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**Monetary Policy and Credit
Demand in India and Some EMEs**

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Contents

Abstract	i
1. Introduction	1
2. Research Questions	2
3. Relevance of Monetary Policy	3
3.1 <i>Theoretical Challenges</i>	3
3.2 <i>Open / Market Economy Considerations</i>	4
3.3 <i>Role of Monetary Policy</i>	4
3.4 <i>Developing Economy Considerations</i>	5
4. An Overview of Select EMEs	5
5. Impact of Changes in Policy Rate on Lending and Deposit Rates	7
6. Model Specification	11
7. Data and Methodology	12
8. Empirical Results	13
9. Conclusions	15
Appendix A	16
References	21

List of Tables

Table 1: Some Important Ratios of EMEs.....	7
Table 2: Some Selected Indicators of Emerging Markets Economies.....	7
Table 3: Changes in Policy Rate and Commercial Bank Lending and Deposit Rates, India.....	11
Table 4: Results of Panel Unit Root Test.....	14
Table 5: G L S Estimates for Panel Data Model.....	14

List of Graphs

Graph 1: Changes in Policy Rate and Commercial Bank Lending and Deposit Rate, Chile.....	8
Graph 2: Changes in Policy Rate and Commercial Bank Lending and Deposit Rate, South Africa.....	9
Graph 3: Changes in Policy Rate and Commercial Bank Lending and Deposit Rate, Mexico.....	9
Graph 4: Changes in Policy Rate and Commercial Bank Lending and Deposit Rate, Brazil.....	10
Graph 5: Changes in Policy Rate and Commercial Bank Lending and Deposit Rate, South Korea.....	10

Abstract

Impact of changes in policy rate of interest on demand for bank credit is examined for seven emerging market economies including India for the period 2002 to 2010. Panel data techniques are used after ruling out the presence of unit roots. The results show that when other determinants, like domestic demand pressure, export demand and impact of stock market signals are controlled for, change in policy rate of interest is an important determinant of firms' demand for bank credit. The results confirm that monetary policy is an important countercyclical tool for setting the pace of economic activity.

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Monetary Policy and Credit Demand in India and Some EMEs*

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1. Introduction

How far is the short run monetary policy effective in influencing the demand for bank credit and thereby the pace of economic activity in India and other Emerging Market Economies (EMEs) is an interesting question. In such economies only in recent years, monetary and financial sector reforms have resulted in deregulation of financial markets, decontrol of interest rates, greater cross-country capital mobility and market determined exchange rates. Trade policy reforms have led to removal of series of tariffs and quantitative restrictions on trade, resulting in an open current account. A large number of cross country capital control structures have been demolished and both foreign direct investment and portfolio investment have at times touched unparalleled levels (see Pandit and Siddharthan, 2009). Stock markets have grown in size, depth and reach. The market for government securities has also become more vibrant.

For researchers in the field of economic policy, the recent reforms in markets for money, finance and international finance, make these economies almost a laboratory case for examining the effectiveness of monetary policy in the post reform period. For economies with developed financial markets there are several studies which examine the impact of monetary policy initiatives using the credit channel of transmission. Some of these studies are, Bernanke and Gertler (1995), Kashyap, Stein and Wilcox (1993) and Friedman and Kuttner (1993). Vera (2002) examines these issues for Venezuela and Pandit et al (2006) examine the bank lending channel of transmission mechanism for India.

In the present study we focus on how, among other factors, change in a monetary policy variable like the policy rate in India and six other EMEs, will influence the firms' demand for non food bank credit, which in the short run reflects the pace of potential economic activity in the industrial sector (see Davidson and Weintraub 1973, and Arestis 1988). Use of monthly data in the present study makes it possible to capture short run response of the industrial sector to changes in policy rate. As an instrument of monetary policy, we select the policy rate variable because any change in this rate is expected to influence borrowing cum discount rates, capital flows and rates of exchange. On top of all this, a change in policy rate has an announcement effect on the market. Monetary policy fine tuning through change in the policy rate in the short run, would have a rather quick impact on intended pace and direction of economic activity

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of an economic entity like a firm, for which a proximate measure is firms' demand for bank credit.

In section 2 we list the research questions of the present study. This is followed by a discussion in section 3 on the relevance of monetary policy in developing economies and EMEs in the backdrop of financial integration of the global economy on the one hand and the analytics of rational expectations hypothesis on the other. In section 4 we have an overview of important economic parameters of the seven EMEs including India which constitute the panel for the present study. How changes in policy rates, which are mostly overnight rates, transmit their influence to lending and deposit rates which are medium term rates in India and other EMEs is taken up in section 5. The empirical model is specified in section 6. In section 7 data sources and research methodology are presented. Empirical results are discussed in section 8 and conclusions are summarized in section 9.

2. Research Questions

As pointed out above, the focus of the present study is on the impact of the monetary policy induced changes in policy rates of interest on the firms' demand for bank credit. In this study we are assuming that in the short run demand for bank loans reflects the direction and pace of economic activity in the corporate sector. Having chosen bank loans as the dependent variable for the reason specified above in introduction, the transmission mechanism is a hybrid of what in the literature are called interest rate channel and credit channel and it may be named as *Policy Rate Channel*. In the traditionally described interest rate channel, first there is a policy induced change in money supply and this drives down the market rates of interest. In our description of what we call Policy Rate Channel it is the policy rate which is changed by the monetary authority and the objective is to expand not just "money supply" in a narrow sense but "liquidity" in general. Credit channel as it operates through bank lending channel and balance sheet channel, has been examined in several studies. Bernanke and Blinder (1988) started this whole debate followed by Bernanke (1993), Bernanke and Gertler (1995), Kashyap and Stein (1995, 2000), Kishan and Opiela (2000) and Altunbas, Fazylov and Molyneux (2002) among others. For Indian economy distinguishing between demand and supply of bank loans, Pandit et al (2006) examined the supply of bank loans in India.

Our first research question in this study relates to examining the impact of changes in policy rates on lending rates and deposit rates of commercial banks. Table 3 shows how lending and deposit rates change following the changes in policy rates in India. This aspect of transmission of impact of policy induced changes in policy rates on lending and deposit rates for other EMEs in our sample is shown by Graphs 1 to 5. This certifies the existence of first important step of transmission mechanism in Indian economy and other EMEs. One can therefore say with confidence that there are inter linkages among short term policy rates and medium term lending and deposit rates.

The second research question is the impact of the short run demand pressure measured by the ratio of Consumer Price Index (CPI) to Wholesale Price Index (WPI), measured on the same base year, as a mark up. If the short run demand pressure is more, economic activity picks up. In addition, Vera (2002) suggests that cash flow to a firm can be approximated by using the ratio of consumer price index to the whole sale price index, measured on the same base year. This approximation, says Vera, is based on the normal association between the markup and the cash flow of corporate firms. CPI reflects demand price and WPI through time can be assumed to approximate the relative behavior of cost. The ratio of CPI to WPI should be a fairly good measure of the markup and short run demand pressure.

In the post reform period, stock market activities have also been on the rise in most of the EMEs. World stock markets are now more integrated than ever before. In fact stock prices, more than any other variable, measure the impact of expectations on the current and future tempo of economic activity in the industrial sector. If the noise of stock price movement is eliminated, a moving average of stock prices will clearly show this impact on the pace of economic activity.

In emerging market economies including India, trade GDP ratio has risen to higher levels in the post reform period. Reforms in trade policy have resulted in large scale revision in tariff rates across the board and also removal of a large number of quantitative restrictions on trade. It is worthwhile to examine the impact of the change in export demand on business activity in an EME. We have fielded volume of exports rather than export intensity as an independent variable because monthly data were available only for the volume of exports.

3. Relevance of Monetary Policy

3.1 Theoretical Challenges

In the theoretical literature on development economics and macro economics, there are two important streams of thought about the role of monetary policy, which may be tackled at the outset. First, in the development economics literature it is suggested that investment activities in an under developed country are subject to greater degree of uncertainty than in a financially developed country. Changes in policy rates which are always small and incremental may not be important enough as determinants of investment. It might be factors like availability of credit, expected rates of return which will be predominant as determinants of investment. Our response to this concern is that our study is related to a period in which there have been extensive reforms in the financial sectors of the EMEs. When there is fall in policy rates for example, market rates of interest also fall and as a result, discount rates go down. This increases the present value of cash flows from investment besides reducing the borrowing cost. Further, the central banks of the EMEs have to a large extent fine tuned the use of policy tools and besides quantity signals, price signals are also effective. The overall

scenario in EMEs is more liberalized in the post reform period. As a result, the domestic financial markets are better integrated within the home economy and also with international financial markets.

The next challenge in the theory is about the irrelevance of monetary policy. Here we refer to applicability of rational expectations hypothesis of the New Classical Macroeconomics and the degree of capital mobility across economies. Rational expectations as a hypothesis is theoretically important but in applied macro policy especially in the context of EMEs, the implicit assumption of rational expectations hypothesis like wage price flexibility does not hold valid. Another implicit assumption associated with New Classical Macro Economics of which rational hypothesis provides the base, is that of competitive markets. This implies a perpetual tendency toward full employment under equilibrium conditions. Markets in EMEs can not to be said to be competitive in an Arrow-Debreu sense nor is full employment the inevitable equilibrium outcome in such markets. An important assumption of rational expectations hypothesis is the availability of information especially about economic policy changes. For EMEs this assumption is also violated and workers as economic agents may not have full information.

3.2 Open / Market Economy Considerations

With respect to relevance of monetary policy in an open economy it has been argued in Pandit (2005, 2006) that monetary policy is in fact more relevant in economies like India for a number of reasons. However, several developments in the recent past seem to have fuelled the debate regarding the irrelevance of monetary policy. The most important among these are the deregulation of the domestic financial sector; the opening up of economies and the trend towards globalisation. Among open economies, capital movement in the form of direct and portfolio investments, coupled with market determined exchange rates, makes control of money supply or what is called monetary targeting an altogether different and difficult ball game. Similarly, domestic interest rates in open EMEs tend to get aligned with foreign rates and follow the covered interest parity conditions (See Dua and Pandit, 2002). International financial integration of debt, equity and credit markets might be viewed putting the central bank in a bind. It can be argued that central banks in the market- driven economies of a globalised world can neither fix the quantity i.e. the supply of money and credit, nor can it fix the price i.e. the rate of interest. Hence, a question mark is being put on the relevance of monetary policy.

3.3 Role of Monetary Policy

The view that monetary policy is irrelevant in a globalised world is seriously flawed. It continues to be relevant in pursuing the short and medium term targets of price stability, exchange stability and more importantly, financial stability. A central bank need not fix rates of interest but using a very short rate such as the repo rate in India, as

an instrument, the central bank can send programmed signals to the money and credit markets. This would drive the money market towards generating the corresponding spectrum of interest rates.

Similarly, while money supply is not completely controllable by a central bank, the monetary authority has to decide the timing and magnitude of sterilisation and enforce it to ensure optimal liquidity and a rate of growth of money supply which is not well outside the targeted range. Similarly, if the domestic currency is under pressure, only central bank intervention can bring about orderly conditions in the foreign exchange market. At times there is policy induced non intervention in the foreign exchange market for realizing the short term goals of monetary policy.

It must be admitted, however, that central banks no longer preside over the so-called command economies characterised by fixed exchange rates, capital controls and administered rates of interest. Alongside the money market, credit markets, debt and stock markets are expanding and deepening and are also in the process of getting integrated across the world. For a central bank, the science of successful monetary policy is now different, in which less of fiat and more of correct assessment of market signals is essential. The central bank does not have to be guided by market signals alone, since that would imply end of “policy”. Keeping the targets and multiple indicators of monetary policy in view, the monetary authority has to respond to signals not only from the real sector but also from debt, equity, money and currency markets—both domestic and foreign. Following economic reforms in EMEs, these markets are more vibrant and at times even volatile. This makes the practice of successful monetary policy more demanding.

3.4 Developing Economy Considerations

For developing countries and EMEs, the role of monetary policy is all the more important. First, in such countries, output is usually concentrated in a smaller range of goods and services and financial markets are not very deep. This makes diversification of risk very difficult. To counter the de-stabilising shocks, countervailing monetary policy is all the more important. Second, the operation of market forces in some spheres of a developing economy may be weak, non-optimal or even non-existent. This makes the case for monetary policy directed lending essential. Third, on account of wage-indexation and other structural rigidities in both labour and goods markets, control of inflation through contractionary policy may not be easy. Fiscal distortions like high fiscal deficits, in a developing economy, may result in inflation which can be effectively tackled with a judicious mix of fiscal cum monetary policies.

4. An Overview of Select EMEs

Over the last two decades, emerging market economies (EMEs) have become very influential in global trade and these economies have emerged as an alternative engine

of global economic growth. This fact was confirmed during last decade when these economies kept global growth sentiments high despite a relatively slow growth in advanced economies (Table 1). However, it should be noted that these economies are very diverse in terms of their economic size and stage of development. The level of diversity is visible from the fact that some of these economies like South Korea have already achieved a level of per capita income comparable to high income economies, while some others like India are still having a per capita income of less than US\$ 1100. The structural diversity of these EMEs could also be gauged from the proportion of GDP originating from the industrial sector. While this proportion is less than 29 per cent for India, Brazil and Turkey, for Chile (43.8 percent), South Korea (37.1 per cent) and Mexico (37.1 percent), it is much higher. Similar trends could be noticed in trade GDP ratio. Though trade GDP ratio in all these economies, except Brazil, has increased impressively during 2002-2009 (Table 1), it is still much higher for South Korea (96.90 percent), Chile (77.80 percent) and South Africa (65.00 percent) as compared to Turkey (50.10 percent) and India (46.20 percent). Surprisingly, despite being at a fairly advanced level of development, Brazil is least outward oriented economy in the group. Moreover, quite in contrast with other economies, the outward orientation of Brazil has declined during last decade.

The above mentioned diversities among EMEs are more or less in line with the duration for which these economies have been under market led economic regime. For example, South Korea which is the most advanced economy in the group has a much longer history of a market oriented growth strategy than other economies. South Korea made transition from inward oriented economy to an outward oriented economy during early 1960s, which was followed by an unprecedented increase in industrialization, trade and GDP growth in late 60s, 70s and 80s. The economic transition in Latin American economies and Turkey started exactly after two decades of liberal economic policies in South Korea. India is the most recent member of this group as it made a transition from a command economy to market economy in early 1990s.

Despite all diversities, the growth of stock markets is a recent and common phenomenon across all EMEs, with the exception of South Africa. Financial sector reforms along with a comparatively higher expected return attracted huge amount of foreign investment to emerging market economies in post 2002. From 2002 to 2007, net capital flows to all EMEs grew nearly five fold to US\$1.2 trillion (Suchanek and Vasishtha 2010). The most notable increase was observed in the inflows of portfolio investment. The magnitude of increase can be judged from the fact that inflows of portfolio investment to India which were just about US\$ 1 billion in 2002-03 increased to more than US\$32 billion in 2009-10. The increase in inflows through foreign institutional investors resulted in an exponential growth of stock market activities in EMEs. The most notable increase was observed in India where market capitalization ratio increased more than three fold over a period of five years (Table 1).

Table 1: Some Important Ratios of EMEs

	Trade as % GDP		FDI GDP ratio			Market Cap % of GDP		
	2002	2007-2009	2002	2008	2009	2002	2007	2009
Brazil	26.70	24.70	3.30	2.90	1.65	24.60	102.80	50.76
Chile	65.70	77.80	3.80	9.90	9.39	70.70	129.90	142.76
India	30.00	46.20	1.10	3.60	2.80	50.80	161.35	107.30
Korea, Rep.	64.80	96.90	0.40	0.20	0.70	43.30	107.10	100.25
Mexico	55.50	58.10	3.30	2.10	3.40	15.90	38.90	40.24
South Africa	62.10	65.00	0.70	3.50	1.98	166.50	293.80	278.19
Turkey	48.80	50.10	0.50	2.50	1.24	14.60	44.20	38.08

Source: World Development Indicators, 2010, CD-Rom Data Base.

Table 2: Some Selected Indicators of Emerging Markets Economies

	Composition of GDP 2008			Per Capita Income 2009		Population 2009 (Million)	GDP growth 2002-2009	CPI Inflation Rate 2002-2009
	Agri.	Industry	Services	USD	USD PPP			
Brazil	6.7	28.0	65.3	8220	10498	191	3.4	6.9
Chile	3.9	43.8	52.3	9515	14315	16	3.6	3.5
India	17.5	28.8	53.7	1031	3015	1199	7.6	6.0
Korea, Rep.	2.5	37.1	60.3	17074	27938	48	3.9	3.1
Mexico	3.8	37.1	59.1	8133	13608	107	1.6	4.5
South Africa	3.3	33.7	63.0	5823	10229	49	3.6	5.3
Turkey	8.6	27.6	63.7	8711	12465	70	4.6	15.9

Source: World Development Indicators, 2010, CD-Rom Data Base.

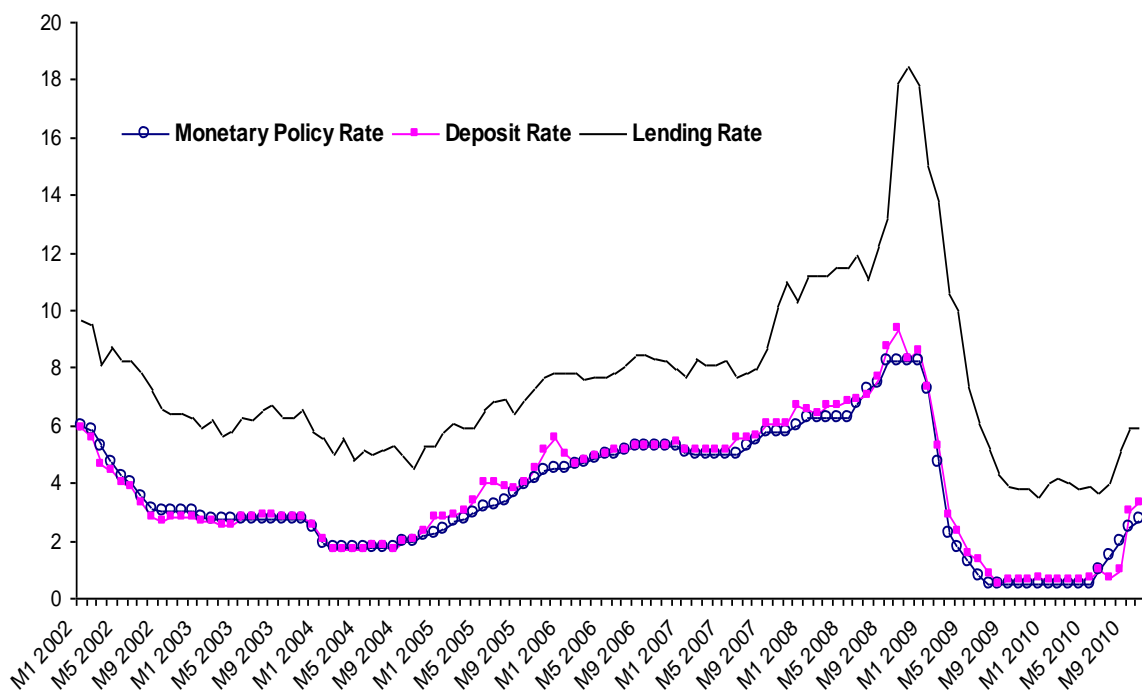
5. Impact of Changes in Policy Rate on Lending and Deposit Rates

Effectiveness of monetary policy can be evaluated only if the impact of changes in policy rates of interest is visible from the data. In an empirical study this is crucial and in fact it can establish the first and the crucial step of transmission mechanism which links short term policy rate to medium term lending and deposit rates. We have conducted a detailed study of the impact of changes of policy rates on the magnitude

and direction of lending and deposit rates across the seven EMEs. For India since there were not many changes in policy rate, we have constructed a table showing the timing of change in policy rate and its impact on lending and deposit rates of commercial banks (also see RBI 2010 A). Table 3 shows it very clearly that in India whenever there has been a change in policy rate after a time lag, it has been followed by corresponding changes in lending and deposit rates of commercial banks. In India it has been observed (see RBI 2010A) that different bank groups adjust their lending rates to changes in the policy rate with varying time lags. Some of the EMEs like Chile, Mexico and Brazil, have witnessed more frequent changes in policy rate due to inflation targeting in these economies. The number of entries in policy rate changes were found to be very large so for EMEs excluding India, the response of lending and deposit rates to changes in policy rates has been shown in Graphs 1 to 5. Since the data on lending and deposit rate for Turkey were not available it was not possible to conduct this exercise for Turkey.

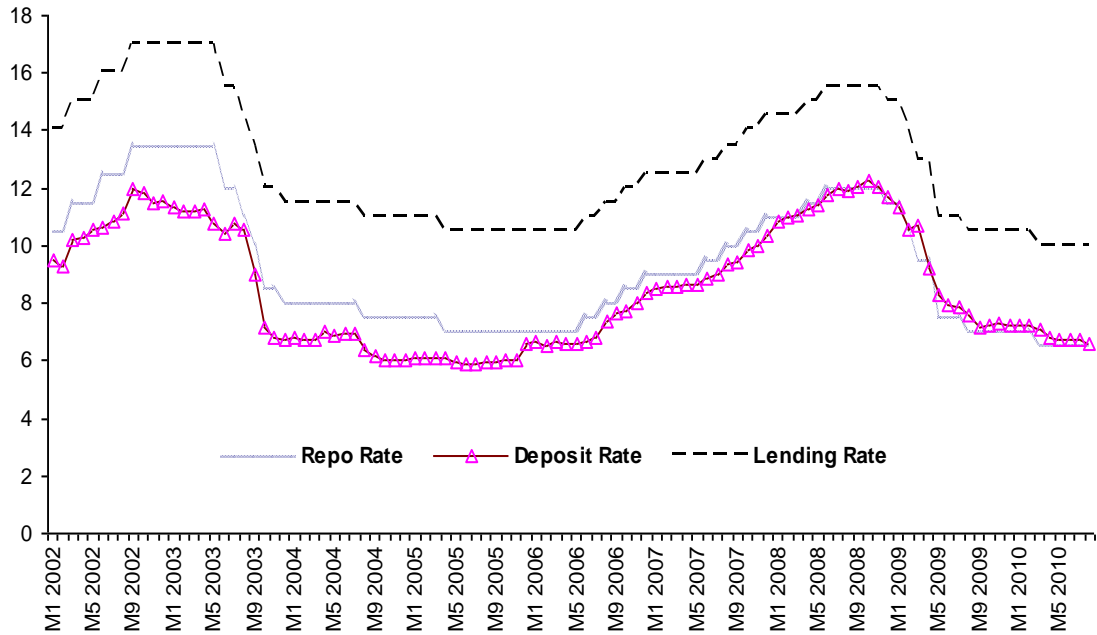
On the basis of the data in Table 3 and Graphs 1 to 5 it can be said that there is a transmission mechanism working between changes in policy rate and the resultant changes in lending and deposit rates.

Graph 1: Changes in Policy Rate and Commercial Bank Lending and Deposit Rate, Chile



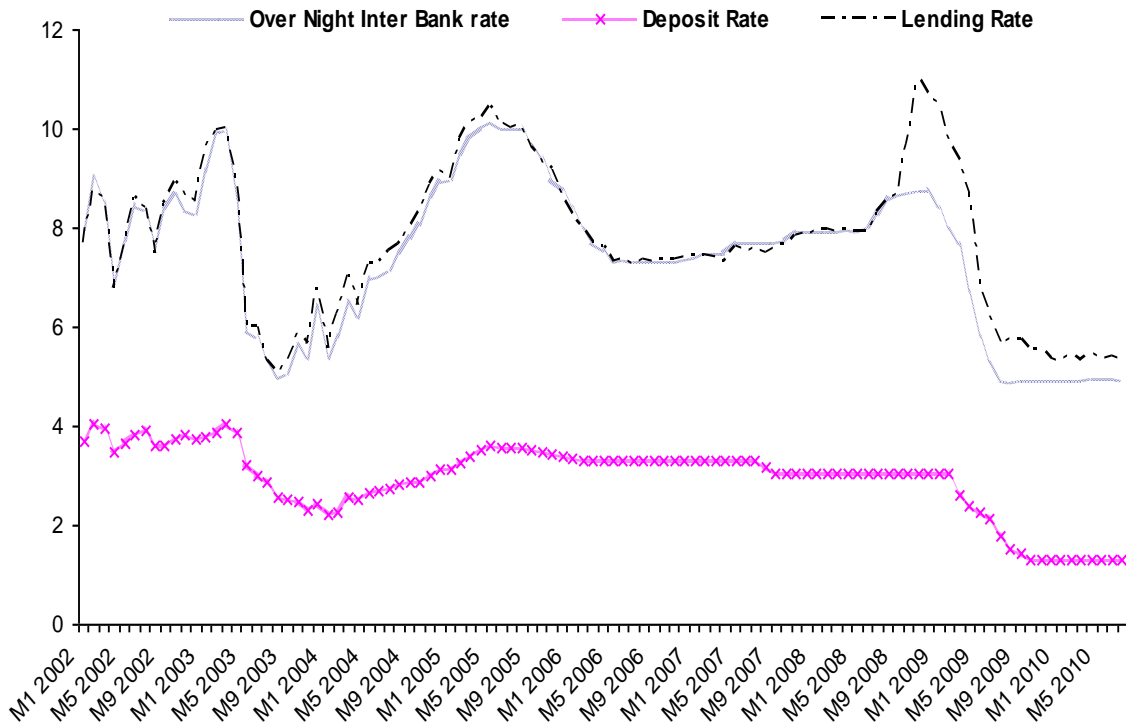
Source: International Financial Statistics, CD Rom Data Base, IMF

Graph 2: Changes in Policy Rate and Commercial Bank Lending and Deposit Rate, South Africa



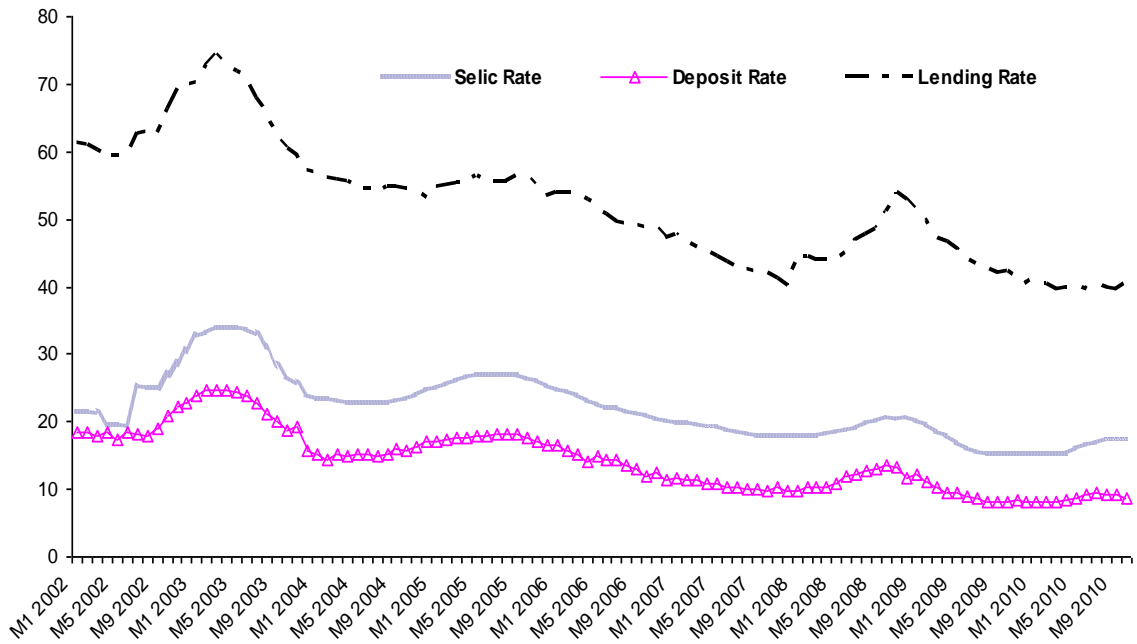
Source: International Financial Statistics, CD Rom Data Base, IMF

Graph 3: Changes in Policy Rate and Commercial Bank Lending and Deposit Rate, Mexico



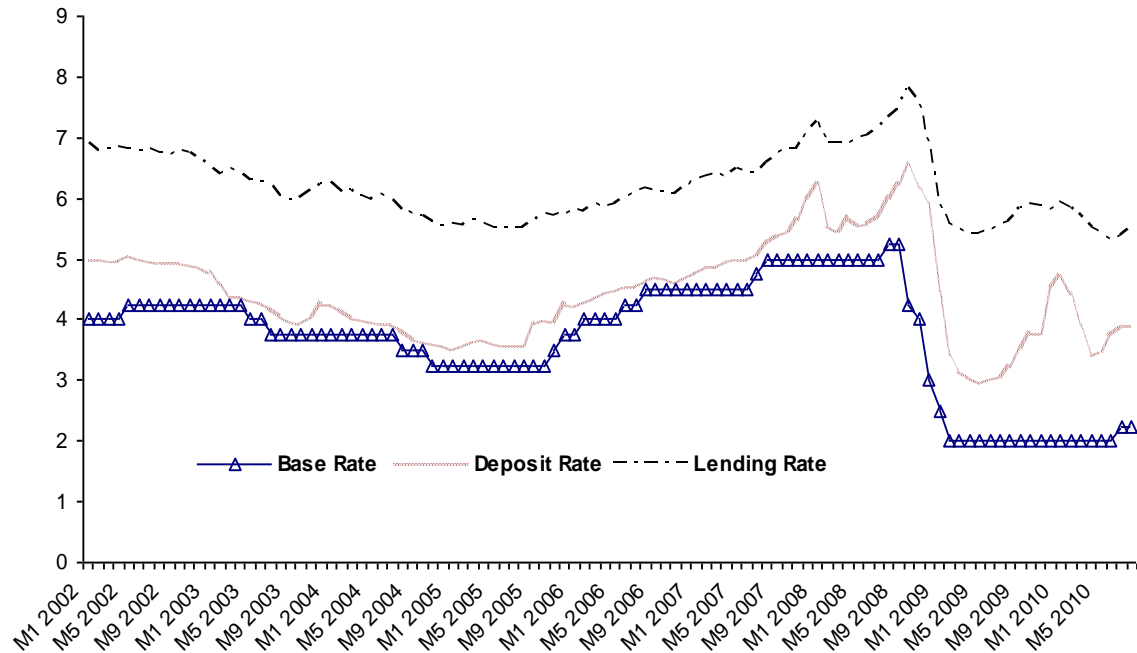
Source: International Financial Statistics, CD Rom Data Base, IMF

Graph 4: Changes in Policy Rate and Commercial Bank Lending and Deposit Rate, Brazil



Source: International Financial Statistics, CD Rom Data Base, IMF

Graph 5: Changes in Policy Rate and Commercial Bank Lending and Deposit Rate, South Korea



Source: International Financial Statistics, CD Rom Data Base, IMF

Table 3: Changes in Policy Rate and Commercial Bank Lending and Deposit Rates, India

Repo Rate	Reverse Repo Rate	Lending Rate	Deposit Rate
(-)50 bps 5 th March 02	(-)50 bps 5 th March 02		(-)25 bps 18 th May 02
(-)25 bps 27 th June 02	(-)25 bps 27 th June 02		(-)25 bps 24 th Aug. 02
(-)25 bps 30 th Oct. 02	(-)25 bps 30 th Oct. 02	(-)50 bps 9 th Nov. 02	(-)50 bps 14 th Sep. 02 (-)75 bps 64 th Nov. 02
	(-)50 bps 7 th Mar. 03	(-)50 bps 6 th Dec. 03	(-)25 bps 18 th Jan. 03 (-) 25 bps 10 th May. 03
(-)100 bps 25 th Aug. 03	(-)50 bps 25 th Aug. 03	(-)25 bps 18 th Sep. 04	(-) 25 bps 6 th Dec. 03 (-) 25 bps 17 th Jan. 04
	(+)25 bps 27 th Oct. 04		(+)50 bps 4 th Dec. 04
	(+)25 bps 29 th Apr. 05		(+)25 bps 31 st Dec. 05
(+)25 bps 26 th Oct. 05	(+)25 bps 26 th Oct. 05		
(+)25 bps 24 th Jan. 06	(+)25 bps 24 th Jan. 06		(+)50 bps 18 th Mar. 06
(+)25 bps 9 th Jun. 06	(+)25 bps 9 th Jun. 06	(+) 50 bps 6 th May. 06	
(+)25 bps 25 th Jul. 06	(+)25 bps 25 th Jul. 06	(+) 25 bps 5 th Aug. 06	(+)100 bps 5 th Aug. 06
(+)25 bps 31 st Oct. 06		(+)50 bps 6 th Jan. 07	(+)50 bps 20 th Jan. 07
(+)25 bps 31 st Jan. 07		(+)50 bps 17 th Feb. 07	(+)50 bps 17 th Feb. 07
(+)25 bps 31 st Mar. 07		(+)75 bps 14 th Apr. 07	(+)60 bps 30 th Jun. 07
(+)25 bps 12 th Jun. 08		(-)50 bps 8 th Mar. 08	(-)50 bps 17 th Nov. 07
(+)50 bps 25 th Jun. 08		(+)50 bps 5 th Jul. 08	(+)50 bps 5 th Jul. 08
(+)50 bps 30 th Jul. 08		(+)75 bps 16 th Aug. 08	(+)50 bps 23 rd Aug. 08 (+)50 bps 4 th Oct. 08
(-)100 bps 20 th Oct. 08			(-)50 bps 6 th Dec. 08
(-)50 bps 20 th Nov. 08		(-)50 bps 15 th Nov. 08	
(-)100 bps 8 th Dec. 08	(-)100 bps 8 th Dec. 08	(-)25 bps 6 th Dec. 08	
(-)100 bps 5 th Jan. 09	(-)100 bps 5 th Jan. 09	(-)75 bps 3 rd Jan. 09	(-)100 bps 17 th Jan. 09
(-)50 bps 4 th Mar. 09	(-)50 bps 4 th Mar. 09	(-)25 bps 11 th Apr. 09	(-)25 bps 14 th Mar. 09
(-)25 bps 21 st Apr. 09	(-)25 bps 21 st Apr. 09	(-)25 bps 4 th Jul. 09	(-)25 bps 4 th Apr. 09 (-) 25 bps 9 th May 09 (-) 25 bps 20 th Jul. 09 (-) 25 bps 1 st Aug. 09 (-) 25 bps 10 th Oct. 09
(+)25 bps Mar. 10	(+)25 bps 21 st Mar. 10	12	
(+)25 bps Apr. 10	(+)25 bps Apr. 10	12	
(+)25 bps Jul. 10	(+)25 bps Jul. 10	8*	(+) 25 bps 21st Aug.10
(+)25 bps Aug. 10	(+)50 bps Aug. 10	8*	(+) 25 bps 2 nd Oct.10

Source: Handbook of statistics on the Indian Economy, RBI (various issues).

Note: * With effect from 1st July 2010, RBI has directed commercial banks to shift from Benchmark prime lending rate to a system of Base rate

6. Model Specification

As mentioned earlier, the focus of the present study is on the impact the monetary policy induced changes in policy rates of interest on firms' demand for bank credit. (In India and South Africa the policy rate we use in this study is called the Repo Rate; in South Korea ,the Base Rate; in Brazil, the Selic Rate; in Mexico, the Overnight Interbank Rate; in Chile, Monetary Policy Rate and in Turkey, Overnight Interest

Rate). Under this Policy Rate Channel of monetary policy, a change in the policy rate, **after a time lag**, will exercise its short run impact on the pace of economic activity through change in demand for bank credit.

In order to control for other determinants of firms' demand for bank credit, we have introduced other variables. To capture the impact of demand pressure we use ratio of Consumer Price Index (CPI) to Wholesale Price Index (WPI) which shows the markup and also measures demand pressure. Foreign demand has been captured by volume of exports. Of late, stock markets in all the EMEs have become vibrant. Economic theory tells us that the behavior of stock prices captures the role of expectations of the best informed group in the economy which is the stock market participants. Firms' plans for expansion or contraction are inter-temporal in nature. So following the changes in the policy rate as a barometer of firms' expectations, signals from the stock prices are also taken into account by the firms. By taking moving average of stock price- indices, an attempt has been made to eliminate the noise.

On the basis of considerations outlined here and also discussed in detail in section 2 above, we suggest that firms' demand for real bank credit will be determined by the lagged policy rate, domestic demand pressure measured by the mark up variable, foreign demand reflected by volume of exports, and stock market price signals indicative of current market sentiment about the future state of the economy. The empirical model to be tested is as follows:

Log Real Bank Credit to Firms = f (Lagged Policy Rate, Log Exports in US Dollars, Log CPI/WPI, Log Moving Average of Stock Price Index,)

Our a priori expectations are that lower the policy rate,---- the overnight rate at which commercial banks borrow short term liquidity from the central bank, higher will be the firms' demand for bank credit. The mark up variable, export variable and stock price variable will be positively related to the demand for bank credit which in our study is assumed to reflect the pace of economic activity in the industrial sector.

When policy rate is reduced, after a time lag, its impact is transmitted to medium term lending rates and borrowing cost goes down. Simultaneously discount rates also go down and present value of cash flows increases. Following this twin impact, investment activity picks up and demand for bank loans increases. Bank credit to firms thus reflects the potential pace of economic activity in the corporate sector.

7. Data and Methodology

The data used in the present study are of **monthly frequency** within the period from January 2002 to August 2010 for seven EMEs including India. For computing the three months' moving average of stock prices, two observations are lost. Thus, the pooled data set includes a total of $102 \times 7 = 714$ observations. The main source of the data is *International Financial Statistics (IFS)*, compiled and maintained by International

Monetary Fund. Panel data are drawn from seven EMEs, India, South Korea, South Africa, Brazil, Mexico, Chile and Turkey. Time period for the present study starts from January 2002. By the year 2002, extensive reforms in financial sector in most EMEs including India had been carried out. Trade reforms were showing their impact and the tempo of economic activities at global level was at its peak. After the dot com bust in US in 2001, the global economy led by US was pushing up with fast speed. This explains why the present study starts with 2002. The recent financial crisis of 2008 had its definite impact on India and other EMEs. However, the object of present study is to examine effectiveness of monetary policy. During and after the crisis counter cyclical monetary and fiscal policies have been used extensively for bringing about recovery in growth. Since our objective is to examine the short run impact of monetary policy changes, we have used monthly data in the present study. Monthly data for all the variables used in our study are not available for all EMEs and that is what explains the choice of EMEs for the present study.

Assuming time lags of one to three months, the Lagged Policy Rate variables have been constructed and used in the empirical tests. The data on level variable of bank credit have been deflated by the price index of the concerned economy. Data on exports from all EMEs are in terms of US\$ and data on rate of interest are in percentages. The markup variable is the ratio of CPI to WPI. Moving average of stock market prices is in nominal magnitudes only.

We use panel data technique (see Baltagi 2003, Green, 2008 and Wooldridge 2002) for obtaining Generalised Least Squares (GLS) estimates for the equation specified above. Panel data have both a spatial and a temporal dimension. The spatial dimension refers to the cross-section of units (countries in this study), and the temporal dimension refers to the period of observations characterizing the cross-sectional units over time. Beine and Coulombe (2004) emphasize that panel data analysis allows for more consistent econometric results than those obtained from time-series and cross-section analyses. We use Random Effect and Fixed Effect models for conducting panel data estimation. We have used monthly data for the period January 2002 till August 2010 and it makes a time series of 104 observations for each of the seven countries.

We have checked for the time series properties of the panel data. For this we use Levin, Lin and Chu (2002) panel unit root test to check for the presence of unit roots. The test uses a null hypothesis of a unit root. The results of this exercise are given in Table 4 below. The results show that null hypothesis of the presence of unit root for all data series used in this study is rejected at 10 percent level. The detailed results of panel unit root test are given in an Appendix.

8. Empirical Results

After ruling out the presence of the panel unit root, the model specified above has been estimated by using the panel data technique. We estimate both Fixed Effect and Random Effect models. The results of both the models are given in Table 5. Since time

series entries are significantly larger than the cross section entries both the models provide almost identical results (see Wooldridge, 1999). It is evident from Table 5 that all independent variables have expected signs and are also statistically significant. Exports, as expected have a positive and significant relation with the level of economic activity. It confirms the importance of external demand in emerging market economies. In the same way, mark up variable has a positive and statistically significant coefficient indicating a positive impact of demand pressure on firms' demand for bank credit. A positive and statistically significant coefficient of stock prices highlights the importance of stock market development in generating the signals regarding the future health of the economy. This is an interesting result because just a few years ago, the signalling power of stock market variables would surely have been insignificant in relation to the real economy. Finally, after controlling for all other determinants of pace of economic activity typified by firms' demand for bank credit, we find that changes in policy rates do play a significant role in setting the pace of economic activity in the selected EMEs. A negative and significant coefficient of lagged policy rate variable indicates that monetary policy is an effective countercyclical tool in such economies.

Table 4: Results of Panel Unit Root Test

Series	Test Statistic	Prob.
Log Real Bank Credit	-2.08	0.01
Log Exports	-2.30	0.01
Policy Rate	-2.39	0.00
Log Moving average of Stock Prices	-2.32	0.01
Log(CPI/WPI)	-1.37	0.08

Table 5: G L S Estimates for Panel Data Model

	Random Effect Model				Fixed Effect Model			
	1	2	3	4	1	2	3	4
Policy Rate	-0.017*				-0.018*			
Policy Rate_{t-1}		-0.020*				-0.020*		
Policy Rate_{t-2}			-0.023*				-0.023*	
Policy Rate_{t-3}				-0.026*				-0.026*
Log Moving Average of Stock Prices	0.295*	0.265*	0.236*	0.204*	0.334*	0.302*	0.269*	0.234*
Log (CPI/WPI)	2.371*	2.170*	1.942*	1.705*	2.208*	2.005*	1.775*	1.539*
Log Exports	0.428*	0.448*	0.472*	0.500*	0.331*	0.354*	0.381*	0.413*
Constant	-6.102**	-5.182	-4.176	-3.157	-4.624	-3.705	-2.701	-1.715
Adjusted R Square	0.62	0.64	0.66	0.68	0.55	0.58	0.60	0.63
No. of observations	714	707	700	693	714	707	700	693

* Statistically significant at 1%, ** statistically significant at 10%

9. Conclusions

On the basis of data- analysis (Table 3 and Graphs 1 to 5) and panel data estimation (Table 5), we conclude as follows. **First**, following a change in policy rates, the behaviour of lending and deposit rates very clearly shows that Policy Rate Channel of transmission mechanism, itself a hybrid of the traditional interest rate channel and credit channel, is working in India and other EMEs. The results are robust even with varying lags . **Second**, our small panel data analysis shows that when we control for variables like domestic demand pressure or markup, export demand and impact of changes in stock prices, firms' demand for bank credit reflecting the pace of economic activity in the industrial sector, gets a boost when policy rates are reduced. This shows that monetary policy is effective in India and other EMEs in realizing its stated targets. **Third**, a change in policy rate at the short end of the market, after a time lag, brings about corresponding changes in the medium term interest rates. The inter linkage between the policy rate and resultant changes in other rates of interest is firmly established. **Finally**, the pace of economic activity in the industrial sector is positively influenced by stock price behaviour, foreign demand and domestic demand pressure or markup shown by the ratio of CPI to WPI.

Appendix A

1. Log Real Bank Credit

Null Hypothesis: Unit root (common unit root process)

Series Log Real Bank Credit

Date: 03/23/11 Time: 19:53

Sample: 2000M01 2008M06

Exogenous variables: Individual effects

User-specified lags: 4

Newey-West automatic bandwidth selection and Bartlett kernel

Total (balanced) observations: 679

Cross-sections included: 7

<i>Method</i>	<i>Statistic</i>	<i>Prob.**</i>
Levin, Lin & Chu t*	-2.08846	0.0184

** Probabilities are computed assuming asymptotic normality

Intermediate results on Log Real Bank Credit

<i>Cross section</i>	<i>2nd Stage Coefficient</i>	<i>Variance of Reg</i>	<i>HAC of Dep.</i>	<i>Lag</i>	<i>Max Lag</i>	<i>Bandwidth</i>	<i>Obs</i>
1	-0.00677	0.0001	0.0001	4	4	5.0	97
2	-0.03076	0.0262	0.0236	4	4	4.0	97
3	-0.22243	0.0540	0.0363	4	4	6.0	97
4	-0.02935	0.0105	0.0090	4	4	4.0	97
5	-0.02978	0.0030	0.0025	4	4	10.0	97
6	-0.03869	0.1692	0.0591	4	4	14.0	97
7	-0.01018	0.0004	0.0004	4	4	5.0	97
	<i>Coefficient</i>	<i>t-Stat</i>	<i>SE Reg</i>	<i>mu*</i>	<i>sig*</i>		<i>Obs</i>
Pooled	-0.01128	-2.859	1.008	-0.519	0.778		679

2. Log Exports

Null Hypothesis: Unit root (common unit root process)

Series: LOG_EXPORTS

Date: 03/23/11 Time: 19:55

Sample: 2000M01 2008M06

Exogenous variables: Individual effects

User-specified lags: 4

Newey-West automatic bandwidth selection and Bartlett kernel

Total (balanced) observations: 679

Cross-sections included: 7

<i>Method</i>	<i>Statistic</i>	<i>Prob.**</i>
Levin, Lin & Chu t*	-2.30747	0.0105

** Probabilities are computed assuming asymptotic normality

Intermediate results on LOG_EXPORTS

<i>Cross section</i>	<i>2nd Stage Coefficient</i>	<i>Variance of Reg</i>	<i>HAC of Dep.</i>	<i>Lag</i>	<i>Max Lag</i>	<i>Band-width</i>	<i>Obs</i>
1	-0.04138	0.0058	0.0012	4	4	31.0	97
2	-0.04214	0.0129	0.0046	4	4	14.0	97
3	-0.04972	0.0135	0.0082	4	4	2.0	97
4	-0.03983	0.0059	0.0004	4	4	100.0	97
5	-0.01898	0.0133	0.0044	4	4	10.0	97
6	-0.06220	0.0113	0.0021	4	4	100.0	97
7	-0.02111	0.0099	0.0008	4	4	61.0	97
	<i>Coefficient</i>	<i>t-Stat</i>	<i>SE Reg</i>	<i>mu*</i>	<i>sig*</i>		<i>Obs</i>
Pooled	-0.03938	-3.631	1.001	-0.519	0.778		679

3. Log Moving Average of Stock Prices

Null Hypothesis: Unit root (common unit root process)

Series: Log Moving average of stock Prices

Date: 03/23/11 Time: 19:59

Sample: 2000M01 2008M06

Exogenous variables: Individual effects

User-specified lags: 4

Newey-West automatic bandwidth selection and Bartlett kernel

Total (balanced) observations: 679

Cross-sections included: 7

<i>Method</i>	<i>Statistic</i>	<i>Prob.**</i>
Levin, Lin & Chu t*	-2.32498	0.0100

** Probabilities are computed assuming asymptotic normality

Intermediate results on ILog Moving Average of Stock Prices

<i>Cross Section</i>	<i>2nd Stage Coefficient</i>	<i>Variance of Reg</i>	<i>HAC of Dep.</i>	<i>Lag</i>	<i>Max Lag</i>	<i>Band-width</i>	<i>Obs</i>
1	-0.00795	0.0004	0.0049	4	4	6.0	97
2	-0.00715	0.0006	0.0078	4	4	6.0	97
3	-0.00445	0.0003	0.0025	4	4	7.0	97
4	-0.00576	0.0004	0.0050	4	4	7.0	97
5	-0.01114	0.0006	0.0064	4	4	6.0	97
6	-0.01055	0.0009	0.0094	4	4	6.0	97
7	-0.00879	0.0010	0.0079	4	4	6.0	97
	<i>Coefficient</i>	<i>t-Stat</i>	<i>SE Reg</i>	<i>mu*</i>	<i>sig*</i>		<i>Obs</i>
Pooled	-0.00717	-3.907	1.001	-0.519	0.778		679

4. Log CPI/WPI

Null Hypothesis: Unit root (common unit root process)

Series: CPI/WPI

Date: 03/23/11 Time: 20:00

Sample: 2000M01 2008M06

Exogenous variables: Individual effects

User-specified lags: 4

Newey-West automatic bandwidth selection and Bartlett kernel

Total (balanced) observations: 679

Cross-sections included: 7

<i>Method</i>	<i>Statistic</i>	<i>Prob.**</i>
Levin, Lin & Chu t*	-1.37756	0.0842

** Probabilities are computed assuming asymptotic normality

Intermediate results on CPI/WPI

<i>Cross section</i>	<i>2nd Stage Coefficient</i>	<i>Variance of Reg</i>	<i>HAC of Dep.</i>	<i>Lag</i>	<i>Max Lag</i>	<i>Band-width</i>	<i>Obs</i>
1	-0.11806	0.1743	0.5416	4	4	5.0	97
2	-0.07887	0.4164	4.9673	4	4	7.0	97
3	-0.03967	1.9108	2.3576	4	4	0.0	97
4	-0.03340	0.2909	0.5076	4	4	2.0	97
5	-0.09143	1.1473	1.4976	4	4	1.0	97
6	-0.09128	1.2710	1.9724	4	4	5.0	97
7	-0.00154	0.7293	1.0019	4	4	3.0	97
	<i>Coefficient</i>	<i>t-Stat</i>	<i>SE Reg</i>	<i>mu*</i>	<i>sig*</i>		<i>Obs</i>
Pooled	-0.05099	-5.867	1.011	-0.519	0.778		679

5. Policy Rate

Null Hypothesis: Unit root (common unit root process)

Date: 04/07/11 Time: 10:01

Sample: 2000M01 2008M06

Exogenous variables: Individual effects

User specified lags at: 4

Newey-West bandwidth selection using Bartlett kernel

Total (balanced) observations: 679

Cross-sections included: 7

<i>Method</i>	<i>Statistic</i>	<i>Prob.**</i>
	-	
Levin, Lin & Chu t*	2.39497	0.0083

** Probabilities are computed assuming asymptotic normality

Intermediate results on Policy Rate

<i>Cross section</i>	<i>2nd Stage Coefficient</i>	<i>Variance of Reg</i>	<i>HAC of Dep.</i>	<i>Lag</i>	<i>Max Lag</i>	<i>Bandwidth</i>	<i>Obs</i>
1	-0.07920	0.0222	0.0256	4	4	1.0	97
2	-0.00965	1.6051	3.2537	4	4	5.0	97
3	-0.03269	0.0720	0.5741	4	4	6.0	97
4	-0.06646	0.1855	0.3872	4	4	5.0	97
5	-0.05141	0.1180	0.4834	4	4	7.0	97
6	-0.01901	0.4133	3.1091	4	4	7.0	97
7	-0.04564	0.0482	0.1477	4	4	5.0	97
	<i>Coefficient</i>	<i>t-Stat</i>	<i>SE Reg</i>	<i>mu*</i>	<i>sig*</i>		<i>Obs</i>
Pooled	-0.02750	-5.292	1.006	-0.519	0.778		679

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