THE PHILIPPINE REVIEW OF ECONOMICS
VOL. XLII NO. 1 JUNE 2005

Monetary transmission mechanism in the Philippines: the interest rate channel

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Abstract

The transmission mechanism of monetary policy explains how monetary policy works—that is, how economic and financial variables respond to monetary policy actions. In view of the complexity of the transmission process, properly identifying the process as it works in the Philippines requires considerable effort and volume of work. In the context of inflation targeting, for example, an understanding of the monetary policy transmission mechanism is essential to understanding what monetary policy can and should do, and at what point in time actions should be undertaken to contain or offset disturbances that could threaten the achievement of the inflation target.

In this paper, we concentrate on the interest rate channel. We present initial estimates, obtained from general-to-specific modeling, and validate the results using a vector error correction model. The results confirm expectations that an increase in the 91-day Tbill rate generates a lagged reduction in the level of fixed capital formation and a decline in GDP growth, which is strongest about four quarters after the interest rate shock. However, the results also show that there is likewise an initial increase in the inflation rate; by the eighth quarter, however, inflation falls below the baseline. We view our results as an initial step in a research program that seeks to specify the various channels of monetary policy impact.

JEL classification: E31, E52
Keywords: inflation targeting, interest rate, monetary policy

> "Monetary policy is a powerful tool, but one that sometimes has unexpected or unwanted consequences. To be successful in conducting monetary policy, the monetary authorities must have an accurate assessment of the timing and effect of their policies on the economy, thus requiring an understanding of the mechanisms through which monetary policy affects the economy."
>
> Mishkin, F.S. [1995]. "Symposium on the monetary transmission mechanism," Journal of Economic Perspectives.

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1. Introduction

The transmission mechanism of monetary policy explains how monetary policy works—that is, how economic and financial variables respond to monetary policy actions. This mechanism describes the various channels, as well as the associated lags or length of time through which monetary policy actions affect the economy, particularly inflation and output. Recent surveys in the literature have identified and focused on several channels of transmission, particularly through market interest rates, the foreign exchange rate, the volume and allocation of credit, portfolio effects induced by asset price changes, and induced changes in agents' expectations, among others.[1] These channels are interdependent as the effects of monetary policy actions could flow through various paths and influence the level of aggregate demand and supply in the economy and ultimately, inflation. In the context of inflation targeting, for example, an understanding of the monetary policy transmission mechanism is essential to understanding what monetary policy can and should do and at what point in time actions should be undertaken to contain or offset disturbances that could threaten the achievement of the inflation target.

In view of the complexity of the transmission process, properly identifying the process as it works in the Philippines requires considerable effort and volume of work. In this paper, we concentrate on the interest rate channel and, in particular, aim to estimate the impact of changes in the Bangko Sentral ng Pilipinas' (BSP) policy interest rates on the level of investment and output. We view this as an initial step toward a research program that seeks to specify the various channels of monetary policy impact.

2. The interest rate channel

A central bank's interest in the transmission mechanism of monetary policy arises from the fact that it takes time for monetary policy to exert its maximum impact on inflation. A central bank should be able to carefully calibrate its policy interest rate at the present so as to achieve its inflation target in the future to a level that is consistent with the economy's growth objective.

In the Philippines, the policy interest rates consist of the BSP's overnight reverse repurchase (RRP) or borrowing rate and overnight repurchase (RP) or lending rate. The policy rates are set by the Monetary Board, which is the policymaking body of the BSP. By affecting the level of liquidity in the system, the change in the level of the BSP's policy rates influence the benchmark 91-day Treasury bill rate, banks' lending rates, deposit rates and the whole spectrum of market interest rates. In particular, the short-term market interest rates closely track the movements in the BSP's policy rates. Hence, if there is an adjustment in the BSP's policy rates, the immediate consequence of such an action would be a parallel change in the short-

[1]See, for example, the Monetary Policy Committee, Bank of England, "The transmission mechanism of monetary policy, 1999".

term rates. However, while short-term rates tend to follow the adjustments in the policy rates, they may not change by the same magnitude as the changes in the policy rates.

Meanwhile, the impact of movements of policy rates on long-term interest rates would depend on inflation expectations formed by economic agents—following the adjustments in the policy rates—and the credibility of the central bank. For instance, if the BSP raises its policy rates and if the market believes the BSP, this could lead to expectations that inflation would slow down in the future and thus, expected future interest rates could fall. On the other hand, higher policy rates could send a signal that the BSP is concerned over the inflation scenario. This could lead to expectations that the high interest rates would be sustained for an extended period of time in the future. Thus, the credibility of the central bank tends to reinforce the desired objectives of its policy actions.

Changes in interest rates could also affect an individual's saving and consumption decisions as well as the investment decisions of firms. The impact of interest rate changes on a consumer's decision would depend on whether the individual is a saver or a borrower. For a borrower, higher interest rates imply larger interest payments on outstanding debt (i.e., payments for housing loans and credit card payments). This would lead to lower disposable income, which in turn could result in lower consumption. Meanwhile, higher interest rates could encourage savings since returns on savings would have risen with higher interest rates. Movements in interest rates could also have "wealth effects". High interest rates (current and expected) tend to reduce asset values, and lower wealth leads to lower spending. On the other hand, high interest rates could be beneficial to a saver since with higher interest rate, a saver would have earned more from his savings.

Investment decisions of firms are also affected in a similar fashion by movements in interest rates. For example, higher interest rates would raise the cost of financing investments, thereby reducing investments. This is particularly true for firms with strong reliance on bank financing. On the other hand, firms with large savings or holdings of interest-bearing instruments such as insurance companies could earn more from their bank deposits or investment holdings. Hence, an increase in interest rates could encourage higher investments for this type of firms.

Policy-induced changes in interest rates can also affect the exchange rate. Abstracting from other factors, an increase in policy interest rate could lead to an appreciation of the Philippine peso relative to the US dollar as investors would be encouraged to hold on to their peso-denominated assets. Conversely, a cut in the policy interest rates could lead to depreciation of the peso vis-à-vis the US dollar. In turn, the resulting movements in the exchange rate lead to changes in relative prices between tradable and non-tradable goods, which could influence the price level directly and indirectly, through the changes in the pattern of spending.

3. Empirical estimates

In our examination of the interest rate channel, we presume that the basic relationship is the link between capital formation and market interest rates. We follow the general-to-specific modeling strategy in specifying this link. Our general specification follows an accelerator-type model, in which per capita fixed capital formation (*FC/POP*) depends on lag distributions of past levels of capital formation, real growth rates of per capita GDP, and real interest rates (*RTBILL*), measured by the difference between the 91-day Tbill rate and the rate of inflation:

$$\begin{aligned} FCF/POP = \alpha + \Sigma_{i=1^n} \beta_i\, FCF_i/POP_{-i} + \\ \Sigma_{i=0^j} \gamma_i \left(GDP_{-i}/POP_{-i} - GDP_{-i-4}/POP_{-i-4}\right) + \\ \Sigma_{i=0^j} \kappa_i \left(RTBILL_{-i}\right). \end{aligned}$$

We allow for a length of up to four quarters in the lag distributions of *FCF/POP* and *GDP/POP*, and up to an eight-quarter lag in the corresponding distribution for the real interest rate. The choice of lag length is largely constrained by data availability, while our decision to allow for a longer lag length for the interest rate is based on findings for many economies of a 3-5 quarter lag before the maximal impact of monetary policy on the economy is experienced.

The results of the initial general unrestricted and the automatic model reduction procedure of PC-GETS, covering the period 1984–first quarter 2003, are shown in Annexes 1 and 2. Note that a seasonal dummy variable (*S4*) was used to designate the fourth quarter. Although the model passes the Chow tests for structural breaks at different points in the sample period, there is some evidence of heteroskedasticity in the model residuals. This possibility is supported by the plots of the residuals and squared residuals of the model (please see Annex 3).

Most of the outliers lie in the 1980s, at a time when significant structural and political changes were taking place in the economy. As it turns out, the problem of heteroskedasticity can be corrected by dropping the initial observations from the analysis. Accordingly, a general unrestricted model was estimated for the period 1987–first quarter 2003 (see Annex 4) and Table 1 shows the specific model generated by the automatic model selection facility of the PC-GETS.

The equation yields the per capita level of fixed capital formation as a function of its own lagged values for the immediate quarter and for one year ago, the year-on-year growth rate of GDP, with a lag of three quarters, a lag distribution of real interest rates, and seasonal factors. It can be noted that the results support our earlier presumption of relatively longer lags between changes in real interest rates and induced changes in investment.

Test statistics generated by the program indicate that the relationship has remained stable for the sample period considered. Likewise, the residuals are normally distributed, are free from serial correlation, and are homoskedastic. (See Table 2).

Table 1. Specific model of FCF_POP, 1987 (1) - 2003 (1)

	Coeff	*StdError*	*t-value*	*t-prob*
Constant	424.50979	59.87563	7.09	0.0000
FCF_POP_1	0.26529	0.09100	2.915	0.0052
FCF_POP_4	0.28496	0.07469	3.815	0.0004
D4GDP_POP_3	0.18745	0.07643	2.452	0.0175
RTBILL_3	-5.70444	1.89428	-3.011	0.0040
RTBILL_5	-6.30887	2.59145	-2.434	0.0182
RTBILL_6	6.82574	3.09039	2.209	0.0315
RTBILL_7	-8.45717	2.43301	-3.476	0.0010
Seasonal	-52.39982	17.84045	-2.937	0.0049
Seasonal_1	-70.30939	17.54302	-4.008	0.0002
Seasonal_2	-72.10089	16.47526	-4.376	0.0001

RSS	92265	*sigma*	41.335
R^2	0.86527	*Radj^2*	0.84032
LogLik	-235.89	*AIC*	7.59649
HQ	7.74168	*SC*	7.96446
T	65	*p*	11
FpNull	0	*FpGUM*	0.97415

Table 2. Test statistics and residual values for Chow, 1995 (1) – 2001(3)

	value	*prob*
Chow(1995:1)	0.668	0.8541
Chow(2001:3)	0.2006	0.975
normality test	2.5844	0.2747
AR 1-4 test	0.4367	0.7815
ARCH 1-4 test	0.8591	0.4956
hetero test	16.7522	0.4713

Of interest are the implied long-run relationships associated with the foregoing model (refer to results of Dynamic Analysis on Table 3). Note that the long-run coefficients are substantially larger than the short-run parameters, and that the directions of the estimated long-run impacts are in accord with theoretical expectations. Moreover, the roots of the autoregressive dynamics are all less than 1, thus supporting the existence of a cointegrating relationship (see Annex 5 for the complete results).

One limitation of the foregoing analysis is that, having concentrated on the specification of a single equation, we have not allowed for feedback effects in analyzing the impact of interest rate changes on the level of investment. As a first step in addressing this concern, we have embedded the cointegrating relationship in a vector error correction (VEC) model. In the following model estimated by EVIEWS, we have estimated a VEC with the same variables that have been identified by PCGETS as entering into the long-run relationship. Other than this, no other constraints have been imposed on the specifications of the cointegrating equation. It is noteworthy that the estimated long-run coefficients from the VEC are quite close to those obtained from the PCGETS analysis (please see Annex 6 for the complete results).

The impulse responses following an increase in the 91-day Tbill rate are shown in Figure 1. Any such increase is most strongly correlated with the Tbill rate up to three quarters hence, after which there is a gradual decline to the baseline level. This generates a lagged reduction in the level of fixed capital formation. By the end of the 10-quarter simulation period, investment still will not recover to the baseline level, following the interest rate shock. The results also show a decline in GDP growth, which is strongest about four quarters after the interest rate shock. There is likewise an initial increase in the inflation rate, which persists up to two years after the interest rate increase. The increase may, perhaps, be attributable to cost-push factors. Further research in this area may be of interest to policymakers. By the eighth quarter, however, inflation falls below the baseline. Again, this is in accordance with the theoretically expected long-run impact of an interest rate increase.

4. Conclusion

The present paper can perhaps serve as an indication of how econometric analysis can help in identifying the channels of impact of monetary policy. In this paper, we have concentrated on a small aspect of this channel, i.e. the impact of interest rate changes on the economy. The analysis has identified significant impacts on investment, the rate of economic growth rate and inflation, and has also given some indication of the relative timings of the different channels of influence. We hope that the present approach can be of use, likewise, in fleshing out and identifying the other mechanisms by which monetary policy actions exert their impact on the economy. Again, we underscore not only the broadness of the scope but also the importance of such a research program.

Table 3. Dynamic analysis

Lag structure	*Lag 0*	*Lag 1*	*Lag 2*	*Lag 3*	*Lag 4*	*Lag 5*	*Lag 6*	*Lag 7*	*Sum*	*LongRun*
FCF_POP	0.0000	0.2653	0.0000	0.0000	0.2850	0.0000	0.0000	0.0000	0.5503	1.0000
SE	0.0000	0.0910	0.0000	0.0000	0.0747	0.0000	0.0000	0.0000	0.0741	0.0000
D4GDP_POP	0.0000	0.0000	0.0000	0.1874	0.0000	0.0000	0.0000	0.0000	0.1874	0.4168
SE	0.0000	0.0000	0.0000	0.0764	0.0000	0.0000	0.0000	0.0000	0.0764	0.1765
RTBILL	0.0000	0.0000	0.0000	-5.7044	0.0000	-6.3089	6.8260	-8.4570	-13.6447	-30.3386
SE	0.0000	0.0000	0.0000	1.8943	0.0000	2.5914	3.0904	2.4330	2.6083	4.3465
Constant	424.5098	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	424.5098	943.8821
SE	59.8756	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	59.8756	46.9009
Seasonal	-52.4000	-70.3100	-72.1000	0.0000	0.0000	0.0000	0.0000	0.0000	-194.8101	-433.1532
SE	17.8405	17.5430	16.4750	0.0000	0.0000	0.0000	0.0000	0.0000	44.4998	125.9000

Table 4. Vector error correction estimates

Sample(adjusted): 1983:3 2003:1

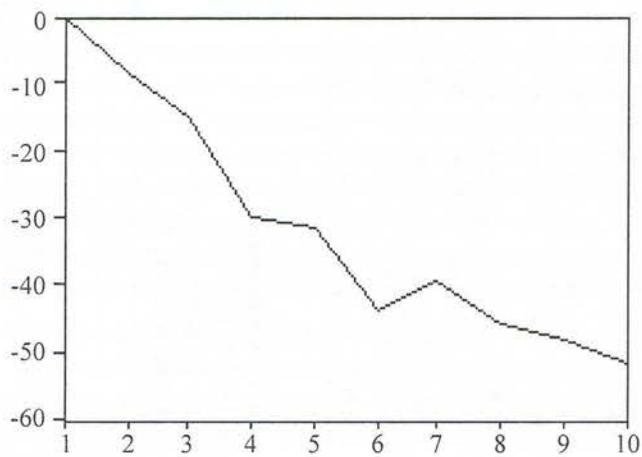
Included observations: 79 after adjusting endpoints

Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	*CointEq1*		
FCF(-1)/POP(-1)	1.000000		
GDP(-1)/POP(-1)-GDP(-5)/POP(-5)	-0.537146	-0.38745	[-1.38637]
TBILL91(-1)	32.38377	-5.0518	[6.41035]
INFLATION(-1)	-25.49298	-5.29051	[-4.81863]
C	-859.1817		

Figure 1. Response to Cholesky One S.D. Innovations

Response of FCF/POP to TBILL91



Response of TBILL91 to TBILL91

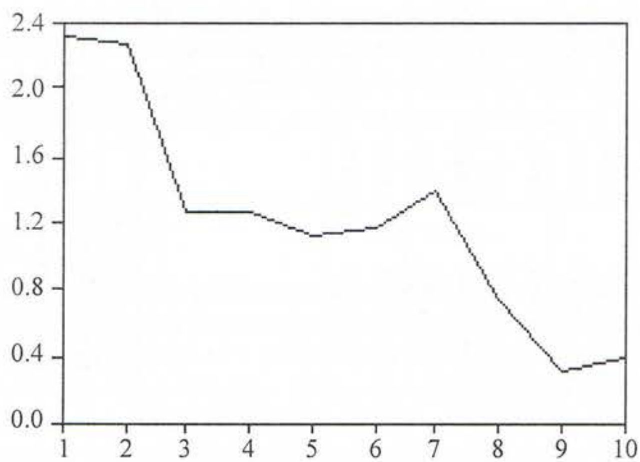
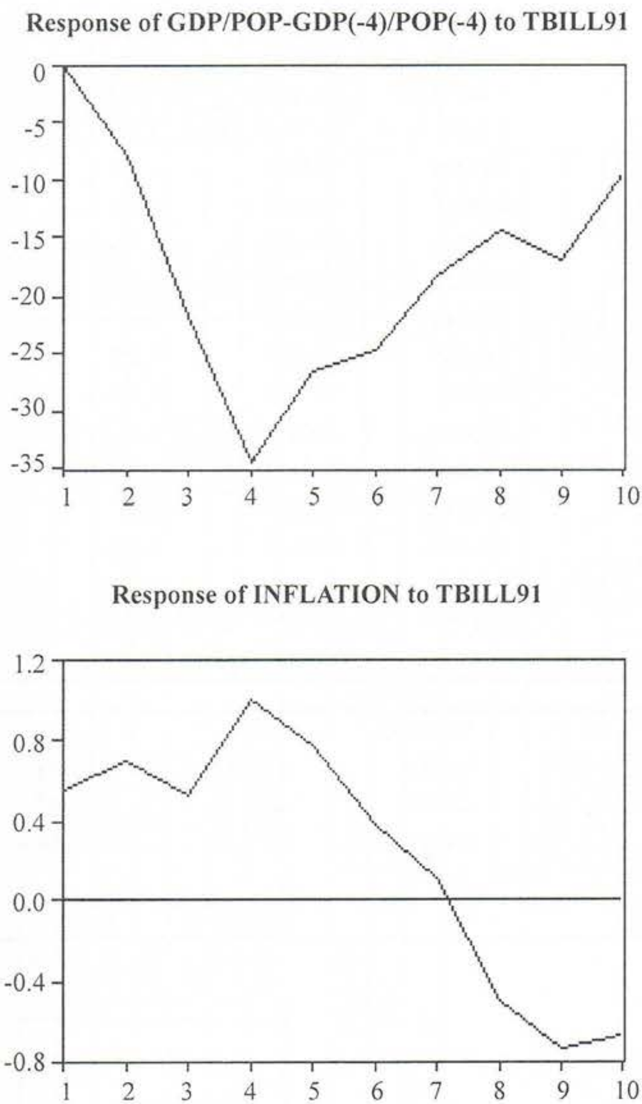


Figure 1. Response to Cholesky One S.D. Innovations (continued)



Annex 1

Modelling FCF_POP by GETS, 1984 (2) - 2003 (1)

	Coeff	*StdError*	*t-value*	*t-prob*
Constant	100.92157	65.92044	1.531	0.1314
FCF_POP_1	0.34168	0.13378	2.554	0.0134
FCF_POP_2	-0.01714	0.11195	-0.153	0.8788
FCF_POP_3	0.00528	0.10614	0.05	0.9605
FCF_POP_4	0.48875	0.12241	3.993	0.0002
D4GDP_POP	0.20301	0.15038	1.35	0.1825
D4GDP_POP_1	0.22209	0.15323	1.449	0.1528
D4GDP_POP_2	-0.03181	0.14152	-0.225	0.823
D4GDP_POP_3	0.12732	0.14372	0.886	0.3794
D4GDP_POP_4	-0.0202	0.12086	-0.167	0.8679
RTBILL	0.49149	2.89464	0.17	0.8658
RTBILL_1	1.54366	3.45257	0.447	0.6565
RTBILL_2	0.52374	3.37729	0.155	0.8773
RTBILL_3	-2.19457	3.09171	-0.71	0.4808
RTBILL_4	1.79686	3.03173	0.593	0.5558
RTBILL_5	-2.65449	3.12337	-0.85	0.399
RTBILL_6	1.01872	3.16012	0.322	0.7484
RTBILL_7	-1.50137	3.2386	-0.464	0.6447
RTBILL_8	0.81755	2.10879	0.388	0.6997
S4	39.76301	21.1604	1.879	0.0654

RSS	1.58E+05	*sigma*	53.054
R^2	0.85255	*Radj^2*	0.80253
LogLik	-290.22	*AIC*	8.16357
HQ	8.4087	*SC*	8.77692
T	76	*p*	20
FpNull	0	*FpConst*	0

Annex 2

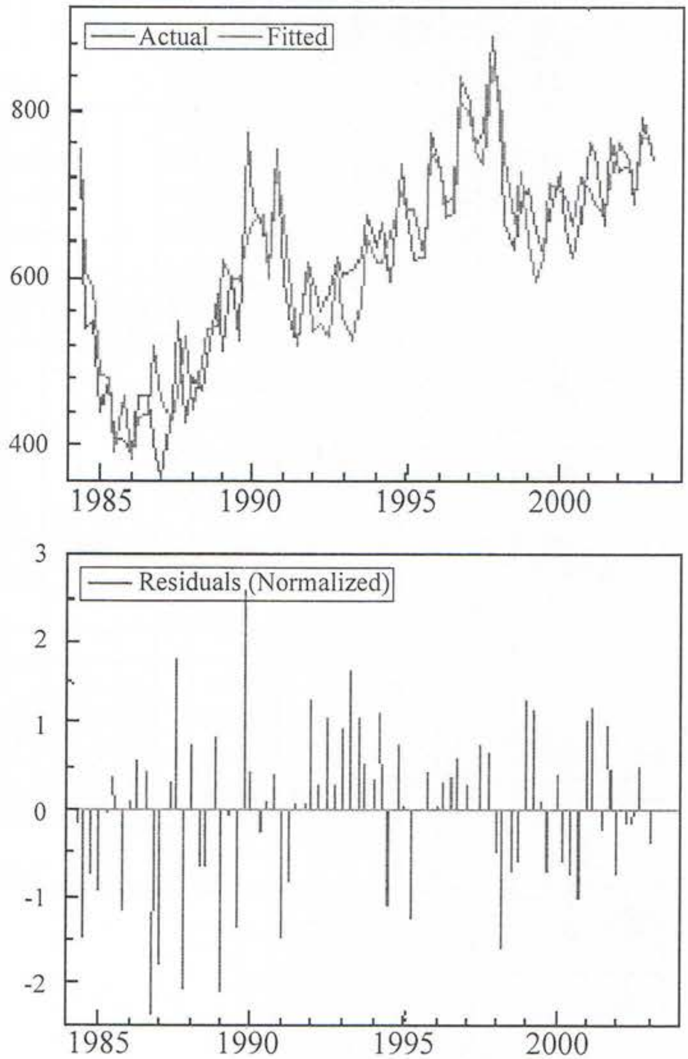
Specific model of FCF_POP, 1984 (2) - 2003 (1)

	Coeff	*Std Error*	*t-value*	*t-prob*	*Split1*	*Split2*	*reliable*
Constant	116.31372	34.12322	3.409	0.0011	0.0003	0.0008	1
FCF_POP_1	0.31961	0.0947	3.375	0.0012	0.0034	0.0001	1
FCF_POP_4	0.4878	0.08687	5.615	0	0	0.0005	1
D4GDP_POP	0.26372	0.11631	2.267	0.0265	0.0179	0.1186	0.7
D4GDP_POP_1	0.25334	0.09899	2.559	0.0127	0.0081	0.2939	0.7
RTBILL_5	-2.06777	0.89024	-2.323	0.0232	0.0057	0.1256	0.7

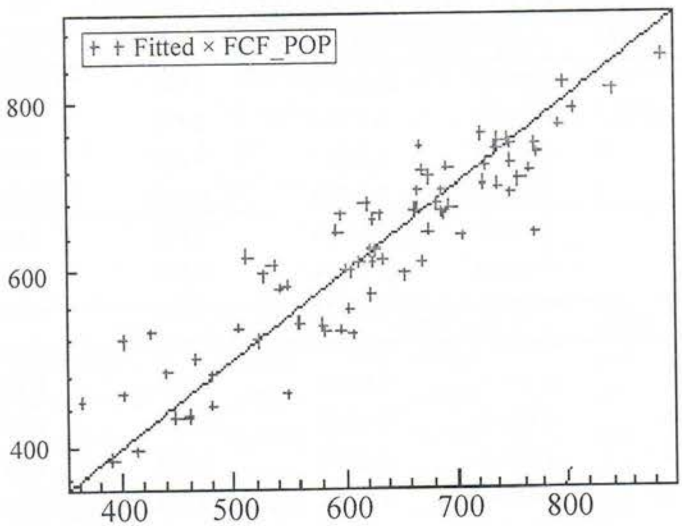
RSS	1.69E+05	*sigma*	49.422	*R^2*	0.84235	*Radj^2*	0.82864
LogLik	-292.76	*AIC*	7.88837	*HQ*	7.97416	*SC*	8.10304
T	76	*p*	7	*FpNull*	0	*FpGUM*	0.99002

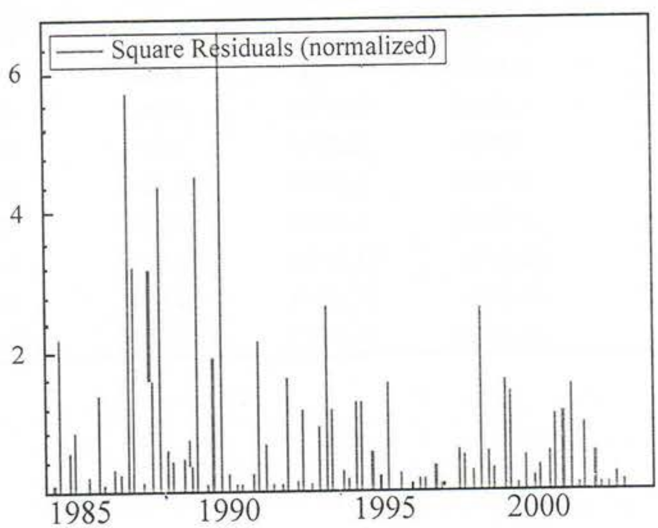
	value	*prob*
Chow(1993:4)	0.3776	0.9976
Chow(2001:2)	0.2853	0.9574
normality test	1.1393	0.5657
AR 1-4 test	0.1468	0.9638
ARCH 1-4 test	1.7855	0.1433
hetero test	20.0614	0.0445

Annex 3


Actual
Fitted
800
600
400
1985
1990
1995
2000
Residuals (Normalized)
3
2
1
0
-1
-2
1985
1990
1995
2000

Annex 3 (continued)





Annex 4

Modelling FCF_POP by GETS, 1987 (1) - 2003 (1)

	Coeff	*StdError*	*t-value*	*t-prob*
Constant	391.84647	96.86652	4.045	0.0002
FCF_POP_1	0.34228	0.13812	2.478	0.0172
FCF_POP_2	-0.07945	0.12627	-0.629	0.5326
FCF_POP_3	0.06207	0.12746	0.487	0.6287
FCF_POP_4	0.28011	0.12964	2.161	0.0363
D4GDP_POP	0.02187	0.15764	0.139	0.8903
D4GDP_POP_1	0.12963	0.15452	0.839	0.4062
D4GDP_POP_2	-0.01742	0.1537	-0.113	0.9103
D4GDP_POP_3	0.24178	0.15683	1.542	0.1305
D4GDP_POP_4	-0.15503	0.12423	-1.248	0.2188
RTBILL	-1.26166	3.22541	-0.391	0.6976
RTBILL_1	-0.43646	4.04732	-0.108	0.9146
RTBILL_2	0.21727	4.00566	0.054	0.957
RTBILL_3	-6.39647	3.85998	-1.657	0.1048
RTBILL_4	1.70507	4.02087	0.424	0.6736
RTBILL_5	-6.32958	4.07421	-1.554	0.1276
RTBILL_6	7.94404	4.20301	1.89	0.0655
RTBILL_7	-8.73292	3.92206	-2.227	0.0313
RTBILL_8	-0.58502	2.90918	-0.201	0.8416
Seasonal	-62.6174	24.00138	-2.609	0.0124
Seasonal_1	-71.9189	27.15374	-2.649	0.0113
Seasonal_2	-78.84262	25.19819	-3.129	0.0031

Annex 4 (continued)

RSS	85065	*sigma*	44.478
R^2	0.87578	*Radj^2*	0.81512
LogLik	-233.25	*AIC*	7.85371
HQ	8.14409	*SC*	8.58966
T	65	*p*	22
FpNull	0	*FpConst*	0

	value	*prob*	*alpha*
Chow(1995:1)	0.4431	0.9641	0.01
Chow(2001:3)	0.2001	0.9746	0.01
normality test	1.6768	0.4324	0.01
AR 1-4 test	2.3504	0.071	0.01
ARCH 1-4 test	0.1771	0.9487	0.01
hetero test	41.1125	0.3782	0.01

Annex 5

Dynamic analysis

Lag structure	*Lag 0*	*Lag 1*	*Lag 2*	*Lag 3*	*Lag 4*	*Lag 5*	*Lag 6*	*Lag 7*	*Sum*	*LongRun*
FCF_POP	0.0000	0.2653	0.0000	0.0000	0.2850	0.0000	0.0000	0.0000	0.5503	1.0000
SE	0.0000	0.0910	0.0000	0.0000	0.0747	0.0000	0.0000	0.0000	0.0741	0.0000
D4GDP_POP	0.0000	0.0000	0.0000	0.1874	0.0000	0.0000	0.0000	0.0000	0.1874	0.4168
SE	0.0000	0.0000	0.0000	0.0764	0.0000	0.0000	0.0000	0.0000	0.0764	0.1765
RTBILL	0.0000	0.0000	0.0000	-5.7044	0.0000	-6.3089	6.8260	-8.4570	-13.6447	-30.3386
SE	0.0000	0.0000	0.0000	1.8943	0.0000	2.5914	3.0904	2.4330	2.6083	4.3465
Constant	424.5098	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	424.5098	943.8821
SE	59.8756	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	59.8756	46.9009
Seasonal	-52.4000	-70.3100	-72.1000	0.0000	0.0000	0.0000	0.0000	0.0000	-194.8101	-433.1532
SE	17.8405	17.5430	16.4750	0.0000	0.0000	0.0000	0.0000	0.0000	44.4998	125.9000

Annex 5 (continued)

Dynamic analysis

Roots of the autoregressive dynamics

real	*imag*	*modulus*
0.80717	0.00000	0.80717
0.06523	-0.72169	0.72464
0.06523	0.72169	0.72464
-0.67234	0.00000	0.67234

Roots of the distributed lag polynomial in RTBILL

real	*imag*	*modulus*
-1.57106	0.00000	1.57106
1.10975	0.00000	1.10975
0.23066	0.89283	0.92214
0.23066	-0.89283	0.92214

Roots of the distributed lag polynomial in Seasonal

real
2.02222
-0.68043

Annex 6

Vector error correction estimates
Sample(adjusted): 1983:3 2003:1
Included observations: 79 after adjusting endpoints
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
FCF(-1)/POP(-1)	1
GDP(-1)/POP(-1)-GDP(-5)/POP(-5)	-0.537146
	-0.38745
	[-1.38637]
TBILL91(-1)	32.38377
	-5.0518
	[6.41035]
INFLATION(-1)	-25.49298
	-5.29051
	[-4.81863]
C	-859.1817

Annex 6 (continued)

Vector error correction estimates
Sample(adjusted): 1983:3 2003:1
Included observations: 79 after adjusting endpoints
Standard errors in ( ) & t-statistics in [ ]

Error Correction:	D(FCF/POP)	D(GDP/POP-GDP(-4)/POP(-4))	D(TBILL91)	D(INFLATION)
CointEq1	-0.270126	-0.326037	-0.004883	0.009261
	-0.07004	-0.07758	-0.00355	-0.0034
	[-3.85685]	[-4.20286]	[-1.37633]	[2.72061]
D(FCF(-1)/POP(-1))	-0.238998	0.130231	0.004372	-0.000829
	-0.13944	-0.15444	-0.00706	-0.00678
	[-1.71403]	[0.84323]	[0.61906]	[-0.12227]
D(FCF(-2)/POP(-2))	0.098718	0.123583	0.005353	0.001685
	-0.1082	-0.11984	-0.00548	-0.00526
	[0.91236]	[1.03120]	[0.97678]	[0.32032]
D(FCF(-3)/POP(-3))	0.145975	-0.025839	0.008619	0.012549
	-0.1059	-0.11729	-0.00536	-0.00515
	[1.37846]	[-0.22030]	[1.60690]	[2.43811]
D(FCF(-4)/POP(-4))	0.559366	-0.204609	0.003705	-0.00014
	-0.11412	-0.1264	-0.00578	-0.00555
	[4.90160]	[-1.61874]	[0.64092]	[-0.02529]

Annex 6 (continued)

Vector error correction estimates
Sample(adjusted): 1983:3 2003:1
Included observations: 79 after adjusting endpoints
Standard errors in ( ) & t-statistics in [ ]

Error Correction:	D(FCF/POP)	D(GDP/POP-GDP(-4)/POP(-4))	D(TBILL91)	D(INFLATION)
D(FCF(-5)/POP(-5))	0.422962	0.066962	0.004614	0.003597
	-0.12632	-0.13991	-0.0064	-0.00614
	[3.34840]	[0.47861]	[0.72119]	[0.58592]
D(GDP(-1)/POP(-1)-GDP(-5)/POP(-5))	-0.256928	-0.594851	-0.006638	-0.008392
	-0.171	-0.1894	-0.00866	-0.00831
	[-1.50249]	[-3.14065]	[-0.76636]	[-1.00974]
D(GDP(-2)/POP(-2)-GDP(-6)/POP(-6))	-0.254246	-0.596122	0.001085	0.003684
	-0.16204	-0.17948	-0.00821	-0.00788
	[-1.56902]	[-3.32141]	[0.13219]	[0.46775]
D(GDP(-3)/POP(-3)-GDP(-7)/POP(-7))	-0.393565	-0.339615	-0.003776	0.002151
	-0.15101	-0.16726	-0.00765	-0.00734
	[-2.60620]	[-2.03044]	[-0.49360]	[0.29305]
D(GDP(-4)/POP(-4)-GDP(-8)/POP(-8))	-0.084286	-0.19064	0.001367	0.00815
	-0.13125	-0.14538	-0.00665	-0.00638
	[-0.64216]	[-1.31133]	[0.20567]	[1.27759]

Annex 6 (continued)

Vector error correction estimates
Sample(adjusted): 1983:3 2003:1
Included observations: 79 after adjusting endpoints
Standard errors in ( ) & t-statistics in [ ]

Error Correction:	D(FCF/POP)	D(GDP/POP-GDP(-4)/POP(-4))	D(TBILL91)	D(INFLATION)
D(GDP(-5)/POP(-5)-GDP(-9)/POP(-9))	-0.096152	-0.087641	-0.003633	0.004807
	-0.12404	-0.13738	-0.00628	-0.00603
	[-0.77520]	[-0.63793]	[-0.57825]	[0.79735]
D(TBILL91(-1))	5.479149	7.729267	0.092984	-0.33371
	-2.89423	-3.20569	-0.1466	-0.14067
	[1.89313]	[2.41111]	[0.63426]	[-2.37237]
D(TBILL91(-2))	4.846551	3.23315	-0.344692	-0.474008
	-3.11444	-3.4496	-0.15776	-0.15137
	[1.55615]	[0.93725]	[-2.18497]	[-3.13148]
D(TBILL91(-3))	-3.026874	-2.868069	-0.021402	-0.070451
	-2.72202	-3.01495	-0.13788	-0.1323
	[-1.11199]	[-0.95128]	[-0.15523]	[-0.53253]
D(TBILL91(-4))	-1.503297	0.900493	-0.139212	-0.308716
	-2.64164	-2.92592	-0.13381	-0.12839
	[-0.56908]	[0.30776]	[-1.04039]	[-2.40453]

Annex 6 (continued)

Vector error correction estimates
Sample(adjusted): 1983:3 2003:1
Included observations: 79 after adjusting endpoints
Standard errors in ( ) & t-statistics in [ ]

Error Correction:	D(FCF/POP)	D(GDP/POP-GDP(-4)/POP(-4))	D(TBILL91)	D(INFLATION)
D(TBILL91(-5))	-5.457111	-1.489	0.136676	-0.241563
	-2.45867	-2.72326	-0.12454	-0.1195
	[-2.21953]	[-0.54677]	[1.09745]	[-2.02150]
D(INFLATION(-1))	-8.811882	-10.53937	0.085049	0.657233
	-3.06146	-3.39091	-0.15507	-0.14879
	[-2.87833]	[-3.10812]	[0.54845]	[4.41709]
D(INFLATION(-2))	-10.74696	-11.47129	0.033585	0.492106
	-3.01076	-3.33476	-0.1525	-0.14633
	[-3.56951]	[-3.43991]	[0.22022]	[3.36300]
D(INFLATION(-3))	-3.582656	-2.5548	0.454034	-0.006145
	-2.76061	-3.05769	-0.13983	-0.13417
	[-1.29778]	[-0.83553]	[3.24697]	[-0.04580]
D(INFLATION(-4))	-1.571496	-4.364934	-0.294048	-0.325579
	-2.97045	-3.29011	-0.15046	-0.14437
	[-0.52904]	[-1.32668]	[-1.95430]	[-2.25516]

Annex 6 (continued)

Vector error correction estimates
Sample(adjusted): 1983:3 2003:1
Included observations: 79 after adjusting endpoints
Standard errors in ( ) & t-statistics in [ ]

Error Correction:	D(FCF/POP)	D(GDP/POP-GDP(-4)/POP(-4))	D(TBILL91)	D(INFLATION)
D(INFLATION(-5))	-0.253592	-3.993612	0.06135	0.561287
	-2.991	-3.31287	-0.1515	-0.14537
	[-0.08479]	[-1.20548]	[0.40495]	[3.86113]
C	-15.35121	-2.800132	-0.411718	-0.346466
	-7.50213	-8.30946	-0.38001	-0.36462
	[-2.04625]	[-0.33698]	[-1.08345]	[-0.95021]
S4	51.50293	8.506209	1.394045	1.12149
	-18.4254	-20.4082	-0.9333	-0.89551
	[2.79522]	[0.41680]	[1.49367]	[1.25234]

Annex 6 (continued)

Vector error correction estimates
Sample(adjusted): 1983:3 2003:1
Included observations: 79 after adjusting endpoints
Standard errors in ( ) & t-statistics in [ ]

Error Correction:	D(FCF/POP)	D(GDP/POP-GDP(-4)/POP(-4))	D(TBILL91)	D(INFLATION)
R-squared	0.727304	0.488415	0.624193	0.790365
Adj. R-squared	0.620174	0.287435	0.476555	0.708008
Sum sq. resids	148895	182665.5	382.0236	351.7149
S.E. equation	51.56393	57.11291	2.611867	2.506117
F-statistic	6.788964	2.43017	4.22785	9.596847
Log likelihood	-409.9873	-418.0617	-174.3495	-171.0844
Akaike AIC	10.9617	11.16612	4.99619	4.913529
Schwarz SC	11.65154	11.85596	5.686029	5.603368
Mean dependent	-4.097472	-0.541882	-0.104076	-0.005107
S.D. dependent	83.6669	67.65846	3.610068	4.637842

Annex 6 (continued)

Vector error correction estimates
Sample(adjusted): 1983:3 2003:1
Included observations: 79 after adjusting endpoints
Standard errors in ( ) & t-statistics in [ ]

Determinant Residual Covariance	1.93E+08
Log Likelihood	-1147.583
Log Likelihood (d.f. adjusted)	-1201.951
Akaike Information Criteria	32.85951
Schwarz Criteria	35.73884

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