Is Inflation a Fiscal Phenomenon in Pakistan?

By

Hamna Ahmed

Department of Economics,

University of Warwick

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I) Introduction

The debate on *inflation*, *public sector deficits* and the *means of financing* public deficits has dominated the macroeconomic literature since long now. Different economists, Khan, Montiel and Haque(1991), Easterly, Rodriquez and Hebbel (1994), Agenor and Montiel (1999), Catao and Terrones (2003), Agha and Khan (2006), Khan and Schimmelpfennig (2006), to name a few, have attempted to address various issues pertaining to this debate. This paper is geared in the same direction. More specifically it is an attempt to unravel the long run relationship between fiscal deficit, inflation and seigniorage in Pakistan.

As the paper unfolds, the following questions will be answered- Is inflation always a purely monetary phenomenon Friedman postulated? Can a country's fiscal environment influence its inflation rate? What is the nature of this influence? Is the relationship meaningful in the long run?

I have constructed a simple econometrical model to examine annual time series data on Inflation, Fiscal Deficits and Seigniorage for Pakistan for the period 1956 to 2005. The Johansen approach to co integration analysis has been employed to assess the long run relationship. A VECM has been used for estimation.

The results indicate that inflation is positively related to both fiscal deficits and seigniorage in Pakistan. This relationship is stable in the long run.

1.1 Motivating the Topic

I have chosen to investigate the long run relationship between inflation, public deficits and seigniorage because the direction and magnitude of short run dynamics between these variables is difficult to discern. Agenor and Montiel present various arguments to corroborate this claim. The most notable explanation is that in the short run the government might switch to an alternative source of financing, domestic borrowing for instance, consequently yielding a weak correlation between inflation, deficit and seigniorage. But a persistently rising fiscal deficit cannot be financed by domestic or foreign borrowing indefinitely due to the associated debt service/interest payments that come as part of the borrowing package. Given fiscal deficit in a country persists, in the long run, the government must resort to seigniorage or 'money creation' to close the gap between expenditures and revenues. Therefore it is more likely to find these variables are closely linked in the long run.

1.2 Objective

A simple model has been designed to assess:

Direct Impact of d on p:

↑d → ↑aggregate demand → ↑p (demand pull inflation)

Indirect Impact of d on p:

↑d → ↑s by printing money → ↑p

Thus the empirical model in this paper will be used to determine whether fiscal deficits exert a direct impact, an indirect impact or both a direct and indirect impact on inflation in Pakistan? It will also be used to see whether the signs on these variables are in consonance with economic theory or not?

2.1 Variables:

Fiscal Deficit:

Government budget deficit has been defined in a variety of ways in macroeconomic literature, the most common being primary deficit, conventional deficit and operational deficit.[1] Throughout the paper fiscal deficit would imply primary deficit. It is not only the most standard way of defining deficits but it was also the only measure on which data was readily available. It is defined as a simple difference between government revenues and expenditure:

$$D \equiv G - \tau$$

where G is real public spending on goods and services (including current and capital expenditure) and τ is real tax revenue.

(FD/GDP) and (FD/GNP) ratios are the most common proxies used in empirical literature. To employ Johansen I wanted a set of variables with the same order of integration. The ratios failed to satisfy this criterion. Hence only deficit was employed.

Seigniorage:

Seigniorage (also referred to as inflation tax) is an implicit tax levied by the government on the stock of base money (M) in the economy. Developing country governments have increasingly used seigniorage as an important tool for raising revenue. It is defined as a change in nominal money stock over the price level:

$$S = \dot{M}/P$$

where $\dot{M} = M - M(-1)$

[1] Conventional deficit is primary deficit augmented by interest payments on both domestic and foreign debt while operational deficit equals conventional deficit which has been adjusted for inflation. Agenor & Montiel (1999).

For Pakistan, data on inflation tax was not available. Hence using data on CPI and stock of money supply over the sample period I calculated the seigniorage series in excel.

Inflation:

A whole series of proxies exist in the empirical literature ranging from CPI to GDP deflator to Whole price Index. I have employed CPI as it is considered a sufficiently accurate measure of inflation in the literature, where CPI reflects the cost of acquiring a fixed basket of goods and services by the average consumer.

2.2 Data

The model employs an annual time series over a sample period from 1956 to 2005. According to Podivinsky (1990)[2] finite sample evidence on Johansen tests suggests that tabulated critical values based on the asymptotic distribution may be inappropriate when applied to a finite sample. Thus the data should have been quarterly but given inadequacies in data collection in Pakistan, access was restricted to annual data only. All the data has been taken from International Financial Statistics repository of the IMF. The data has been calculated as follows:

Deficit: represented on a cash basis in millions of rupees. It has been calculated as the difference between → Expenditure + (Lending – Repayment) – (Total revenue +grants received)

P: has been calculated as an index number based on 12 major cities of Pakistan, with 2000 as the base year. The Laspeyres formula has been used for its calculation.

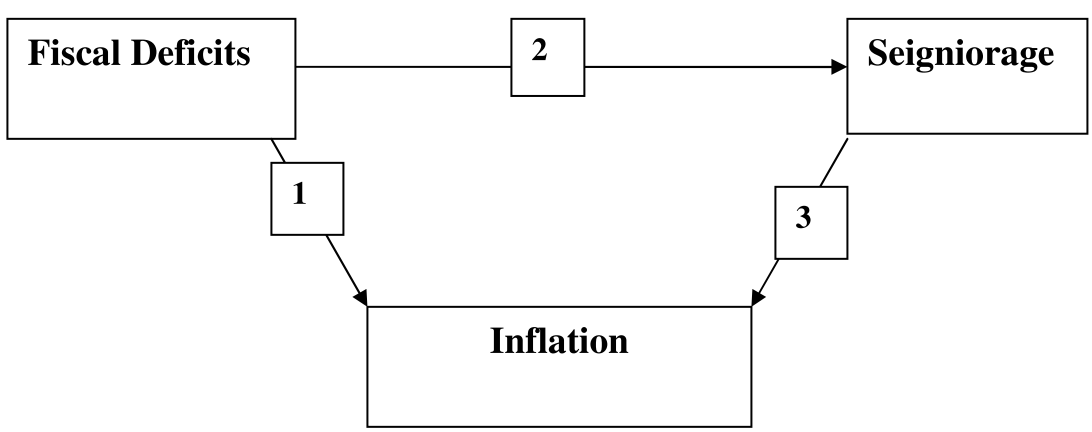
M: has been calculated as the sum of currency in circulation and deposits of deposit money banks with the monetary authorities.

[2] Podivinsky(1990)

3.0 Methodology:

A step wise approach has been employed to develop the model. Step one entails constructing a preliminary model to assess whether a meaningful long run relationship exists between deficit and seigniorage. Only if such a relation exists, can we hypothesize that in addition to directly influencing inflation (path 1 in the figure below), deficits can also do so indirectly in the long run via money creation (path from 2 to 3 in the figure below). Therefore in the second step, I will present the main model in which all three variables will be tested jointly.

Various techniques for undertaking co integration analysis are present in the literature such as EG, Johansen, and ARDL model. EG has not been used for 3 reasons. Firstly, I am not interested in the short run dynamics between these variables for reasons discussed previously. Secondly, I have more than two variables and the number of co integrating vectors amongst these variables is not known a priori. Lastly using EG will not allow me to test for weak exogeniety. The ARDL procedure would have been suitable if the variables had differed in their order of integration. Fortunately, a series of unit root tests revealed that all three variables had the same order of integration. Hence the use of Johansen procedure was the appropriate choice.



4.0 The Model

4.1 Specification:

Since I was interested in unraveling a long run relationship between these variables, it seemed rational to use a model with elasticities. Hence a log linear specification of the model was applied where:

$$p = \alpha + \beta^{*}d + \gamma^{*}s + error$$

where:

$p = ln(P)$

$d = ln(G - \tau)$

$s = ln(\dot{M}/P) = ln(\dot{M}) - ln(P)$

β = *elasticity of p w.r.t deficits*

γ = *elasticity of p w.r.t. seigniorage*

The only problem encountered with using log-linear was that Pakistan experienced a budget surplus in some years during the 60s. Since log of a negative number does not exist, some observations during the 1960-1970 decade were lost. But since no other data on fiscal deficits was available, correcting for this problem was not possible.

4.2 Graphical Analysis:

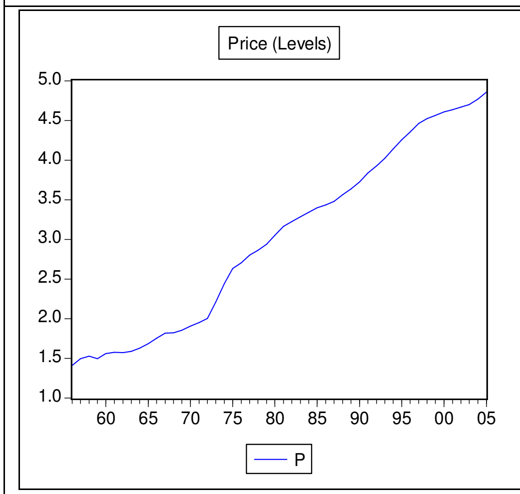
Prices: Graphs A, C, E depict prices in level, first and second difference & their ACs from 1956 till 2005.

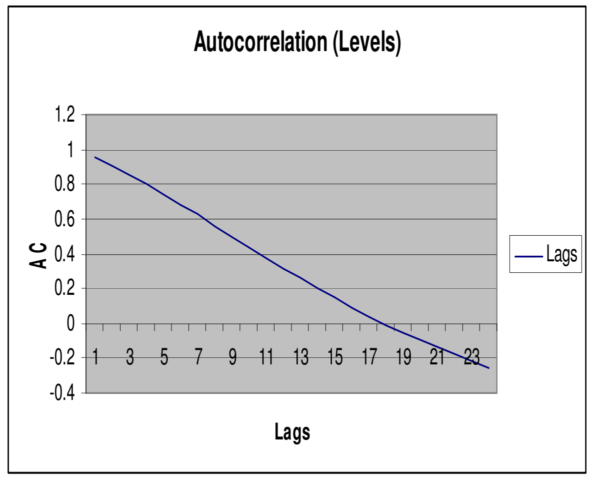
Graph A shows that there is a clear positive trend in level prices. Graph B shows that autocorrelation dies away rather slowly in levels. Graph C illustrates that prices in first difference depict much less persistence. The mean is non zero and the possibility of structural breaks exists; particularly at 1975. The autocorrelations for the first difference die out to zero quite quickly (graph D). Graph E and F for the second difference give evidence for a stationary series.

Overall it appears that the series is non stationary in levels but stationary in differences.

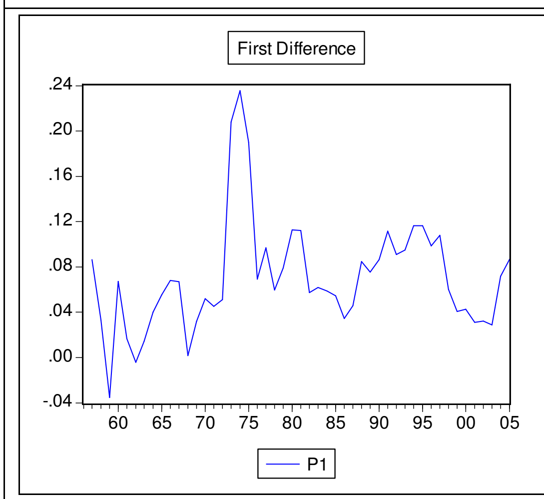
Figure I

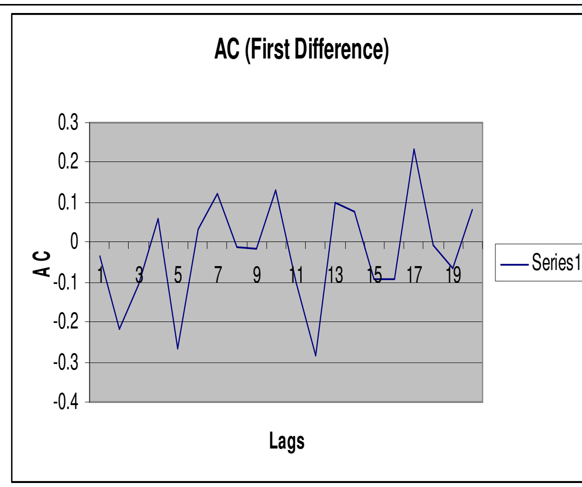
Prices (Levels)

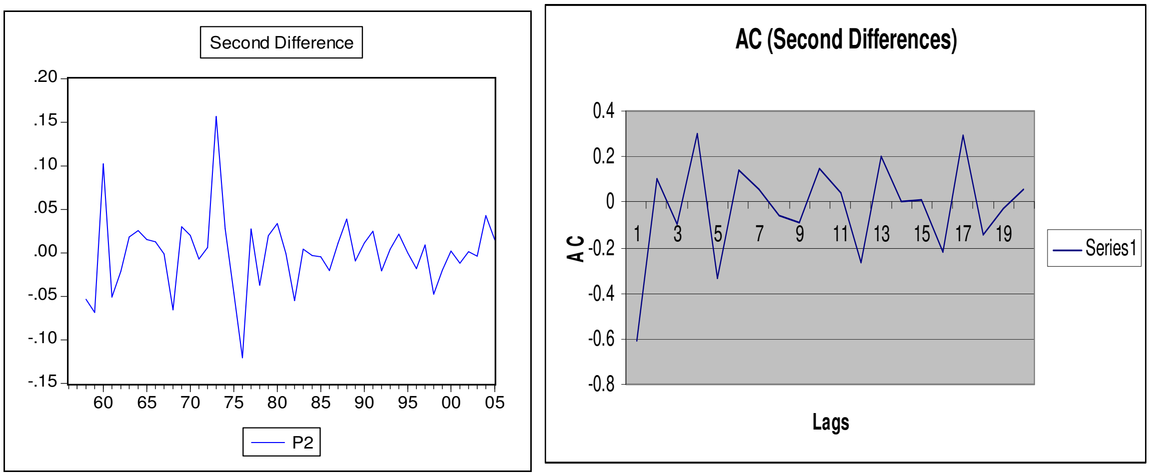




First Difference





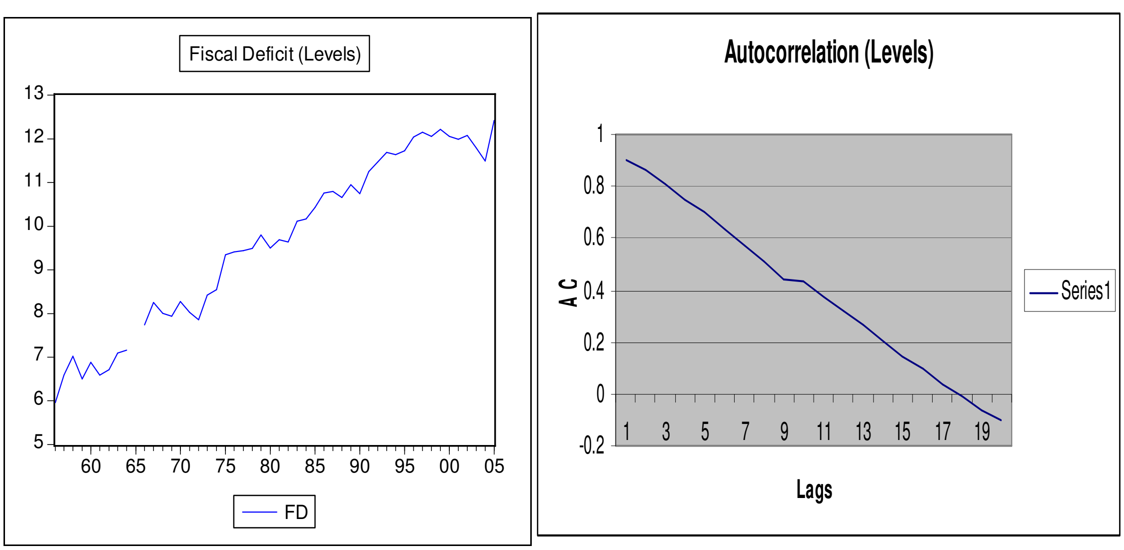


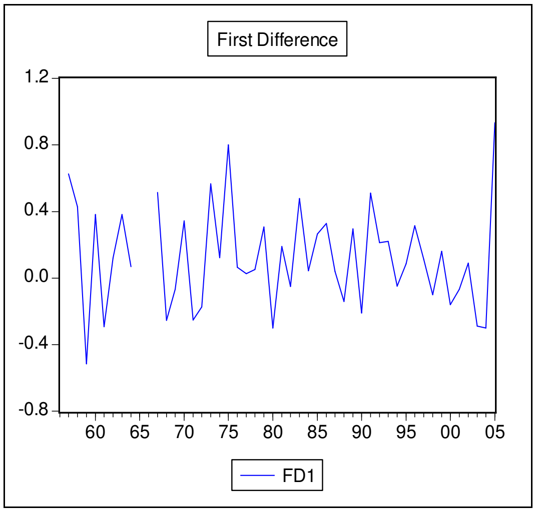
Second Difference

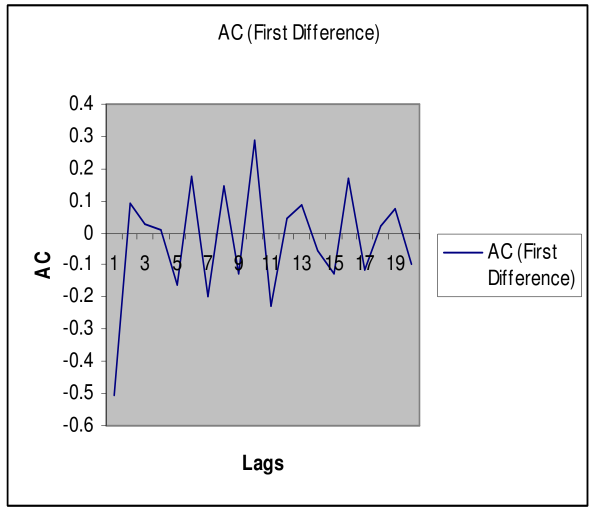
Fiscal Deficit:

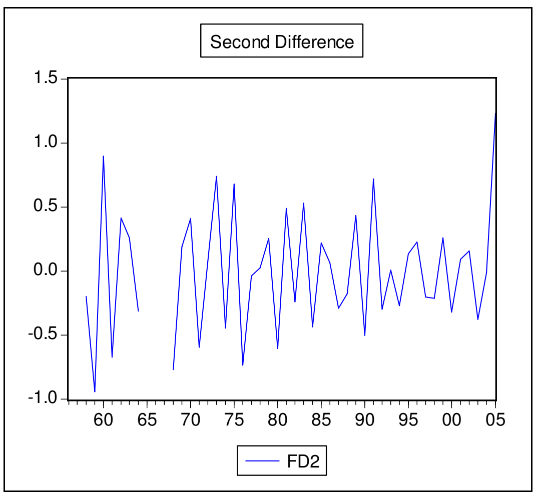
Graphs A-F in Fig II depict exactly the same picture as the price series above. Hence I will not undertake a detailed verbal explanation.

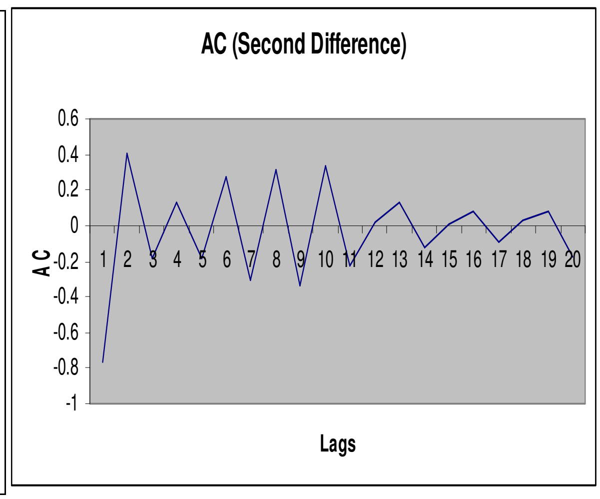
Figure II







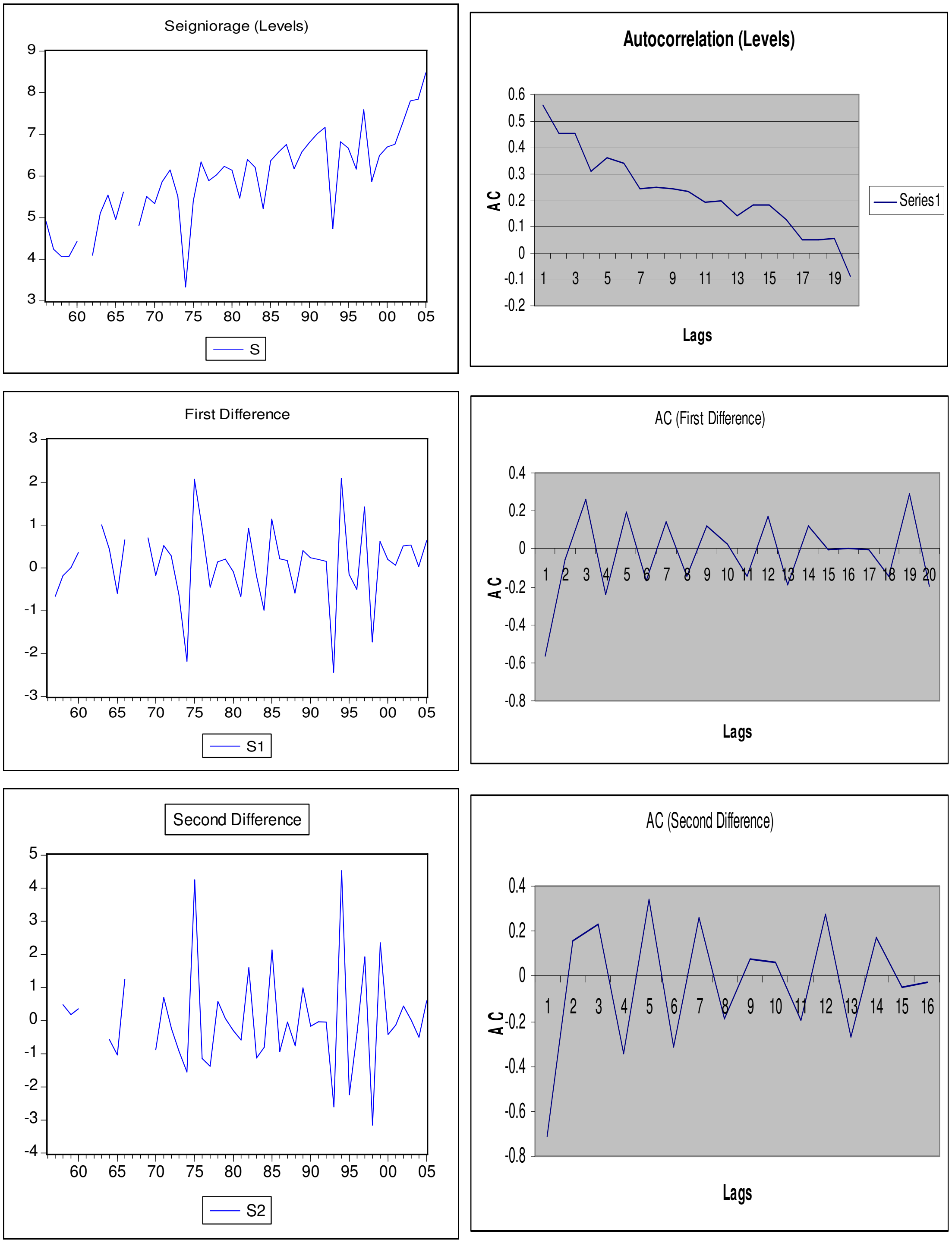




Seigniorage

Fig III depicts seigniorage. Again the visual analysis seems very similar to the above two series. The only exception is the presence of a structural break around 1975. This is reflected by sharp dip in graph A. In first and second difference, the series appears to be stationary.

Figure III


Seigniorage (Levels)
S
Autocorrelation (Levels)
A C
Lags
Series1
First Difference
S1
AC (First Difference)
A C
Lags
Second Difference
S2
AC (Second Difference)
A C
Lags

4.3 Unit Root Test

ADF was employed to account for possible serial correlation in the residuals. Two important considerations had to be made. Firstly what model to use to conduct the test i.e. should both trend and intercept be included, just the trend or just the intercept. Secondly what lag length should be used to ensure that serial correlation has been wiped out?

Not including an intercept in the model implies that the series has a zero mean. Since in reality it is very much possible that these series had non zero means, hence an intercept was included in every test to allow for nonzero mean to be picked up. Based on graph A in figures I, II and III, a trend was included for all variables in level forms but not in differences as the differenced series did not depict any sustained tendency to trend or wander (graphs C and E in figures I, II and III).

Owing to the small sample size and the fact that data is annual, lag length was fixed at 2 to minimize loss of power in testing.

Estimation and Results:

Table 4-3-1

Variables	*At Level*	*Significant At*	*Null Hypothesis*
p	-3.091	All levels	Not rejected
d	-1.639	All levels	Not rejected
s	-3.072	All levels	Not rejected

Note: The test statistics for P and S are very close to 5 specially 10 percent critical values. It could be that these series are in fact stationary at level but due to presence of structural breaks the test results are biased towards non rejection of the null which is stating that both p and s has a unit root in level form.

Table 4-3-2

Variables	*At First Difference*	*Significant At*	*Null Hypothesis*	*Order of Integration*
Δp	-3.106	5 & 10%	Rejected	I(1)
Δd	-3.585	5 & 10%	Rejected	I(1)
Δs	-5.093	all	Rejected	I(1)

4.4 Preliminary Model:

I have modeled a VAR (a vector autoregressive model) to discern a long run relationship between deficit and seigniorage. The dimensions of the VAR are:

- ρ= 2 (lag length) because annual data is being used. Since the sample size is small, including too many lags may result in loss of power.
- k = 2, where k represents the number of endogenous variables being modeled jointly.

$$y(t) = \mu + \prod(1)y(t-1) + \prod(2)\, y(t-2) + e(t)$$

where

$y(t)' = (y(1t), y(2t))$

$y(1t) = s$

$y(2t) = d$

$e(t)' = (e(1t), e(2t))$

4.4.1 Estimation and Results:

Since only two endogenous variables are being modeled, at most we can expect no more than one co integrating relationship.

Table 4-4-1

Hypothesized no of CE(s)	*Eigenvalue*	*Trace Statistic*	*Trace CV**	*Max-Eigen Statistic*	*Max-Eigen* CV*
None	0.320410	16.628	15.41	15.451	14.07
At most one	0.028998	1.177	3.76	1.177	3.76

* Critical values at 5% significance level.

Using the Johansen approach both the trace test and the Max-eigen value test detect the following co integrating combination between deficit and seigniorage at the 5% significance level:

$$s = 0.447d + residual \qquad \text{(C1)}$$

Given one co integrating vector, only one restriction is required which in this case is the normalization of the coefficient of s on d. Recall all variables are in log form. This implies, to finance a 1% increase in fiscal deficit in the long run, seigniorage would increase by 0.447% on average, ceteris paribus.

A long run equilibrium relationship has been established between s and d. Next the VECM is calculated to obtain equilibrium error terms to determine how stable the relationship is. The VECM yields two equations, one for Δs and one for Δd. Equilibrium error for Δd turns out to be statistically insignificant proving first that the co integrating relationship is stationary and second that deficits are weakly exogenous, hence deficits influence seigniorage and not vice versa.

We are left with the following error correction equation:

$$\Delta s = -1.1456[s(-1) - 0.4131d(-1) - 1.8987] + 0.1698\Delta s(-1) - 0.0130\Delta s(-2) - 1.0126\Delta d(-1) - 1.0204\Delta d(-2) + 0.3143$$

Equilibrium error is given by -1.1456 which is statistically significant. The coefficients on lagged differences yield short term dynamics and hence will not be considered.

4.5 The Final Model

Again a VAR is modeled, but with three variables. ρ stays the same while $k = 3$ now.

4.5.1 Estimation and Results:

From Fig I, II and III it is obvious that p, d and s exhibit an upward trend in levels. Therefore it is important to rule out the possibility of a spurious relationship. The following regression was run and an ADF test conducted on μ (results in Table 1) to check for stationary:

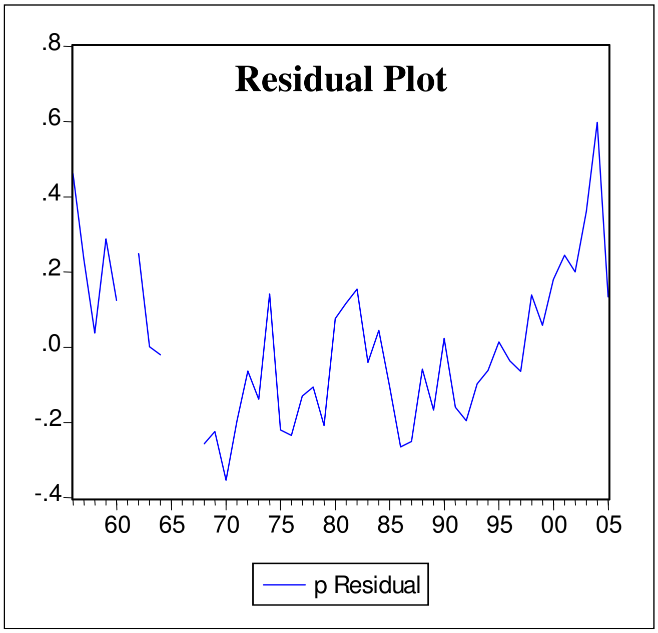
$$p = \alpha + \beta{*}d + \gamma{*}s + \mu$$

where α= -2.614, β= 0.5554 and γ= 0.0514. Since the t statistics are no longer valid, no inference on the magnitude of impact of d and s on p can be made. Note however that both β, and γ possess a positive sign which is in line with what was postulated at the start.

Table 4-5-1

Variable	*Lag Length*	*Test Statistic*	*Manually calculated CV(5%)*	*Manually Calculated CV(10%)*	*Order of Integration*
M	1	-2.2579	-3.778	-3.478	I(1)
M	2	-1.2613	-3.778	-3.478	I(1)
M	AIC	-3.767	-3.778	-3.478	I(0)

Figure IV



The residual plot shows some persistence due to the fact that a static equation was estimated.

Next I applied the Johansen procedure.

Table 4-5-2

Hypothesized no of CE(s)	*Eigenvalue*	*Trace Statistic*	*Trace CV**	*Max-Eigen Statistic*	*Max-Eigen* CV*
None	0.419879	31.66	29.68	21.78	20.97
At most one	0.190109	9.88	15.41	8.43	14.07
At most two	0.035672	1.45	3.76	1.45297	3.76

* Critical values at 5% significance level.

Both Max-eigen and trace Test estimated one co integrating combination at 5% significance level which is as follows:

$$p = 0.0349d + 1.1535s + residual \qquad (C2)$$

The above co integrating relationship illustrates that both deficits and seigniorage have a positive impact on inflation. More precisely, a 1% increase in deficit increases expected inflation by 0.0349% *ceteris paribus* while a 1% increase in seigniorage increases expected inflation by 1.1535% *ceteris paribus*.

Next to check for stability of the above long run relationship a VECM was estimated involving three equations. The following long run adjustment parameters were revealed:

Table 4-5-3

	Δp	Δd	Δs
α	-0.054955	-0.094541	0.612404
SE	(0.02212)	(0.16682)	(0.44671)
t statistic	[-2.48395]	[-0.56671]	[1.37093]

From the table above it is clear that only the own adjustment coefficient is significant while α for Δd and Δs are insignificant. This suggests that d & s may be weakly exogenous and hence the Δd and Δs equations may be discarded.

To reinforce my prediction I imposed restrictions for weak exogeniety for α(2,1) and α(3,1) first individually and then jointly. The following results were estimated:

Table 4-5-4

	Deficit weakly exogenous	*Seigniorage weakly exogenous*	*Both weakly exogenous*
p (t stat)	-0.014129 (-2.55698)	-0.012625(-2.30911)	-0.012420(-2.49862)
d (t stat)	0 (NA)	0.007414(0.17630)	0 (NA)
s(t stat)	0.130337 (1.10492)	0 (NA)	0(NA)
Chi-sqr [msl]	0.206730 [0.649343]	1.041431 [0.307489]	1.064646 [0.587239]

Hence we are left with the following error correction equation. We are only interested in long run dynamics which are given by the highlighted portion of the equation:

$$\Delta P = \mathbf{-\ 0.0124(\ 6.1847*P(-1) - 2.8801*FD(-1) - 0.9543*S(-1) + 14.4495)} + 0.8387\Delta P(-1) - 0.1225\Delta P(-2) - 0.0891\Delta FD(-1) - 0.0322\Delta FD(-2) - 0.0083\Delta S(-1) + 0.0014\Delta S(-2) + 0.0375$$

5.0 Diagnostics

LM Test: Given annual data, lag length is fixed at two to avoid omitting too many variables which may result in misspecification. Given the dynamic nature of the model, D-W statistic will be biased towards finding no serial correlation. Hence the SC LM test is the appropriate choice.

The results rule out SC. We fail to reject the null. Lagged residuals are not correlated with current residual, neither individually (t statistics for resid(-1) and resid(-2) are insignificant in table 5-2) nor jointly (F statistic fails to reject the null with probability 0.09, table 5-1). The LM statistic also favors no SC with a p value of 0.05.

The failure to reject 'no serial correlation' with two lags was marginal (the LM test statistic is close to the CV). Hence I also tested with 3 lags to reinforce my results. The results detected no third order serial correlation either.

The test for normality yielded a J-B test statistic of 3.49 with a probability of 0.175. Hence the null stating that errors are normally distributed cannot be rejected. The values for skewness and kurtosis are sufficiently close to 0 and 3, and hence can be accepted in favor of normality.

In the White test only own square terms were included to avoid too many variables in the test equation. Given the results in table 5-1 we fail to reject the null of homoskedasticity.

Reset test for functional form for both $\rho = 2$ and $\rho = 3$ was done. Chi-sqr and F statistics showed no signs of a misspecified functional form. In both cases the coefficients of fitted values also turned out to be insignificant (table 5-3).

Table 5-1

Test	*Chi-sqr[prob]*	*CV^*	*F statistic[prob]*	*CV^^*
SC LM test(2)	5.879020 [0.052892]	5.99	2.573770 [0.093553]	3.33
SC LM test(3)	5.966050 [0.113274]	7.82	1.685634 [0.192721]	2.95
J-B Normality test	3.4895 [0.17468]	5.99	NA	NA
White Test	17.57007 [0.227069]	23.69	1.405516 [0.224486]	2.11
Ramsey Reset(1 restric)	2.411616 [0.120438]	3.84	1.913646 [0.176768]	4.17
Ramsey Reset(2 restric)	4.956957 [0.083871]	5.99	1.965217 [0.158346]	3.33

^critical values for chi-sqr distribution at 5% significance level

^^critical values for F distribution at 5% significance level

Table 5-2

Lag Length: 2		
Variables	**Coefficients**	**'t' statistic* [SE]**
Resid(-1)	-1.129913	-1.629558 [0.693386]
Resid(-2)	-0.342408	-1.279893 [0.267529]
Lag Length: 3		
Variables	**Coefficients**	**'t' statistic* [SE]**
Resid(-1)	-1.127716	-1.600101 [0.704778]
Resid(-2)	-0.325184	-1.164679 [0.279205]
Resid(-3)	0.073117	0.271602 [0.269208]

* at 5% significance level

Table 5-3

Ramsey Reset with one restriction		
Variables	**Coefficients**	**'t' statistic* [SE]**
Fitted^2	4.146988	1.383346 [2.997796]
Ramsey Reset with two restrictions		
Variables	**Coefficients**	**'t' statistic* [SE]**
Fitted^2	-21.55431	-1.158017 [18.61313]
Fitted^3	92.30257	1.398506 [66.00084]

*at 5% significance level.

6.0 Summary and Findings:

My findings are in consonance with classical economic theory- inflation is highly sensitive to changes in money supply in the economy. My model predicts that a 1% increase in seigniorage (money creation) would lead to a price hike of 1.15% in the economy (captured by C2). Clearly inflation is highly elastic to monetary expansion. But my findings also suggest that inflation in Pakistan is not purely a monetary phenomenon. Persistent public sector deficits over the past three decades have exerted a two fold influence- direct and indirect. The direct influence is captured by the positive coefficient on'd' in C2, which implies that a 1% increase in deficits increases expected inflation by 0.0349% ceteris paribus. Due to persistence of deficits in the long run the government has resorted to money creation as a means of financing its deficits. Therefore in the long run, a 1% increase in fiscal deficit has led to a 0.447% increase in seigniorage (evident from C1 in the preliminary model) which in turn has led to a price hike of 0.5156%.[3] Both d and s are weakly exogenous. Hence the relationship between p on the one hand and d and s on the other is one way only. The long run elasticity possesses the correct sign and is significant. It implies that in the long run 1.24% of the equilibrium error will be

[3] A 1% increase in s increases p by 1.1535% (from C2 in final model). Hence a 0.447% increase in s (Caused by a 1% increase in d, as seen from C1 in the preliminary model) will increase p by 0.5156% (1.1535%*0.447%).

corrected, ceteris paribus. The test results proved robust when subjected to a battery of diagnostic tests.

7.0 Conclusions & Policy Implications:

Inflation is a fiscal phenomenon in Pakistan. Economic theory rightly predicts a positive causal link between deficits and inflation. The apparent cause of inflation may be monetary but the true dynamics of macroeconomic instability go deeper- the problem of inflation can be attributed to the persistence of high fiscal deficits, financed largely, if not entirely, by raising seigniorage. External debt and domestic borrowing may pose as viable financing options for sustaining a huge budget deficit only in the short run. The massive buildup of public liabilities from these alternative sources will force the government to resort to money financing in the long run. Consequently the economy is bound to experience a price hike – greater in proportion than the increase in money creation (0.15% higher). Therefore switching to an alternative source of financing is not enough. Fiscal adjustment is necessary for undertaking a price stabilization policy in Pakistan.

It is however important to note that due to the limited scope of this paper, a very simplistic setting involving only three variables was modeled. In reality, macroeconomic variables such as inflation, public sector deficits, domestic money supply, debt, current/capital accounts, exchange rates, GDP, and real interest rates are intertwined in a complex manner. For a deeper understanding of the dynamics of inflation, analyzing the links between these variables and incorporating them in the model would be essential.

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APPENDIX A

Unit Root Tests

Unit Root Test for Inflation

LEVELS

Null Hypothesis: P has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 2 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.091409	0.1202
Test critical values:	1% level	-4.165756	
	5% level	-3.508508	
	10% level	-3.184230	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(P)
Method: Least Squares
Date: 03/18/07 Time: 17:46
Sample (adjusted): 1959 2005
Included observations: 47 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
P(-1)	-0.131587	0.042566	-3.091409	0.0035
D(P(-1))	0.645875	0.138841	4.651895	0.0000
D(P(-2))	-0.032929	0.143080	-0.230145	0.8191
C	0.148711	0.041781	3.559247	0.0009
@TREND(1956)	0.010770	0.003432	3.138200	0.0031

R-squared	0.540154	Mean dependent var	0.070754
Adjusted R-squared	0.496359	S.D. dependent var	0.050064
S.E. of regression	0.035529	Akaike info criterion	-3.736651
Sum squared resid	0.053017	Schwarz criterion	-3.539827
Log likelihood	92.81129	F-statistic	12.33371
Durbin-Watson stat	1.959410	Prob(F-statistic)	0.000001

FIRST DIFFERENCE

Null Hypothesis: D(P) has a unit root
Exogenous: Constant
Lag Length: 2 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.106238	0.0330
Test critical values:	1% level	-3.581152	

5% level	-2.926622	
10% level	-2.601424	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(P,2)
Method: Least Squares
Date: 03/18/07 Time: 18:13
Sample (adjusted): 1960 2005
Included observations: 46 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(P(-1))	-0.426092	0.137173	-3.106238	0.0034
D(P(-1),2)	0.126552	0.148725	0.850912	0.3996
D(P(-2),2)	-0.017737	0.146414	-0.121142	0.9042
C	0.032523	0.011160	2.914181	0.0057

R-squared	0.236906	Mean dependent var	0.002653
Adjusted R-squared	0.182399	S.D. dependent var	0.041608
S.E. of regression	0.037622	Akaike info criterion	-3.639504
Sum squared resid	0.059448	Schwarz criterion	-3.480491
Log likelihood	87.70859	F-statistic	4.346361
Durbin-Watson stat	1.763486	Prob(F-statistic)	0.009366

Unit Root Test for Fiscal Deficits

LEVELS

Null Hypothesis: FD has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 2 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.639180	0.7605
Test critical values:	1% level	-4.186481	
	5% level	-3.518090	
	10% level	-3.189732	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FD)

Method: Least Squares
Date: 03/18/07 Time: 18:15
Sample (adjusted): 1959 2005
Included observations: 43 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FD(-1)	-0.287777	0.175562	-1.639180	0.1094
D(FD(-1))	-0.122428	0.224007	-0.546536	0.5879
D(FD(-2))	0.037488	0.190611	0.196674	0.8451
C	1.889812	1.058986	1.784549	0.0823
@TREND(1956)	0.038755	0.024074	1.609800	0.1157

R-squared	0.176691	Mean dependent var	0.106206
Adjusted R-squared	0.090027	S.D. dependent var	0.298959
S.E. of regression	0.285184	Akaike info criterion	0.437581
Sum squared resid	3.090541	Schwarz criterion	0.642372
Log likelihood	-4.407996	F-statistic	2.038802
Durbin-Watson stat	1.802207	Prob(F-statistic)	0.108367

FIRST DIFFERENCE

Null Hypothesis: D(FD) has a unit root
Exogenous: Constant
Lag Length: 2 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.585951	0.0104
Test critical values:	1% level	-3.600987	
	5% level	-2.935001	
	10% level	-2.605836	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FD,2)
Method: Least Squares
Date: 03/18/07 Time: 18:16
Sample (adjusted): 1960 2005
Included observations: 41 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(FD(-1))	-1.237312	0.345044	-3.585951	0.0010
D(FD(-1),2)	-0.081455	0.271491	-0.300029	0.7658

D(FD(-2),2)	-0.071358	0.162749	-0.438452	0.6636
C	0.143717	0.056023	2.565323	0.0145

R-squared	0.639472	Mean dependent var	0.038591
Adjusted R-squared	0.610240	S.D. dependent var	0.456049
S.E. of regression	0.284715	Akaike info criterion	0.417813
Sum squared resid	2.999320	Schwarz criterion	0.584990
Log likelihood	-4.565160	F-statistic	21.87573
Durbin-Watson stat	1.813729	Prob(F-statistic)	0.000000

Unit Root Test for Seigniorage

LEVELS

Null Hypothesis: S has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 2 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.072376	0.1269
Test critical values:	1% level	-4.211868	
	5% level	-3.529758	
	10% level	-3.196411	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(S)
Method: Least Squares
Date: 03/18/07 Time: 18:18
Sample (adjusted): 1959 2005
Included observations: 39 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
S(-1)	-1.054227	0.343131	-3.072376	0.0042
D(S(-1))	0.105223	0.264164	0.398325	0.6929
D(S(-2))	-0.009993	0.185394	-0.053903	0.9573
C	4.632399	1.545359	2.997620	0.0051
@TREND(1956)	0.064500	0.021092	3.057992	0.0043

R-squared	0.469698	Mean dependent var	0.091877
Adjusted R-squared	0.407309	S.D. dependent var	0.929928
S.E. of regression	0.715918	Akaike info criterion	2.288708

Sum squared resid	17.42634	Schwarz criterion	2.501985
Log likelihood	-39.62981	F-statistic	7.528597
Durbin-Watson stat	1.987510	Prob(F-statistic)	0.000186

FIRST DIFFERENCE

Null Hypothesis: D(S) has a unit root
Exogenous: Constant
Lag Length: 2 (Fixed)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.093552	0.0002
Test critical values:	1% level	-3.626784	
	5% level	-2.945842	
	10% level	-2.611531	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(S,2)
Method: Least Squares
Date: 03/18/07 Time: 18:20
Sample (adjusted): 1960 2005
Included observations: 36 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(S(-1))	-2.222732	0.436382	-5.093552	0.0000
D(S(-1),2)	0.587101	0.313145	1.874853	0.0700
D(S(-2),2)	0.103440	0.170661	0.606115	0.5487
C	0.177444	0.140251	1.265186	0.2149

R-squared	0.761959	Mean dependent var	0.047759
Adjusted R-squared	0.739642	S.D. dependent var	1.612276
S.E. of regression	0.822668	Akaike info criterion	2.551910
Sum squared resid	21.65702	Schwarz criterion	2.727857
Log likelihood	-41.93438	F-statistic	34.14350
Durbin-Watson stat	2.145279	Prob(F-statistic)	0.000000

APPENDIX B

Preliminary Model

Johansen Cointegration Test

Date: 03/18/07 Time: 18:25
Sample (adjusted): 1958 2005
Included observations: 40 after adjustments
Trend assumption: Linear deterministic trend
Series: S FD
Lags interval (in first differences): 1 to 1

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None *	0.320410	16.62768	15.41	20.04
At most 1	0.028998	1.177056	3.76	6.65

Trace test indicates 1 cointegrating equation(s) at the 5% level
Trace test indicates no cointegration at the 1% level
*(**) denotes rejection of the hypothesis at the 5%(1%) level

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	5 Percent Critical Value	1 Percent Critical Value
None *	0.320410	15.45063	14.07	18.63
At most 1	0.028998	1.177056	3.76	6.65

Max-eigenvalue test indicates 1 cointegrating equation(s) at the 5% level
Max-eigenvalue test indicates no cointegration at the 1% level
*(**) denotes rejection of the hypothesis at the 5%(1%) level

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

S	FD
-2.060485	0.921446
0.255738	0.486884

Unrestricted Adjustment Coefficients (alpha):

D(S)	0.462230	-0.024387
D(FD)	-0.025240	-0.047703

1 Cointegrating Equation(s):	Log likelihood	-47.88701

Normalized cointegrating coefficients (standard error in parentheses)

S	FD
1.000000	**-0.447199**
	(0.07029)

Adjustment coefficients (standard error in parentheses)

D(S)	-0.952418
	(0.23635)
D(FD)	0.052007
	(0.09703)

Estimating Vector Error Correction Model

Vector Error Correction Estimates
Date: 03/18/07 Time: 18:30
Sample (adjusted): 1959 2005
Included observations: 37 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1	
S(-1)	1.000000	
FD(-1)	-0.413137	
	(0.06934)	
	[-5.95821]	
C	-1.898708	
Error Correction:	D(S)	D(FD)
CointEq1	**-1.145583**	**0.064816**
	(0.34436)	**(0.14590)**
	[-3.32667]	**[0.44424]**
D(S(-1))	0.169781	-0.106825
	(0.26494)	(0.11225)
	[0.64083]	[-0.95164]
D(S(-2))	-0.013031	-0.051235
	(0.18704)	(0.07925)
	[-0.06967]	[-0.64650]

D(FD(-1))	-1.012580	-0.352473
	(0.47868)	(0.20281)
	[-2.11535]	[-1.73791]
D(FD(-2))	-1.020349	-0.086928
	(0.51449)	(0.21799)
	[-1.98321]	[-0.39878]
C	0.314310	0.162041
	(0.14581)	(0.06178)
	[2.15557]	[2.62287]
R-squared	0.497412	0.156690
Adj. R-squared	0.416350	0.020673
Sum sq. resids	16.12087	2.893970
S.E. equation	0.721130	0.305539
F-statistic	6.136157	1.151985
Log likelihood	-37.13087	-5.357382
Akaike AIC	2.331398	0.613913
Schwarz SC	2.592628	0.875142
Mean dependent	0.094947	0.108421
S.D. dependent	0.943924	0.308747

Determinant resid covariance (dof adj.)	0.048475
Determinant resid covariance	0.034028
Log likelihood	-42.46080
Akaike information criterion	3.051935
Schwarz criterion	3.661471

APPENDIX C

The Final Model

OLS Regression of P on D and S

Dependent Variable: P
Method: Least Squares
Date: 03/18/07 Time: 18:44
Sample: 1956 2005
Included observations: 47

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.613771	0.175910	-14.85855	0.0000
FD	0.555431	0.025375	21.88866	0.0000
S	0.051255	0.044552	1.150446	0.2562

R-squared	0.967199	Mean dependent var	3.101614
Adjusted R-squared	0.965708	S.D. dependent var	1.134958
S.E. of regression	0.210174	Akaike info criterion	-0.220065
Sum squared resid	1.943608	Schwarz criterion	-0.101970
Log likelihood	8.171521	F-statistic	648.7043
Durbin-Watson stat	0.671171	Prob(F-statistic)	0.000000

ADF Test on residuals from the above OLS regression

Null Hypothesis: CIRESID has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic based on AIC, MAXLAG=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		**-3.767260**	0.0063
Test critical values:	1% level	-3.592462	
	5% level	-2.931404	
	10% level	-2.603944	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(CIRESID)
Method: Least Squares
Date: 03/18/07 Time: 18:56

Sample (adjusted): 1957 2005
Included observations: 43 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CIRESID(-1)	-0.410664	0.109009	-3.767260	0.0005
C	-0.005161	0.022674	-0.227597	0.8211

R-squared	0.257142	Mean dependent var	-0.005005
Adjusted R-squared	0.239024	S.D. dependent var	0.170444
S.E. of regression	0.148685	Akaike info criterion	-0.928576
Sum squared resid	0.906399	Schwarz criterion	-0.846660
Log likelihood	21.96438	F-statistic	14.19225
Durbin-Watson stat	2.185180	Prob(F-statistic)	0.000520

Johansen Cointegration Test

Date: 03/18/07 Time: 18:59
Sample (adjusted): 1958 2005
Included observations: 40 after adjustments
Trend assumption: Linear deterministic trend
Series: P FD S
Lags interval (in first differences): 1 to 1

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5 Percent Critical Value	1 Percent Critical Value
None *	0.419879	31.66792	29.68	35.65
At most 1	0.190109	9.887187	15.41	20.04
At most 2	0.035672	1.452971	3.76	6.65

Trace test indicates 1 cointegrating equation(s) at the 5% level
Trace test indicates no cointegration at the 1% level
*(**) denotes rejection of the hypothesis at the 5%(1%) level

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	5 Percent Critical Value	1 Percent Critical Value
None *	0.419879	21.78074	20.97	25.52
At most 1	0.190109	8.434216	14.07	18.63
At most 2	0.035672	1.452971	3.76	6.65

Max-eigenvalue test indicates 1 cointegrating equation(s) at the 5% level

Max-eigenvalue test indicates no cointegration at the 1% level
*(**) denotes rejection of the hypothesis at the 5%(1%) level

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

P	FD	S
-1.738136	0.060679	2.004853
-5.167626	3.379941	-0.200265
2.206077	-1.008303	0.578838

Unrestricted Adjustment Coefficients (alpha):

D(P)	0.015642	0.002511	-0.004805
D(FD)	0.019401	-0.104927	-0.018531
D(S)	-0.481416	0.004455	-0.068374

1 Cointegrating Equation(s): Log likelihood 38.24299

Normalized cointegrating coefficients (standard error in parentheses)

P	FD	S
1.000000	-0.034910	-1.153450
	(0.12074)	(0.23854)

Adjustment coefficients (standard error in parentheses)

D(P)	-0.027188
	(0.00938)
D(FD)	-0.033722
	(0.07665)
D(S)	0.836767
	(0.19739)

2 Cointegrating Equation(s): Log likelihood 42.46010

Normalized cointegrating coefficients (standard error in parentheses)

P	FD	S
1.000000	0.000000	-1.220672
		(0.14387)
0.000000	1.000000	-1.925549
		(0.25533)

Adjustment coefficients (standard error in parentheses)

D(P)	-0.040161	0.009435
	(0.02932)	(0.01818)
D(FD)	0.508502	-0.353470
	(0.22012)	(0.13648)

D(S)	0.813746	-0.014155
	(0.61914)	(0.38388)

Vector Error Correction Model

Vector Error Correction Estimates
Date: 03/18/07 Time: 19:00
Sample (adjusted): 1959 2005
Included observations: 37 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
P(-1)	1.000000
FD(-1)	-0.266551
	(0.14251)
	[-1.87043]
S(-1)	-0.586863
	(0.33637)
	[-1.74467]
C	2.947172

Error Correction:	D(P)	D(FD)	D(S)
CointEq1	**-0.054955**	**-0.094541**	**0.612404**
	(0.02212)	**(0.16682)**	**(0.44671)**
	[-2.48395]	**[-0.56671]**	**[1.37093]**
D(P(-1))	0.770598	1.879209	-8.621706
	(0.18307)	(1.38039)	(3.69626)
	[4.20941]	[1.36136]	[-2.33255]
D(P(-2))	-0.025053	2.327934	10.23341
	(0.21497)	(1.62098)	(4.34050)
	[-0.11654]	[1.43613]	[2.35765]
D(FD(-1))	-0.068273	-0.721958	-0.355345
	(0.02556)	(0.19277)	(0.51618)
	[-2.67058]	[-3.74518]	[-0.68841]
D(FD(-2))	-0.019854	-0.315122	-1.033753
	(0.02729)	(0.20574)	(0.55091)

	[-0.72764]	[-1.53165]	[-1.87644]
D(S(-1))	-0.021948	-0.070143	-0.455456
	(0.01170)	(0.08822)	(0.23622)
	[-1.87595]	[-0.79510]	[-1.92806]
D(S(-2))	-0.005417	-0.013803	-0.325785
	(0.00871)	(0.06564)	(0.17578)
	[-0.62229]	[-0.21027]	[-1.85342]
C	0.032551	-0.114206	0.159511
	(0.01291)	(0.09733)	(0.26062)
	[2.52180]	[-1.17337]	[0.61203]
R-squared	0.606521	0.399384	0.539264
Adj. R-squared	0.511543	0.254407	0.428052
Sum sq. resids	0.036251	2.061124	14.77845
S.E. equation	0.035356	0.266596	0.713864
F-statistic	6.385918	2.754819	4.848970
Log likelihood	75.67127	0.921107	-35.52238
Akaike AIC	-3.657906	0.382643	2.352561
Schwarz SC	-3.309600	0.730949	2.700868
Mean dependent	0.080614	0.108421	0.094947
S.D. dependent	0.050588	0.308747	0.943924

Determinant resid covariance (dof adj.)	4.12E-05
Determinant resid covariance	1.98E-05
Log likelihood	42.80812
Akaike information criterion	-0.854493
Schwarz criterion	0.321042

VECM: Deficits weakly exogenous

Vector Error Correction Estimates
Date: 03/18/07 Time: 19:06
Sample (adjusted): 1959 2005
Included observations: 37 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegration Restrictions:
A(2,1) = 0
Convergence achieved after 12 iterations.
Not all cointegrating vectors are identified
LR test for binding restrictions (rank = 1):
Chi-square(1) 0.206730

Probability	0.649343

Error Correction:	D(P)	D(FD)	D(S)
CointEq1	-0.014129	0.000000	0.130337
	(0.00553)	(0.00000)	(0.11796)
	[-2.55698]	[NA]	[1.10492]
D(P(-1))	0.785969	2.019442	-9.071616
	(0.18035)	(1.37012)	(3.69213)
	[4.35814]	[1.47392]	[-2.45701]
D(P(-2))	-0.045838	2.105803	10.92137
	(0.21021)	(1.59699)	(4.30350)
	[-0.21806]	[1.31861]	[2.53779]
D(FD(-1))	-0.078516	-0.717069	-0.296323
	(0.02672)	(0.20298)	(0.54698)
	[-2.93873]	[-3.53273]	[-0.54175]
D(FD(-2))	-0.025290	-0.307753	-1.014114
	(0.02768)	(0.21032)	(0.56675)
	[-0.91355]	[-1.46329]	[-1.78935]
D(S(-1))	-0.018461	-0.047226	-0.535739
	(0.01051)	(0.07985)	(0.21519)
	[-1.75635]	[-0.59140]	[-2.48965]
D(S(-2))	-0.003854	-0.001411	-0.366961
	(0.00829)	(0.06297)	(0.16970)
	[-0.46500]	[-0.02241]	[-2.16244]
C	0.034402	-0.110743	0.138210
	(0.01284)	(0.09752)	(0.26278)
	[2.68011]	[-1.13564]	[0.52595]
R-squared	0.609156	0.394386	0.529492
Adj. R-squared	0.514814	0.248203	0.415922
Sum sq. resids	0.036008	2.078274	15.09188
S.E. equation	0.035237	0.267702	0.721394
F-statistic	6.456908	2.697900	4.662224
Log likelihood	75.79558	0.767812	-35.91064
Akaike AIC	-3.664626	0.390929	2.373548
Schwarz SC	-3.316320	0.739236	2.721855
Mean dependent	0.080614	0.108421	0.094947
S.D. dependent	0.050588	0.308747	0.943924

Determinant resid covariance (dof adj.)	4.13E-05
Determinant resid covariance	1.99E-05
Log likelihood	42.70475
Akaike information criterion	-0.848905
Schwarz criterion	0.326629

VECM: Seigniorage weakly exogenous

Vector Error Correction Estimates
Date: 03/18/07 Time: 19:12
Sample (adjusted): 1959 2005
Included observations: 37 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegration Restrictions:
A(3,1) = 0
Convergence achieved after 14 iterations.
Not all cointegrating vectors are identified
LR test for binding restrictions (rank = 1):

Chi-square(1)	1.041431
Probability	0.307489

Error Correction:	D(P)	D(FD)	D(S)
CointEq1	-0.012625	0.007414	0.000000
	(0.00547)	(0.04205)	(0.00000)
	[-2.30911]	[0.17630]	[NA]
D(P(-1))	0.844448	2.164190	-9.917621
	(0.17747)	(1.33413)	(3.65058)
	[4.75831]	[1.62217]	[-2.71672]
D(P(-2))	-0.131428	1.863733	12.26089
	(0.20216)	(1.51977)	(4.15854)
	[-0.65011]	[1.22633]	[2.94837]
D(FD(-1))	-0.090238	-0.677034	-0.358263
	(0.02958)	(0.22236)	(0.60845)
	[-3.05077]	[-3.04474]	[-0.58882]
D(FD(-2))	-0.032389	-0.278800	-1.067407
	(0.02913)	(0.21897)	(0.59916)
	[-1.11199]	[-1.27325]	[-1.78151]

D(S(-1))	-0.007297	-0.026913	-0.672699
	(0.00808)	(0.06075)	(0.16623)
	[-0.90299]	[-0.44300]	[-4.04674]
D(S(-2))	0.001871	0.010569	-0.442445
	(0.00747)	(0.05616)	(0.15368)
	[0.25049]	[0.18819]	[-2.87903]
C	0.037771	-0.111967	0.121532
	(0.01305)	(0.09808)	(0.26839)
	[2.89493]	[-1.14154]	[0.45282]
R-squared	0.600074	0.393229	0.513951
Adj. R-squared	0.503540	0.246767	0.396629
Sum sq. resids	0.036845	2.082244	15.59038
S.E. equation	0.035644	0.267958	0.733212
F-statistic	6.216207	2.684857	4.380684
Log likelihood	75.37064	0.732505	-36.51184
Akaike AIC	-3.641656	0.392838	2.406046
Schwarz SC	-3.293350	0.741144	2.754352
Mean dependent	0.080614	0.108421	0.094947
S.D. dependent	0.050588	0.308747	0.943924

Determinant resid covariance (dof adj.)	4.20E-05
Determinant resid covariance	2.02E-05
Log likelihood	42.28740
Akaike information criterion	-0.826346
Schwarz criterion	0.349189

VECM: Both Deficits and Seigniorage weakly exogenous

Vector Error Correction Estimates
Date: 03/18/07 Time: 19:16
Sample (adjusted): 1959 2005
Included observations: 37 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegration Restrictions:
A(3,1)=0
A(2,1)=0
Convergence achieved after 7 iterations.
Not all cointegrating vectors are identified
LR test for binding restrictions (rank = 1):
Chi-square(2) 1.064646

Probability	0.587239

Error Correction:	D(P)	D(FD)	D(S)
CointEq1	-0.012420	0.000000	0.000000
	(0.00497)	(0.00000)	(0.00000)
	[-2.49862]	[NA]	[NA]
D(P(-1))	0.838699	2.148521	-9.854531
	(0.17725)	(1.33706)	(3.65298)
	[4.73180]	[1.60690]	[-2.69767]
D(P(-2))	-0.122462	1.891950	12.15492
	(0.20231)	(1.52613)	(4.16954)
	[-0.60531]	[1.23971]	[2.91517]
D(FD(-1))	-0.089087	-0.686281	-0.346059
	(0.02910)	(0.21955)	(0.59983)
	[-3.06091]	[-3.12586]	[-0.57693]
D(FD(-2))	-0.032179	-0.285123	-1.055885
	(0.02894)	(0.21829)	(0.59640)
	[-1.11199]	[-1.30616]	[-1.77044]
D(S(-1))	-0.008314	-0.028611	-0.663691
	(0.00822)	(0.06200)	(0.16940)
	[-1.01157]	[-0.46145]	[-3.91799]
D(S(-2))	0.001374	0.009412	-0.437385
	(0.00750)	(0.05658)	(0.15459)
	[0.18320]	[0.16634]	[-2.82933]
C	0.037450	-0.111157	0.121672
	(0.01299)	(0.09801)	(0.26776)
	[2.88252]	[-1.13418]	[0.45440]
R-squared	0.602572	0.392866	0.515147
Adj. R-squared	0.506641	0.246317	0.398113
Sum sq. resids	0.036614	2.083490	15.55204
S.E. equation	0.035533	0.268038	0.732309
F-statistic	6.281315	2.680773	4.401699
Log likelihood	75.48655	0.721438	-36.46629
Akaike AIC	-3.647922	0.393436	2.403583
Schwarz SC	-3.299615	0.741742	2.751890
Mean dependent	0.080614	0.108421	0.094947
S.D. dependent	0.050588	0.308747	0.943924

APPENDIX D

Diagnostics

<u>Serial Correlation LM Test</u> (2 Lags)

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	***2.573770***	***Prob. F(2,29)***	***0.093553***
Obs*R-squared	***5.879020***	***Prob. Chi-Square(2)***	***0.052892***

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 03/15/07 Time: 06:42
Sample: 1959 2005
Included observations: 39
Presample and interior missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.103923	0.083886	1.238867	0.2253
CIRESID(-1)	0.033958	0.023328	1.455656	0.1562
D(P(-1))	0.983858	0.642046	1.532381	0.1363
D(P(-2))	-0.663921	0.567468	-1.169971	0.2515
D(FD(-1))	-0.000581	0.023991	-0.024227	0.9808
D(FD(-2))	0.052032	0.044030	1.181740	0.2469
D(S(-1))	0.031291	0.023564	1.327882	0.1946
D(S(-2))	0.019553	0.014916	1.310907	0.2002
RESID(-1)	**-1.129913**	**0.693386**	**-1.629558**	**0.1140**
RESID(-2)	**-0.342408**	**0.267529**	**-1.279893**	**0.2107**

R-squared	0.150744	Mean dependent var	2.78E-17
Adjusted R-squared	-0.112818	S.D. dependent var	0.031863
S.E. of regression	0.033612	Akaike info criterion	-3.731288
Sum squared resid	0.032764	Schwarz criterion	-3.304734
Log likelihood	82.76012	F-statistic	0.571949
Durbin-Watson stat	1.971599	Prob(F-statistic)	0.808666

Serial Correlation LM Test (3 Lags)

Breusch-Godfrey Serial Correlation LM Test:

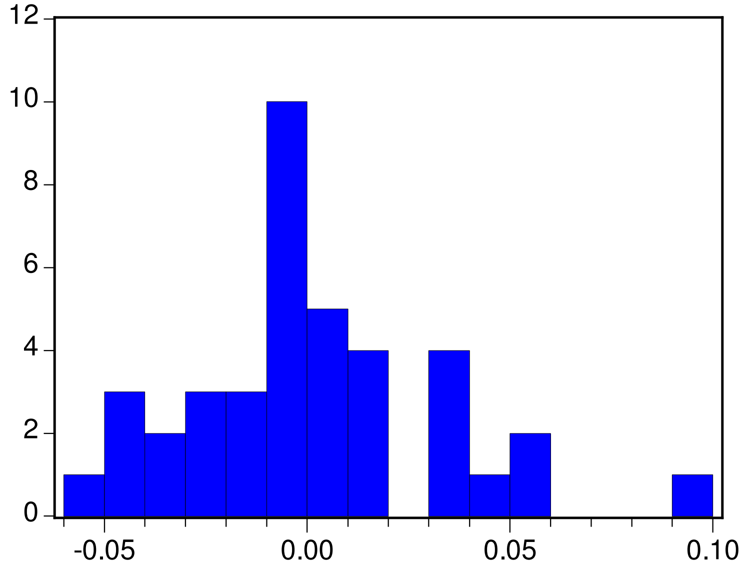
F-statistic	***1.685634***	***Prob. F(3,28)***	***0.192721***
Obs*R-squared	***5.966050***	***Prob. Chi-Square(3)***	***0.113274***

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 03/15/07 Time: 07:24
Sample: 1959 2005
Included observations: 39
Presample and interior missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.104320	0.085271	1.223399	0.2314
CIRESID(-1)	0.033772	0.023720	1.423815	0.1655
D(P(-1))	0.999485	0.655083	1.525739	0.1383
D(P(-2))	-0.694747	0.587814	-1.181916	0.2472
D(FD(-1))	-0.002138	0.025048	-0.085350	0.9326
D(FD(-2))	0.053194	0.044955	1.183287	0.2466
D(S(-1))	0.030335	0.024207	1.253133	0.2205
D(S(-2))	0.019363	0.015176	1.275879	0.2125
RESID(-1)	**-1.127716**	**0.704778**	**-1.600101**	**0.1208**
RESID(-2)	**-0.325184**	**0.279205**	**-1.164679**	**0.2540**
RESID(-3)	**0.073117**	**0.269208**	**0.271602**	**0.7879**

R-squared	0.152976	Mean dependent var	2.78E-17
Adjusted R-squared	-0.149533	S.D. dependent var	0.031863
S.E. of regression	0.034162	Akaike info criterion	-3.682637
Sum squared resid	0.032678	Schwarz criterion	-3.213427
Log likelihood	82.81142	F-statistic	0.505690
Durbin-Watson stat	1.999211	Prob(F-statistic)	0.871505

Normality Test



Series: Residuals	
Sample 1959 2005	
Observations 39	
Mean	2.78e-17
Median	-0.004973
Maximum	0.093961
Minimum	-0.053915
Std. Dev.	0.031863
Skewness	0.664829
Kurtosis	3.615974
Jarque-Bera	3.489548
Probability	0.174684

White Heteroskedasticity Test

White Heteroskedasticity Test:

F-statistic	***1.405516***	***Prob. F(14,24)***	***0.224486***
Obs*R-squared	***17.57007***	***Prob. Chi-Square(14)***	***0.227069***

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 03/15/07 Time: 07:29
Sample: 1959 2005
Included observations: 39

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.003998	0.011272	0.354712	0.7259
CIRESID(-1)	0.003608	0.005458	0.661116	0.5148
CIRESID(-1)^2	**0.000630**	**0.000627**	**1.003963**	**0.3254**
D(P(-1))	-0.018791	0.021974	-0.855150	0.4009
(D(P(-1)))^2	**0.067660**	**0.090421**	**0.748273**	**0.4616**
D(P(-2))	0.033337	0.018342	1.817501	0.0816
(D(P(-2)))^2	**-0.166366**	**0.092304**	**-1.802372**	**0.0841**
D(FD(-1))	-0.002047	0.001270	-1.611769	0.1201
(D(FD(-1)))^2	**0.005705**	**0.003555**	**1.604995**	**0.1216**
D(FD(-2))	-0.003645	0.001523	-2.394197	0.0248
(D(FD(-2)))^2	**0.006115**	**0.003055**	**2.001775**	**0.0567**
D(S(-1))	-0.000906	0.000978	-0.926294	0.3635

(D(S(-1)))^2	**3.63E-05**	**0.000465**	**0.078030**	**0.9385**
D(S(-2))	-0.000517	0.000506	-1.020959	0.3175
(D(S(-2)))^2	**0.000301**	**0.000288**	**1.043616**	**0.3071**

R-squared	0.450515	Mean dependent var	0.000989
Adjusted R-squared	0.129981	S.D. dependent var	0.001621
S.E. of regression	0.001512	Akaike info criterion	-9.867210
Sum squared resid	5.49E-05	Schwarz criterion	-9.227379
Log likelihood	207.4106	F-statistic	1.405516
Durbin-Watson stat	1.834632	Prob(F-statistic)	0.224486

Ramsey Reset Test (1 fitted value)

Ramsey RESET Test:

F-statistic	***1.913646***	***Prob. F(1,30)***	***0.176768***
Log likelihood ratio	***2.411616***	***Prob. Chi-Square(1)***	***0.120438***

Test Equation:
Dependent Variable: D(P)
Method: Least Squares
Date: 03/15/07 Time: 08:37
Sample: 1959 2005
Included observations: 39

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.028439	0.086164	-0.330053	0.7437
CIRESID(-1)	-0.014995	0.020282	-0.739329	0.4655
D(P(-1))	0.113334	0.472921	0.239646	0.8122
D(P(-2))	0.127790	0.190615	0.670411	0.5077
D(FD(-1))	-0.017730	0.037696	-0.470351	0.6415
D(FD(-2))	-0.014589	0.025173	-0.579542	0.5666
D(S(-1))	-0.008620	0.019547	-0.440970	0.6624
D(S(-2))	-0.001923	0.010322	-0.186290	0.8535
FITTED^2	**4.146988**	**2.997796**	**1.383346**	**0.1768**

R-squared	0.624798	Mean dependent var	0.078324
Adjusted R-squared	0.524744	S.D. dependent var	0.050434
S.E. of regression	0.034769	Akaike info criterion	-3.681012
Sum squared resid	0.036266	Schwarz criterion	-3.297113
Log likelihood	80.77973	F-statistic	6.244620
Durbin-Watson stat	2.080186	Prob(F-statistic)	0.000092

Ramsey Reset Test (2 fitted values)

Ramsey RESET Test:

F-statistic	***1.965217***	***Prob. F(2,29)***	***0.158346***
Log likelihood ratio	***4.956957***	***Prob. Chi-Square(2)***	***0.083871***

Test Equation:
Dependent Variable: D(P)
Method: Least Squares
Date: 03/15/07 Time: 08:55
Sample: 1959 2005
Included observations: 39

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.316191	0.222555	-1.420729	0.1661
CIRESID(-1)	-0.090809	0.057771	-1.571885	0.1268
D(P(-1))	1.439850	1.056621	1.362694	0.1835
D(P(-2))	0.321934	0.233418	1.379219	0.1784
D(FD(-1))	-0.143162	0.097064	-1.474929	0.1510
D(FD(-2))	-0.040699	0.031027	-1.311730	0.1999
D(S(-1))	-0.068759	0.047112	-1.459488	0.1552
D(S(-2))	-0.022753	0.018031	-1.261913	0.2170
FITTED^2	**-21.55431**	**18.61313**	**-1.158017**	**0.2563**
FITTED^3	**92.30257**	**66.00084**	**1.398506**	**0.1726**

R-squared	0.648504	Mean dependent var	0.078324
Adjusted R-squared	0.539419	S.D. dependent var	0.050434
S.E. of regression	0.034228	Akaike info criterion	-3.694995
Sum squared resid	0.033975	Schwarz criterion	-3.268440
Log likelihood	82.05240	F-statistic	5.944938
Durbin-Watson stat	1.971531	Prob(F-statistic)	0.000107