated)

```

```

. reg llmanwgs caputil numrefin refinca netsumca extralos cpvtyund cpvtysur cp
> vtytot clpropw clprope copropsf copropug manasmip l2rinv realgdp htdgyear cld
> gyear l2manwgs llgovpur if year >= 1959 & year <= 1996

```

Source	SS	df	MS	Number of obs =	37
Model	10.0625155	19	.529606077	F(19, 17) =	.
Residual	8.2370e-09	17	4.8453e-10	Prob > F =	0.0000
				R-squared =	1.0000
				Adj R-squared =	1.0000
Total	10.0625155	36	.279514319	Root MSE =	2.2e-05

llmanwgs	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
caputil	6.11e-15	2.28e-06	0.000	1.000	-4.80e-06 4.80e-06
numrefin	-1.94e-14	9.76e-07	0.000	1.000	-2.06e-06 2.06e-06
refinca	4.58e-13	.0000257	0.000	1.000	-.0000542 .0000542
netsumca	-4.33e-15	6.38e-07	0.000	1.000	-1.35e-06 1.35e-06
extralos	2.62e-12	.0001628	0.000	1.000	-.0003434 .0003434
cpvtyund	-4.00e-13	.0000343	0.000	1.000	-.0000724 .0000724
cpvtysur	2.83e-13	.0000347	0.000	1.000	-.0000733 .0000733
cpvtytot	-1.95e-12	.0000712	0.000	1.000	-.0001502 .0001502
clpropw	-5.23e-09	.1030354	0.000	1.000	-.2173858 .2173857
clprope	-3.49e-09	.1029614	0.000	1.000	-.2172295 .2172295
copropsf	6.56e-09	.0653322	0.000	1.000	-.137839 .137839
copropug	1.13e-08	.0654199	0.000	1.000	-.1380239 .1380239
manasmip	5.77e-15	5.06e-07	0.000	1.000	-1.07e-06 1.07e-06
l2rinv	7.72e-15	1.07e-06	0.000	1.000	-2.25e-06 2.25e-06
realgdp	1.45e-15	1.49e-07	0.000	1.000	-3.14e-07 3.14e-07
htdgyear	1.31e-15	3.92e-08	0.000	1.000	-8.27e-08 8.27e-08
cldgyear	2.81e-15	8.93e-08	0.000	1.000	-1.88e-07 1.88e-07
l2manwgs	1	.0000521	.	0.000	.99989 1.00011
llgovpur	2.58e-15	2.63e-07	0.000	1.000	-5.55e-07 5.55e-07
_cons	-4.94e-09	.1245169	0.000	1.000	-.2627077 .2627077

```

. predict manwgsht
(12 missing values generated)

```

```

. newey intenhat caputil maniphath htdgyear cldgyear fosshat electthat fosshat2 e
> lectht2 l2rinv manwgsht if year >= 1960 & year <= 1996, t(year) lag(4)

```

Regression with Newey-West standard errors	Number of obs =	37
maximum lag : 4	F(10, 26) =	2032.79
	Prob > F =	0.0000

Manintenf.log 210999

intenh	Coef.	Newey-West Std. Err.	t	P> t	[95% Conf. Interval]	
caputil	-.6451046	.089786	-7.185	0.000	-.8296624	-.4605468
maniphat	-55.58179	3.302681	-16.829	0.000	-62.37055	-48.79304
htdgyear	.0029991	.0012008	2.498	0.019	.0005308	.0054674
cldgyear	-.0131121	.0043791	-2.994	0.006	-.0221135	-.0041107
fossht	-29.93434	9.658716	-3.099	0.005	-49.78811	-10.08057
electhat	22.41357	7.220631	3.104	0.005	7.57135	37.25579
fossht2	5.218769	1.493584	3.494	0.002	2.148664	8.288874
electht2	-2.293863	.5977669	-3.837	0.001	-3.52259	-1.065135
l2rinv	.1175306	.0444239	2.646	0.014	.0262161	.2088452
manwgsht	15.47813	1.537811	10.065	0.000	12.31711	18.63915
_cons	-11.67776	23.0776	-0.506	0.617	-59.11444	35.75892

```

.
. drop fossht fossht2 electhat electht2 maniphat manwgsht

. gen fossht = ffppcomr

. gen fossht2 = ffppcom2

. gen electhat = eleprinr
(11 missing values generated)

. gen electht2 = electp2
(11 missing values generated)

. gen maniphat = manbeaip

. gen manwgsht = llmanwgs
(1 missing value generated)

.

. predict yhat
(11 missing values generated)

. sort year

. list year yhat

```

	year	yhat
1.	1949	.
2.	1950	.
3.	1951	.
4.	1952	.
5.	1953	.
6.	1954	.
7.	1955	.
8.	1956	.
9.	1957	.
10.	1958	.
11.	1959	.
12.	1960	75.09401
13.	1961	78.77248

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14.	1962	76.67097
15.	1963	75.86045
16.	1964	75.3406
17.	1965	73.21105
18.	1966	73.0959
19.	1967	78.39857
20.	1968	78.25562
21.	1969	79.02435
22.	1970	83.29759
23.	1971	83.85574
24.	1972	81.67829
25.	1973	77.17827
26.	1974	77.65742
27.	1975	83.02348
28.	1976	79.58283
29.	1977	70.89488
30.	1978	71.05218
31.	1979	70.22034
32.	1980	68.17184
33.	1981	67.32926
34.	1982	66.99905
35.	1983	62.57554
36.	1984	57.5578
37.	1985	54.83492
38.	1986	58.60765
39.	1987	57.19169
40.	1988	53.72005
41.	1989	52.505
42.	1990	47.16947
43.	1991	51.99263
44.	1992	53.12436
45.	1993	47.85518
46.	1994	44.56604
47.	1995	41.22818
48.	1996	36.46292
49.	1997	31.95724
50.	1998	33.10173

.

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.

. log close

Variable Codebook
Sorted by Order of Variable Appearance

Variable	Description
Year	Year
nomGDP	nominal GDP (Bil \$)
realGDP	real GDP (Bil Chained 1992 \$)
manuGDPn	GDP by Industry-Manufacturing (Bil \$) - nominal
duraGDPn	GDP by Industry-Durable Goods (Bil \$)-nominal
nondGDPn	GDP by Industry-nondurable Goods (Bil \$)-nominal
tranGDPn	GDP by Industry-transportation and public utilities (Bil \$)-nominal
finrGDPn	GDP by Industry-finance, insurance, and real estate (Bil \$)-nominal
servGDPn	GDP by Industry-services (Bil \$)-nominal
manuGDPPr	GDP by Industry-Manufacturing (billion real chained 1992 \$)
duraGDPPr	GDP by Industry-Durable Goods (billion real chained 1992 \$)
nondGDPPr	GDP by Industry-nondurable Goods (billion real chained 1992 \$)
tranGDPPr	GDP by Industry-transportation and public utilities (billion real chained 1992 \$)
finrGDPPr	GDP by Industry-finance, insurance, and real estate (billion real chained 1992 \$)
servGDPPr	GDP by Industry-services (billion real chained 1992 \$)
coaconRC	Residential&Commercial Coal Consumption-Quadrillion Btu
ngconRC	Residential&Commercial natural gas Consumption-Quadrillion Btu
petconRC	Residential&Commercial Petroleum Consumption-Quadrillion Btu
eleconRC	Residential&Commercial electricity Consumption-Quadrillion Btu
losconRC	Residential&Commercial Losses Consumption-Quadrillion Btu
totconRC	Residential&Commercial Total Energy Consumption-Quadrillion Btu
coaconIN	Industrial Coal Consumption-Quadrillion Btu
ngconIN	Industrial natural gas Consumption-Quadrillion Btu
petconIN	Industrial Petroleum Consumption-Quadrillion Btu
eleconIN	Industrial electricity Consumption-Quadrillion Btu
losconIN	Industrial Losses Consumption-Quadrillion Btu
totconIN	Industrial Total Energy Consumption-Quadrillion Btu
petconTR	Transportation Petroleum Consumption-Quadrillion Btu
totconTR	Transportation Total Energy Consumption-Quadrillion Btu
enconTOT	Total Energy Consumption- Quadrillion Btu
ngCO2IN	Energy-related CO2 Emissions from Industrial Sector-natural gas (Million Metric Tons of Carbon)
petCO2IN	Energy-related CO2 Emissions from Industrial Sector-Petroleum (Million Metric Tons of Carbon)
coaCO2IN	Energy-related CO2 Emissions from Industrial Sector-Coal (Million Metric Tons of Carbon)
eleCO2IN	Energy-related CO2 Emissions from Industrial Sector-Electricity (Million Metric Tons of Carbon)
totCO2IN	Energy-related CO2 Emissions from Industrial Sector-Total (Million Metric Tons of Carbon)
ngCO2TR	Energy-related CO2 Emissions from Transportation Sector-natural gas (Million Metric Tons of Carbon)
petCO2TR	Energy-related CO2 Emissions from Transportation Sector-Petroleum (Million Metric Tons of Carbon)
coaCO2TR	Energy-related CO2 Emissions from Transportation Sector-Coal (Million Metric Tons of Carbon)
eleCO2TR	Energy-related CO2 Emissions from Transportation Sector-Electricity (Million Metric Tons of Carbon)
totCO2TR	Energy-related CO2 Emissions from Transportation Sector-Total (Million Metric Tons of Carbon)
ngCO2EG	Energy-related CO2 Emissions from Electricity Generation Sector-natural gas (Million Metric Tons of Carbon)
petCO2EG	Energy-related CO2 Emissions from Electricity Generation Sector-petroleum (Million Metric Tons of Carbon)
coaCO2EG	Energy-related CO2 Emissions from Electricity Generation Sector-Coal (Million Metric Tons of Carbon)
totCO2EG	Energy-related CO2 Emissions from Electricity Generation Sector-Total (Million Metric Tons of Carbon)
ngCO2RE	Energy-related CO2 Emissions from Residential Sector-natural gas (Million Metric Tons of Carbon)
petCO2RE	Energy-related CO2 Emissions from Residential Sector-Petroleum (Million Metric Tons of Carbon)
coaCO2RE	Energy-related CO2 Emissions from Residential Sector-Coal (Million Metric Tons of Carbon)
eleCO2RE	Energy-related CO2 Emissions from Residential Sector-Electricity (Million Metric Tons of Carbon)
totCO2RE	Energy-related CO2 Emissions from Residential Sector-Total (Million Metric Tons of Carbon)
ngCO2CO	Energy-related CO2 Emissions from Commercial Sector-natural gas (Million Metric Tons of Carbon)
petCO2CO	Energy-related CO2 Emissions from Commercial Sector-petroleum (Million Metric Tons of Carbon)
coaCO2CO	Energy-related CO2 Emissions from Commercial Sector-coal (Million Metric Tons of Carbon)
eleCO2CO	Energy-related CO2 Emissions from Commercial Sector-electricity (Million Metric Tons of Carbon)
totCO2CO	Energy-related CO2 Emissions from Commercial Sector-total (Million Metric Tons of Carbon)
toC02ALL	Energy-related CO2 Emissions from All Sectors-Total (Million Metric Tons of Carbon)
eleprREN	Retail prices of electricity sold by electric utilities-nominal-Residential (cents per Kilowatthour)
eleprRER	Retail prices of electricity sold by electric utilities-real-Residential (cents per Kilowatthour)
eleprCON	Retail prices of electricity sold by electric utilities-nominal-Commercial (cents per Kilowatthour)

eleprCO	Retail prices of electricity sold by electric utilities-real-Commercial (cents per Kilowatthour)
eleprIN	Retail prices of electricity sold by electric utilities-nominal-Industrial (cents per Kilowatthour)
eleprINr	Retail prices of electricity sold by electric utilities-real-Industrial (cents per Kilowatthour)
eleprOTn	Retail prices of electricity sold by electric utilities-nominal-Other (cents per Kilowatthour)
eleprOTr	Retail prices of electricity sold by electric utilities-real-Other (cents per Kilowatthour)
eleprTON	Retail prices of electricity sold by electric utilities-nominal-Total (cents per Kilowatthour)
eleprTOR	Retail prices of electricity sold by electric utilities-real-Total (cents per Kilowatthour)
fuelrate	Fuel Rate of all motor vehicles-miles per gallon
htdgyear	Heating Degree-Days by Month-Annual Total
htdgsemy	Heating Degree-Days by Month-September through May
cldgyear	Cooling Degree-Days by Month-Annual Total
cldgmyoc	Cooling Degree-Days by Month-May through October
ffppcoan	Fossil Fuel Production Prices-Coal (\$ per Million Btu)-nominal
ffppcoar	Fossil Fuel Production Prices-Coal (\$ per Million Btu)-real
ffppngn	Fossil Fuel Production Prices-natural gas (\$ per Million Btu)-nominal
ffppngr	Fossil Fuel Production Prices-natural gas (\$ per Million Btu)-real
ffppoiln	Fossil Fuel Production Prices-crude oil (\$ per Million Btu)-nominal
ffppoilr	Fossil Fuel Production Prices-crude oil (\$ per Million Btu)-real
ffppcomn	Fossil Fuel Production Prices-fossil fuel composite (\$ per Million Btu)-nominal
ffppcomr	Fossil Fuel Production Prices-fossil fuel composite (\$ per Million Btu)-real
prodtot	Industrial Production Index, market groupings - Total (1992=100)
prodfin	Industrial Production Index-Final Products (1992=100)
prodint	Industrial Production Index-Intermediate Products (1992=100)
prodmatt	Industrial Production Index-Materials (1992=100)
numrefin	Number of Operable Refineries
refincap	Refinery Capacity (Millions of barrels per day)
netsumca	Electric Utility Net Summer Capability-Total (Million Kilowatts)
extralos	natural gas production-extraction loss (Trillion Cubic Feet)
cpvtyund	Coal Mining Productivity-Underground (Short Tons per Miner hour)
cpvtysur	Coal Mining Productivity-Surface (Short Tons per Miner hour)
cpvtytot	Coal Mining Productivity-Total (Short Tons per Miner hour)
copround	Coal Production- Underground (Million Short Tons)
coprosur	Coal Production- Surface (Million Short Tons)
coprowes	Coal Production- West of Mississippi (Million Short Tons)
coproeas	Coal Production- East of Mississippi (Million Short Tons)
coprotot	Coal Production- Total (Million Short Tons)

Variable Codebook
Sorted by Alphabetization of variable name

Variable	Description
cldgmyoc	Cooling Degree-Days by Month-May through October
cldgyear	Cooling Degree-Days by Month-Annual Total
coaC02CO	Energy-related C02 Emissions from Commercial Sector-coal (Million Metric Tons of Carbon)
coaC02EG	Energy-related C02 Emissions from Electricity Generation Sector-Coal (Million Metric Tons of Carbon)
coaC02IN	Energy-related C02 Emissions from Industrial Sector-Coal (Million Metric Tons of Carbon)
coaC02RE	Energy-related C02 Emissions from Residential Sector-Coal (Million Metric Tons of Carbon)
coaC02TR	Energy-related C02 Emissions from Transporation Sector-Coal (Million Metric Tons of Carbon)
coaconIN	Industrial Coal Consumption-Quadrillion Btu
coaconRC	Residential&Commercial Coal Consumption-Quadrillion Btu
coproeas	Coal Production- East of Mississippi (Million Short Tons)
coprosur	Coal Production- Surface (Million Short Tons)
coprotot	Coal Production- Total (Million Short Tons)
copround	Coal Production- Underground (Million Short Tons)
coprowes	Coal Production- West of Mississippi (Million Short Tons)
cpvtysur	Coal Mining Productivity-Surface (Short Tons per Miner hour)
cpvtytot	Coal Mining Productivity-Total (Short Tons per Miner hour)
cpvtyund	Coal Mining Productivity-Underground (Short Tons per Miner hour)
duraGDPn	GDP by Industry-Durable Goods (Bil \$)-nominal
duraGDPPr	GDP by Industry-Durable Goods (billion real chained 1992 \$)
eleC02CO	Energy-related C02 Emissions from Commercial Sector-electricity (Million Metric Tons of Carbon)
eleC02IN	Energy-related C02 Emissions from Industrial Sector-Electricity(Million Metric Tons of Carbon)
eleC02RE	Energy-related C02 Emissions from Residential Sector-Electricity (Million Metric Tons of Carbon)
eleC02TR	Energy-related C02 Emissions from Transporation Sector-Electricity (Million Metric Tons of Carbon)
eleconIN	Industrial electricity Consumption-Quadrillion Btu
eleconRC	Residential&Commercial electricity Consumption-Quadrillion Btu
eleprCOn	Retail prices of electricity sold by electric utilities-nominal-Commercial (cents per Kilowatthour)
eleprCOr	Retail prices of electricity sold by electric utilities-real-Commercial (cents per Kilowatthour)
eleprINn	Retail prices of electricity sold by electric utilities-nominal-Industrial (cents per Kilowatthour)
eleprINr	Retail prices of electricity sold by electric utilities-real-Industrial (cents per Kilowatthour)
eleprOTn	Retail prices of electricity sold by electric utilities-nominal-Other (cents per Kilowatthour)
eleprOTr	Retail prices of electricity sold by electric utilities-real-Other (cents per Kilowatthour)
eleprREN	Retail prices of electricity sold by electric utilities-nominal-Residential (cents per Kilowatthour)
eleprREr	Retail prices of electricity sold by electric utilities-real-Residential (cents per Kilowatthour)
eleprTON	Retail prices of electricity sold by electric utilities-nominal-Total (cents per Kilowatthour)
eleprTOR	Retail prices of electricity sold by electric utilities-real-Total (cents per Kilowatthour)
enconTOT	Total Energy Consumption- Quadrillion Btu
extralos	natural gas production-extraction loss (Trillion Cubic Feet)
ffppcoan	Fossil Fuel Production Prices-Coal (\$ per Million Btu)-nominal
ffppcoar	Fossil Fuel Production Prices-Coal (\$ per Million Btu)-real
ffppcomn	Fossil Fuel Production Prices-fossil fuel composite (\$ per Million Btu)-nominal
ffppcomr	Fossil Fuel Production Prices-fossil fuel composite (\$ per Million Btu)-real
ffppngn	Fossil Fuel Production Prices-natural gas (\$ per Million Btu)-nominal
ffppngr	Fossil Fuel Production Prices-natural gas (\$ per Million Btu)-real
ffppoiln	Fossil Fuel Production Prices-crude oil (\$ per Million Btu)-nominal
ffppoilr	Fossil Fuel Production Prices-crude oil (\$ per Million Btu)-real
finrGDPn	GDP by Industry-finance, insurance, and real estate (Bil \$)-nominal
finrGDPPr	GDP by Industry-finance, insurance, and real estate (billion real chained 1992 \$)
fuelrate	Fuel Rate of all motor vehicles-miles per gallon
htdgsemy	Heating Degree-Days by Month-September through May
htdgyear	Heating Degree-Days by Month-Annual Total
losconIN	Industrial Losses Consumption-Quadrillion Btu
losconRC	Residential&Commercial Losses Consumption-Quadrillion Btu
manuGDPn	GDP by Industry-Manufacturing (Bil \$) - nominal

manuGDP	GDP by Industry-Manufacturing (billion real chained 1992 \$)
netsumca	Electric Utility Net Summer Capability-Total (Million Kilowatts)
ngC02CO	Energy-related C02 Emissions from Commercial Sector-natural gas (Million Metric Tons of Carbon)
ngC02EG	Energy-related C02 Emissions from Electricity Generation Sector-natural gas (Million Metric Tons of Carbon)
ngC02RE	Energy-related C02 Emissions from Residential Sector-natural gas (Million Metric Tons of Carbon)
ngC02IN	Energy-related C02 Emissions from Industrial Sector-natural gas (Million Metric Tons of Carbon)
ngC02TR	Energy-related C02 Emissions from Transporation Sector-natural gas (Million Metric Tons of Carbon)
ngconIN	Industrial natural gas Consumption-Quadrillion Btu
ngconRC	Residential&Commercial natural gas Consumption-Quadrillion Btu
nomGDP	nominal GDP (Bil \$)
nondGDPn	GDP by Industry-nondurable Goods (Bil \$)-nominal
nondGDPPr	GDP by Industry-nondurable Goods (billion real chained 1992 \$)
numrefin	Number of Operable Refineries
petC02CO	Energy-related C02 Emissions from Commercial Sector-petroleum (Million Metric Tons of Carbon)
petC02EG	Energy-related C02 Emissions from Electricity Generation Sector-petroleum (Million Metric Tons of Carbon)
petC02IN	Energy-related C02 Emissions from Industrial Sector-Petroleum (Million Metric Tons of Carbon)
petC02RE	Energy-related C02 Emissions from Residential Sector-Petroleum (Million Metric Tons of Carbon)
petC02TR	Energy-related C02 Emissions from Transporation Sector-Petroleum (Million Metric Tons of Carbon)
petconIN	Industrial Petroleum Consumption-Quadrillion Btu
petconRC	Residential&Commercial Petroleum Consumption-Quadrillion Btu
petconTR	Transporation Petroleum Consumption-Quadrillion Btu
prodfin	Industrial Production Index-Final Products (1992=100)
prodint	Industrial Production Index-Intermediate Products (1992=100)
prodmatt	Industrial Production Index-Materials (1992=100)
prodtot	Industrial Production Index, market groupings - Total (1992=100)
realGDP	real GDP (Bil Chained 1992 \$)
refincap	Refinery Capacity (Millions of barrels per day)
servGDPn	GDP by Industry-services (Bil \$)-nominal
servGDPPr	GDP by Industry-services (billion real chained 1992 \$)
toC02ALL	Energy-related C02 Emissions from All Sectors-Total (Million Metric Tons of Carbon)
totC02CO	Energy-related C02 Emissions from Commercial Sector-total (Million Metric Tons of Carbon)
totC02EG	Energy-related C02 Emissions from Electricity Generation Sector-Total (Million Metric Tons of Carbon)
totC02IN	Energy-related C02 Emissions from Industrial Sector-Total (Million Metric Tons of Carbon)
totC02RE	Energy-related C02 Emissions from Residential Sector-Total (Million Metric Tons of Carbon)
totC02TR	Energy-related C02 Emissions from Transporation Sector-Total (Million Metric Tons of Carbon)
totconIN	Industrial Total Energy Consumption-Quadrillion Btu
totconRC	Residential&Commercial Total Energy Consumption-Quadrillion Btu
totconTR	Transporation Total Energy Consumption-Quadrillion Btu
tranGDPn	GDP by Industry-transportation and public utilites (Bil \$)-nominal
tranGDPPr	GDP by Industry-transportation and public utilites (billion real chained 1992 \$)
Year	Year

multiple use

To: Leigh Linden

01-202-395-6870

From: Joe Aldy

10/4/99

Leigh,

The paper on 1998 Emissions looks good. Here are my comments.

page 1

- Structural change: At the end of the next to last sentence, let's add a footnote with an example (eg microchips) that illustrates this point.
- Weather, energy prices, tech change: let's use the language that we agreed to in the WEB article for these bullet points.
- "The open question is why CO₂ emissions grew even slower than normal?"; This sentence and the intro paragraph are written on the premise that GDP should explain CO₂, when this analysis finds that the relationship is better explained by a component of GDP, weather, and energy prices. I suggest that we use language like "The open question is why CO₂ emissions appear to have grown even slower than normal?"
- Data from 1947 - 1997: I thought the analyses ^{were} ~~were~~ for a series starting in early 1960s? I also thought 1998 was in the sample. Is 1998 within or out of sample?

page 2

- First sentence: We should include a reference to energy prices here. Research has found

to energy prices here. Research has found

that the oil price shocks influenced the structure of output.

- Constructing non-hi-tech GDP: We should note one what time period we are constructing this series.
- Business cycle peaks: Have you compared the growth rate trend from 80:3 - 90:3 with growth rate trends based on other peaks? Also, have you compared the non-hi-tech cycles with GDP cycles? Can we do that from 1960 or so through 91? If so, we could include these to substantiate the use of the trend we use.
- GDP trend + CO₂ trend: We note that CO₂ trend is 1.26%/yr - I thought it was 2.26%/yr. What is GDP trend? If CO₂ is 3/4 of GDP, wouldn't CO₂ be higher.
- Weather: Can we include cites for the weather data, and a reference that a heating day is more energy-intensive than a cooling day?
- 2SLS: We should note that the weather variables are changes from the previous year.
- 1990-1995 and 1997-1998: Why do we highlight those years? Let's focus on either the whole

page 3

- 1110-1115 and 1111, 1110. why are we not doing these years? Let's focus on either the whole series or just the last couple of years.

that the oil price shocks influenced the structure of output.

- Constructing non-hi-tech GDP: We should note one what time period we are constructing this series.
- Business cycle peaks: Have you compared the growth rate trend from 80:3 - 90:3 with growth rate trends based on other peaks? Also, have you compared the non-hi-tech cycles with GDP cycles? Can we do that from 1960 or so through 91? If so, we could include these to substantiate the use of the trend we use.
- GDP trend + CO₂ trend: We note that CO₂ trend is 1.26%/yr - I thought it was 2.26%/yr. What is GDP trend? If CO₂ is $\frac{3}{4}$ of GDP, wouldn't CO₂ be higher.
- Weather: Can we include cites for the weather data, and a reference that a heating day is more energy-intensive than a cooling day?
- 2SLS: We should note that the weather variables are changes from the previous year.
- 1990-1995 and 1997-1998: Why do we highlight these years? Let's focus on either the whole series or just the last couple of years.

page 4

- Price measures: I suggest inserting "energy" before "price measures" when listing the various models used of energy prices.
- Interpreting energy prices: While not significant, oil and coal prices have a counter-intuitive sign. Oil could be a result of fuel-switching during the oil shocks in power plants (oil to coal). We should include this as a possible explanation. On coal, I realize that it is only the current coal price in the model with current & lagged - there may be no real story here.
- CO₂ trend: The statement that CO₂ would have to grow 9%/yr for the model to be off is not very clear. We should discuss when I am back.
- Additions: As we have previously discussed, some text on the motivation for this approach and alternatives would be useful. Also, a couple of sentences on testing for serial correlation would be good. In the last paragraph, a reference to energy prices should be made.

Overall, this looks very good, and is close to being ready for circulation. See you on Wednesday.



```

.
. /*****
> *** Detrend the series
> *****/

.
. sort year

. gen dgdp = gdp[_n] - 1.03081*gdp[_n-1]
(1 missing value generated)

. gen dntek = nonhitek[_n] - 1.03002*nonhitek[_n - 1]
(1 missing value generated)

. gen dco2 = co2[_n] - 1.01259*co2[_n - 1]
(1 missing value generated)

.
. gen tgdgdp = 1.03081*gdp[_n-1]
(1 missing value generated)

. gen tntek = 1.03002*nonhitek[_n-1]
(1 missing value generated)

. gen tco2 = 1.01259*co2[_n-1]
(1 missing value generated)

.
. /*****
> *** Relation between off-trend deviations
> *****/

.
. reg dco2 dgdp


```

Source	SS	df	MS	Number of obs =	49
Model	32052.7091	1	32052.7091	F(1, 47) =	70.07
Residual	21501.1128	47	457.470485	Prob > F =	0.0000
Total	53553.8219	48	1115.70462	R-squared =	0.5985
				Adj R-squared =	0.5900
				Root MSE =	21.389

```

-----+-----
      dco2 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-----+-----
      dgdp |   .2924542   .0349387     8.370   0.000     .2221665   .3627418
      _cons |   3.783005   3.056578     1.238   0.222    -2.366037   9.932047
-----+-----

. .pred pdgdp
(1 missing value generated)

. gen pgdp = tco2 + pdgdp
(1 missing value generated)

.
. reg dco2 dntek

```

Gordon1.log

Source	SS	df	MS	Number of obs =	49
Model	31750.529	1	31750.529	F(1, 47) =	68.44
Residual	21803.2929	47	463.899849	Prob > F =	0.0000
Total	53553.8219	48	1115.70462	R-squared =	0.5929
				Adj R-squared =	0.5842
				Root MSE =	21.538

dco2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
dntek	.2882476	.0348419	8.273	0.000	.2181547 .3583406
_cons	5.97446	3.082347	1.938	0.059	-.2264221 12.17534

```
. pred pdntek
(1 missing value generated)

. gen pntek = pdntek + tco2
(1 missing value generated)

.
. /* Results for prediction levels of CO2 */
.
. sort year

. list co2 pntek pgdp
```

	co2	pntek	pgdp
1.	595.6	.	.
2.	642.2	634.1726	632.0056
3.	681.5	677.6849	675.4338
4.	667.3	699.6995	697.1606
5.	684.9	689.9493	687.4631
6.	655.6	679.4124	676.4931
7.	726.3	691.9707	689.6707
8.	749.7	735.3731	732.6311
9.	746.6	758.4988	755.7395
10.	731.4	737.9353	734.9128
11.	760.3	772.7943	770.5099
12.	787.9	771.912	769.1525
13.	793.7	799.0288	796.245
14.	826.6	830.1398	827.7125
15.	858.6	851.8901	849.2615
16.	895.2	896.1861	893.7069
17.	934.5	938.7892	936.3564
18.	985.7	981.5284	979.0988
19.	1011.5	998.2739	997.0494
20.	1069.2	1045.203	1042.563
21.	1115.6	1088.698	1085.922
22.	1149	1107.692	1104.02
23.	1162.5	1172.362	1169.507
24.	1223.7	1207.838	1205.531
25.	1277.9	1274.463	1272.115
26.	1233.1	1258.937	1255.143
27.	1197	1216.057	1212.287
28.	1269.5	1244.353	1242.07
29.	1307.4	1310.423	1308.248

30.	1320.9	1358.051	1356.225
31.	1337.7	1340.21	1338.056
32.	1289.4	1315.044	1312.038
33.	1256	1301.035	1298.745
34.	1189.1	1207.218	1203.698
35.	1182.5	1221.158	1219.859
36.	1245.2	1256.244	1256.268
37.	1244.6	1274.74	1271.981
38.	1245.9	1266.921	1264.106
39.	1286.6	1265.287	1263.241
40.	1348.6	1320.001	1318.759
41.	1360.8	1376.426	1374.068
42.	1346.1	1352.938	1348.823
43.	1330.8	1298.467	1294.899
44.	1352.1	1343.114	1344.814
45.	1379.8	1358.643	1359.105
46.	1398.4	1398.977	1408.043
47.	1411.7	1388.989	1404.384
48.	1460.6	1419.938	1440.501
49.	1479.6	1471.303	1500.17
50.	1484	1488.831	1519.008

```

.
. gen resn = co2 - pntek
(1 missing value generated)

. gen resg = co2 - pgdp
(1 missing value generated)

.
. egen temp = sum(resn^2) if year > 1949
(1 missing values generated)

. gen statn = sqrt(temp/49)
(1 missing value generated)

. drop temp

.
. egen temp = sum(resg^2) if year > 1949
(1 missing values generated)

. gen statg = sqrt(temp/49)
(1 missing value generated)

. drop temp

.
. list statn statg if year == 1998

      statn      statg
1.      21.0942      20.94752

. drop statn statg

.
. egen temp = sum(resn^2) if year > 1970

```

```

(22 missing values generated)

. gen statn = sqrt(temp/28)
(22 missing values generated)

. drop temp

.
. egen temp = sum(resg^2) if year > 1970
(22 missing values generated)

. gen statg = sqrt(temp/28)
(22 missing values generated)

. drop temp

.
. list statn statg if year == 1998

      statn      statg
1.   22.9897   22.26025

. drop statn statg

.
. egen temp = sum(resn^2) if year > 1980
(32 missing values generated)

. gen statn = sqrt(temp/18)
(32 missing values generated)

. drop temp

.
. egen temp = sum(resg^2) if year > 1980
(32 missing values generated)

. gen statg = sqrt(temp/18)
(32 missing values generated)

. drop temp

.
. list statn statg if year == 1998

      statn      statg
1.   24.40601   23.83822

. drop statn statg

.
. egen temp = sum(resn^2) if year > 1990
(42 missing values generated)

. gen statn = sqrt(temp/8)
(42 missing values generated)

```

```

. drop temp

.
. egen temp = sum(resg^2) if year > 1990
(42 missing values generated)

. gen statg = sqrt(temp/8)
(42 missing values generated)

. drop temp

.
. list statn statg if year == 1998

      statn      statg
1.  21.89617   22.27513

. drop statn statg

.
. egen temp = sum(resn^2) if year > 1993
(45 missing values generated)

. gen statn = sqrt(temp/5)
(45 missing values generated)

. drop temp

.
. egen temp = sum(resg^2) if year > 1993
(45 missing values generated)

. gen statg = sqrt(temp/5)
(45 missing values generated)

. drop temp

.
. list statn statg if year == 1998

      statn      statg
1.  21.26831   20.97222

. drop statn statg

.
. egen temp = sum(resn^2) if year > 1995
(47 missing values generated)

. gen statn = sqrt(temp/3)
(47 missing values generated)

. drop temp

.
. egen temp = sum(resg^2) if year > 1995
(47 missing values generated)

```

Gordon1.log

```
. gen statg = sqrt(temp/3)
(47 missing values generated)

. drop temp

.
. list statn statg if year == 1998

      statn      statg
1.  24.12185  26.15759

. drop statn statg

.
.
.
.
. log close
```

Gordon1a.log

```
.
. /*****
> *** Detrend the series
> *****/
.
. sort year

. gen dgdg = gdp[_n] - 1.03081*gdp[_n-1]
(1 missing value generated)

. gen dntek = nonhitek[_n] - 1.03002*nonhitek[_n - 1]
(1 missing value generated)

. gen dco2 = co2[_n] - 1.0225*co2[_n - 1]
(1 missing value generated)

.
. gen tgdp = 1.03081*gdp[_n-1]
(1 missing value generated)

. gen tntek = 1.03002*nonhitek[_n-1]
(1 missing value generated)

. gen tco2 = 1.0225*co2[_n-1]
(1 missing value generated)

.
. /*****
> *** Relation between off-trend deviations
> *****/
.
. reg dco2 dgdg
```

Source	SS	df	MS	Number of obs =	49
Model	33565.1549	1	33565.1549	F(1, 47) =	69.53
Residual	22688.6048	47	482.736271	Prob > F =	0.0000
Total	56253.7596	48	1171.95333	R-squared =	0.5967
				Adj R-squared =	0.5881
				Root MSE =	21.971

```
-----+-----
```

dco2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
dgdg	.2992746	.0358906	8.339	0.000	.227072 .3714771
_cons	-6.993502	3.13985	-2.227	0.031	-13.31007 -.6769384

```
-----+-----

. pred pdgdg
(1 missing value generated)

. gen pgdp = tco2 + pdgdg
(1 missing value generated)

.
. reg dco2 dntek
```

Gordon1a.log

Source	SS	df	MS	Number of obs =	49
Model	34132.9073	1	34132.9073	F(1, 47) =	72.52
Residual	22120.8523	47	470.656432	Prob > F =	0.0000
Total	56253.7596	48	1171.95333	R-squared =	0.6068
				Adj R-squared =	0.5984
				Root MSE =	21.695

dco2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
dntek	.2988663	.0350948	8.516	0.000	.2282647 .3694678
_cons	-4.730466	3.104713	-1.524	0.134	-10.97634 1.51541

```
. pred pdntek
(1 missing value generated)
```

```
. gen pntek = pdntek + tco2
(1 missing value generated)
```

```
. /* Results for prediction levels of CO2 */
```

```
. sort year
```

```
. list co2 pntek pgdp
```

	co2	pntek	pgdp
1.	595.6	.	.
2.	642.2	630.2947	627.7173
3.	681.5	674.1334	671.5198
4.	667.3	695.8825	693.2147
5.	684.9	686.1621	683.4855
6.	655.6	674.7549	672.0186
7.	726.3	688.5784	685.905
8.	749.7	731.6431	728.8984
9.	746.6	754.9797	752.225
10.	731.4	733.7436	730.9551
11.	760.3	770.3031	767.5907
12.	787.9	768.5967	765.8055
13.	793.7	795.9564	793.1516
14.	826.6	828.0547	825.2735
15.	858.6	849.705	846.8742
16.	895.2	894.7562	891.9175
17.	934.5	937.9261	935.0601
18.	985.7	981.1633	978.2606
19.	1011.5	997.1232	995.9282
20.	1069.2	1045.075	1042.15
21.	1115.6	1088.591	1085.729
22.	1149	1107.014	1103.613
23.	1162.5	1173.151	1170.169
24.	1223.7	1209.564	1206.849
25.	1277.9	1276.968	1274.147
26.	1233.1	1259.385	1256.037
27.	1197	1216.152	1212.794
28.	1269.5	1246.479	1243.767
29.	1307.4	1312.998	1310.495

Gordon1a.log

30.	1320.9	1361.342	1359.071
31.	1337.7	1342.474	1340.294
32.	1289.4	1315.92	1313.439
33.	1256	1302.719	1300.498
34.	1189.1	1206.361	1203.691
35.	1182.5	1222.646	1221.146
36.	1245.2	1259.205	1258.495
37.	1244.6	1276.666	1273.715
38.	1245.9	1268.575	1265.665
39.	1286.6	1266.845	1264.762
40.	1348.6	1322.46	1321.016
41.	1360.8	1379.265	1376.766
42.	1346.1	1354.578	1350.765
43.	1330.8	1298.502	1295.784
44.	1352.1	1345.213	1347.074
45.	1379.8	1360.731	1361.406
46.	1398.4	1401.792	1411.105
47.	1411.7	1390.927	1407.106
48.	1460.6	1422.651	1443.883
49.	1479.6	1474.57	1504.274
50.	1484	1492.223	1523.291

```
.
. gen resn = co2 - pn tek
(1 missing value generated)

. gen resg = co2 - pgdp
(1 missing value generated)

.
. egen temp = sum(resn^2) if year > 1949
(1 missing values generated)

. gen statn = sqrt(temp/49)
(1 missing value generated)

. drop temp

.
. egen temp = sum(resg^2) if year > 1949
(1 missing values generated)

. gen statg = sqrt(temp/49)
(1 missing value generated)

. drop temp

.
. list statn statg if year == 1998

      statn      statg
1.  21.24725    21.5182

. drop statn statg

.
. egen temp = sum(resn^2) if year > 1970
```

```

(22 missing values generated)

. gen statn = sqrt(temp/28)
(22 missing values generated)

. drop temp

. egen temp = sum(resg^2) if year > 1970
(22 missing values generated)

. gen statg = sqrt(temp/28)
(22 missing values generated)

. drop temp

.
. list statn statg if year == 1998

      statn      statg
1.   23.17799   22.88645

. drop statn statg

.
. egen temp = sum(resn^2) if year > 1980
(32 missing values generated)

. gen statn = sqrt(temp/18)
(32 missing values generated)

. drop temp

.
. egen temp = sum(resg^2) if year > 1980
(32 missing values generated)

. gen statg = sqrt(temp/18)
(32 missing values generated)

. drop temp

.
. list statn statg if year == 1998

      statn      statg
1.   24.43519   24.51792

. drop statn statg

.
. egen temp = sum(resn^2) if year > 1990
(42 missing values generated)

. gen statn = sqrt(temp/8)
(42 missing values generated)

```

```

. drop temp

.
. egen temp = sum(resg^2) if year > 1990
(42 missing values generated)

. gen statg = sqrt(temp/8)
(42 missing values generated)

. drop temp

.
. list statn statg if year == 1998

      statn      statg
1.   20.70695   22.92445

. drop statn statg

.
. egen temp = sum(resn^2) if year > 1993
(45 missing values generated)

. gen statn = sqrt(temp/5)
(45 missing values generated)

. drop temp

.
. egen temp = sum(resg^2) if year > 1993
(45 missing values generated)

. gen statg = sqrt(temp/5)
(45 missing values generated)

. drop temp

.
. list statn statg if year == 1998

      statn      statg
1.   19.87978   22.86717

. drop statn statg

.
. egen temp = sum(resn^2) if year > 1995
(47 missing values generated)

. gen statn = sqrt(temp/3)
(47 missing values generated)

. drop temp

.
. egen temp = sum(resg^2) if year > 1995
(47 missing values generated)

```

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```
. gen statg = sqrt(temp/3)
(47 missing values generated)

. drop temp

.
. list statn statg if year == 1998
      statn      .statg
1.  22.60535    28.47224

. drop statn statg

.
.
.
.
.
. log close
```

```

.
. /*****
> *** Create estimates just by comparing the growth rates
> *****/
.
. sort year

. gen rgdp = (gdp[_n] - gdp[_n-1])/gdp[_n-1]
(1 missing value generated)

. gen rco2 = (co2[_n] - co2[_n-1])/co2[_n-1]
(1 missing value generated)

. gen rntek = (nonhitek[_n] - nonhitek[_n-1])/nonhitek[_n-1]
(1 missing value generated)

.
. reg rco2 rgdp, noconstant

      Source |           SS          df           MS              Number of obs =      49
-----+-----+-----+-----+-----+-----+-----+-----
      Model |    .048042182         1    .048042182              F( 1,    48) =   100.34
    Residual |    .022982447        48    .000478801              Prob > F      =    0.0000
-----+-----+-----+-----+-----+-----+-----
      Total |    .07102463         49    .001449482              R-squared     =    0.6764
                                              Adj R-squared =    0.6697
                                              Root MSE     =    .02188

-----+-----+-----+-----+-----+-----+-----
      rco2 |           Coef.      Std. Err.      t    P>|t|     [95% Conf. Interval]
-----+-----+-----+-----+-----+-----+-----
      rgdp |    .7406105      .073936     10.017   0.000     .5919522     .8892688
-----+-----+-----+-----+-----+-----+-----

. pred prgdp
(1 missing value generated)

.
. reg rco2 rntek, noconstant

      Source |           SS          df           MS              Number of obs =      49
-----+-----+-----+-----+-----+-----+-----
      Model |    .048938013         1    .048938013              F( 1,    48) =   106.36
    Residual |    .022086617        48    .000460138              Prob > F      =    0.0000
-----+-----+-----+-----+-----+-----+-----
      Total |    .07102463         49    .001449482              R-squared     =    0.6890
                                              Adj R-squared =    0.6826
                                              Root MSE     =    .02145

-----+-----+-----+-----+-----+-----+-----
      rco2 |           Coef.      Std. Err.      t    P>|t|     [95% Conf. Interval]
-----+-----+-----+-----+-----+-----+-----
      rntek |    .7683947      .0745084     10.313   0.000     .6185856     .9182039
-----+-----+-----+-----+-----+-----+-----

. pred prntek
(1 missing value generated)

.
. /* Since 1949 */

```

```
. sort year
```

```
. gen pgdp = co2[_n-1]*(1+prgdp[_n])
(1 missing value generated)
```

```
. gen pntek = co2[_n-1]*(1+prntek[_n])
(1 missing value generated)
```

```
. gen resg = co2 - pgdp
(1 missing value generated)
```

```
. gen resn = co2 - pntek
(1 missing value generated)
```

```
. list year co2 pntek pgdp
```

	year	co2	pntek	pgdp
1.	1949	595.6	.	.
2.	1950	642.2	636.2688	634.7983
3.	1951	681.5	679.777	678.4183
4.	1952	667.3	701.0391	700.3326
5.	1953	684.9	690.8751	690.0226
6.	1954	655.6	681.2076	681.3411
7.	1955	726.3	691.4364	690.1406
8.	1956	749.7	737.2045	736.8102
9.	1957	746.6	760.5143	760.1233
10.	1958	731.4	740.8038	741.0134
11.	1959	760.3	773.1099	771.6017
12.	1960	787.9	774.2299	773.7262
13.	1961	793.7	801.6517	801.1544
14.	1962	826.6	830.7252	829.3864
15.	1963	858.6	853.6641	852.6855
16.	1964	895.2	897.0081	895.6193
17.	1965	934.5	939.0616	937.4756
18.	1966	985.7	981.3807	979.6855
19.	1967	1011.5	1003.463	1004.253
20.	1968	1069.2	1047.704	1046.419
21.	1969	1115.6	1093.917	1093.168
22.	1970	1149	1116.808	1116.574
23.	1971	1162.5	1178.143	1177.152
24.	1972	1223.7	1211.19	1209.669
25.	1973	1277.9	1277.874	1276.085
26.	1974	1233.1	1271.605	1271.834
27.	1975	1197	1228.907	1229.04
28.	1976	1269.5	1246.333	1244.828
29.	1977	1307.4	1314.546	1313.414
30.	1978	1320.9	1360.642	1359.375
31.	1979	1337.7	1348.784	1348.621
32.	1980	1289.4	1333.375	1334.362
33.	1981	1256	1311.225	1311.272
34.	1982	1189.1	1234.601	1236.216
35.	1983	1182.5	1224.209	1224.057
36.	1984	1245.2	1244.775	1243.83
37.	1985	1244.6	1279.068	1278.104

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38.	1986	1245.9	1273.736	1273.031
39.	1987	1286.6	1273.249	1273.106
40.	1988	1348.6	1323.173	1322.981
41.	1989	1360.8	1382.733	1382.113
42.	1990	1346.1	1373.412	1373.153
43.	1991	1330.8	1335.336	1336.856
44.	1992	1352.1	1355.331	1357.55
45.	1993	1379.8	1373.623	1375.385
46.	1994	1398.4	1409.179	1415.161
47.	1995	1411.7	1411.549	1422.057
48.	1996	1460.6	1435.305	1447.743
49.	1997	1479.6	1486.302	1503.128
50.	1998	1484	1504.826	1522.122

```

.
. /* How well do the models fit? */
.
. egen temp = sum(resg^2) if year > 1949
(1 missing values generated)

. gen statg = sqrt(temp/49)
(1 missing value generated)

. drop temp

. egen temp = sum(resn^2) if year > 1949
(1 missing values generated)

. gen statn = sqrt(temp/49)
(1 missing value generated)

. drop temp

. list statn statg if year == 1998

      statn      statg
1.  22.74854  23.44448

. drop statn statg

.
. egen temp = sum(resg^2) if year > 1970
(22 missing values generated)

. gen statg = sqrt(temp/28)
(22 missing values generated)

. drop temp

. egen temp = sum(resn^2) if year > 1970
(22 missing values generated)

. gen statn = sqrt(temp/28)
(22 missing values generated)

. drop temp

```

```

. list statn statg if year == 1998
      statn      statg
1.  26.25714   27.21674

. drop statn statg

.
. egen temp = sum(resg^2) if year > 1980
(32 missing values generated)

. gen statg = sqrt(temp/18)
(32 missing values generated)

. drop temp

. egen temp = sum(resn^2) if year > 1980
(32 missing values generated)

. gen statn = sqrt(temp/18)
(32 missing values generated)

. drop temp

. list statn statg if year == 1998
      statn      statg
1.  26.0112    27.41978

. drop statn statg

.
. egen temp = sum(resg^2) if year > 1990
(42 missing values generated)

. gen statg = sqrt(temp/8)
(42 missing values generated)

. drop temp

. egen temp = sum(resn^2) if year > 1990
(42 missing values generated)

. gen statn = sqrt(temp/8)
(42 missing values generated)

. drop temp

. list statn statg if year == 1998
      statn      statg
1.  12.76659   18.18734

. drop statn statg

.
. egen temp = sum(resg^2) if year > 1993

```

```

(45 missing values generated)

. gen statg = sqrt(temp/5)
(45 missing values generated)

. drop temp

. egen temp = sum(resn^2) if year > 1993
(45 missing values generated)

. gen statn = sqrt(temp/5)
(45 missing values generated)

. drop temp

. list statn statg if year == 1998

      statn      statg
1.   15.71439   22.62903

. drop statn statg

.
. egen temp = sum(resg^2) if year > 1995
(47 missing values generated)

. gen statg = sqrt(temp/3)
(47 missing values generated)

. drop temp

. egen temp = sum(resn^2) if year > 1995
(47 missing values generated)

. gen statn = sqrt(temp/3)
(47 missing values generated)

. drop temp

. list statn statg if year == 1998

      statn      statg
1.   19.30882   26.90839

. drop statn statg

.
.
.
. log close

```

```

.
. /*****
> *** Detrend the series
> *****/

.
. sort year

. gen dgdp = gdp[_n] - 1.03081*gdp[_n-1]
(1 missing value generated)

. gen dntek = nonhitek[_n] - 1.03002*nonhitek[_n - 1]
(1 missing value generated)

. gen dco2 = co2[_n] - 1.01259*co2[_n - 1]
(1 missing value generated)

.
. gen tgdgdp = 1.03081*gdp[_n-1]
(1 missing value generated)

. gen tntek = 1.03002*nonhitek[_n-1]
(1 missing value generated)

. gen tco2 = 1.01259*co2[_n-1]
(1 missing value generated)

.
. /*****
> *** Relation between off-trend deviations
> *****/

.
. reg dco2 dgdp


```

Source	SS	df	MS	Number of obs =	49
Model	32052.7091	1	32052.7091	F(1, 47) =	70.07
Residual	21501.1128	47	457.470485	Prob > F =	0.0000
Total	53553.8219	48	1115.70462	R-squared =	0.5985
				Adj R-squared =	0.5900
				Root MSE =	21.389

```

-----
      dco2 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-----+-----
      dgdp |   .2924542   .0349387     8.370   0.000     .2221665   .3627418
      cons |   3.783005   3.056578     1.238   0.222    -2.366037   9.932047
-----+-----

.
. pred pdgdp
(1 missing value generated)

. gen pgdp = tco2 + pdgdp
(1 missing value generated)

.
. reg dco2 dntek

```

Source	SS	df	MS	Number of obs	=	49
Model	31750.529	1	31750.529	F(1, 47)	=	68.44
Residual	21803.2929	47	463.899849	Prob > F	=	0.0000
Total	53553.8219	48	1115.70462	R-squared	=	0.5929
				Adj R-squared	=	0.5842
				Root MSE	=	21.538

dco2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
dntek	.2882476	.0348419	8.273	0.000	.2181547	.3583406
_cons	-5.97446	3.082347	1.938	0.059	-.2264221	12.17534

```

. pred pdntek
(1 missing value generated)

. gen pntek = pdntek + tco2
(1 missing value generated)

.
. sort year

. gen rco2 = (co2[_n] - co2[_n-1])/co2[_n-1]
(1 missing value generated)

. gen rpgdp = (pgdp[_n] - pgdp[_n-1])/pgdp[_n-1]
(2 missing values generated)

. gen rpntek = (pntek[_n] - pntek[_n-1])/pntek[_n-1]
(2 missing values generated)

.
. /* Results for prediction rates of CO2 */
.
. sort year

. list rco2 rpntek rpgdp

      rco2      rpntek      rpgdp
1.      .          .          .
2.  .0782405          .          .
3.  .0611959  .0686127  .068715
4. -.0208364  .0324851  .0321672
5.  .026375  -.0139348 -.0139101
6.  -.04278  -.0152721 -.0159572
7.  .1078402  .0184841  .0194793
8.  .0322181  .0627229  .0622912
9.  -.004135  .0314476  .0315417
10. -.0203589 -.0271108 -.0275581
11.  .0395132  .0472385  .0484373
12.  .0363015 -.0011417 -.0017618
13.  .0073613  .0351294  .0352239
14.  .0414514  .038936  .0395198
15.  .0387128  .0262008  .0260345
16.  .0426276  .0519973  .0523341
17.  .0439008  .0475382  .047722

```

```

18. .0547887 .0455259 .0456475
19. .0261743 .0170606 .0183338
20. .0570439 .0470106 .0456482
21. .043397 .0416134 .0415891
22. .0299391 .0174468 .016666
23. .0117493 .0583822 .0593164
24. .0526451 .0302605 .030803
25. .044292 .0551607 .0552321
26. -.0350576 -.0121827 -.0133412
27. -.0292758 -.0340604 -.0341449
28. .0605681 .0232686 .0245682
29. .0298543 .0530964 .0532802
30. .0103258 .0363449 .0366726
31. .0127185 -.0131366 -.0133966
32. -.0361067 -.0187781 -.0194445
33. -.0259035 -.0106525 -.0101314
34. -.0532643 -.0721094 -.0731845
35. -.0055504 .0115467 .0134263
36. .0530232 .0287316 .0298474
37. -.0004818 .0147237 .0125075
38. .0010446 -.006134 -.0061912
39. .0326671 -.0012896 -.0006844
40. .048189 .0432422 .0439487
41. .0090465 .0427464 .0419406
42. -.0108025 .0170646 -.0183727
43. -.0113661 -.0402615 -.0399789
44. .0160054 .0343845 .0385479
45. .0204867 .0115619 .0106267
46. .0134802 .0296871 .0360073
47. .0095108 -.0071394 -.0025988
48. .0346391 .0222814 .0257175
49. .0130084 .0361745 .0414225
50. .0029738 .0119131 .0125572

```

```

. gen resn = rco2 - rpntek
(2 missing values generated)

```

```

. gen resg = rco2 - rpgdp
(2 missing values generated)

```

```

. egen temp = sum(resn^2) if year > 1949
(1 missing values generated)

```

```

. gen statn = sqrt(temp/49)
(1 missing value generated)

```

```

. drop temp

```

```

. egen temp = sum(resg^2) if year > 1949
(1 missing values generated)

```

```

. gen statg = sqrt(temp/49)
(1 missing value generated)

```

```

. drop temp

.
. list statn statg if year == 1998

      statn      statg
1.   .0255614   .0256432

. drop statn statg

.
. egen temp = sum(resn^2) if year > 1970
(22 missing values generated)

. gen statn = sqrt(temp/28)
(22 missing values generated)

. drop temp

.
. egen temp = sum(resg^2) if year > 1970
(22 missing values generated)

. gen statg = sqrt(temp/28)
(22 missing values generated)

. drop temp

.
. list statn statg if year == 1998

      statn      statg
1.   .022026   .0223157

. drop statn statg

.
. egen temp = sum(resn^2) if year > 1980
(32 missing values generated)

. gen statn = sqrt(temp/18)
(32 missing values generated)

. drop temp

.
. egen temp = sum(resg^2) if year > 1980
(32 missing values generated)

. gen statg = sqrt(temp/18)
(32 missing values generated)

. drop temp

.
. list statn statg if year == 1998

```

```

      statn      statg
1.   .0192453   .0198474

. drop statn statg

.
. egen temp = sum(resn^2) if year > 1990
(42 missing values generated)

. gen statn = sqrt(temp/8)
(42 missing values generated)

. drop temp

.
. egen temp = sum(resg^2) if year > 1990
(42 missing values generated)

. gen statg = sqrt(temp/8)
(42 missing values generated)

. drop temp

.
. list statn statg if year == 1998

      statn      statg
1.   .0178941   .019548

. drop statn statg

.
. egen temp = sum(resn^2) if year > 1993
(45 missing values generated)

. gen statn = sqrt(temp/5)
(45 missing values generated)

. drop temp

.
. egen temp = sum(resg^2) if year > 1993
(45 missing values generated)

. gen statg = sqrt(temp/5)
(45 missing values generated)

. drop temp

.
. list statn statg if year == 1998

      statn      statg
1.   .0161814   .0180716

. drop statn statg

```

```
.  
. egen temp = sum(resn^2) if year > 1995  
(47 missing values generated)  
  
. gen statn = sqrt(temp/3)  
(47 missing values generated)  
  
. drop temp  
  
.   
. egen temp = sum(resg^2) if year > 1995  
(47 missing values generated)  
  
. gen statg = sqrt(temp/3)  
(47 missing values generated)  
  
. drop temp  
  
.   
. list statn statg if year == 1998  
  
      statn      statg  
1.   .0160135   .0180629  
  
. drop statn statg  
  
.   
.   
.   
.   
.   
. log close
```

```
.
. /*****
> *** Create estimates just by comparing the growth rates
> *****/
```

```
. sort year
```

```
. gen rgdp = (gdp[_n] - gdp[_n-1])/gdp[_n-1]
(1 missing value generated)
```

```
. gen rco2 = (co2[_n] - co2[_n-1])/co2[_n-1]
(1 missing value generated)
```

```
. gen rntek = (nonhitek[_n] - nonhitek[_n-1])/nonhitek[_n-1]
(1 missing value generated)
```

```
. reg rco2 rgdp, noconstant
```

Source	SS	df	MS	Number of obs =	49
Model	.048042182	1	.048042182	F(1, 48) =	100.34
Residual	.022982447	48	.000478801	Prob > F =	0.0000
Total	.07102463	49	.001449482	R-squared =	0.6764
				Adj R-squared =	0.6697
				Root MSE =	.02188

rco2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
rgdp	.7406105	.073936	10.017	0.000	.5919522 .8892688

```
. pred prgdp
(1 missing value generated)
```

```
. reg rco2 rntek, noconstant
```

Source	SS	df	MS	Number of obs =	49
Model	.048938013	1	.048938013	F(1, 48) =	106.36
Residual	.022086617	48	.000460138	Prob > F =	0.0000
Total	.07102463	49	.001449482	R-squared =	0.6890
				Adj R-squared =	0.6826
				Root MSE =	.02145

rco2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
rntek	.7683947	.0745084	10.313	0.000	.6185856 .9182039

```
. pred prntek
(1 missing value generated)
```

```
. gen resg = rco2 - prgdp
```

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(1 missing value generated)

```
. gen resn = rco2 - prntek
(1 missing value generated)
```

```
. list year rco2 prntek prgdp
```

	year	rco2	prntek	prgdp
1.	1949	.	.	.
2.	1950	.0782405	.0682821	.0658131
3.	1951	.0611959	.058513	.0563972
4.	1952	-.0208364	.0286708	.0276341
5.	1953	.026375	.035329	.0340516
6.	1954	-.04278	-.0053911	-.0051962
7.	1955	.1078402	.0546621	.0526856
8.	1956	.0322181	.0150138	.014471
9.	1957	-.004135	.0144248	.0139033
10.	1958	-.0203589	-.0077634	-.0074827
11.	1959	.0395132	.0570274	.0549653
12.	1960	.0363015	.0183216	.0176591
13.	1961	.0073613	.0174535	.0168224
14.	1962	.0414514	.0466489	.0449621
15.	1963	.0387128	.0327416	.0315577
16.	1964	.0426276	.0447335	.043116
17.	1965	.0439008	.0489964	.0472248
18.	1966	.0547887	.0501666	.0483526
19.	1967	-.0261743	.0180205	.0188217
20.	1968	.0570439	.035792	.034522
21.	1969	.043397	.0231177	.0224169
22.	1970	.0299391	.0010827	.0008729
23.	1971	.0117493	.0253635	.024501
24.	1972	.0526451	.0418841	.0405753
25.	1973	.044292	.0442704	.0428087
26.	1974	-.0350576	-.0049259	-.0047467
27.	1975	-.0292758	-.0034006	-.0032927
28.	1976	.0605681	.0412139	.0399565
29.	1977	.0298543	.0354834	.0345917
30.	1978	.0103258	.0407237	.0397548
31.	1979	.0127185	.0211096	.0209864
32.	1980	-.0361067	-.003233	-.0024951
33.	1981	-.0259035	.0169263	.0169627
34.	1982	-.0532643	-.0170374	-.0157514
35.	1983	-.0055504	.0295257	.0293981
36.	1984	.0530232	.0526641	.0518645
37.	1985	-.0004818	.0271991	.0264251
38.	1986	.0010446	.0234097	.0228437
39.	1987	.0326671	.0219512	.0218362
40.	1988	.048189	.0284263	.0282768
41.	1989	.0090465	.02531	.0248503
42.	1990	-.0108025	.0092679	.0090774
43.	1991	-.0113661	-.0079963	-.0068674
44.	1992	.0160054	.0184333	.0201008
45.	1993	.0204867	.015918	.0172213
46.	1994	.0134802	.0212925	.0256274
47.	1995	.0095108	.0094028	.0169168
48.	1996	.0346391	.0167209	.0255315

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```
49.      1997      .0130084      .0175969      .029117
50.      1998      .0029738      .0170493      .0287389
```

```
.
. /* How well do the models fit? */
.
. egen temp = sum(resg^2) if year > 1949
(1 missing values generated)

. gen statg = sqrt(temp/49)
(1 missing value generated)

. drop temp

. egen temp = sum(resn^2) if year > 1949
(1 missing values generated)

. gen statn = sqrt(temp/49)
(1 missing value generated)

. drop temp

. list statn statg if year == 1998

      statn      statg
1.   .0212308   .0216571

. drop statn statg

.
. egen temp = sum(resg^2) if year > 1970
(22 missing values generated)

. gen statg = sqrt(temp/28)
(22 missing values generated)

. drop temp

. egen temp = sum(resn^2) if year > 1970
(22 missing values generated)

. gen statn = sqrt(temp/28)
(22 missing values generated)

. drop temp

. list statn statg if year == 1998

      statn      statg
1.   .0205425   .0211268

. drop statn statg

.
. egen temp = sum(resg^2) if year > 1980
(32 missing values generated)
```

```

. gen statg = sqrt(temp/18)
(32 missing values generated)

. drop temp

. egen temp = sum(resn^2) if year > 1980
(32 missing values generated)

. gen statn = sqrt(temp/18)
(32 missing values generated)

. drop temp

. list statn statg if year == 1998

      statn      statg
1.   .0203522   .0211894

. drop statn statg

.
. egen temp = sum(resg^2) if year > 1990
(42 missing values generated)

. gen statg = sqrt(temp/8)
(42 missing values generated)

. drop temp

. egen temp = sum(resn^2) if year > 1990
(42 missing values generated)

. gen statn = sqrt(temp/8)
(42 missing values generated)

. drop temp

. list statn statg if year == 1998

      statn      statg
1.   .0089401   .0125318

. drop statn statg

.
. egen temp = sum(resg^2) if year > 1993
(45 missing values generated)

. gen statg = sqrt(temp/5)
(45 missing values generated)

. drop temp

. egen temp = sum(resn^2) if year > 1993
(45 missing values generated)

. gen statn = sqrt(temp/5)

```

Gordon4.log

```
(45 missing values generated)

. drop temp

. list statn statg if year == 1998

      statn      statg
1.   .0109662   .0155479

. drop statn statg

.
. egen temp = sum(resg^2) if year > 1995
(47 missing values generated)

. gen statg = sqrt(temp/3)
(47 missing values generated)

. drop temp

. egen temp = sum(resn^2) if year > 1995
(47 missing values generated)

. gen statn = sqrt(temp/3)
(47 missing values generated)

. drop temp

. list statn statg if year == 1998

      statn      statg
1.   .0134194   .0183147

. drop statn statg

.
.
.
. log close
```

```

.
. /*****
> *** Detrend the series
> *****/
.
. sort year

. gen dgdgdp = gdp[_n] - 1.03081*gdp[_n-1]
(14 missing values generated)

. gen dntek = nonhitek[_n] - 1.03002*nonhitek[_n - 1]
(14 missing values generated)

. gen dco2 = co2[_n] - 1.01259*co2[_n - 1]
(14 missing values generated)

.
. gen tgdp = 1.03081*gdp[_n-1]
(14 missing values generated)

. gen tntek = 1.03002*nonhitek[_n-1]
(14 missing values generated)

. gen tco2 = 1.01259*co2[_n-1]
(14 missing values generated)

.
. gen cheat = htdgyear[_n] - htdgyear[_n-1]
(14 missing values generated)

. gen ccool = cldgyear[_n] - cldgyear[_n-1]
(14 missing values generated)

. gen cfossil = ffppcomr[_n-1] - ffppcomr[_n-2]
(15 missing values generated)

. gen celec = eleprrer[_n] - eleprrer[_n-1]
(25 missing values generated)

. gen celec1 = eleprrer[_n-1] - eleprrer[_n-2]
(26 missing values generated)

. gen cnumref = numrefin[_n] - numrefin[_n-1]
(14 missing values generated)

. gen crefcap = refincap[_n] - refincap[_n-1]
(14 missing values generated)

. gen cnetsum = netsumca[_n] - netsumca[_n-1]
(15 missing values generated)

. gen cextra = extralos[_n] - extralos[_n-1]
(14 missing values generated)

. gen cpdctu = cpvtyund[_n] - cpvtyund[_n-1]
(15 missing values generated)

```

Gordon7.log

```
. gen cpdcts = cpvtysur[_n] - cpvtysur[_n-1]
(15 missing values generated)
```

```
. gen cnumele = numeleut[_n] - numeleut[_n-1]
(14 missing values generated)
```

```
. gen propcoal = hrscoal/hrstotal
(13 missing values generated)
```

```
. gen cprpcoal = propcoal[_n] - propcoal[_n-1]
(14 missing values generated)
```

```
.
. /*****
> *** Total GDP
> *****/
```

```
. reg celec dgdp cheat ccool cfossl cnetsum cnumele cprpcoal
```

Source	SS	df	MS	Number of obs =	37
Model	2.02370562	7	.289100803	F(7, 29) =	3.96
Residual	2.11629602	29	.072975725	Prob > F =	0.0038
Total	4.14000164	36	.115000046	R-squared =	0.4888
				Adj R-squared =	0.3654
				Root MSE =	.27014

celec	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
dgdp	-.0008921	.0007329	-1.217	0.233	-.002391 .0006068
cheat	.0002267	.0002494	0.909	0.371	-.0002834 .0007367
ccool	.0003031	.0005463	0.555	0.583	-.0008141 .0014204
cfossl	.1388691	.1650169	0.842	0.407	-.1986282 .4763665
cnetsum	.0117409	.0055057	2.132	0.042	.0004805 .0230014
cnumele	-.0030008	.0019333	-1.552	0.131	-.0069549 .0009532
cprpcoal	6.417693	3.280498	1.956	0.060	-.2916793 13.12706
_cons	-.0898468	.1257407	-0.715	0.481	-.3470153 .1673218

```
. *pred celechat
(16 missing values generated)
```

```
. reg dco2 dgdp cheat ccool cfossl celechat
```

Source	SS	df	MS	Number of obs =	47
Model	35741.4112	5	7148.28223	F(5, 41) =	18.03
Residual	16257.7145	41	396.529622	Prob > F =	0.0000
Total	51999.1256	46	1130.41577	R-squared =	0.6873
				Adj R-squared =	0.6492
				Root MSE =	19.913

dco2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
dgdp	.2377043	.0443614	5.358	0.000	.1481146 .327294

Gordon7.log

```

      cheat |      .028875      .0140052      2.062      0.046      .000591      .057159
      ccool |      .0093759      .0302753      0.310      0.758      -.0517663      .0705182
      cfossl |     -12.4199      13.24958      -0.937      0.354      -39.17798      14.33818
celechat |     -28.52491      21.57016      -1.322      0.193      -72.08674      15.03692
      _cons |      1.691277      3.546557      0.477      0.636      -5.471141      8.853694
-----

```

```
. drop celechat
```

```
. reg dco2 dgdp cheat ccool cfossl celecl
```

Source	SS	df	MS	Number of obs =	37
Model	33372.7415	5	6674.54829	F(5, 31) =	19.55
Residual	10583.0028	31	341.387186	Prob > F =	0.0000
				R-squared =	0.7592
				Adj R-squared =	0.7204
Total	43955.7442	36	1220.9929	Root MSE =	18.477

dco2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
dgdp	.2578624	.0347962	7.411	0.000	.1868951 .3288296
cheat	.0388236	.0144915	2.679	0.012	.0092679 .0683792
ccool	.0237305	.0304586	0.779	0.442	-.0383902 .0858512
cfossl	-5.220144	11.82884	-0.441	0.662	-29.34521 18.90492
celecl	-33.83284	10.53499	-3.211	0.003	-55.31909 -12.34659
_cons	.6044664	3.235702	0.187	0.853	-5.994791 7.203723

```
. reg dco2 dgdp cheat ccool celecl
```

Source	SS	df	MS	Number of obs =	37
Model	33306.2558	4	8326.56394	F(4, 32) =	25.02
Residual	10649.4885	32	332.796515	Prob > F =	0.0000
				R-squared =	0.7577
				Adj R-squared =	0.7274
Total	43955.7442	36	1220.9929	Root MSE =	18.243

dco2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
dgdp	.2632785	.0321476	8.190	0.000	.197796 .3287611
cheat	.0396644	.0141838	2.796	0.009	.0107729 .0685559
ccool	.025034	.0299312	0.836	0.409	-.0359338 .0860018
celecl	-36.05874	9.131951	-3.949	0.000	-54.65992 -17.45757
_cons	.33289	3.136419	0.106	0.916	-6.055787 6.721567

```
. reg celecl dgdp cheat ccool celecl cnetsum cnumele cprpcoal
```

Source	SS	df	MS	Number of obs =	36
Model	2.16324124	7	.309034463	F(7, 28) =	4.38
				Prob > F =	0.0022

Gordon7.log

Residual		1.9767604	28	.070598586		R-squared	=	0.5225
-----+-----								
Total		4.14000164	35	.118285761		Adj R-squared	=	0.4032
						Root MSE	=	.2657

celec		Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
-----+-----						
dgdp		-.0010876	.0007169	-1.517	0.140	-.0025562 .000381
cheat		.0001321	.0002568	0.514	0.611	-.0003939 .000658
ccool		.000145	.0005506	0.263	0.794	-.0009827 .0012728
celec1		.2502998	.1521549	1.645	0.111	-.0613754 .561975
cnetsum		.0111833	.0052328	2.137	0.041	.0004645 .0219021
cnumele		-.002413	.0019403	-1.244	0.224	-.0063875 .0015616
cprpcoal		4.865457	3.410382	1.427	0.165	-2.120394 11.85131
_cons		-.0927227	.1244584	-0.745	0.462	-.3476641 .1622187

```
. pred celechat
(27 missing values generated)
```

```
. reg dco2 dgdp cheat ccool celec1 celechat
```

Source		SS	df	MS		Number of obs	=	36
-----+-----								
Model		33820.978	5	6764.19561		F(5, 30)	=	20.68
Residual		9814.64185	30	327.154728		Prob > F	=	0.0000
-----+-----								
Total		43635.6199	35	1246.732		R-squared	=	0.7751
						Adj R-squared	=	0.7376
						Root MSE	=	18.087

dco2		Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
-----+-----						
dgdp		.2294116	.0532025	4.312	0.000	.1207576 .3380655
cheat		.0308931	.015098	2.046	0.050	.0000588 .0617273
ccool		.0235295	.0315284	0.746	0.461	-.04086 .0879191
celec1		-25.66314	14.46248	-1.774	0.086	-55.19947 3.87319
celechat		-25.12219	27.29183	-0.921	0.365	-80.85955 30.61517
_cons		-.6452895	3.582612	-0.180	0.858	-7.961959 6.67138

```
. drop celechat
```

```
. reg celec dgdp cheat ccool cfossil celec1 cnetsum cnumele cprpcoal
```

Source		SS	df	MS		Number of obs	=	36
-----+-----								
Model		2.16614911	8	.270768639		F(8, 27)	=	3.70
Residual		1.97385253	27	.073105649		Prob > F	=	0.0049
-----+-----								
Total		4.14000164	35	.118285761		R-squared	=	0.5232
						Adj R-squared	=	0.3820
						Root MSE	=	.27038

celec		Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
-----+-----						

Gordon7.log

```

      dgdg | -.0010593 .0007433 -1.425 0.166 -.0025844 .0004659
      cheat | .0001332 .0002613 0.509 0.615 -.0004031 .0006694
      ccool | .0001464 .0005603 0.261 0.796 -.0010033 .001296
      cfoss1 | .0360911 .180962 0.199 0.843 -.3352122 .4073944
      celecl | .2364917 .1696072 1.394 0.175 -.1115136 .584497
      cnetsum | .0108685 .0055538 1.957 0.061 -.0005269 .022264
      cnumele | -.0023674 .0019876 -1.191 0.244 -.0064456 .0017108
      cprpcoal | 4.882938 3.471514 1.407 0.171 -2.240021 12.0059
      _cons | -.0927582 .1266491 -0.732 0.470 -.3526206 .1671043
-----

```

```

. pred celechat
(27 missing values generated)

```

```

. reg dco2 dgdg cheat ccool cfoss1 celecl celechat

```

Source	SS	df	MS	Number of obs =	36
Model	33844.5498	6	5640.75831	F(6, 29) =	16.71
Residual	9791.07003	29	337.623105	Prob > F =	0.0000
Total	43635.6199	35	1246.732	R-squared =	0.7756
				Adj R-squared =	0.7292
				Root MSE =	18.375

dco2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
dgdg	.2285971	.0539339	4.238	0.000	.1182898 .3389043
cheat	.0306699	.0153634	1.996	0.055	-.0007517 .0620915
ccool	.0232921	.0320218	0.727	0.473	-.0421998 .088784
cfoss1	-2.109617	12.27415	-0.172	0.865	-27.21307 22.99384
celecl	-25.13118	14.77703	-1.701	0.100	-55.35361 5.091239
celechat	-24.23266	28.83165	-0.840	0.408	-83.2 34.73467
_cons	-.4804817	3.814464	-0.126	0.901	-8.281936 7.320973

```

. drop celechat

```

```

. /*****
> *** Non-hitek
> *****/

```

```

. reg celec dntek cheat ccool cfoss1 cnetsum cnumele cprpcoal

```

Source	SS	df	MS	Number of obs =	37
Model	2.06362753	7	.294803932	F(7, 29) =	4.12
Residual	2.07637411	29	.071599107	Prob > F =	0.0030
Total	4.14000164	36	.115000046	R-squared =	0.4985
				Adj R-squared =	0.3774
				Root MSE =	.26758

celecl	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
celecl					

Gordon7.log

```

dntek | -.0010018 .0006967 -1.438 0.161 -.0024267 .0004231
cheat | .0002345 .0002419 0.969 0.340 -.0002603 .0007292
ccool | .0003174 .0005209 0.609 0.547 -.000748 .0013828
cfossil | .1175564 .1654492 0.711 0.483 -.2208253 .4559381
cnetsum | .0131762 .0054057 2.437 0.021 .0021202 .0242322
cnumele | -.0029917 .001791 -1.670 0.106 -.0066547 .0006714
cprpcoal | 6.498688 3.23799 2.007 0.054 -.1237451 13.12112
_cons | -.1190833 .130416 -0.913 0.369 -.385814 .1476474
-----

```

```

. pred celechat
(16 missing values generated)

```

```

.
. reg dco2 dntek cheat ccool cfossil celechat

```

Source	SS	df	MS	Number of obs =	47
Model	34940.8209	5	6988.16419	F(5, 41) =	16.80
Residual	17058.3047	41	416.056212	Prob > F =	0.0000
Total	51999.1256	46	1130.41577	R-squared =	0.6720
				Adj R-squared =	0.6319
				Root MSE =	20.397

dco2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
dntek	.2172347	.0434202	5.003	0.000	.1295458 .3049236
cheat	.0286785	.0143515	1.998	0.052	-.0003048 .0576619
ccool	.002794	.0309455	0.090	0.928	-.0597018 .0652897
cfossil	-10.05766	13.49516	-0.745	0.460	-37.31168 17.19637
celechat	-38.11767	21.08107	-1.808	0.078	-80.69176 4.45641
_cons	1.867695	3.702321	0.504	0.617	-5.609295 9.344685

```

.
. drop celechat

```

```

.
. reg dco2 dntek cheat ccool cfossil celecl

```

Source	SS	df	MS	Number of obs =	37
Model	32648.5544	5	6529.71088	F(5, 31) =	17.90
Residual	11307.1898	31	364.748059	Prob > F =	0.0000
Total	43955.7442	36	1220.9929	R-squared =	0.7428
				Adj R-squared =	0.7013
				Root MSE =	19.098

dco2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
dntek	.2507462	.0356701	7.030	0.000	.1779965 .323496
cheat	.0317317	.0149388	2.124	0.042	.0012639 .0621995
ccool	.0226735	.0314745	0.720	0.477	-.0415193 .0868662
cfossil	-6.415404	12.1974	-0.526	0.603	-31.29216 18.46135
celecl	-34.14393	10.89164	-3.135	0.004	-56.35757 -11.93028
_cons	3.127515	3.355105	0.932	0.358	-3.715267 9.970297

Gordon7.log

```
. reg dco2 dntek cheat ccool celecl
```

Source	SS	df	MS	Number of obs =	37
Model	32547.6508	4	8136.9127	F(4, 32) =	22.82
Residual	11408.0934	32	356.50292	Prob > F =	0.0000
				R-squared =	0.7405
				Adj R-squared =	0.7080
Total	43955.7442	36	1220.9929	Root MSE =	18.881

dco2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
dntek	.2572499	.033078	7.777	0.000	.1898723	.3246276
cheat	.0325861	.0146814	2.220	0.034	.0026812	.0624911
ccool	.0242558	.0309743	0.783	0.439	-.0388368	.0873484
celecl	-36.90079	9.438942	-3.909	0.000	-56.12728	-17.67429
_cons	2.857583	3.277932	0.872	0.390	-3.819345	9.534512

```
. reg celec dntek cheat ccool celecl cnetsum cnumele cprpcoal
```

Source	SS	df	MS	Number of obs =	36
Model	2.21176366	7	.315966238	F(7, 28) =	4.59
Residual	1.92823798	28	.068865642	Prob > F =	0.0016
				R-squared =	0.5342
				Adj R-squared =	0.4178
Total	4.14000164	35	.118285761	Root MSE =	.26242

celecl	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
dntek	-.0011729	.00067	-1.750	0.091	-.0025454	.0001997
cheat	.0001452	.0002476	0.587	0.562	-.0003619	.0006524
ccool	.0001714	.000522	0.328	0.745	-.000898	.0012407
celecl	.2446516	.149897	1.632	0.114	-.0623984	.5517015
cnetsum	.0126666	.0050349	2.516	0.018	.0023531	.0229802
cnumele	-.0024028	.0017949	-1.339	0.191	-.0060794	.0012738
cprpcoal	4.930698	3.362896	1.466	0.154	-1.957882	11.81928
_cons	-.1251624	.1288347	-0.971	0.340	-.3890684	.1387435

```
. pred celechat
(27 missing values generated)
```

```
. reg dco2 dntek cheat ccool celecl celechat
```

Source	SS	df	MS	Number of obs =	36
Model	33149.2144	5	6629.84287	F(5, 30) =	18.97
Residual	10486.4055	30	349.54685	Prob > F =	0.0000
				R-squared =	0.7597
				Adj R-squared =	0.7196
Total	43635.6199	35	1246.732	Root MSE =	18.696

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dco2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
dntek	.1973197	.0494844	3.988	0.000	.0962591	.2983803
cheat	.0282848	.015507	1.824	0.078	-.0033847	.0599543
ccool	.0120038	.0319091	0.376	0.709	-.0531633	.0771709
celecl	-19.76676	14.10122	-1.402	0.171	-48.56529	9.031774
celechat	-40.84969	25.2008	-1.621	0.115	-92.3166	10.61722
_cons	-.1890813	3.762948	-0.050	0.960	-7.874046	7.495883

.
. drop celechat

.
. reg celec dntek cheat ccool cfossl celecl cnetsum cnumele cprpcoal

Source	SS	df	MS	Number of obs = 36		
Model	2.21200763	8	.276500953	F(8, 27)	=	3.87
Residual	1.92799401	27	.071407186	Prob > F	=	0.0037
Total	4.14000164	35	.118285761	R-squared	=	0.5343
				Adj R-squared	=	0.3963
				Root MSE	=	.26722

celecl	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
dntek	-.0011625	.0007047	-1.650	0.111	-.0026085	.0002835
cheat	.0001456	.0002522	0.577	0.568	-.0003718	.0006631
ccool	.000172	.0005317	0.323	0.749	-.000919	.0012629
cfossl	.0105978	.1813109	0.058	0.954	-.3614214	.382617
celecl	.2406224	.1674815	1.437	0.162	-.1030213	.584266
cnetsum	.0125632	.0054237	2.316	0.028	.0014347	.0236917
cnumele	-.002392	.001837	-1.302	0.204	-.0061613	.0013773
cprpcoal	4.934269	3.424934	1.441	0.161	-2.093114	11.96165
_cons	-.1247571	.1313736	-0.950	0.351	-.3943136	.1447993

. pred celechat
(27 missing values generated)

.
. reg dco2 dntek cheat ccool cfossl celecl celechat

Source	SS	df	MS	Number of obs = 36		
Model	33155.0722	6	5525.84537	F(6, 29)	=	15.29
Residual	10480.5477	29	361.398196	Prob > F	=	0.0000
Total	43635.6199	35	1246.732	R-squared	=	0.7598
				Adj R-squared	=	0.7101
				Root MSE	=	19.01

dco2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
dntek	.197053	.0503516	3.914	0.001	.0940724	.3000336
cheat	.0281857	.0158045	1.783	0.085	-.0041383	.0605096
ccool	.0119249	.032453	0.367	0.716	-.054449	.0782988

Gordon7.log

cfossil		-1.074692	12.65358	-0.085	0.933	-26.95418	24.80479
celec1		-19.54246	14.52451	-1.345	0.189	-49.24842	10.16351
celechat		-40.28533	26.66294	-1.511	0.142	-94.81718	14.24651
_cons		-.100298	3.981006	-0.025	0.980	-8.24237	8.041774

```
.  
. drop celechat
```

```
.  
.
```

```
. log close
```

```

.
. /*****
> *** Detrend the series
> *****/

.
. sort year

. gen dgdp = gdp[_n] - 1.03081*gdp[_n-1]
(14 missing values generated)

. gen dntek = nonhitek[_n] - 1.03002*nonhitek[_n - 1]
(14 missing values generated)

. gen dco2 = co2[_n] - 1.01259*co2[_n - 1]
(14 missing values generated)

.
. gen tgdp = 1.03081*gdp[_n-1]
(14 missing values generated)

. gen tntek = 1.03002*nonhitek[_n-1]
(14 missing values generated)

. gen tco2 = 1.01259*co2[_n-1]
(14 missing values generated)

.
. gen cheat = htdgyear[_n] - htdgyear[_n-1]
(14 missing values generated)

. gen ccool = cldgyear[_n] - cldgyear[_n-1]
(14 missing values generated)

. gen cfossil = ffppcomr[_n-1] - ffppcomr[_n-2]
(15 missing values generated)

. gen celec = eleprrer[_n] - eleprrer[_n-1]
(25 missing values generated)

. gen celec1 = eleprrer[_n-1] - eleprrer[_n-2]
(26 missing values generated)

. gen cnumref = numrefin[_n] - numrefin[_n-1]
(14 missing values generated)

. gen crefcap = refincap[_n] - refincap[_n-1]
(14 missing values generated)

. gen cnetsum = netsumca[_n] - netsumca[_n-1]
(15 missing values generated)

. gen cextra = extralos[_n] - extralos[_n-1]
(14 missing values generated)

. gen cpdctu = cpvtyund[_n] - cpvtyund[_n-1]
(15 missing values generated)

```

```
. gen cpdcts = cpvtysur[_n] - cpvtysur[_n-1]
(15 missing values generated)
```

```
. gen cnumele = numeleut[_n] - numeleut[_n-1]
(14 missing values generated)
```

```
. gen propcoal = hrscoal/hrstotal
(13 missing values generated)
```

```
. gen cprpcoal = propcoal[_n] - propcoal[_n-1]
(14 missing values generated)
```

```
.
.
. reg celec dntek cheat ccool cfossil cnetsum cnumele cprpcoal
```

Source	SS	df	MS	Number of obs =	37
Model	2.06362753	7	.294803932	F(7, 29) =	4.12
Residual	2.07637411	29	.071599107	Prob > F =	0.0030
				R-squared =	0.4985
				Adj R-squared =	0.3774
Total	4.14000164	36	.115000046	Root MSE =	.26758

celec	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
dntek	-.0010018	.0006967	-1.438	0.161	-.0024267 .0004231
cheat	.0002345	.0002419	0.969	0.340	-.0002603 .0007292
ccool	.0003174	.0005209	0.609	0.547	-.000748 .0013828
cfossil	.1175564	.1654492	0.711	0.483	-.2208253 .4559381
cnetsum	.0131762	.0054057	2.437	0.021	.0021202 .0242322
cnumele	-.0029917	.001791	-1.670	0.106	-.0066547 .0006714
cprpcoal	6.498688	3.23799	2.007	0.054	-.1237451 13.12112
_cons	-.1190833	.130416	-0.913	0.369	-.385814 .1476474

```
. pred celechat
(16 missing values generated)
```

```
. reg dco2 dntek cheat ccool cfossil celechat
```

Source	SS	df	MS	Number of obs =	47
Model	34940.8209	5	6988.16419	F(5, 41) =	16.80
Residual	17058.3047	41	416.056212	Prob > F =	0.0000
				R-squared =	0.6720
				Adj R-squared =	0.6319
Total	51999.1256	46	1130.41577	Root MSE =	20.397

dco2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
dntek	.2172347	.0434202	5.003	0.000	.1295458 .3049236
cheat	.0286785	.0143515	1.998	0.052	-.0003048 .0576619
ccool	.002794	.0309455	0.090	0.928	-.0597018 .0652897
cfossil	-10.05766	13.49516	-0.745	0.460	-37.31168 17.19637

Gordon9.log

```

celechat | -38.11767    21.08107    -1.808    0.078    -80.69176    4.45641
   _cons |   1.867695    3.702321     0.504    0.617    -5.609295    9.344685
-----

```

```

.
```

```

. drop celechat

```

```

. gen celechat = celec

```

```

(25 missing values generated)

```

```

. predict fpdco2

```

```

(25 missing values generated)

```

```

. gen fpco2 = tco2 + fpdco2

```

```

(25 missing values generated)

```

```

.
```

```

. drop celechat

```

```

. reg celec dntek cheat ccool celecl cnetsum cnumele cprpcoal

```

Source	SS	df	MS	Number of obs =	36
Model	2.21176366	7	.315966238	F(7, 28) =	4.59
Residual	1.92823798	28	.068865642	Prob > F =	0.0016
Total	4.14000164	35	.118285761	R-squared =	0.5342
				Adj R-squared =	0.4178
				Root MSE =	.26242

celecl	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
dntek	-.0011729	.00067	-1.750	0.091	-.0025454 .0001997
cheat	.0001452	.0002476	0.587	0.562	-.0003619 .0006524
ccool	.0001714	.000522	0.328	0.745	-.000898 .0012407
celecl	.2446516	.149897	1.632	0.114	-.0623984 .5517015
cnetsum	.0126666	.0050349	2.516	0.018	.0023531 .0229802
cnumele	-.0024028	.0017949	-1.339	0.191	-.0060794 .0012738
cprpcoal	4.930698	3.362896	1.466	0.154	-1.957882 11.81928
_cons	-.1251624	.1288347	-0.971	0.340	-.3890684 .1387435

```

. pred celechat

```

```

(27 missing values generated)

```

```

.
```

```

. reg dco2 dntek cheat ccool celecl celechat

```

Source	SS	df	MS	Number of obs =	36
Model	33149.2144	5	6629.84287	F(5, 30) =	18.97
Residual	10486.4055	30	349.54685	Prob > F =	0.0000
Total	43635.6199	35	1246.732	R-squared =	0.7597
				Adj R-squared =	0.7196
				Root MSE =	18.696

dco2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
------	-------	-----------	---	------	----------------------

Gordon9.log

dntek		.1973197	.0494844	3.988	0.000	.0962591	.2983803
cheat		.0282848	.015507	1.824	0.078	-.0033847	.0599543
ccool		.0120038	.0319091	0.376	0.709	-.0531633	.0771709
celecl		-19.76676	14.10122	-1.402	0.171	-48.56529	9.031774
celechat		-40.84969	25.2008	-1.621	0.115	-92.3166	10.61722
_cons		-.1890813	3.762948	-0.050	0.960	-7.874046	7.495883

```
.
. drop celechat

. gen celechat = celec
(25 missing values generated)

. predict pdco2
(26 missing values generated)

. gen pco2 = tco2 + pdco2
(26 missing values generated)

.
. sort year

. list year co2 pco2 fpco2
```

	year	co2	pco2	fpco2
1.	1936	.	.	.
2.	1937	.	.	.
3.	1938	.	.	.
4.	1939	.	.	.
5.	1940	.	.	.
6.	1941	.	.	.
7.	1942	.	.	.
8.	1943	.	.	.
9.	1944	.	.	.
10.	1945	.	.	.
11.	1946	.	.	.
12.	1947	.	.	.
13.	1948	.	.	.
14.	1949	595.6	.	.
15.	1950	642.2	.	.
16.	1951	681.5	.	.
17.	1952	667.3	.	.
18.	1953	684.9	.	.
19.	1954	655.6	.	.
20.	1955	726.3	.	.
21.	1956	749.7	.	.
22.	1957	746.6	.	.
23.	1958	731.4	.	.
24.	1959	760.3	.	.
25.	1960	787.9	.	.
26.	1961	793.7	.	794.726
27.	1962	826.6	832.1527	833.0602
28.	1963	858.6	868.726	865.965
29.	1964	895.2	895.0914	888.6467
30.	1965	934.5	953.356	952.3508
31.	1966	985.7	1010.792	1001.406

Gordon9.log

32.	1967	1011.5	1012.524	1000.615
33.	1968	1069.2	1057.19	1054.911
34.	1969	1115.6	1121.378	1113.558
35.	1970	1149	1139.103	1123.693
36.	1971	1162.5	1169.418	1164.074
37.	1972	1223.7	1197.647	1201.807
38.	1973	1277.9	1253.169	1256.054
39.	1974	1233.1	1227.984	1228.336
40.	1975	1197	1196.642	1209.532
41.	1976	1269.5	1231.405	1238.739
42.	1977	1307.4	1285.673	1286.75
43.	1978	1320.9	1354.503	1363.469
44.	1979	1337.7	1336.761	1334.732
45.	1980	1289.4	1296.914	1290.072
46.	1981	1256	1261.266	1270.156
47.	1982	1189.1	1201.219	1200.37
48.	1983	1182.5	1205.297	1217.202
49.	1984	1245.2	1241.905	1249.589
50.	1985	1244.6	1279.484	1278.128
51.	1986	1245.9	1261.536	1263.39
52.	1987	1286.6	1277.392	1285.916
53.	1988	1348.6	1333.586	1329.939
54.	1989	1360.8	1381.389	1383.197
55.	1990	1346.1	1349.833	1343.208
56.	1991	1330.8	1328.655	1319.923
57.	1992	1352.1	1345.536	1350.186
58.	1993	1379.8	1371.217	1370.93
59.	1994	1398.4	1394.076	1393.793
60.	1995	1411.7	1405.613	1404.025
61.	1996	1460.6	1430.497	1429.172
62.	1997	1479.6	1474.471	1470.298
63.	1998	1484	1483.193	1478.513

.
.
.
.
.
.
.
. log close

Maninten2.log

```
.
. /* This program examines the residuals from the 2sls estimates of the energy
> intensity
> equation.
>
> */
.
. gen asminten = rmanengy/manasmip
(11 missing values generated)

. gen beainten = rmanengy/manbeaip
(11 missing values generated)

.
. sort year

. gen llmaninv = rmaninv[_n - 1]
(11 missing values generated)

. gen l2maninv = rmaninv[_n - 2]
(11 missing values generated)

.
. gen clpropw = coprowes/coprotot

. gen clprope = coproeas/coprotot

. gen copropsf = coprosur/coprotot

. gen copropug = copround/coprotot

.
. reg ffppcomr numrefin refinca netsumca extralos cpvtyund cpvtysur cpvtytot c
> lpropw clprope copropsf copropug asminten manasmip htdgyear cldgyear rmaninv
> if year >= 1959 & year <= 1996
```

Source	SS	df	MS	Number of obs =	38
-----+-----				F(16, 21) =	13.40
Model	26.7533269	16	1.67208293	Prob > F =	0.0000
Residual	2.62122345	21	.124820164	R-squared =	0.9108
-----+-----				Adj R-squared =	0.8428
Total	29.3745504	37	.793906766	Root MSE =	.3533

ffppcomr	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
-----+-----					
numrefin	-.0013773	.014988	-0.092	0.928	-.0325464 .0297919
refinca	.2639674	.3772033	0.700	0.492	-.5204698 1.048405
netsumca	-.002867	.0074272	-0.386	0.703	-.0183127 .0125787
extralos	2.175037	2.465021	0.882	0.388	-2.951255 7.301328
cpvtyund	.0900194	.4179751	0.215	0.832	-.7792073 .9592462
cpvtysur	-.1468609	.4219334	-0.348	0.731	-1.024319 .7305976
cpvtytot	-.0822911	.7016464	-0.117	0.908	-1.541445 1.376862
clpropw	-675.0436	1595.79	-0.423	0.677	-3993.671 2643.583
clprope	-682.9632	1594.392	-0.428	0.673	-3998.682 2632.756
copropsf	.1391355	852.4871	0.000	1.000	-1772.705 1772.983
copropug	.5343382	853.7841	0.001	1.000	-1775.007 1776.076

Maninten2.log

```

asminten |      12.419   34.18344    0.363   0.720   -58.66936   83.50735
manasmip |    -.0040082   .0023182   -1.729   0.098   -.0088291   .0008128
htdgyear |    -.000184   .0005549   -0.332   0.744   -.001338   .0009701
cldgyear |    -.0007329   .0011456   -0.640   0.529   -.0031154   .0016496
  rmaninv |    7.36e-06   4.28e-06    1.718   0.100   -1.55e-06   .0000163
    _cons |   684.8838   1962.194    0.349   0.731   -3395.722   4765.49
-----

```

```

.
. predict fosshat
(11 missing values generated)

```

```

.
. reg eleprinr numrefin refinca netsumca extralos cpvtyund cpvtysur cpvtytot c
> lpropw clprope copropsf copropug asminten manasmip htdgyear cldgyear rmaninv
> if year >= 1959 & year <= 1996

```

Source	SS	df	MS	Number of obs =	37
Model	35.9552684	16	2.24720428	F(16, 20) =	28.34
Residual	1.58581441	20	.079290721	Prob > F =	0.0000
				R-squared =	0.9578
				Adj R-squared =	0.9240
Total	37.5410828	36	1.04280786	Root MSE =	.28159

eleprinr	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
numrefin	-.0110733	.0119519	-0.926	0.365	-.0360046 .0138579
refinca	.2884914	.3012034	0.958	0.350	-.3398079 .9167906
netsumca	-.0021242	.0059608	-0.356	0.725	-.0145582 .0103097
extralos	.6454312	2.047562	0.315	0.756	-3.625708 4.916571
cpvtyund	.3040577	.3417426	0.890	0.384	-.4088049 1.01692
cpvtysur	-.3257385	.3450981	-0.944	0.356	-1.045601 .3941235
cpvtytot	-.5702145	.5730721	-0.995	0.332	-1.765622 .6251929
clpropw	-475.5223	1279.282	-0.372	0.714	-3144.057 2193.013
clprope	-486.479	1278	-0.381	0.707	-3152.341 2179.383
copropsf	992.0509	796.5105	1.245	0.227	-669.4408 2653.543
copropug	996.3341	797.3508	1.250	0.226	-666.9105 2659.579
asminten	-13.05833	29.38809	-0.444	0.662	-74.36081 48.24415
manasmip	-.0034852	.0018844	-1.850	0.079	-.007416 .0004455
htdgyear	2.16e-06	.0004585	0.005	0.996	-.0009542 .0009586
cldgyear	-.0002287	.0009149	-0.250	0.805	-.0021373 .0016798
rmaninv	4.93e-06	3.44e-06	1.434	0.167	-2.24e-06 .0000121
_cons	-499.1704	1588.813	-0.314	0.757	-3813.377 2815.036

```

.
. predict electthat
(11 missing values generated)

```

```

.
. newey asminten manasmip htdgyear cldgyear fosshat electthat rmaninv if year >=
> 1959 & year <= 1996, lag(1) t(year)

```

Regression with Newey-West standard errors	Number of obs =	38
maximum lag : 1	F(5, 31) =	63.79
	Prob > F =	0.0000

Maninten2.log

		Newey-West				
asminten		Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
manasmip		-.0000287	3.10e-06	-9.255	0.000	-.000035 -.0000224
htdgyear		2.13e-06	4.72e-06	0.452	0.655	-7.49e-06 .0000118
cldgyear		-.0000108	.0000115	-0.940	0.354	-.0000344 .0000127
fosshat		.0106233	.0022305	4.763	0.000	.0060742 .0151724
electhat		-.0095693	.0017598	-5.438	0.000	-.0131584 -.0059802
rmaninv		-1.11e-07	2.29e-08	-4.830	0.000	-1.57e-07 -6.40e-08
_cons		.1127042	.0343925	3.277	0.003	.0425602 .1828481

```

.
. predict intenhat
(11 missing values generated)

.
. gen intres = asminten - intenhat
(11 missing values generated)

.
. sort year

.
. gen l1intres = intres[_n - 1]
(11 missing values generated)

. gen l2intres = intres[_n - 2]
(11 missing values generated)

. gen l3intres = intres[_n - 3]
(12 missing values generated)

. gen l4intres = intres[_n - 4]
(13 missing values generated)

. gen l5intres = intres[_n - 5]
(14 missing values generated)

. gen l6intres = intres[_n - 6]
(15 missing values generated)

.
. /*****
> *** Straight resids on resids
> *****/
.
. reg intres l1intres if year >= 1960 & year <= 1996

```

Source	SS	df	MS
Model	.000201484	1	.000201484
Residual	.000283357	35	8.0959e-06
Total	.000484841	36	.000013468

```

Number of obs =      37
F( 1,      35) =    24.89
Prob > F       =    0.0000
R-squared      =    0.4156
Adj R-squared  =    0.3989
Root MSE      =    .00285

```

Maninten2.log

intres	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
llintres	.6429079	.1288728	4.989	0.000	.3812822	.9045337
_cons	.0000432	.0004678	0.092	0.927	-.0009064	.0009928

```
. reg intres llintres l2intres if year >= 1961 & year <= 1996
```

Source	SS	df	MS	Number of obs = 36		
Model	.00019743	2	.000098715	F(2, 33) =	11.64	
Residual	.0002798	33	8.4788e-06	Prob > F =	0.0001	
Total	.000477231	35	.000013635	R-squared =	0.4137	
				Adj R-squared =	0.3782	
				Root MSE =	.00291	

intres	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
llintres	.6051994	.1791788	3.378	0.002	.2406574	.9697413
l2intres	.0495061	.1872169	0.264	0.793	-.3313895	.4304018
_cons	.000083	.0004862	0.171	0.866	-.0009062	.0010721

```
. reg intres llintres l2intres l3intres if year >= 1962 & year <= 1996
```

Source	SS	df	MS	Number of obs = 35		
Model	.000208567	3	.000069522	F(3, 31) =	8.05	
Residual	.00026775	31	8.6371e-06	Prob > F =	0.0004	
Total	.000476317	34	.000014009	R-squared =	0.4379	
				Adj R-squared =	0.3835	
				Root MSE =	.00294	

intres	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
llintres	.6197384	.1816189	3.412	0.002	.2493242	.9901526
l2intres	.1475304	.2320311	0.636	0.530	-.3257001	.6207609
l3intres	-.1402645	.1931609	-0.726	0.473	-.5342186	.2536897
_cons	.0000121	.000498	0.024	0.981	-.0010036	.0010277

```
. reg intres llintres l2intres l3intres l4intres if year >= 1963 & year <= 1996
```

Source	SS	df	MS	Number of obs = 34		
Model	.000243144	4	.000060786	F(4, 29) =	8.30	
Residual	.000212295	29	7.3205e-06	Prob > F =	0.0001	
Total	.000455439	33	.000013801	R-squared =	0.5339	
				Adj R-squared =	0.4696	
				Root MSE =	.00271	

intres	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
--------	-------	-----------	---	------	----------------------	--

Maninten2.log

```
-----+-----
11intres | .644364 .1712102 3.764 0.001 .2941998 .9945281
12intres | .0762056 .2179428 0.350 0.729 -.3695374 .5219486
13intres | .12262 .219748 0.558 0.581 -.3268151 .5720551
14intres | -.3590982 .1798161 -1.997 0.055 -.7268635 .008667
_cons | .0002075 .0004668 0.444 0.660 -.0007472 .0011621
-----+-----
```

```
.
. reg intres 11intres 12intres 13intres 14intres 15intres if year >= 1963 & year
> r <= 1996
```

Source	SS	df	MS	Number of obs =	34
Model	.000244516	5	.000048903	F(5, 28) =	6.49
Residual	.000210923	28	7.5330e-06	Prob > F =	0.0004
				R-squared =	0.5369
				Adj R-squared =	0.4542
Total	.000455439	33	.000013801	Root MSE =	.00274

intres	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
11intres	.6687566	.182844	3.658	0.001	.2942177 1.043296
12intres	.0752371	.2210945	0.340	0.736	-.3776546 .5281287
13intres	.1135721	.2239205	0.507	0.616	-.3451082 .5722523
14intres	-.4152217	.2248859	-1.846	0.075	-.8758795 .0454361
15intres	.0857471	.2009628	0.427	0.673	-.3259064 .4974007
_cons	.000184	.0004767	0.386	0.702	-.0007924 .0011604

```
.
. reg intres 11intres 12intres 13intres 14intres 15intres 16intres if year >= 1
> 963 & year <= 1996
```

Source	SS	df	MS	Number of obs =	33
Model	.000227117	6	.000037853	F(6, 26) =	4.95
Residual	.000198968	26	7.6526e-06	Prob > F =	0.0017
				R-squared =	0.5330
				Adj R-squared =	0.4253
Total	.000426085	32	.000013315	Root MSE =	.00277

intres	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
11intres	.5941157	.1939901	3.063	0.005	.1953633 .992868
12intres	.2013675	.2461271	0.818	0.421	-.3045541 .707289
13intres	.0616241	.2302192	0.268	0.791	-.4115983 .5348464
14intres	-.4367333	.2277029	-1.918	0.066	-.9047832 .0313166
15intres	.0294163	.2464803	0.119	0.906	-.4772312 .5360639
16intres	.1004595	.203288	0.494	0.625	-.3174049 .5183239
_cons	.0002509	.0004896	0.512	0.613	-.0007555 .0012572

```
.
. /*****
> *** Might as well check for hetroskedasticity
> *****/
```

Maninten2.log

```
.
. gen intres2 = intres*intres
(11 missing values generated)
```

```
.
. reg intres2 manasmip htdgyear cldgyear fosshat electthat rmaninv if year >= 19
> 59 & year <= 1996
```

Source	SS	df	MS	Number of obs =	38
Model	4.3531e-10	6	7.2551e-11	F(6, 31) =	0.22
Residual	1.0206e-08	31	3.2922e-10	Prob > F =	0.9673
				R-squared =	0.0409
				Adj R-squared =	-0.1447
Total	1.0641e-08	37	2.8760e-10	Root MSE =	1.8e-05

intres2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
manasmip	9.20e-10	1.20e-08	0.077	0.939	-2.35e-08 2.53e-08
htdgyear	1.47e-08	1.82e-08	0.806	0.426	-2.24e-08 5.18e-08
cldgyear	-5.58e-09	4.42e-08	-0.126	0.900	-9.58e-08 8.46e-08
fosshat	-1.19e-06	.0000101	-0.118	0.907	-.0000218 .0000194
electthat	9.00e-07	8.95e-06	0.101	0.921	-.0000174 .0000192
rmaninv	-1.40e-10	1.89e-10	-0.740	0.465	-5.25e-10 2.46e-10
_cons	-.0000501	.0001122	-0.447	0.658	-.0002789 .0001787

```
.
. reg intres2 manasmip if year >= 1959 & year <= 1996
```

Source	SS	df	MS	Number of obs =	38
Model	5.7106e-11	1	5.7106e-11	F(1, 36) =	0.19
Residual	1.0584e-08	36	2.9400e-10	Prob > F =	0.6620
				R-squared =	0.0054
				Adj R-squared =	-0.0223
Total	1.0641e-08	37	2.8760e-10	Root MSE =	1.7e-05

intres2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
manasmip	-4.06e-09	9.20e-09	-0.441	0.662	-2.27e-08 1.46e-08
_cons	.0000165	8.80e-06	1.876	0.069	-1.34e-06 .0000344

```
.
end of do-file
```

```
. log close
```

```

.
. /*****
> *** Detrend the series
> *****/
.
. sort year

. gen dgdgdp = gdp[_n] - 1.03081*gdp[_n-1]
(14 missing values generated)

. gen dntek = nonhitek[_n] - 1.03002*nonhitek[_n - 1]
(14 missing values generated)

. gen dco2 = co2[_n] - 1.007727*co2[_n - 1]
(14 missing values generated)

.
. gen tgdp = 1.03081*gdp[_n-1]
(14 missing values generated)

. gen tntek = 1.03002*nonhitek[_n-1]
(14 missing values generated)

. gen tco2 = 1.007727*co2[_n-1]
(14 missing values generated)

.
. gen cheat = htdgyear[_n] - htdgyear[_n-1]
(14 missing values generated)

. gen ccool = cldgyear[_n] - cldgyear[_n-1]
(14 missing values generated)

. gen cfoss1 = ffppcomr[_n-1] - ffppcomr[_n-2]
(15 missing values generated)

. gen celec = eleprrr[_n] - eleprrr[_n-1]
(25 missing values generated)

. gen celec1 = eleprrr[_n-1] - eleprrr[_n-2]
(26 missing values generated)

. gen cnumref = numrefin[_n] - numrefin[_n-1]
(14 missing values generated)

. gen crefcap = refincap[_n] - refincap[_n-1]
(14 missing values generated)

. gen cnetsum = netsumca[_n] - netsumca[_n-1]
(15 missing values generated)

. gen cextra = extralos[_n] - extralos[_n-1]
(14 missing values generated)

. gen cpdctu = cpvtyund[_n] - cpvtyund[_n-1]
(15 missing values generated)

```

```
. gen cpdcts = cpvtysur[_n] - cpvtysur[_n-1]
(15 missing values generated)
```

```
. gen cnumele = numeleut[_n] - numeleut[_n-1]
(14 missing values generated)
```

```
. gen propcoal = hrscoal/hrstotal
(13 missing values generated)
```

```
. gen cprpcoal = propcoal[_n] - propcoal[_n-1]
(14 missing values generated)
```

```
. reg celec dntek cheat ccool cfossl cnetsum cnumele cprpcoal
```

Source	SS	df	MS	Number of obs =	37
Model	2.06362753	7	.294803932	F(7, 29) =	4.12
Residual	2.07637411	29	.071599107	Prob > F =	0.0030
				R-squared =	0.4985
				Adj R-squared =	0.3774
Total	4.14000164	36	.115000046	Root MSE =	.26758

* celec	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
dntek	-.0010018	.0006967	-1.438	0.161	-.0024267 .0004231
cheat	.0002345	.0002419	0.969	0.340	-.0002603 .0007292
ccool	.0003174	.0005209	0.609	0.547	-.000748 .0013828
cfossl	.1175564	.1654492	0.711	0.483	-.2208253 .4559381
cnetsum	.0131762	.0054057	2.437	0.021	.0021202 .0242322
cnumele	-.0029917	.001791	-1.670	0.106	-.0066547 .0006714
cprpcoal	6.498688	3.23799	2.007	0.054	-.1237451 13.12112
_cons	-.1190833	.130416	-0.913	0.369	-.385814 .1476474

```
. pred celechat
(16 missing values generated)
```

```
. reg dco2 dntek cheat ccool cfossl celechat
```

Source	SS	df	MS	Number of obs =	47
Model	34076.4509	5	6815.29017	F(5, 41) =	16.36
Residual	17078.1321	41	416.539808	Prob > F =	0.0000
				R-squared =	0.6661
				Adj R-squared =	0.6254
Total	51154.583	46	1112.05615	Root MSE =	20.409

dco2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
dntek	.21099	.0434454	4.856	0.000	.1232502 .2987298
cheat	.0284203	.0143598	1.979	0.055	-.0005799 .0574205
ccool	.0019358	.0309635	0.063	0.950	-.0605962 .0644679
cfossl	-9.785017	13.503	-0.725	0.473	-37.05487 17.48484

Gordon10.log

```
celechat | -39.41042 21.09332 -1.868 0.069 -82.00924 3.188399
_cons | 6.995746 3.704473 1.888 0.066 -.485588 14.47708
```

.

```
. drop celechat
```

```
. gen celechat = celec
```

```
(25 missing values generated)
```

```
. predict fpdco2
```

```
(25 missing values generated)
```

```
. gen fpco2 = tco2 + fpdco2
```

```
(25 missing values generated)
```

.

```
. drop celechat
```

```
. reg dco2 dntek cheat ccool celecl celec (dntek cheat ccool celecl cnetsum cnu
> mele cprpcoal)
```

Source	SS	df	MS	(2SLS)	
Model	32573.8186	5	6514.76372	Number of obs =	36
Residual	10249.3056	30	341.643519	F(5, 30) =	18.91
Total	42823.1242	35	1223.51783	Prob > F =	0.0000
				R-squared =	0.7607
				Adj R-squared =	0.7208
				Root MSE =	18.484

dco2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
celecl	-42.78258	24.91428	-1.717	0.096	-93.66432	8.099164
dntek	.1908608	.0489218	3.901	0.001	.0909492	.2907724
cheat	.027686	.0153307	1.806	0.081	-.0036234	.0589954
ccool	.0108085	.0315463	0.343	0.734	-.0536176	.0752347
celecl	-18.2987	13.94089	-1.313	0.199	-46.7698	10.1724
_cons	5.546422	3.720164	1.491	0.146	-2.051166	13.14401

```
. test celecl celec
```

```
( 1) celecl = 0.0
```

```
( 2) celec = 0.0
```

```
F( 2, 30) = 9.15
Prob > F = 0.0008
```

.

```
. predict pdco2
```

```
(26 missing values generated)
```

```
. gen pco2 = tco2 + pdco2
```

```
(26 missing values generated)
```

.

```
. sort year
```

```
. list year co2 pco2 fpcO2
```

	year	co2	pco2	fpcO2
1.	1936	.	.	.
2.	1937	.	.	.
3.	1938	.	.	.
4.	1939	.	.	.
5.	1940	.	.	.
6.	1941	.	.	.
7.	1942	.	.	.
8.	1943	.	.	.
9.	1944	.	.	.
10.	1945	.	.	.
11.	1946	.	.	.
12.	1947	.	.	.
13.	1948	.	.	.
14.	1949	595.6	.	.
15.	1950	642.2	.	.
16.	1951	681.5	.	.
17.	1952	667.3	.	.
18.	1953	684.9	.	.
19.	1954	655.6	.	.
20.	1955	726.3	.	.
21.	1956	749.7	.	.
22.	1957	746.6	.	.
23.	1958	731.4	.	.
24.	1959	760.3	.	.
25.	1960	787.9	.	.
26.	1961	793.7	.	796.3295
27.	1962	826.6	833.7042	834.0944
28.	1963	858.6	870.8611	867.4921
29.	1964	895.2	895.9919	889.4692
30.	1965	934.5	955.0319	953.3382
31.	1966	985.7	1011.714	1002.22
32.	1967	1011.5	1013.094	1001.413
33.	1968	1069.2	1058.039	1055.239
34.	1969	1115.6	1122.578	1114.318
35.	1970	1149	1139.765	1124.494
36.	1971	1162.5	1169.028	1163.614
37.	1972	1223.7	1197.15	1200.761
38.	1973	1277.9	1252.609	1254.74
39.	1974	1233.1	1226.437	1226.95
40.	1975	1197	1198.221	1209.348
41.	1976	1269.5	1231.042	1237.585
42.	1977	1307.4	1283.996	1284.736
43.	1978	1320.9	1353.934	1361.875
44.	1979	1337.7	1336.288	1333.796
45.	1980	1289.4	1295.469	1288.726
46.	1981	1256	1261.464	1269.089
47.	1982	1189.1	1202.266	1200.647
48.	1983	1182.5	1205.435	1216.136
49.	1984	1245.2	1241.408	1248.212
50.	1985	1244.6	1278.687	1277.089
51.	1986	1245.9	1261.586	1262.673
52.	1987	1286.6	1277.359	1285.082

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```

53.      1988      1348.6      1332.552      1328.731
54.      1989      1360.8      1380.658      1381.936
55.      1990      1346.1      1350.039      1342.764
56.      1991      1330.8      1329.13      1320.084
57.      1992      1352.1      1345.09      1349.187
58.      1993      1379.8      1370.572      1369.733
59.      1994      1398.4      1393.369      1392.477
60.      1995      1411.7      1405.411      1403.201
61.      1996      1460.6      1429.64      1427.929
62.      1997      1479.6      1473.78      1469.021
63.      1998          1484      1482.071      1476.876

```

```

.
.
. /*****
> *** Out of sample for 1998
> *****/
.
. drop fpdco2 fpco2 pdco2 pco2

.
. reg celec dntek cheat ccool cfossil cnetsum cnumele cprpcoal if year < 1998

```

Source	SS	df	MS	Number of obs =	37
Model	2.06362753	7	.294803932	F(7, 29) =	4.12
Residual	2.07637411	29	.071599107	Prob > F =	0.0030
Total	4.14000164	36	.115000046	R-squared =	0.4985
				Adj R-squared =	0.3774
				Root MSE =	.26758

celec	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
dntek	-.0010018	.0006967	-1.438	0.161	-.0024267 .0004231
cheat	.0002345	.0002419	0.969	0.340	-.0002603 .0007292
ccool	.0003174	.0005209	0.609	0.547	-.000748 .0013828
cfossil	.1175564	.1654492	0.711	0.483	-.2208253 .4559381
cnetsum	.0131762	.0054057	2.437	0.021	.0021202 .0242322
cnumele	-.0029917	.001791	-1.670	0.106	-.0066547 .0006714
cprpcoal	6.498688	3.23799	2.007	0.054	-.1237451 13.12112
_cons	-.1190833	.130416	-0.913	0.369	-.385814 .1476474

```

. pred celechat
(16 missing values generated)

```

```

.
. reg dco2 dntek cheat ccool cfossil celechat if year < 1998

```

Source	SS	df	MS	Number of obs =	47
Model	34076.4509	5	6815.29017	F(5, 41) =	16.36
Residual	17078.1321	41	416.539808	Prob > F =	0.0000
Total	51154.583	46	1112.05615	R-squared =	0.6661
				Adj R-squared =	0.6254
				Root MSE =	20.409

dco2	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
dntek	.21099	.0434454	4.856	0.000	.1232502	.2987298
cheat	.0284203	.0143598	1.979	0.055	-.0005799	.0574205
ccool	.0019358	.0309635	0.063	0.950	-.0605962	.0644679
cfossl	-9.785017	13.503	-0.725	0.473	-37.05487	17.48484
celechat	-39.41042	21.09332	-1.868	0.069	-82.00924	3.188399
_cons	6.995746	3.704473	1.888	0.066	-.485588	14.47708

```
.
. drop celechat
```

```
. gen celechat = celec
(25 missing values generated)
```

```
. predict fpdco2
(25 missing values generated)
```

```
. gen fpco2 = tco2 + fpdco2
(25 missing values generated)
```

```
.
. drop celechat
```

```
. reg celec dntek cheat ccool celecl cnetsum cnumele cprpcoal if year < 1998
```

Source	SS	df	MS	Number of obs = 36		
Model	2.21176366	7	.315966238	F(7, 28) =	4.59	
Residual	1.92823798	28	.068865642	Prob > F =	0.0016	
Total	4.14000164	35	.118285761	R-squared =	0.5342	
				Adj R-squared =	0.4178	
				Root MSE =	.26242	

celecl	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
dntek	-.0011729	.00067	-1.750	0.091	-.0025454	.0001997
cheat	.0001452	.0002476	0.587	0.562	-.0003619	.0006524
ccool	.0001714	.000522	0.328	0.745	-.000898	.0012407
celecl	.2446516	.149897	1.632	0.114	-.0623984	.5517015
cnetsum	.0126666	.0050349	2.516	0.018	.0023531	.0229802
cnumele	-.0024028	.0017949	-1.339	0.191	-.0060794	.0012738
cprpcoal	4.930698	3.362896	1.466	0.154	-1.957882	11.81928
_cons	-.1251624	.1288347	-0.971	0.340	-.3890684	.1387435

```
. pred celechat
(27 missing values generated)
```

```
.
. reg dco2 dntek cheat ccool celecl celechat if year < 1998
```

Source	SS	df	MS	Number of obs = 36		
Model	32298.9895	5	6459.7979	F(5, 30) =	18.41	
Residual	10524.1347	30	350.80449	Prob > F =	0.0000	
				R-squared =	0.7542	

Gordon10.log

-----+-----					Adj R-squared = 0.7133	
Total		42823.1242	35	1223.51783	Root MSE	= 18.73
-----+-----						
dco2		Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
-----+-----						
dntek		.1908608	.0495733	3.850	0.001	.0896186 .2921031
cheat		.027686	.0155348	1.782	0.085	-.0040404 .0594124
ccool		.0108085	.0319665	0.338	0.738	-.0544757 .0760928
celecl		-18.2987	14.12656	-1.295	0.205	-47.149 10.55159
celechat		-42.78258	25.2461	-1.695	0.101	-94.34199 8.776834
_cons		5.546422	3.769711	1.471	0.152	-2.152355 13.2452
-----+-----						

```

.
. drop celechat

. gen celechat = celec
(25 missing values generated)

. predict pdco2
(26 missing values generated)

. gen pco2 = tco2 + pdco2
(26 missing values generated)

.
. sort year

. list year co2 pco2 fpco2 if year == 1998

      year      co2      pco2      fpco2
63.    1998    1484    1482.071    1476.876

.
.
.
.
.
. log close

```