"RELATIONSHIP BANKING" AND THE CREDIT MARKET IN INDIA: AN EMPIRICAL ANALYSIS

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ABSTRACT

Relationship banking based on Okun's "customer credit markets" has important implications for monetary policy via the credit transmission channel. Studies of LDC credit markets from this point of view seem to be scanty and this paper attempts to address this lacuna. Relationship banking implies short-term disequilibrium in credit markets, suggesting the VECM (vector error-correction model) as an appropriate framework for analysis. We develop VECM models in the Indian context (for the period April 1991- December 2004 using monthly data) to analyse salient features of the credit market. An analysis of the ECMs (error-correction mechanisms) reveals that disequilibrium in the Indian credit market is adjusted via demand responses rather than supply responses, which is in accordance with the customer view of credit markets. Further light on the working of the model is obtained through the "generalized" impulse responses and "generalized" error decompositions (both of which are independent of the variable ordering). Our conclusions point towards firms using short-term credit as a liquidity buffer. This fact, together with the gradual adjustment exhibited by the "persistence profiles" provides substantive evidence in favour of "customer credit markets".

Keywords: customer credit markets - monetary policy – co-integration - impulse response - persistence profiles.

JEL : C32; E51.

1. INTRODUCTION

In a remarkably insightful contribution, Okun (1981) introduced the important distinction between "auction" and "customer" markets for products. Auction markets are characterized by the absence of "price tags", sellers being "price-takers" rather than 'price-makers'. Such markets are efficient, with speculators arbitraging away any unexploited profit opportunities. However, most markets in the real world exhibit strong inertial tendencies, with price tags being changed infrequently and with a considerable lag in response to shifts in costs and demand conditions. Okun (op. cit.) attributes such price inertia to "search costs" incurred by buyers in obtaining price and quality information from sellers, and terms such markets as "customer markets".

Bank-credit markets exhibit the typical features of "customer markets" (Sharpe (1990)). At least three factors contribute to the building of long-term customer relationship between a bank and its clients (Petersen and Rajan (1994), Berger and Udell (1995), Conigliani *et al* (1997), Boot (2000) etc). Firstly, mechanisms to monitor the default risks of small borrowers are absent in the bond market, and hence small borrowers can only have recourse to commercial banks for meeting their credit needs. Once the bank possesses information about a specific firm, this can be regularly updated and utilized for future transactions. Secondly, as Hodgman (1961) had noted earlier, loan-relationships are reinforced by deposit relationships between banks and clients. Finally, Kakes (2000), indicates that clients are prepared to pay a higher interest (than they could obtain by a thorough market search), in return for assured access to credit on easy terms throughout the cycle. A verifiable outcome of "customer markets" for credit is "sticky" lending rates. Such sticky rates seem to be an almost universal phenomenon.

The concept of customer credit markets has important implications for the "credit view" of monetary policy, elaborated in Bernanke & Gertler (1995) (but dating back much earlier to Wicksell (1934) and other classical writers). A credit channel may be operative either via a bank lending channel (monetary policy changes leading to corresponding changes in bank lending) or a "financial accelerator" channel (monetary policy changes impinging on the firm's cost of borrowing through changes in their net worth). A long-term bank-client relationship, of the type discussed above, would restrain banks from recalling loans to such clients or in raising interest rates on such loans when they are renewed. The tendency is reinforced if the banks can readily switch between loans and other types of investments or find non-deposit sources of funding. This would render the credit channel somewhat ineffective and in the extreme case even nullify it altogether.

The present paper focuses on the Indian credit market, which has been witnessing major changes in the past few years[3]. The market was a highly regulated one, prior to the onset of structural reforms in 1991- most of the banks were government owned, interest rates completely regulated, a substantial portion of the credit was earmarked for "priority sectors", and there was a flourishing "unorganized" market for credit. With the onset of liberalization in 1991, private banks (including foreign banks) were encouraged to start operations, interest rates were extensively deregulated, the role of

[3] It is important to remind ourselves, that the concept of "customer" credit markets refers to bank credit to business firms. Its applicability to other forms of credit i.e. by non-bank institutions on the one hand, and to agricultural loans on the other, is far from clear.

directed credit was de-emphasized, the unorganized market marginalised and in general the credit market was substantially liberalized. Most of the existing studies in the Indian context have concerned themselves with the rural credit market in which the role of commercial banks is important but not exclusive.

In such a context, it becomes of interest to study whether the Indian credit market understood in the sense of bank credit to firms (see endnote 1) in the post-liberalisation phase could be characterized as a customer market. No systematic empirical studies, seem to be available on this aspect, whether of the survey kind or of the econometric variety

2 A VECM MODEL

The empirical study of credit markets reflects the differing theoretical perceptions of the credit phenomenon discussed above. We model the credit market as a five-variable VECM based on the following considerations. Our credit variable is gross bank credit of scheduled commercial banks but excluding credit for public food procurement[4], i.e. non-food bank credit (NFBC). About 28% of non-food credit is directed credit (to the so-called "priority sectors" of agriculture, small scale industries etc.), the rest is to the corporate sector, wholesale trade, exports, consumer and housing finance etc. and is fully at banks' discretion[5].

[4] Credit for public food procurement, is a special type of credit arrangement between the government of India and the banking system for financing the food public distribution system (PDS). Food credit currently accounts for about 8% of total bank credit.

[5] A priori, on theoretical grounds, priority sector lending should have been excluded from the modelling of the credit market, since it is not really based on profit considerations. Unfortunately,

The demand for credit is assumed to depend on real activity as well as the cost of credit. As an indicator of real activity, we employ the index of industrial production (IIP), which is the only indicator of real activity available at monthly frequency. It is admittedly an unsatisfactory measure, since it excludes services (which are an increasingly important component of GDP). Quarterly series of GDP is available, but only for a brief recent period (post-1996). The cost of credit to the borrower is represented by the prime lending rate (PLR) of the State Bank of India, which is the largest commercial bank in the country, and whose PLR is regarded as a reference rate by the rest of the Indian banking system.

The supply of credit (NFBC) depends both on the return on credit and its availability. The net return on credit from the bank's point of view is the spread between the lending rate (proxied by the PLR) and the cost of funding. The latter would be related to a short-term interest rate. In the Indian context two choices are available - the inter-bank call money rate (CMR) and the rate on 91-day treasury bills (TBR). Both are closely watched by the monetary authorities, the CMR in this regard closely paralleling the Federal Funds rate in the U.S. The TBR is however more directly related to the long-term rate of interest, via the fortnightly auction system of treasury bills and dated government securities in operation by the monetary authority (Reserve Bank of India). We experiment with both choices of the short-term rate of interest in our empirical exercise. The theoretical justification for a credit availability variable comes from Jaffee & Stiglitz (1990) who building on Keynes' (1930) concept of a "fringe of unsatisfied borrowers" conclude that in models allowing for credit

monthly data is recorded for non-food credit as an aggregate with no break-up into priority and non-priority credit.

rationing, credit availability may be more important than the cost of credit. Since models of customer credit markets do allow for the possibility of credit rationing, an availability variable is indicated. In the Indian context, the broad money measure M3 seems the most appropriate candidate – statistics on broader liquidity measures are not forthcoming on a reliable or regular basis.

Thus we estimate two VECM models, which differ only in the choice of the short-term interest rate

Model A: NFBC, CMR, PLR, IIP, M3

Model B: NFBC, TBR, PLR, IIP, M3

The variables NFBC and M3 are in real terms (the corresponding nominal magnitudes being deflated by the wholesale price index WPI) All variables are in natural logs except the interest rate variables CMR, TBR and PLR. **Our data spans the post-liberalisation phase in India (April 1992 to December 2004) and is on a monthly basis. The main source of the data are the successive issues of the *Handbook of Statistics on the Indian Economy* published by the *Reserve Bank of India.***

Both models also include two kinds of dummy variables. Firstly, there are the centred seasonal dummies. Secondly, the Basle Accord was implemented as of March 1995, imposing capital adequacy requirements on the Indian banking system. The availability of credit is likely to be constrained by the capitalisation requirements, now in force. To take account of this factor, we initially introduced a dummy variable D defined as

D = 0 prior to March 1995

D = 1 subsequent to March 1995

But even though the Accord come into force from March 1995, it is conceivable that the capitalization build-up commenced at least a year earlier. We therefore postulate an alternative dummy variable D_* as

$D_* = 0$ prior to March 1994

$D_* = 1$ subsequent to March 1994

3. ESTIMATION RESULTS

The first step in the estimation of the VECM is to check for the stationarity properties of the variables under investigation. This was done via the standard ADF statistics (with the lags being based on the AIC (Akaike Information Criterion)). The results are presented in Table 1. All the variables show strong evidence supportive of unit roots[6], and hence a VECM model is in order.

We next turn our attention to the selection of the orders of the VAR models. A maximum order of 6 was specified and the AIC and SBC (Schwarz-Bayesian Criterion) are computed for Models A & B (with centred seasoned dummies and including D and D_* alternatively). Both criteria unanimously select the optimal order as 1 for Models A and B for both choices of the dummy variable D as well as D_*.

[6] There is some equivocation in the case of the CMR and PLR – the ADF regressions including a trend throw up statistics which are insignificant and marginally significant respectively. However, the trend term itself was insignificant in both these cases, and in the models without trend, the ADF statistics are significant as Table 1 shows.

We also test for the significance of the dummy variables via a likelihood ratio (LR) test. The LR statistic was insignificant for the seasonal dummies and D together, but was highly significant when D was replaced by D_* (in both Models A and B)[7]. Thus, our Models A and B both include D_* and the seasonal dummies as exogenous variables, and are modelled as VARs of order 1.

It is now possible to estimate the member of co-integrating relations in our models. It is usual to distinguish the following 5 cases, depending on the cointegration VAR specification.

1. No intercepts or trends in the VAR
2. Restricted intercepts, no trends
3. Unrestricted intercepts, no trends
4. Unrestricted intercepts, restricted trends
5. Unrestricted intercepts, unrestricted trends

The importance of distinguishing between these cases is discussed in detail in Franses (1998). The choice between the 5 cases is guided by the so-called Pantula principle explained in Hansen & Juselius (1995). The application of this principle in our case leads to the choice of specification 2 (ie. restricted intercepts and no trends) for both Models A & B. The maximum eigenvalue and trace statistics for Models A and B are presented in Table 2 and 3 respectively, and for both models, the 2 tests unanimously suggest the number of cointegrating vectors r as r = 3.

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[7] Thus capitalization of banks seems to have impacted on credit availability at least a year ahead of the actual implementation.

The unrestricted cointegrating vectors are displayed in Table 4. A priori one expects credit demand (NFBC) to be negatively related to the PLR and positively related to the index of industrial production IIP, while credit supply is expected to be positively related to the return on credit (PLR) and negatively related to its cost (CMR or TBR), and perhaps additionally also positively related to credit availability (as proxied by money supply M3) Thus cointegrating vector 2 and 3 (for both models) are potential credit demand and credit supply equations. The interpretation of cointegrating vector 1 is unclear at the moment. It could either be a money demand function or a money supply reaction function of the monetary authorities, which can only be decided after further analysis.

We now impose restrictions on the cointegrating vectors for identifying the system. Since the number of cointegrating vectors is r = 3, we need to impose three restrictions on each vector for exact identification (see Johansen (1988, 1991)). We impose the following exact restrictions (for both models)

i) C1 (1) = C1 (3) = 0; C1 (5) = 1

ii) C2 (1) = 1; C2 (2) = C2 (5) = 0

iii) C3 (1) = 1; C3 (4) = 0; C3 (2) + C3 (3) = 0

Where CI (J) refers to the coefficient of the Jth variable in the Ith cointegrating vector (The ordering of the variables is as per Table 4)

The rationale for the imposed restrictions is as follows .

As stated earlier, the first cointegrating vector could be either a money demand equation or a money supply reaction function. The relevant interest rate for either interpretation is the cost of funds (CMR in Model A or TBR in Model B), not the PLR. The NFBC or credit variable also does not figure in any conventional money demand or supply function. Thus we do not expect the first cointegrating vector to include either PLR or NFBC. Hence C1 (1) = C1 (3) = 0. The remaining restriction (i.e. C1 (5) = 1) is simply a normalizing restriction.

The cost of credit for borrowers is indicated by the PLR, and the CMR or TBR is irrelevant for the borrower's decision. Similarly M3 does not influence the demand for credit. Hence for the second cointegrating vector we impose the normalizing restriction C2 (1) = 1 and the two exclusion restrictions C2 (2) = 0, C2 (5) = 0

The supply of credit depends on the spread i.e. the difference between the return on loans to banks (PLR) and the cost of funds (CMR or TBR), and the availability of credit proxied by M3. The activity variable IIP influences the demand for credit but not the willingness to supply credit. Thus, on the third cointegrating vector, we impose the normalizing restriction C3 (1) = 1, the exclusion restriction C3 (4) = 0, and the spread restriction C3 (2) + C3 (3) = 0

Apart from the above exact identification restrictions, we also impose an additional restriction to test whether the availability variable M3 affects credit supply. Thus we impose the over-identification restriction.

C3 (5) = 0

The testing of such over-identifying restrictions is discussed in Pesaran (!997) and Pesaran & Shin (1996).

The estimated cointegrating vectors under the above restrictions together with the likelihood ratio (LR) statistics for the over-identifying restriction is presented in Table 5. The LR statistic does not reject the restriction (at 5% level) for both Model A as well as Model B.

The long-term cointegrating relations can be written down as

Model A

$$M3 = 0.4154 + 1.5665^{**} (IIP) – 0.01956^{*} (CMR)$$

$$NFBC^{d} = -0.0142 + 1.6005^{**} (IIP) – 0.0012 (PLR)$$

$$NFBC^{s} = 7.9307 + 0.3443 (PLR – CMR)$$

Model B

$$M3 = 1.1552 + 1.4406^{**} (IIP) – 0.0440^{**} (TBR)$$

$$NFBC^{d} = -0.6922 + 1.7017^{**} (IIP) – 0.0075 (PLR)$$

$$NFBC^{s} = 8.8501 + 0.2666^{*} (PLR – TBR)$$

($NFBC^{d}$ and $NFBC^{s}$ are demand for and supply of credit respectively and (*) and (**) devote significance at 5% and 10% levels).

Thus, with the over-identifying restrictions in place, the three cointegrating vectors in both models A and B, can sustain the interpretation of a demand for money function, a credit demand and a credit supply equation respectively. The long-term income elasticity of the demand for money is in the range 1.44 to 1.56, whereas that of the demand for credit is between 1.60 to 1.70, over the two model versions. The spread variable emerges significant for the credit supply equation only in Model B. This accords with the empirical observation that the CMR variable exhibits considerable overall variability and hence, long-term credit supply decisions are more likely to be based on TBR as a measure of the cost of funds to banks. The elasticities of the interest rate variables are only semi-elasticities[8] and hence have to be multiplied by the corresponding average values of the interest rate variables to obtain the elasticites at the mean. The relevant elasticities are presented in Table 6

While both Models A and B throw up similar conclusions, the latter specification seems slightly superior in view of the TBR being a more reliable indicator of the cost of short-term funds to banks than CMR. Hence in the following sections, our interpretations will be primarily focused on Model B, with a view to rendering the discussion more compact. Where it is deemed relevant, the results from Model A will be presented alongside too.

4. LONG-RUN STRUCTURAL MODELLING

In Table 7, we take a look at the factor loadings for Model B; these loadings indicate the speed of convergence of each variable towards the long-run equilibrium (ie. cointegrating relations), and correspond to the columns of the matrix α in Johansen & Juselius (1990). Reading across the rows, it appears that NFBC adjusts only towards the credit demand equation, the adjustment to the credit supply equation being insignificant. There is also a small but significant adjustment in the direction of the money demand vector. Thus, it is suggested that the market for bank credit, in the

[8] Recalling that all variables are in logs, except the interest rate variables

short-run, is dominated by demand rather than supply. Similarly, the level of industrial activity IIP is seen to adjust in the direction of credit demand rather than supply, whereas the interest rate variables TBR and PLR are dominated by supply considerations[9].

An important facet of long-run structural analysis is represented by impulse response functions. These measure the time profile of the effect of a shock in the system to the various component series. Traditional impulse response analysis (e.g. Enders (1995)) suffers from the well-known limitation that the impact weights are dependent on the ordering of the variables in the VAR, rendering interpretation difficult. To overcome this limitation, Gallant et.al (1993) and Koop et.al (1996) introduce the concept of generalized impulse responses, which are independent of the ordering of the variables. These generalized impulse responses are the difference between the expectation of a future value of the variable conditioned on the shock and the history of the system and its expectation conditioned on its history alone[10]. This, of course, requires some assumption about the distribution of the shocks, which is generally taken to be multivariate Gaussian. We present the generalized impulse responses of all the variables in the system to shocks in the credit variable (NFBC) in Fig. 1, whereas, Fig. 2, traces the response of NFBC to shocks in the other variables. Both sets of impulse responses have been computed for upto 24 months ahead. From the first group of figures, it is evident that shocks to NFBC have pronounced effects on the

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[9] The positive (and significant) factor loadings obtained for IIP and PLR in Table 7, are correct since IIP and PLR enter with negative signs in cointegrating vectors 2 and 3 respectively

[10] Thus, if y_{t+n} is the future value of the variable at time (t+n), v_t the current shock and w_{t-1} the history of the system, the generalised impulse responses is given by

$$GI_y = E(y_{t+n} / v_t,\ w_{t-1}) - E(y_{t+n} / w_{t-1}) \quad n = 0,1,2$$

interest variables, PLR and TB91 as well as IIP. The second group of figures shows that NFBC does not respond significantly to any of the other variables – it responds marginally to shocks in IIP, PLR and TBR. The negative response of NFBC to M3 shocks, for the first few periods, seems to be in line with the buffer stock view of firms' liquidity holdings, wherein short-term credit acts as a liquidity buffer. Firms under this supposition, respond to a monetary contraction by increasing their demand for short-term credit (see De Haan et. al (1994) and Kakes (2000)). The second set of figures shows how shocks to NFBC have pronounced effects on the interest rate variables[11], and also significant effects on IIP.

The generalized forecast error variance decompositions (FEVD's) present essentially the same information in a different form (see Tables 8 and 9). Table 8 yields evidence favouring the importance of NFBC in explaining FEVD of IIP and (to a lesser extent) that of TBR. The FEVD of NFBC are explained primarily in terms of its own movements, with some contributions from TBR, PLR and IIP in that order.

A very useful additional tool for the analysis of cointegrated systems has been recently furnished by Pesaran & Shin (1996) in the form of "persistence profiles". These document the time response of the effects of system-wide shocks on the cointegrating relations of the model. They thus indicate the speed with which an economy reverts to equilibrium, subsequent to a shock. The profiles are invariant to the ordering of the variables, thus circumventing the "non-uniqueness" problem. The persistence profiles for our system are displayed in Table 10. An interesting pattern is

[11] It has to be remembered that the impulse responses focus on shocks to NFBC in isolation, and hence the dramatic rise in interest rates. In practices, such shocks would be compensated by matching changes in the availability of credit (M3).

thrown up by the table. Whereas the adjustment to equilibrium in the case of the money demand function (represented by the first cointegrating vector) is fairly rapid (being almost complete in less than 6 months) that for the credit demand and supply equations stretches out to about 15 months. The rapid convergence of the money market equation is possibly attributable to the money market being dominated by financial institutions with sophisticated information technology. The slow convergence of the credit market furnishes indirect evidence supporting the “customer view” of this market. Banks do not adjust their loan portfolios in the short-run, preferring to adjust via securities instead. Similarly, firms may be following a liquidity buffer strategy, implying a graduated response to imbalances in the credit market.

5. CONCLUSIONS

Systematic studies of the credit market in India have been lacking and the present paper tries to address this lacuna. We build a model of the Indian credit market, focussing on non-food bank credit (NFBC) in the post–1991 (liberalisation period). The theoretical basis for the model is the “customer” view of credit markets introduced by Okun (1981) (also termed as “relationship banking” in the later literature). Such a view also has important implications for the “credit channel” version of monetary policy.

Disequilibrium in the credit market emerges as a distinct possibility in models of this genre, and hence an appropriate methodology for modelling in this context, becomes the VECM. We build two version of a VECM for the Indian credit market – Model A based on the call money rate as an index of the cost of funds to the banking system and Model B using the 91-day Treasury Bill rate as a proxy for this cost. Both models throw up three cointegrating relations which sustain the interpretations of a money demand, a credit demand and a credit-supply equation respectively. Identifying restrictions were imposed on each model, to test various restrictions suggested by the theory, and were found congruent to the data. However, on diagnostic counts, Model B emerged somewhat superior, and further analysis was focussed on this version only.

An analysis of the ECMs (error correction mechanisms) revealed that disequilibrium in the credit market is rectified via demand rather than supply factors, which is consistent with the customer view of credit markets. Further insights into the working of the model is provided by the generalized impulse responses and the generalized forecast error variance decompositions. Those measures share the important feature of being independent of the ordering of the variables, which makes for a substantial improvement over the traditional counterparts of these measures. The analysis of both sets of generalized measures seems to suggest that firms use short-term credit as a liquidity buffer which could be interpreted as additional indirect evidence in favour of the customer view of credit markets. More direct evidence for the customer view, comes from the "persistence profiles", which exhibit a very slow adjustment to equilibrium in the credit market (Table 10).

Thus our empirical analysis adduces considerable support for Okun's original conception of the functioning of credit markets. This analysis needs to be supplemented by survey studies of Indian banks and firms. Admittedly, such surveys are difficult to execute but they can throw considerable insight into the actual mechanisms underlying the customer relationships. Additionally, surveys can throw up useful disaggregative information by disaggregating across borrower categories (e.g. small firms, households, large firms etc.) as well as loan types (short-term and long-term).

The aggregative nature of econometric studies and degrees of freedom constraints imposed on econometric models are well-known limitations and our model is no exception. Nevertheless, as a starting point, it can lay claim to some merit for opening up an issue largely neglected in the context of LDC credit markets.

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TABLES

TABLE 1

Unit Root Tests

Variables	Model without Trend		Model with Trend	
	Lag	ADF	Lag	ADF
(1)	(2)	(3)	(4)	(5)
1. IIP	12	0.47**	12	-2.65*
2. PLR	3	-0.92**	3	-3.41*
3. CMR	3	-2.62*	1	-5.19
4. TBR	1	-2.18*	1	-2.15*
5. NFBC	12	0.11**	12	-2.91*
6. M3	1	-1.07**	1	-1.83**

Notes: (i) (*) and (**) denote significance at 5% and 1% levels respectively

(ii) The lags are selected via the AIC criterion.

TABLE 2

Cointegration Tests for Model A

Maximal Eigen Value Test					Trace Test				
Null	Alternative	Statistic	95% Critical Value	90% Critical Value	Null	Alternative	Statistic	95% Critical Value	90% Critical Value
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
r=0	r = 1	83.13*	34.40	31.73	R=0	r ≥ 1	194.73*	75.98	71.81
r≤1	r = 2	58.42*	28.27	25.80	R≤1	r ≥ 2	111.61*	53.48	49.95
r≤2	r = 3	42.06*	22.04	19.86	R≤2	r ≥ 3	53.18*	34.87	31.93
r≤3	r = 4	6.31	15.87	13.81	R≤3	r ≥ 4	11.12	20.18	17.88
r≤4	r = 5	4.80	9.16	7.53	R≤4	r = 5	4.81	9.16	7.53

Notes : (i) The tests are for the specification 2 (restricted intercepts, no trends)

(ii) (*) denotes significance at 5% level.

TABLE 3

Cointegration Tests for Model B

Maximal Eigen Value Test					Trace Test				
Null	Alternative	Statistic	95% Critical Value	90% Critical Value	Null	Alternative	Statistic	95% Critical Value	90% Critical Value
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
r=0	r = 1	78.20*	34.40	31.73	r=0	r ≥ 1	165.58*	75.98	71.81
r≤1	r = 2	42.93*	28.27	25.80	r≤1	r ≥ 2	87.38*	53.48	49.95
r≤2	r = 3	34.43*	22.04	19.86	r≤2	r ≥ 3	44.45*	34.87	31.93
r≤3	r = 4	8.13	15.87	13.81	r≤3	r ≥ 4	10.02	20.18	17.88
r≤4	r = 5	1.90	9.16	7.53	r≤4	r ≥ 5	1.89	9.16	7.53

Notes: Same as Table 2.

TABLE 4

Cointegration Relationships for Models A and B

Model A				Model B			
Variables	Vector 1	Vector 2	Vector 3	Variables	Vector 1	Vector 2	Vector 3
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1. NFBC	-0.75	-0.98	-1.11	1. NFBC	0.526	1.781	1.458
2. CMR	0.004	0.015	-0.007	2. CMR	0.017	-0.042	0.025
3. PLR	0.007	-0.03	0.017	3. PLR	-0.058	0.045	-0.049
4. IIP	0.07	1.88	1.92	4. IIP	-0.047	-2.597	-2.967
5. M3	0.74	-0.32	0.015	5. M3	-0.823	0.016	0.097
Intercept	-0.40	1.15	-1.03	Intercept	3.22	-1.42	2.91

TABLE 5

Maximum Likelihood Estimates of Cointegrating Vectors with Over-Identifying Restrictions

Model A				Model B			
Variables	Vector 1	Vector 2	Vector 3	Variables	Vector 1	Vector 2	Vector 3
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1. NFBC	0.0000	1.0000	1.0000	1. NFBC	0.0000	1.0000	1.0000
2. CMR	0.01956	0.0000	0.3443	2. CMR	0.0440	0.0000	0.2666
3. PLR	0.0000	0.0012	-0.3443	3. PLR	0.0000	0.0075	-0.2666
4. IIP	-1.5665	-1.6005	0.0000	4. IIP	-1.4406	-1.7017	0.0000
5. M3	1.0000	0.0000	0.0000	5. M3	1.0000	0.0000	0.0000
Intercept	-0.4154	0.0142	-7.9307	Intercept	-1.1552	0.6922	-8.8501
LR = 1.7835				LR = 1.7572			

Note: (i) LR denotes the likelihood ratio statistic for testing the over-identifying restriction C3(5) = 0. This ratio is distributed as $\chi^2_{(1)}$. Both LR are insignificant at 5% levels.

TABLE 6

Elasticities of Relationships

	Model A				Model B			
Relationship	Income Elasticity	Interest Elasticity w.r.t.			Income Elasticity	Interest Elasticity w.r.t.		
		CMR	PLR	Spread (PLR-CMR)		TBR	PLR	Spread (PLR-TBR)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Money Demand	1.5665	-0.2187	-----	-----	1.4406	-0.2653	-----	-----
Credit Demand	1.6005	-----	-0.0179	-----	1.7017	-----	-0.1124	-----
Credit Supply	----	-----	-----	1.3100	-------	----	-----	1.014

Note: (i) All the interest elasticities are at the mean.

TABLE 7

Factor Loadings (Model B)

Variables	Cointegrating Vector 1	Cointegrating Vector 2	Cointegrating Vector 3
(1)	(2)	(3)	(4)
NFBC	0.0375** (2.7863)	-0.1237** (3.2025)	0.0074 (1.6707)
TBR	0.02163 (0.0197)	-3.8567 (1.2249)	-0.9274* (2.5649)
PLR	-0.5096 (1.8231)	-1.0519 (1.3118)	0.2403* (2.6103)
IIP	0.0124 (0.6933)	0.2136** (4.1659)	-0.0072 (1.2250)
M3	-0.4531** (7.9577)	0.0495 (0.3030)	-0.0819** (4.3674)

Notes: (i) (*) and (**) denote significance at 5% and 1% levels respectively.

(ii) figures in brackets are t-values.

TABLE 8

Role of NFBC in the FEVD of all Variables

Horizon	IIP	PLR	TBR	NFBC	M3
(1)	(2)	(3)	(4)	(5)	(6)
0	0.0002	0.0645	0.1226	1.0000	0.0028
1	0.0308	0.0589	0.1186	0.9800	0.0043
2	0.0801	0.0567	0.1157	0.9517	0.0042
3	0.1327	0.0561	0.1138	0.9242	0.0041
4	0.1811	0.0562	0.1124	0.9006	0.0048
5	0.2236	0.0565	0.1115	0.8811	0.0061
6	0.2604	0.0569	0.1110	0.8650	0.0076
7	0.2924	0.0573	0.1106	0.8517	0.0091
8	0.3204	0.0576	0.1105	0.8406	0.0106
9	0.3451	0.0579	0.1104	0.8312	0.0119
10	0.3672	0.0582	0.1103	0.8232	.0130
11	0.3870	0.0584	0.1103	0.8163	0.0139
12	0.4049	0.0586	0.1104	0.8104	0.0148
13	0.4211	0.0587	0.1104	0.8051	0.0156
14	0.4359	0.0588	0.1165	0.8005	0.0163
15	0.4495	0.0590	0.1105	0.7965	0.0169

16	0.4619	0.0590	0.1106	0.7928	0.0174
17	0.4735	0.0591	0.1106	0.7896	0.0179
18	0.4842	0.0592	0.1107	0.7867	0.0184
19	0.4941	0.0593	0.1107	0.7841	0.0188
20	0.5034	0.0593	0.1107	0.7817	0.0192
21	0.5120	0.0594	0.1108	0.7795	0.0195
22	0.5201	0.0594	0.1108	0.7775	0.0199
23	0.5278	0.0595	0.1109	0.7757	0.0202
24	0.5348	0.0595	0.1109	0.7740	0.0205

Notes: (i) FEVD – (Generalised) forecast error variance decomposition

(ii) Each column shows the proportion of variance of the captional variable explained by NFBC.

TABLE 9

Generalised FEVD for NFBC

Horizon	Iip	PLR	TBR	NFBC	M3	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
0	0.000168	0.054197	0.103017	0.840266	0.002353	1.1901
1	0.010181	0.061425	0.08863	0.838395	0.001369	1.1689
2	0.025503	0.067922	0.079979	0.825555	0.001041	1.1528
3	0.040704	0.073792	0.07563	0.808999	0.000875	1.1424
4	0.053493	0.079008	0.074345	0.792363	0.000792	1.1366
5	0.063145	0.083693	0.075403	0.777053	0.000706	1.1339
6	0.070149	0.087973	0.077914	0.763258	0.000706	1.1333
7	0.075234	0.091639	0.081231	0.751191	0.000706	1.1338
8	0.078773	0.094898	0.08503	0.740682	0.000617	1.1349
9	0.081309	0.097677	0.088965	0.731433	0.000616	1.1364
10	0.083048	0.100185	0.092803	0.723438	0.000527	1.1379
11	0.084335	0.102326	0.096446	0.716367	0.000527	1.1395
12	0.085261	0.104276	0.099807	0.71013	0.000526	1.1412
13	0.085952	0.105908	0.10302	0.704683	0.000438	1.1425
14	0.086459	0.107439	0.105866	0.699799	0.000437	1.1439
15	0.086877	0.108792	0.108443	0.695451	0.000437	1.1453
16	0.08715	0.109919	0.110878	0.691617	0.000436	1.1463
17	0.087407	0.111024	0.113115	0.688105	0.000349	1.1475
18	0.087672	0.111962	0.115097	0.684921	0.000348	1.1486
19	0.087777	0.112832	0.11692	0.682123	0.000348	1.1495
20	0.087969	0.113613	0.118567	0.679503	0.000348	1.1504

21	0.088018	0.114345	0.12008	0.677296	0.000261	1.1509
22	0.088138	0.11497	0.121483	0.675148	0.000261	1.1516
23	0.088251	0.115585	0.122787	0.673117	0.00026	1.1524
24	0.088299	0.116142	0.123948	0.671351	0.00026	1.1529

Notes: (i) FEVD – Generalised forecast error variance decomposition

(ii) Each column shows the proportion of the variance in NFBC attributable to the captioned column variable.

TABLE 10

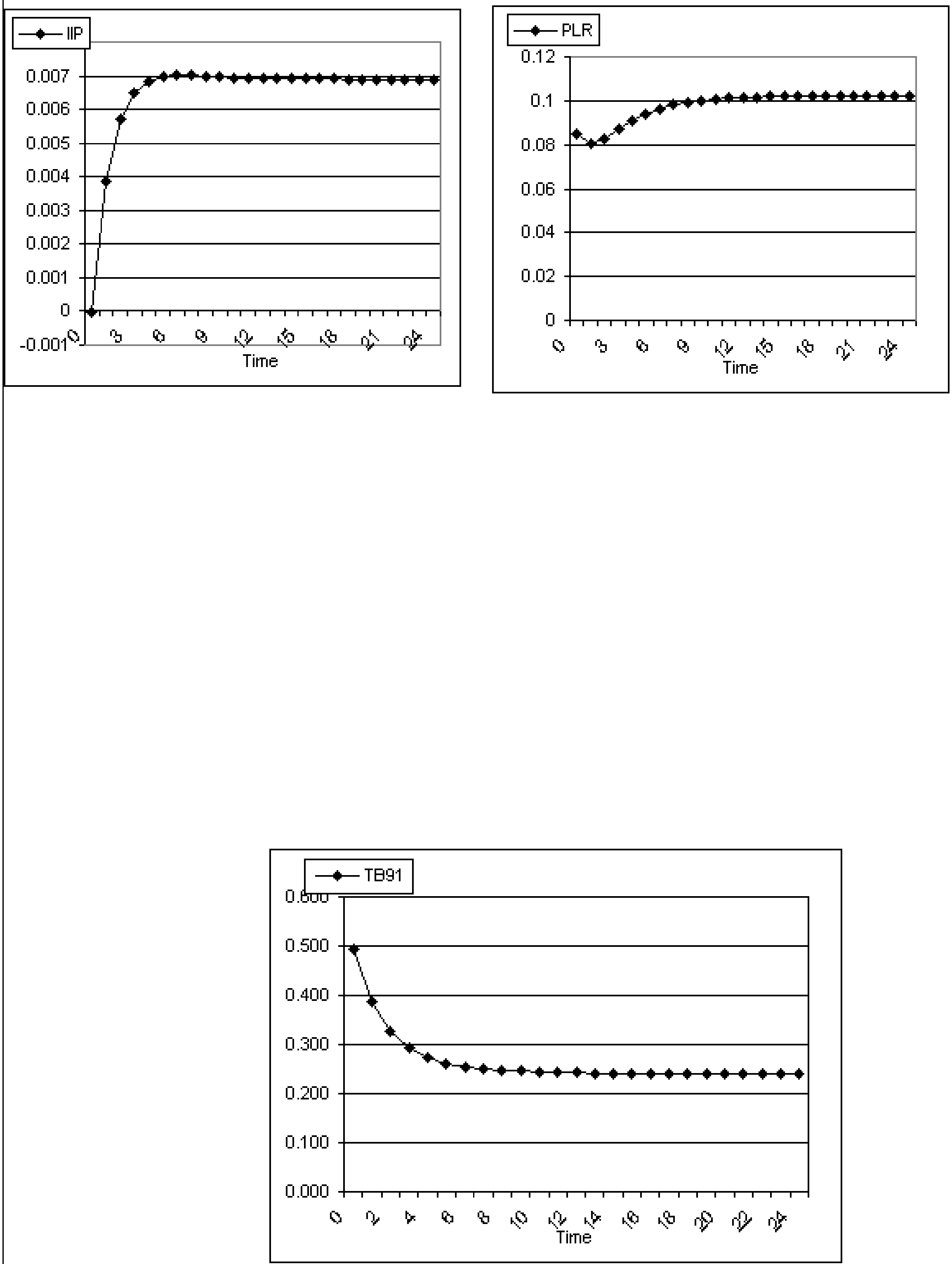
Persistence Profiles

Horizon	CV1	CV2	CV3
(1)	(2)	(3)	(4)
0	1.0000	1.0000	1.0000
1	0.2426	0.9344	0.9601
2	0.0772	0.8762	0.9077
3	0.0340	0.8154	0.8632
4	0.0186	0.7764	0.8059
5	0.0111	0.7003	0.7550
6	0.0068	0.6418	0.6885
7	0.0042	0.5772	0.6104
8	0.0026	0.5108	0.5657
9	0.0015	0.4741	0.5099
10	0.0009	0.4092	0.4326
11	0.0005	0.3416	0.3815
12	0.0003	0.3187	0.3384
13	0.0002	0.2549	0.2762
14	0.0001	0.1765	0.1806
15	Negligible	0.0908	0.1113
16	--“ --	0.0315	0.0882

17	--“ --	0.0098	0.0174
18	--“ --	0.0042	0.0081
19	--“ --	0.0026	0.0004
20	--“ --	0.0005	Negligible
21	--“ --	Negligible	--“ --
22	--“ --	--“ --	--“ --
23	--“ --	--“ --	--“ --
24	--“ --	--“ --	--“ --

Notes: (i) CV1, CV2 and CV3 are the 3 cointegrating vectors of our system, which have been interpreted earlier as the money demand equation, credit demand equation and credit supply equation respectively.

Figure:1 Generalised Impulse Response to one S.E. Shock in NFBC



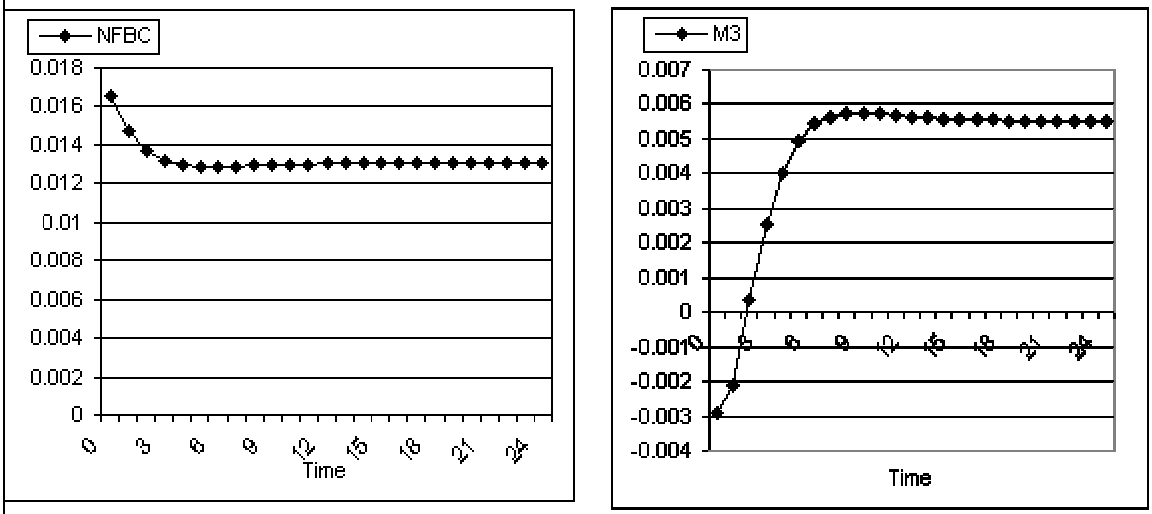
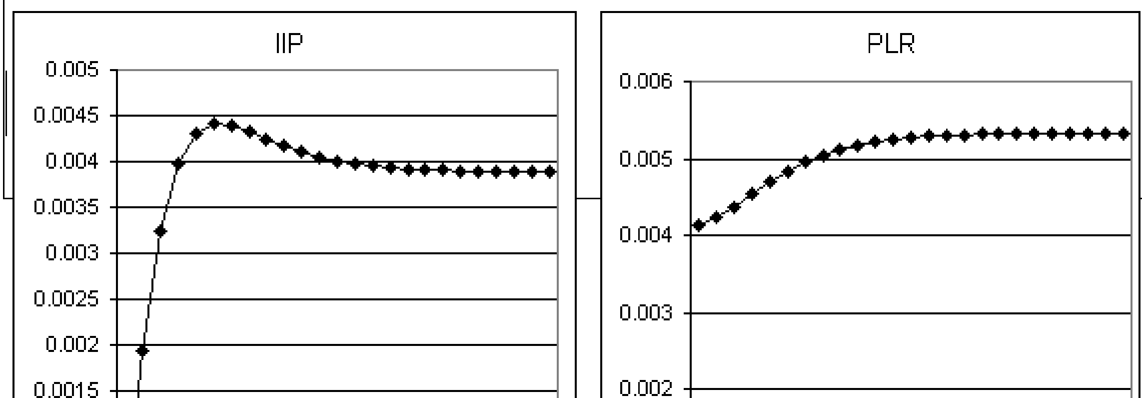
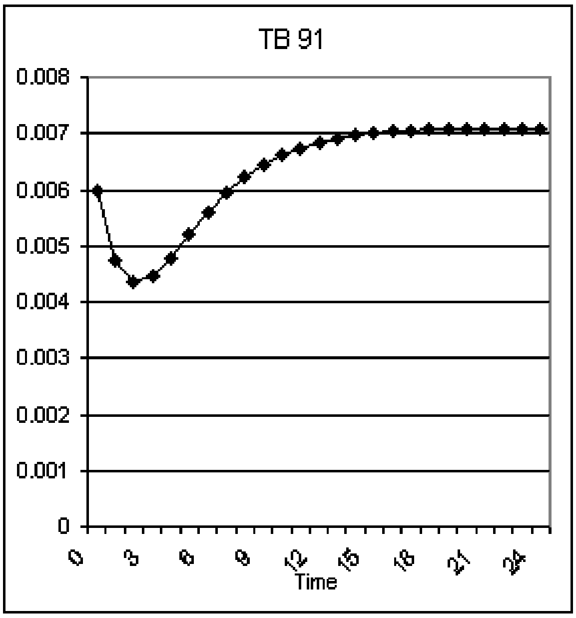


Figure 2: Generalised Impulse Responses of NFBC to one S.E. Shock in other variables

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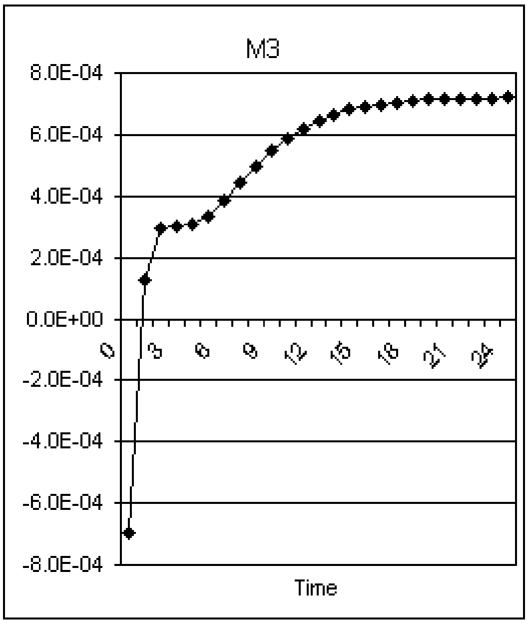
24
Time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-4.0E-04
-6.0E-04
-8.0E-04
0
3
6
9
12
15
18
21
24
Time

Note: The variables, which have been "shocked" are mentioned in the top of each box.