Notes on Data and Methods for
"Who's Afraid of the Big Bad Oil Shock?"

William Nordhaus
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This set of notes provides background on the data and methods used in the paper.

I. Data Sources

The data are contained in an Excel spreadsheet "bpea_data_v1.xls" available at http://www.econ.yale.edu/~nordhaus/homepage/bpeadata . The explanations are as follows:

Macroeconomic variables:

Most macroeconomic variables were drawn from the DRI data base. They were updated from the agency web sites using data as of late August 2007. The major variables are the following:

lhur = unem ployment rate of all workers
gdp = nominal GDP
gdpq = real GDP in 2000 chained prices
gdpqpot_cbo = real potential GDP in 2000 chained prices (from CBO)
ppcebea = price index of personal consumption expenditures
punew = consumer price index
picpi = log(punew/punew(-4))
pipcebea = log(ppcebea/ppcebea(-4))
lbout = productivity per hour worked business sector
dla = log(lbout/lbout(-4)) = productivity growth
pcebea = personal consumption expenditures

Output gap

The output gap is defined as follows:

cucbo = gdpq/gdpqpot_cbo

Oil prices:

The nominal price of oil (poilnew) is a spliced series. It is defined as the refiner acquisition price of crude oil for the period 1968.1-2007.2. During the period of effective price controls, 1973:3 to 1983:4, the price of domestic crude oil was generally below the import price. For that period, we have used the RAC of imported crude oil. These data were from EIA. For the period 1947.1 to 1967.4, we used the producer price index of crude oil from BLS. The PPI was spliced to the RAC in 1968.1.

The real price of crude oil (rpoilnew) deflates the nominal price of crude oil using the PCE price index from BEA. It is indexed to the price index in 2007:2 and therefore is in 2007 prices.

Oil Consumption

Total consumption of petroleum products (eeps) was taken from the DRI data base and updated from the EIA web site. The seasonal factors were weird, so it was seasonally adjusted separately for the 1947.1-1980.4 and 1981.4 – 2007.2 periods. The seasonally adjusted series is eepssa1.

Share of oil

The share of oil is nominal price times consumption divided by GDP (shareoil).

Energy shock variables

The energy shock variable is defined as follows:

energyshock= (log(rppceenergy)/ log(rppceenergy(-1)))*(pceenergy/pcebea)

where the components are

ppcebea = price index of personal consumption expenditures
ppceenergy = price index of energy goods and services
rppceenergy = real price index of energy goods and services = pceenergy/pce

The cumulative energy shock is defined as:

cumshockenergy=cumshockenergy(-1)+shockenergy

Oil shock variables

The oil shock variable is defined as follows:

Oilshock = log(rpoilnew/rpoilnew(-1))*shareoil

where the components were defined above.

The cumulative oil shock is defined as:

cumshockoil=cumshockoil(-1)+shockoil

Exogenous spending

The exogenous spending ratio is defined as:

autoexppotcbo = autoexpq/gdpqpot_cbo

where

autoexpq = real exports of goods and services + real Government consumption expenditures and gross investment
gdpqpot_cbo = real potential GDP in 2000 chained prices (from CBO)

Interest rates
fyff = Federal funds rate
gyfm3 = 3 –month Treasury bill rate
realtb 3 = real 3-month Treasury bill rate = fygm3-100*pipcebea

II. Notes on Tables and Figures

Tables 1, 2, and 3. All data are defined above and contained in spreadsheet labeled “datasources_bpea_v1.”

Table 4. The regressions and compilations are available in a spreadsheet labeled, “Table_4_bpea.xls.” For illustrative purposes, the regression for 1970-90 is shown below. The coefficients can be seen to correspond to those in Table 4 for that subperiod.

Dependent Variable: CUPOT
Method: Least Squares
Date: 08/20/07 Time: 17:08
Sample: 1970Q1 1990Q1
Included observations: 81
Convergence achieved after 102 iterations

	Coefficient	Std. Error	t-Statistic	Prob.
C	0.426745	0.138178	3.088365	0.0028
AUTOEXPPOTCBO	1.127503	0.341416	3.302426	0.0015
CUPOT(-2)	0.292765	0.114197	2.563676	0.0124
FYGM3(-2)/100	-0.343936	0.099766	-3.447431	0.0009
CUMSHOCKOIL	-0.18654	0.264954	-0.704047	0.4836
AR(1)	0.880682	0.066523	13.23869	0

R-squared	0.91365	Mean dependent var	0.995648
Adjusted R-squared	0.907893	S.D. dependent var	0.028201
S.E. of regression	0.008559	Akaike info criterion	-6.612504
Sum squared resid	0.005494	Schwarz criterion	-6.435137
Log likelihood	273.8064	Hannan-Quinn criter.	-6.541342
F-statistic	158.7111	Durbin-Watson stat	1.659859
Prob(F-statistic)	0		

Inverted AR Roots 0.88

Figures 1, 2, and 3. All data are defined above and contained in spreadsheet labeled “datasources_bpea_v1.” Note that the data series for Tables 2 and 3 are normalized so that they equal 0 in the shock period.

Figure 4. The underlying regressions are generated in an EViews program called "vol_program_v6.prg" and attached in an Appendix at the end of these notes.

III. *Notes on Other Statements In Text*

1. Estimates of oil price elasticity.

The equation used to estimate the price elasticity is the following. Note that the standard errors cited in the text are approximate and use the t-statistics for the approximation.

Dependent Variable: LOG(EEPSSA1)
Method: Two-Stage Least Squares
Date: 08/22/07 Time: 12:04
Sample: 1970Q1 1995Q4
Included observations: 104
Convergence achieved after 5 iterations
Instrument list: C LOG(GDPQBEA) LOG(GDPQBEA(-1)) LOG(RPOILNEW(-1)) LOG(RPOILNEW(-2)) LOG(RPOILNEW(-3)) LOG(RPOILNEW(-4))
Lagged dependent variable & regressors added to instrument list

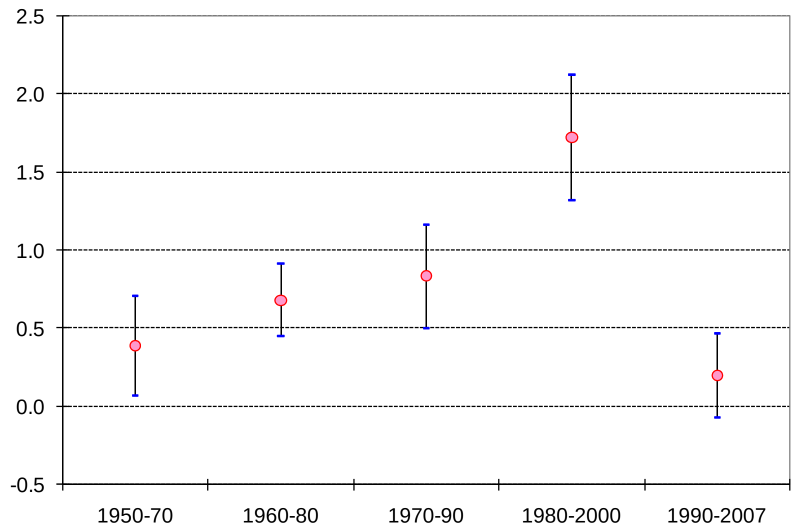
	Coefficient	Std. Error	t-Statistic	Prob.
C	0.684893	0.246582	2.777542	0.0066
LOG(RPOIL3)	-0.014685	0.004266	-3.442438	0.0008
LOG(GDPQBEA)	-0.003321	0.007532	-0.440872	0.6603
LOG(EEPSSA1(-1))	0.937714	0.026708	35.10992	0.0000
AR(1)	-0.181630	0.098071	-1.852017	0.0670
AR(2)	-0.303670	0.097879	-3.102505	0.0025

R-squared	0.871604	Mean dependent var	9.724488
Adjusted R-squared	0.865053	S.D. dependent var	0.065669
S.E. of regression	0.024124	Sum squared resid	0.057031
F-statistic	132.4867	Durbin-Watson stat	1.968480
Prob(F-statistic)	0.000000	Second-Stage SSR	0.058679
Inverted AR Roots	-.09-.54i	-.09+.54i	

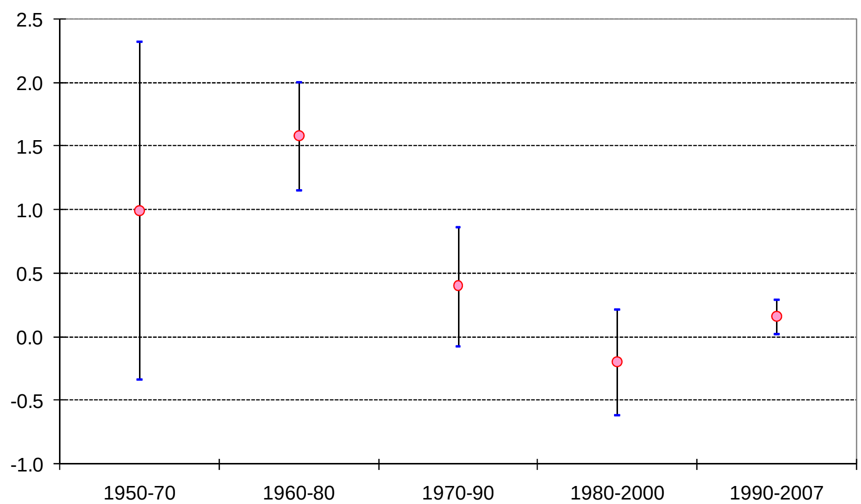
2. Estimate of the differential response of monetary policy to different price indexes.

To examine whether the Fed response to inflation has changed, we ran Taylor-rule-type regressions for different subperiods. For example, the regression for 1990.1 to 2007.2 was as shown below. The coefficients along with the one-sigma ranges for core inflation and energy inflation for the subperiods are shown in the two graphs. The energy inflation variable is the contribution of energy inflation to the PCE inflation rate = energy inflation * share of energy in PCE.

Taylor rule coefficient core inflation



Taylor rule coefficient energy inflation



Dependent Variable: FYFF/100
Method: Least Squares
Date: 08/22/07 Time: 13:07
Sample (adjusted): 1990Q1 2007Q1
Included observations: 69 after adjustments
Convergence achieved after 14 iterations

	Coefficient	Std. Error	t-Statistic	Prob.
C	0.083598	0.016506	5.064702	0.0000
LHUR(-1)/100	-1.136415	0.231331	-4.912512	0.0000
PICOREEN4(-1)	0.203706	0.269488	0.755900	0.4525
FYFF(-2)/100	0.203433	0.112143	1.814048	0.0744
PIPCEENERGY4	0.008900	0.007480	1.189894	0.2386
AR(1)	0.952245	0.029244	32.56215	0.0000

R-squared	0.970604	Mean dependent var	0.043600
Adjusted R-squared	0.968271	S.D. dependent var	0.018755
S.E. of regression	0.003341	Akaike info criterion	-8.482330
Sum squared resid	0.000703	Schwarz criterion	-8.288060
Log likelihood	298.6404	Hannan-Quinn criter.	-8.405257
F-statistic	416.0353	Durbin-Watson stat	1.281900
Prob(F-statistic)	0.000000		

Inverted AR Roots	.95

3. Direct and Indirect Effects of Oil Shocks

To estimate the total effects, I rely on data on oil consumption provided by EIA for 2004. I divided oil consumption into three parts: direct consumption (such as motor gasoline), indirect consumption, and other components of GDP. I then assume that the energy intensity of the second and third components are equal. This yields the following table, which implies that the total effect is 1.78 times the direct effect.

	Output	Energy	Intensity	Total
PCE	8,211.5			757.5
PCE Energy	425.1	425.1	1.000	425.1
PCE Non-energy	7,786.4		0.043	332.4
Other GDP	3,501.0		0.043	149.5
Nonen PCE + Other GDP	11,287.4	481.9	0.043	
Total	11,712.5	907.0		907.0
Ratio of total C to direct C	757.5	/	425.13	1.78

Appendix. EView program for calculating volatilities for Table 4.

```
' program for bpea figure 4 on volatility

smpl @all
series var1=(AUTOEXPPOTCBO-AUTOEXPPOTCBO(-4))
series var2=(cumshockenergy-cumshockenergy(-4))
series var3=(cumshockoil-cumshockoil(-4))
series var4=(fyff-fyff(-4))/100
series var5=(cucbo-cucbo(-4))
series var6=pipcebea-pipcebea(-4)

matrix(6,6) tabvol2

smpl 1950.1 1970.1
tabvol2(1,1)=@stdev(var1)
tabvol2(2,1)=@stdev(var2)
tabvol2(3,1)=@stdev(var3)
tabvol2(4,1)=@stdev(var4)
tabvol2(5,1)=@stdev(var5)
tabvol2(6,1)=@stdev(var6)

smpl 1960.1 1980.1
tabvol2(1,2)=@stdev(var1)
tabvol2(2,2)=@stdev(var2)
tabvol2(3,2)=@stdev(var3)
tabvol2(4,2)=@stdev(var4)
tabvol2(5,2)=@stdev(var5)
tabvol2(6,2)=@stdev(var6)

smpl 1970.1 1990.1
tabvol2(1,3)=@stdev(var1)
tabvol2(2,3)=@stdev(var2)
tabvol2(3,3)=@stdev(var3)
tabvol2(4,3)=@stdev(var4)
tabvol2(5,3)=@stdev(var5)
tabvol2(6,3)=@stdev(var6)

smpl 1980.1 2000.1
tabvol2(1,4)=@stdev(var1)
tabvol2(2,4)=@stdev(var2)
tabvol2(3,4)=@stdev(var3)
tabvol2(4,4)=@stdev(var4)
tabvol2(5,4)=@stdev(var5)
tabvol2(6,4)=@stdev(var6)

smpl 1987.1 2007.2
tabvol2(1,5)=@stdev(var1)
tabvol2(2,5)=@stdev(var2)
tabvol2(3,5)=@stdev(var3)
tabvol2(4,5)=@stdev(var4)
tabvol2(5,5)=@stdev(var5)
tabvol2(6,5)=@stdev(var6)

smpl @all
series v1950
series v1960
series v1970
series v1980
```

```
series v1987
series v

smpl 1840.1 1841.2
group gvol2  v1950 v1960 v1970 v1980 v1987 v
mtos(tabvol2, gvol2)
show v1950 v1960 v1970 v1980 v1987
```