A Time Series Analysis of Interest Rate Movement in Credit Lending Channel with Reference to India's Monetary Policy Transmission Mechanism

ABSTRACT

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BABASAHEB BHIMRAO AMBEDKAR UNIVERSITY

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DEEPANJALI DAS

DEPARTMENT OF ECONOMICS

SCHOOL FOR AMBEDKAR STUDIES

BABASAHEB BHIMRAO AMBEDKAR UNIVERSITY

(A CENTRAL UNIVERSITY)

VidyaVihar, Raebareli Road Lucknow-226025(U.P.), India

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INTRODUCTION

Understanding the working of Monetary Policy is central to the study of Macroeconomics. Like fiscal authorities, central bank also affects development in the real economy by means of Monetary Policy transmission mechanism. Invariably, though in the short run, changes in monetary policy decision affect the rate of economic growth / inflation rate, (Taylor 1995. The monetary policy framework of India's central bank has been evolving since mid 1990's and a path of strengthened framework was laid out in the Patel Committee Report to RBI. A liquidity adjustment facility (LAF) was introduced in April 1990 as a main monetary policy instrument meant to operate in a deficit liquidity mode to ensure more effective monetary transaction. With deepening of financial system and sophistication of financial markets, most monetary authorities are using indirect instrument (policy interest rate and open market operations) rather than direct measures (like credit allocation). The efficacy of monetary policy lies in the speed and magnitude with which they achieve their final objectives. However, there is little consensus as to how the policy specifically exerts its influence. In that context, academic literature had undergone various studies to bring forth the workings of various so-called channels. The three main are interest rate channel, the asset price channel and the credit supply channel (Mishkin 1995, 1998, de Bondt 1998). Being one of the Emerging market economies, India is known to have the absence of well functioning financial markets, an imperfect link with private international capital markets, multiple bank ownership structure, limited capital account convertibility and greater competition. This leaves little scope for conventional interest rate channel, asset channel or the exchange rate channel. Hence, effectiveness and reliability of the monetary transmission depend on the properties of credit supply channel.

The money channel is the standard framework since Keynes and Hicks textbooks IS/LM models, based on the notion that the central bank use interest rates as a tool to manipulate aggregate demand by affecting the marginal cost of borrowing. Taylor (1995) gives a good account of this channel. He shows how contractionary monetary policy raises short-term nominal interest rates, and through the combination of sticky prices and rational expectations, results in higher real long-term interest rates, thus constraining demand, at least for a time. Besides this, policy also transmits via other

relative asset prices, such as exchange rate and real estate prices constituting asset price channels by altering the net worth of households and enterprises.

Studies by Bernanke and Blinder (1992), Kayshap and Stein (1995), (1997a, b), Peek and Rosengren (1995), de Bondt (1999), Favero et al. (1999) and Kishan and Opiela (2000) offered appealing explanation for the strength, timing and distributional effects of policy on an economy via bank credit lending channels. They provide evidence of bank lending channel in monetary policy transmission. The two versions of credit channel are borrower net worth channel (Bernanker and Gertler, 1995) which depends on the collaterals and the access the borrowers have to non-bank sources, i.e. financial markets. The other, the bank lending channel, is the responsiveness of bank loan supply to adjustments in the stance of monetary policy, assuming banks to be the only source of external finance and presence of credit market imperfections. The distinction that underlies is that the bank lending channel operates solely through bank loan supply shocks on manipulations of amount of reserves.

The 2007-10 financial US crises has vividly highlighted the importance of stability of banking sector and the role of banks as a potential source of friction in transmission mechanism. At the same time, the role of banks seems to differ from the traditional model of bank lending channel as a result of deregulation, financial innovation and intensive use of market funding sources, i.e. securitization market.

Monetary policy influence the course of real economy and a financial system of an economy is made of institutional arrangement designed to transform savings into investment determined by rules regarding designs of instruments and regulation on banks practices. The early finding of Friedman and Schwaartz (1963) states that monetary policy action is followed by movement in real output that may lasts for 2-3 years (Romer and Romer 1989, Bernanker and Blinder 1992, Christiano, Eichenbaum and Evans 1994a, b). The results are silent about the interim.

The transmission channel is a hybrid of interest rate and credit channel and named as policy rate channel. First there is policy induced change in money supply. Banks influence the conventional interest rate mechanism of monetary policy since with reduction in money supply, which may consist of deposit liabilities of banks, is one of the principal factors responsible for increase in interest rate. It is the policy rate which

is changed by monetary authority. This is primarily done with the objective to contract money supply in narrow sense but also liquidity in general. But the role of banks in monetary policy transmission mechanism is largely neglected by economic theory.

Aim of the Study

The transmission channel is characterized by long, variable and uncertain time lags, making it difficult to ascertain the precise effects of monetary policy actions on the economy. Apart from differential lags, there is also asymmetric involved in the quantitative responses of policy impulse to the goal variables in alternative phase of business cycle and liquidity condition. In this regard, this study aims to find evidence of an active bank lending channel in India. A bank mobilizes domestic savings and is a conduit of monetary policy transmission. Since capital outlays needs for most development projects are met majorly from these banks, they accelerates economic growth. With reforms, global integration and liberalization in India, granting banks operational autonomy, a well functioning credit market has added an unwelcome effect of debt accumulation. This has changed the predictable way a bank behaves according to the traditional bank lending channel rendering the monetary transmission mechanism unstable. This study inspires to acknowledge the systemic way a bank behaves to the intended moves of RBI and how far banks alter their assets and liabilities, adjusts their loans securities, deposit and non-deposits portfolio behavior to monetary policy stance, highlighting the precise role banks play in monetary policy transmission mechanism.

Objectives of Research

- Test the pass-through from policy actions through money market's instrument to bank lending.
- Empirically substantiate the degree and speed of subsuming complete pass-through after the policy induced disequilibrium.
- Compare the effectiveness of India's monetary policy framework with respect to credit channel transmission in a pre and post new monetary policy regime.

Hypothesis

- There is a complete pass-through from policy changes to bank interest rates.
- There is 100 per cent pass-through equilibrium after a policy induced disequilibrium.
- There is no difference between India's monetary policy framework in terms of credit channel transmission in a pre and post new monetary policy regime.

Contribution to Literature

The study of research holds authenticity in terms of objectives decided, economic model, the econometric modeling besides the elected period of study which entails the duration of Global economic crisis and hence an occasion of policy challenges. The time span is marked by widespread indeterminateness with which economic variables behave doubly complicating the Indian environs faced with global macroeconomic changes, structural issues in domestic economy and inflation volatility (RBI, 2009). Albeit testifying the downturn, Indian central banks were among the few in the world to have been successful in insulating the domestic bank sector for the aftermaths of the GFC.

Research Methodology

The design of the implicated research is framed in a closed economy where neither the out-of-country monetary stance has any effect over the home country nor the home country can leverage the rest of the world by its monetary actions. The fiscal policy is separate under the control of the government, thus given, to which monetary authorities have no major dominion. The RBI has a direct thruway to sway the monetary base by administering the bank rate, Cash Reserve Ratio, Statutory Liquidity Ratio, i.e. quantitative controls on credit creation capacity of commercial banks; resorting to Open Market Operations and Private Placements of Treasury Bills. Henceforth, they govern the quantity and inflation. The intention of the study is to deduce the reach of the interest rates which have been played out customarily as operating and intermediate target variables of the prevalent India's monetary policy transmission.

Retrospection of literature illuminates the models used lately in exploring credit lending channel of monetary policy transmission mechanism. Several economic study reads shed light over Vector Auto Regression (VAR) model propounded by Sims (1992) which provides structure to relationship of contemporaneous variables by ordering them and allowing the orthogonalised impulse response functions to better portray the true structural disturbances. The empirical approach embraced for this research probe comes as a natural progression of VAR model videlicet, cointegration[1] and error correction, to get around the problem of spurious regression consociated with non-stationary time series data. Cointegration furnishes and embody between short-run dynamics and long-run equilibrium. This thesis aims at estimating using the Autoregressive Distributed Lag (ARDL) approach to co-integrating testing rather than the single equation testing for co-integration based on Johansen residual based tests where also pre-testing is not required for the order of integration. The ARDL model used in the study uses the approach of F-statistics to test for joint hypothesis to ensure that all the coefficients of all lagged variables in the ECM equation are zero. Pesaran, Shin and Smith (2001) through five cases of ARDL approach to co-integration to lay down the results of ECM. The model intervenes autoregressive distributed models of orders (p, p,...p) models where the F-statistic has asymptotic critical value bounds for all the cases. If the computed F-statistic falls outside the critical value bounds, the test allows conclusive evidence without discerning about the integration situation of the underlying regressors. Whereas, if the F-statistic fall within the bounds inference, the test stands inconclusive and comprehension of the order of integration is required before advancing further. If F-statistic lies below the 0.05 lower bound, there is evidence of no level relationship. Hence, hypothesis of 'no level relationship' cannot be rejected at 5 percent level.

There are two ways in which this methodology would provide an upper hand to our analysis. One, the long-run liaison between cointegrating vector variables will appear cogently explicating short-run multifariousness. Two, the deliverance of error correction model elucidates facts about the system from which impulses begets, aiming for better long-run perspectives.

[1] Propounded and propagated by Granger (1981, 1986), Hendry (1986), Pagan and Wickens (1989) and Mills (1991).

Data and Variables Selection

- In the Indian context, the data on policy variables like, SLR, CRR, Bank Rate, Repo Rate, etc., financial market's weighted average call money market rates and commercial banks' credit and deposit rates are abstracted from Reserve bank of India's Annual Report, Weekly Statistical Supplements, Handbook of Statistics on Indian Economy and Occasional Papers. We chose monthly data ranging from 1985M1-2016M12. We know that as RBI takes plunge over some indirect instruments too whose effects are reflected in the operating target variables sooner or later. For any monetary stance exercised by RBI through open market operations or reserve base, the effect is immediately felt over call money rates through liquidity manipulations on the inside of commercial banking. Hence, we unify Weighted Average Call Money Rates in study of monetary policy transmission. Since Repo auctions started from 2000, we consider and restrict our analysis including repo rates to the period 2001M1-2016M12. We delve into probing the impact of alternative policy variables on money market segment of financial market of India.
- Ln prefixes is used for logarithms and Δ is prefixed along variables that are integrated to the first order. Models are improved through diagnostics tests and VAR's lag order selection criteria are selected for accurate lag order.

Empirical Model

Originally, the variables are arbitrated for their statistical properties, in specific, the stationarity of picked variables with conventionally competing unit root test available, Dickey Fuller test or Phillip-Perron test. We opted for Augmented- Dickey Fuller test which concluded that all variables concerned were I(1). This permits us to exploit the Bound cointegration test and with the formal use of causal analysis, a meaningful ARDL model is framed to evaluate the effectiveness of the credit lending channel of monetary policy transmission in the post-liberalized Indian economy.

Outline of the Thesis

- The Second Chapter titled **"Theoretical and Conceptual Framework"** begins with the various theories that nurture the seedbed from where the idea

germinated. The chapter then moves to give an overview in order to flash the underpinning of the consortium over the time of monetary policy with various institutions in the form of monetary policy channels. Moreover, it also encompasses the monetary policy framework with an exclusive explanation on the pivotal congress financial market shares with the monetary policies in integral background of the monetary regime shifts. The chapter exposes the evolution in the way monetary policy conducts and the significant role bank and money market holds.

- The Third Chapter, **"Testing the Degree of Association among Policy Rates and Financial Market Rates"** is premised on the understanding that a Time Series analysis sufficiently accommodates only a limited number of variables in a particular model. A narrowing down of the variables is of central importance to deliver a good statistical model. Thus, this chapter tries to bring justification of the selected monetary variables clubbed to test the effectiveness of monetary policy mechanism in India. Therefore, through statistical tools of correlation and regression, we elect the most convincing factors logically structured and shown in the same.
- The Fourth Chapter as its title depicts, "**Empirical Evidence of Monetary Policy Transmission from Policy Rates to WACMR in the Pre-New Monetary Policy Regime**", conforms to the consequential part in addressing the first half of the pass-through towards returning from policy rate innovation back to equilibrium position. The Chapter, with segregation of the time period, also endeavors to find the direction and standing of the pass through in two different regimes witnessed by India. Judgment on the footing of elasticity level and the speed of put-reach in time months is used as a stratum of discernment.
- The Fifth Chapter envisions the "**Empirical Evidence of Monetary Policy Transmission from Policy Rates to WACMR: Post-New Monetary Policy Regime"** and is an extension inclined to the fulfillment of the comparative analysis against the backing of recent shift in the monetary regime. With the same operational procedure in chapter four, this chapter aims to find the impetus to reach back to balance after a policy induced disequilibrium. It is found that there has been a positive leap post the shift in the indirect

instruments based regime by RBI substantiating the improvement in health of India' MPTMs.

- The Sixth Chapter "**Last Leg of Credit Lending Channel: Monetary Transmission to the Bank Interest Rates"** caps off the last node of India's policy rate channel in a monetary environment and aims to postulate the type of relation the bank behavior partakes in the channel. There is a resultant short run relationship discovered of the credit lending behavior of SCBs to the policy signaling. This comes true after the transposing from a quantity based to price based channel since the launch of new and short term instrument based monetary operation.

This research study's Seventh and the last Chapter "**Conclusion and Suggestions**" summarizes the results alluding to the empirical analysis and concludes with the policy discussions based on the derived inferences. It gives an outline of the important detections with some specific suggestions. It is expected that a new door of possible and hitherto unexplored research vistas will take ground and that this will transpire into further investigations of the concerned problem.

Main Comprehensive Findings

The study cumulatively entails to calibrate the credulity people can attach around the Monetary Policy Transmission Mechanism of India. It comes out with various idiosyncratic features with which monetary policy of India is affected and is suggestive of the last node of credit lending channel of transmission mechanism, circumscribed in a monetary environment. Amid the invariable financial and economic reforms, escalating global market integration across various segment of domestic financial market, increasing accessible market in the real time and onrush flow of information multiplier, there are presumptive changes in the confines and speed of behavior of target variables to RBI's policy signals. There is an unmistakable result of transmission lags summoning from monetary policy to the real sector.

First, remunerative of the thirty-two years long monthly data was delved into to decipher the pass-through from monetary policy rate to WACMR, sequestered into two time periods. This is in the light of the regime shift in the monetary policy operating procedure where the time periods are isolated into two halves askewing

towards a focused study. Second, scanning a constellation of 18 year long time period ranging from 1999 to 2017, it seeks to examine the pass-through to bank interest rates trickling down to money market; considered both in context of speed and attainment. Third, a Vector Error Correction Model and Autoregressive Distributed Lag Model (ARDL) was used to circumspect the 32-year long data to decipher the econometric deductions robustly. The scrutinisation of the existing literature on financial market and scheduled commercial banks in there embodiment with RBI policies brings in light the augmenting yet partial behavioral response.

The pass through from the policy decision to bank lending behavior of India's banking sector is a composite structure of long-run and short-run associations among variables. The research study is arranged as a two-step examination of transmission mechanism under the policy rate channel. This channel encapsulates the most traditional channel, i.e., the interest rate channel along with the credit lending channel. The two step modeling took cognizance of the very significant factor in the interim that convincingly vanquishes the monetary policy process outreaching a potential reformative Indian environment. It is the financial environment that reflects a telling story of the country's liquidity health and proves a crucial platform in either facilitating or interrupting the effective mechanism of monetary policy transmission. The translation of achievement of economic goal into advancement of financial market has been red-hot among economic researchers which spurred policy makers to enhance the level of integration of the financial markets in such a way that radical macroeconomic changes are reflected in all the markets. Since economic reforms, these markets are rather more volatile and responsive; hence making monetary policy more challenging.

The preference of weighted average call money rate (WACMR) proxying the money market intends a significant and advancing relation between its values and the values of the policy regulations. The relationship is not only a significant one but also relatively for a long period of time. The bound test of cointegration validates the declared above.

The schism of the thirty-two year on the footing of the regime shift the milieu prior to the New Monetary Policy Regime avouched a significant relation of WACMR with bank rates only. It also explicated that it took more than an eighteen quarters lags for

the financial market to react to the policy signals. The economy then was experiencing of deepening of the money market and credit markets in a so called command economies characterized by fixed administered rates, capital control. The economy typifies an incomplete term structure of money market; undergoing gradational yet significantly calibrated headways under the price discovery process starting 1990s corollary with reforms in the real sector.

While the Pass through from WACMR to Policy rate post to the New Monetary Policy Regime substantiated a significant relation of dependent variable with both the repo rate and reverse repo rate. Albeit, beholding the pre-crisis period of 2003-2007 of "Great Moderation"[2] globally with the immediate world liquidity crisis witnessing a considerable drop in growth followed by worldwide recession[3], the Monetary policy transmission climax out-reach with lags of less than three months. Such ciphering contributed to informational observation of a pronounced progression since the regime shift cinched in the time warp.

The headway since the shift triumphed more than fifteen manifolds. Such shifts-enabled in operating procedure based on direct quantity-based to indirect interest based instruments generated greater reliance on interest rates to flag the stance of monetary policy. Therefore, the intensity of policy rate transmits through the term structure of interest rate strengthened with time, attested by the varying transmission in due time course. The Reserve Bank has been capable of better transmitting the monetary policy signals under the new monetary regime through a single policy repo rate. The empirical evidence in the error correction models suggests a significant improvement in the monetary policy transmission under the new operating framework.

The second test of investigation of effectiveness of pass through found a short-run alliance account. This runs parallel with the turn in operational control of RBI over market management through short-term indirect instruments. While testing the presence and effectiveness of credit lending channel in terms of timing relationships relying on short term responses, deals with the drawbacks ignoring the nature of loans

[2] High growth rate with price stability

[3] The formatting of financial products as combination of securities was more of an "originate-to-distribute"[3] model rather than "originate-to-hold" model[3] in presence of serious lapses in regulation, lack of systemic financial stability and assessment of risks (IMF, 2009).

being sticky contracts. In cases of fall in reserves deposits in case of monetary tightening, they sell off securities. It is only after few quarter lags, banks decrease their loans and its rates and the real activity follows suit dramatically immediately[4].

We know now that credit channel work in tandem with money channel, it becomes obvious that contraction introduced by it will result into decline in output, which in turn causes the bank loans to further decline.

Another interpretation about changes in the quantum of bank lending within overall bank portfolio is also swayed by factors other than interventions through monetary policy instruments. It could be the phased opening of the economy to the worlds as well as the prudential norms as proxied by capital adequacy ratios, asset quality, income recognition and provisioning that exercise influence over the bank lending activities and its behavior.

The reforms in field of money and finance have made India a laboratory case for testing its transmission mechanism in post reform period. In an emerging economy like India, in the examination of credit channel, the study vindicates the existence of the first step of transmission mechanism in Indian Economy tallying the crucial inter-linkage among short term policy rates and medium-term lending and deposit rates. The results substantiate the effectiveness of monetary policy. It is clear that in India every time a change is introduced in a policy rate after a time lag it is followed by a conforming change in the lending rates.

There is still perpetual existence of financial and non-financial intermediary. The financial intermediaries like commercial banks, insurance companies, interbank markets, etc., largely trade amongst themselves. This ignites externality of mismatch between liability and assets which stems a self-amplifying crunch of liquidity glitches across the financial sector. Further an apprehensive decline in asset values and corresponding efforts to set balance sheet right exudes trouble, thus further reducing the market values. This is the reason why India's money market is active for clearing day to day surplus and deficits among banks as a regular source of funding. There is a need for intensive asset liability management (ALM) guidelines from the RBI.

[4] Leontief production function

Suggestion and Policy Implications

The RBI needs fine-tuning of the policy tools. For this it is imperative to take care of price signals along with quantity signals. This builds a more integrated financial market within the home country and also internationally. Moreover, in an open economy, with a careful pursuance of short and medium term target of financial stability, price stability and exchange stability, using a short rate instrument such as repo rate can successfully send programmed signals to the money, credit and capital market. Eventually, such move in an incorporated environment would drive the money market to commence the corresponding spectrum of interests.

The economic reforms (1992) implemented in the Indian financial sector brought about instituting of new private sector and foreign banks with decontrolling of interest rates and forging prudential norms by RBI in the form of capital adequacy ratios (BASEL III) and financial stability[5]. This is clearly vocalizes the Indian policy ethos and belief that free markets cannot always vest best outcome, thus stressing a strong case of regulation of the sector.

The renowned micro-economic theory of firm does not hold solid for financial firms when its role is reflected in terms of economic growth in a developing country. Moreover, Walrasian equilibrium results in market failure. Such fiscal and monetary bailouts proved boon to the economy as RBI succeeded in maintaining financial stability even at the time of crisis. Yet it must be acknowledged that that GFC cannot be treated as an isolated event as Indian stock market and business is highly correlated with the US via outsourcing, technology transfer. The country needs to discover how to deal in order to de-escalate the risks of globalization.

A transmission can only be propitious if the banks proceed the benefit of the credit expansion by the RBI (in case of policy cut) to credit-constrained borrowers. The customers with high marginal propensity to borrow are likely to spend more. But it is the behavior of Indian Banks to lend to those who already have ample funds and this does not give the economy a cyclical boost. This pattern is the cause of the inverse relation between marginal propensity to borrow and risk score of borrowers. This disconnect is one of the causes that substantiates the long lag of 10 months for the

[5] Narasimham Committee (1991)

monetary policy outreach in this research and the failure of the monetary authorities attempt to expand credit and fight recession. In addition, MPTMs is not just about talking banks into lowering their benchmark in tandem with the monetary policy expectations but also to lend credit to the 'right' borrowers.

There is a need of exercising of greater bank's autonomy. This calls for separation of ownership and management, bureaucracy and business management which builds up an environment of accountability for performance and malfeasance as well.

Limitations and Direction for Future

This research thesis confines itself to the monetary sector of the Indian economy keeping constant the demand function of the real sector. Hence, this opens scope for further follow up research in the future in the area of monetary policy transmission mechanism study.

The thirty-two years time period time-series analysis entails in it some phenomenally abrupt and drastic shifts tending to structural breaks vis-à-vis Indian Economic Reforms, Global Financial Crisis and Demonetisation. These displacements have been duly captured such that it does not show spurious regression results. This sets the research to extended search of an even better model that could sufficiently seize such outliers incontestably.