1 Chapter

Introduction

1.1 Introduction

Monetary policy is very important for any countries (developed and developing nations) to achieve high and stable economic growth; maintain low and stable inflation in long run and short run period. By monetary policy means policy concerned with changes in the supply of money[1]. Monetary policy is best fitted to achieve the goal of price stability in any economy (McCallum, 1989), it must be related to developed economy, and objective of monetary policy is achieving long run price stability (low or stable inflation). In other words, high inflation is damaging to long run economic performance and welfare. Monetary policy related to aggregate demand for output in money terms and money holding by public, it is an assets but liability of producer of money i.e. Central bank's currency, bank's deposits and the government.

Either change in the money supply lead to a direct change to level of money income (Quantity theory of money) or first a change in the interest rate, which then leads to change in the rate of investment and then to a change in the level of income (Keynesian theory), given the stable demand function for output in money terms. Both the theories play a vibrant role for the enhancement of monetary behavior of an economy. It works as a significant tool to regulate the demand and supply of money of a nation.

Central bank of a nation has an important role for regulation of monetary policy. It uses regulatory mechanism for the purpose of sustaining availability of credits. These functions of central bank come under the transmission mechanism of monetary policy which helps to avoid un necessary fluctuations of macroeconomic variables such as growth rate (GVA), inflation rate, exchange rate, employment, saving and investment etc.
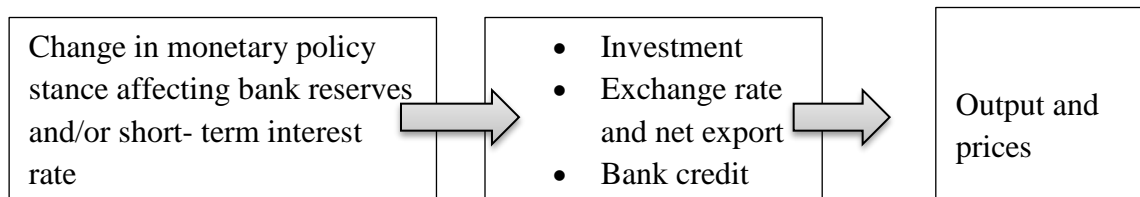
---

[1] Gupta, suraj b. "monetary economics" pp. no. 339

1.2   The transmission mechanism of monetary policy

Traditionally, there were generally existed four types of channels of monetary policy transmission mechanism in any economy:-

- Interest rate channel
- Credit availability channel
- Assets price channel
- Exchange rate channel

Interest rate is the most predominance of monetary policy transmission mechanism channel as any change in monetary policy has immediate influence on it. Now in recent years, expectation is another one of the channel of monetary policy transmission mechanism is introduce in world economy.

| Change in monetary policy stance affecting bank reserves and/or short- term interest rate | ⟹ | • Investment
• Exchange rate and net export
• Bank credit | ⟹ | Output and prices |

Standard monetary policy transmission mechanism[2]

When central bank impose a contractionary monetary policy, first a change as increase in short- term interest rate, when then reduction in money supply then reduction also in investment and output and price level of the economy. Another monetary policy transmission mechanism is presented in the exchange rate influence on net exports. If reduction of money supply influence as an increase interest rate then exchange rate make appreciate, then reduction in net export and therefore aggregate demand. It is works depend on fulfill of Marshall-Lerner condition. Third possible transmission is in bank lending or credit view, banks play a direct significant role in the transmission mechanism

---

[2]Ghatak, Subrata and Sanchez-Fung jose R. "Monetary Economics in Developing Countries" third edition, pp. 127

monetary policy: a lower money supply decrease banks deposit, which in turn lowers bank loans, which works by reducing investment and output.

1.2.1 Monetary transmission mechanism in developing countries

In developing countries, financial liberalization and deregulation influence on credit availability and play major role in monetary policy transmission mechanism. Mainly two type of transmission mechanism in the developing countries are as follow:

- McKinnon & Shaw's monetary transmission mechanism
- Taylor & van Wijibergen's monetary transmission mechanism

McKinnon (1973) and Shaw (1973) introduced the "financial repression". It is the polices in which savers earning profit returns rate through any investment project is less than inflation rate and banks provide cheap loans to savers, companies and government for reducing the burden of payment. It affects total liquidity and the government debt, the government debt is predominance in domestic currency. Financial liberalization and regulation is opposite to financial repression. McKinnon and Shaw argue that, in short-run, resulting from financial liberalization and deregulation, interest rate is higher, output increases, lower inflation and saving and financial intermediation increases, then bank released more loan for private investment in the medium term.

McKinnon-Shaw:

$$FLD \Rightarrow i \Uparrow s \Rightarrow \Uparrow \Rightarrow BL \Uparrow \Rightarrow I \Uparrow \Rightarrow Y \Uparrow$$

In above relationship, $\Uparrow$ indicates an increase in a given indicators.

FLD financial liberalization and deregulation; *i* is the real exchange rate; *I* investment; *s* private saving; *Y* real output; *BL* bank loans.

A main assumption of this approach if the liberalizing interest rates are change, movement of resources has utilized to only productive use. Note substitution between bank deposits and resources embody in informal credit market is important.

In contrast, Taylor and van Wijnbergen are introduced another form of structuralists monetary transmission mechanism (van Wijnbergen, 1982, 1983; Taylor, 1983). They argue that financial liberalization and deregulation of polices may increase the marginal cost of funds in the informal money market, it taken resource but cannot utilized. Informal loan market cannot access the resources due to the contraction of funds. So that structuralists mechanism estimate contractionary monetary policy – when first a higher interest rate, after that, for informed loan markets reduce in the credit availability and increases marginal cost funds which leads to decrease investment and output, increasing inflation rate more than a decreasing inflation rate. These effects are equal to an adverse supply shock and create stagflation. A further estimation from this approach is that, if effective in reducing real aggregate demand, a contractionary monetary policy reducing investment rather than consumption, with negative consequence for economy growth prospect.

Structuralists:

$$FLD \Rightarrow i \Uparrow \Rightarrow LLM \Downarrow \Rightarrow MCF \Uparrow \Rightarrow I \Downarrow \Rightarrow Y \Downarrow$$

In above relationship $\Uparrow$ indicates an increase, and $\Downarrow$ a decrease in above given indicators. And the other indicators are as follows: *LLM* is the informal loans market; and *MCF* is the marginal of funds. In developing economy contractionary monetary policy reducing investment and output but not consumption (not reduction in demand).

1.2.2   Monetary transmission mechanism in developing country: Empirical Results

Monetary policy influence on real and nominal economics variable with the various dimensions, these effects estimate through different econometrics tools such as VARs methods (Sims, 1980), two stage least squared etc.

Researcher's name	Countries	Tools	Key finding
VanWijnbergen (1982)	South Koria	TSLS	Short run stagflation effect of restrictive monetary policy.
Leiderman (1984)	Colombia & Mexico	VARs	For Colombia money growth affects inflation; for Mexico, two-way causality between money and

			inflation
Reinhart&Reinhart(1991)	Colombia & Mexico	VAR$_s$	Finds support for the neo-classical synthesis; that is monetary shocks affect output
Kamas & Joyce (1993)	India & Mexico	VAR$_S$	Domestic monetary policy does not affect output, but in both economies output respond to change in foreign money
Kamas (1995)	Colombia	VAR$_S$	Variation in domestic credit affect the balance of payment but not the exchange rate, si it seems that Colombia's crawling peg works effective as a fixed rather than a flexible exchange rate
Catpenter (1999)	South Korea	VAR$_S$	Central banks credit has a significant effect on output, price and interest rate in the informal sector. Finding support Monetiel's (1991) model, but not the stagflationary response to monetary contractions in van Wijinbergen (1982)
Chonge et al. (2006)	Singapore	Time series	The transmission mechanism from financial institutions' administered rate is asymmetric across sector in the economy. A monetary tightening has an impact on the economy with alonger lag rather than an expansion.
Tsangarides, Charananbas (2010)	Mauritius	VARs	Money supply and exchange rate are influced statistical significance to the price.
Hai, Buivan and Trang M. T. T. (2015)	Vietnam	VARs	Money demand interest rate influence on variations in output responded by monetary tightening with five six quarters

1.2.3   Monetary transmission mechanism in India

Various studies and economists have their own opinion about the monetary transmission mechanism in real sector. Pandit and Vishist (2001) suggested that interest rate and credit channels are more effective in Indian economy and other emerging economies. Whereas Singh and Kalirajan (2008), Mukherjee and Bhattacharya state that the interest rate is more effective in real sector of India after liberalization. Alleem (2010) in his study talk

about that in the real sector bank, lending channels are more effective than exchange rate and assets price. On other hand Al-mashatgave a statement against the Alleem who tells that in real sector bank lending channels are less effective as compare to exchange rate and interest rate. Patra and Kapoor (2012) suggested that interest rate with a lag of at least three quarters are very crucial in Indian economy. It has significant impact on aggregate demand and administrative interest rate also significant to lead monetary policy. Mohanty (2012) found that when monetary policy shock occurs (tight and easy) then the higher policy rates leads to output growth with lag of two quarters and reduction of inflation with lag of three quarters. RBI found that bank rate has a positive effect on output as well as price to follow easy monetary policy.

Therefore, it has been seen that bank credit channel and interest rate are more effective than exchange arte and assets price in real sector of Indian economy.

1.3   The rules versus discretion

For a large portion of a century now, the "rules versus discretion" wrangle in money related financial matters has concentrated on the purported "time irregularity" issue. The issue is that, although an optional national bank may guarantee not to permit the inflation rate to above the zero (or some other perfect esteem), the way that a inflation "shock" can support employment and output in the short run will entice it to break its promise. Understanding this, business sector members will suspect higher inflation. The long-run result is a higher inflation rate with no change in either job or yield. By restricting the national investors' alternatives, a monetary policy rule takes care of the time irregularity issue.

A prior guidelines rules-versus-discretion about had occurred in the 1920s and 1930s. The later one, which was roused by the stagflation of the 1970s, contrasted in that it was affected by the New Classical revolution that was occurring around the same time. Thus, the later pundits of monetary discretion, including Finn Kydland and Ed-ward Prescott, Guillermo Calvo, Benn McCallum, Robert Barro and David Gordon, and John Taylor, contrasted from their forerunners by building their contentions on the reason that central bankers were both well (if not exactly flawlessly) educated and well meaning. Discretion

as indicated by them, prompts not as much as perfect results not because central bankers are unmindful or misinformed, but since of misaligned motivating forces. The rule base monetary policy is related to "target", such as the k% (Friedman, 1959) or nominal-GDP targeting (McCallum rule, 1988) or inflation targeting/interest rate targeting (Taylor, 1993, 1999), and discretion monetary policy is based on the ad-hoc judgment of policymakers. It means that central banks will be choosing appropriate monetary policy, given the current situation.

Wicksell is a first economist to introduce monetary policy based on rules, who said that the central banks should be aim to maintain price stability. (Friedman, Lucas, 1959) Central bank maintain a constant rate of growth of the money supply is equal to the rate of the growth real GDP. McCallum (1988) rule targets nominal gross domestic product through the money supply. The rule states that the need to adjust monetary policy in term of deviation of GDP from target, for instance, if GDP fall below the desired target, the central bank accepted to increase money supply to stimulate the economy so as to facilitate increase in GDP to desired level. While Taylor (1993, 2001) rule is of the view central banks increase the nominal interest rate, if output is above the potential output (output gap) and/or inflation is above the target (inflation gap) and/or exchange rate is above the target (exchange gap).

Various reasons have been given in literature which tells, that the rule- based monetary policy effectiveness. First inflation bias from monetary policy can be reduced by a rule of credible pledge of the central bank to maintain price stability. Second, rules increase economic efficacy by reducing uncertainty about future policy. Thirdly, rules give a steady activity to strategy makes help policymakers maintain a strategic distance from weights from specific vested parties and encourage activity reliable with long-run objectives. Fourth, rules ease communication, stimulate transparency and surge accountability. Fifth, a rule protects the central bank from political pressure. Sixth, a rule allows the performance of the central bank to be judged by the government & the public.[3] As fact that everything has some positive and negative aspects. So rules are not exceptional. There are arguments against the application of rules. First, the economic

---

[3] See Milton Friedman, "A Program for Monetary stability" (1959)

system is not as easy as that its problems can solve through rules. Second, the similar rules are failed in different trade cycle. Third, rule-based policies become rigid to respond to exogenous shocks. Fourth, policy shocks are not allowed under rules which may be desirable for policy usefulness under certain conditions. Finally, it has been observed through experience that due to underdeveloped financial markets & rapid structural transformation.[4]

To examine the behavior of monetary policy in India through the McCallum rule, Taylor rule and hybrid McCallum-Taylor rule.

1.4   Monetary policy reaction function

Monetary Policy Reaction Function (MPRF) is the monetary policy rule to predict the fluctuations of macroeconomic variables through the instrument variables, this is a whole process conducted by RBI. MPRF has been considered both backward and forward looking behavior.

The monetary policy reaction function plays a vital role in macroeconomic variables and policy analysis through describing the performance of monetary reserves at the time when monetary policy changes due to economic development. It can be useful in anticipating real arrangement activities, in this way serving as a benchmark for evaluating the present position and the future heading of monetary policy. Likewise, in large scale models, the response capacity is focal in assessing Sustained strategy and deciding impacts of other full scale approaches or financial stuns, suggesting macroeconomic execution may itself rely on the behavior of money related arrangement. Subsequently, there is impressive enthusiasm for distinguishing the way of genuine approach sought after by the Fed and figuring out if the evaluated response capacity cultivated or ruined macroeconomic stability. The MPRF is associated with rule versus discretion argument dignified by Kydland & Prescott (1977), Barro & gorden (1983) is have also an important role in the debate. Fisher (1990) noticed that analysis optimal response of monetary authority to economic development is not a new area of research. Friedman gave a proposal which focused on a constant growth rate for the money stock than an active feedback rule. Friedman gave his argument through the empirical finding regarding the

---

[4] See Deepak Mohanty. "Efficacy monetary policy rules in India" (2013)

existence of long & variable lags in the influence of monetary policy (Friedman & Schwartz, 1963)[5].

Now a days McCallum (1988) & Taylor (1993) rule have been using in MPRF in developed nations and but also in developing nation.

1.5 Monetary policy regime in India

Till to the mid1980s, the behavior of monetary policy was ineffective to budget deficits. The second round impacts of such adaptation of such policy had an inflationary results that must be controlled by controlling credit to the private sector. Aside from plan of action to hold necessities going about as statutory acquisitions, sectoral credit allotments were set up, while panoply of financing costs were directed.

The Chakravarty Committee on Monetary Policy setup in 1985 suggested that price stability emerge as the 'dominant' objective of monetary policy with accompanying commitment to fiscal discipline (RBI 2002, pp. 67). Price stability was seen to be unstable to sustain the process of reforms begun in 1991 (RBI 1993). In the latter half of the 1990s, as the economy slowed down, monetary policy pursued a reconciling position with an explicit preference for a softer interest rate regime while continuing a constant watch on inflation. In the RBI's view there are several constraints in pursuing a sole price stability objective.

(i) The continuing immerging of supply shocks limits the role of monetary policy in the inflation outcome. Inflation in India depends upon monetary as well as non-monetary factors because of structural factors and supply shocks from within and abroad.

(ii) The fiscal dominance implies that debt management gets inextricably linked with monetary management.

(iii) The absence of fully integrated financial markets suggest that the interest rate transmission channel of policy is weak and yet to evolve fully. In particular the lags in the pass-through from the policy rate to bank lending rates constrain the adoption of inflation targeting.

---

[5]Ghatak. S & Sanchez-Fung R. J. "Monetary Economics in developing countries" Third edition cheapter 8,pp 134

(iv)   High frequency data requirements including those of a fully dependable inflation rate for targeting purposes are yet to be met. (RBI 2004).

The RBI adopted a multiple indicator approach in April 1998. "to extend the scope of variables that could be considered for financial arrangement purposes instead of depend exclusively on a solitary instrument variable, for example, development in expansive cash (M3)"(RBI, 1998)". In 1999-2000, the position of monetary policy was passed on through decline in the (reverse) repo rate and the Bank Rate, and India was on the way to another money related strategy system. The reverse repo rates soon started to give a story to the overnight call currency market rates while repo barters were utilized in case of warm confort in liquidity conditions. It was the Bank Rate, to which all different rates on facilities by the RBI were connected, that stayed, till 2002, the basic flagging rate for passing on the position of strategy, and the roof for currency market rates conditions. It was the Bank Rate, to which all different rates on housing by the RBI were connected, that stayed, till 2002, the principle flagging rate for passing on the position of strategy, and the powerful roof for currency market rates.

An Interim Liquidity Adjustment Facility (ILAF) worked through repos and landing against insurance of Administration of India securities was presented in April 1999. The ILAF was a component by which liquidity was injected at different interest rate, and consumed at the settled repo rate. Starting in the next year, an undeniable LAF was set up in stages, giving a sensible corridor to market play. The Bank Rate basically offered path to the repo rate as the upper bound of the arrangement financing interest rate. From November 2004, the LAF started to be worked with just overnight repo/reverse repo barters and more term barters were suspended, in spite of the fact that the RBI held the alternative to lead them at its judgment. With the establishment of ongoing gross settlement, a screen-based managing stage and a clearing company, intra - day LAF barters have likewise been utilized with some achievement. Over the following period, the LAF has been advanced into the main working strategy of money related arrangement. The working policy rate exchanged amongst repo and opposite repo rates from 2003 till early May 2011, contingent on the macroeconomic and liquidity conditions. There was the absence of a lonely strategy rate. Against this foundation, the

working system has gone for a change in May 3, 2011. Initially, the repo rate was made in a systematic way where transmit of flags of rate straight forwardly. The cash reserve ratio (CRR) has been seen as an instrument which needs more intention in the RBIs to stockpile for controlling liquidity in the economy, while the statutory liquidity ratio has played the part of a prudential apparatus and liquidity cradle as opposed to a statutory pre-emption.

The RBI formally adopted a multiple indicator approach in April 1998.These are (i) to maintain a stable inflation environment; (ii) to maintain appropriate liquidity conditions to support higher economic growth; (iii) to ensure orderly conditions in the exchange market; to avoid excessive volatility in the exchange rate; and (iv) to maintain a stable interest rate environment (RBI, 2002).

One expert committee was headed by Urjit R. Patel, Deputy Governor of the Reserve Bank of India. This committee felt that inflation should be the nominal backbone for the monetary policy framework. The target for inflation should be set at 4 per cent with a band of +/2 per cent around it. It should be set by the RBI as its predominant objective of monetary policy in its policy statement. "The nominal anchor should be communicated without ambiguity, so as to ensure a monetary policy regime shift away from the current approach to one that is centered around the nominal anchor,'' it added. Further thy added the subject to the establishment and achievement of the nominal anchor, monetary policy conduct should be consistent with a sustainable growth trajectory and financial stability.

1.6 Objectives of the study

1. To assess the recent trend & pattern of macroeconomic variables – goal variables (price, output/exchange rate) and operating instruments (interest rate/ Reserve Money).
2. To study the monetary policy reaction functions in India after liberalization.

1.7   Statement of the problem

Rule based monetary policy has very significant impact on output growth, price stability & balance of payment of a nation. The effect of monetary policy will be positive or negative on macroeconomic variables; it depends upon the high/low level of boom or recession. Therefore it's very essential to see which type of rule should be including in the monetary policy or not. The literature suggests various rules of monetary policy such as k% rule, McCallum rule, Taylor rule and hybrid McCallum-Taylor rule. It is a reliable question that among the McCallum rule, Taylor rule and Hybrid McCallum-Taylor rule which are more effective and provide efficient picture in context of Indian economy. However, very few emphasized on the rule of McCallum and Taylor rule of monetary policy. Hence, the present study is an attempt to set the behavior of their rules in Indian context.

1.8   Significance of the Study

The study is an attempt to describe the effectiveness of McCallum rule and Taylor rule in the context of Indian monetary policy. The findings this study will provide benefit to the policy makers considering that monetary policy rules paly an essential role in Indian economics system. For the researcher the study will help them to cover critical areas in the monetary policy rules that many researchers were not able to explore. Society will benefit by monetary policy rules through price stability and maintain high growth in an economy. This study will be benefited for the government by providing the real picture of effectiveness of monetary policy rule in Indian economy. Through which government can make polices & take initiatives in the favor of economics development of country.

1.9   Hypothesis

The hypotheses of second objective are as follows

$H0_1$ = There is no significant effect of inflation rate, output gap and exchange rate on interest rate in Taylor rule.

$H0_2$ = There is no significant effect of nominal output gap, money velocity, target nominal GVA and exchange rate on money base (Reserve money) in McCallum Rule.

$H0_3$ = There is no significant effect of output gap, inflation gap and exchange rate on money base in Hybrid McCallum- Taylor rule.

$H0_4$ = There is no significant effect of nominal output gap, money velocity, target nominal GVA and exchange rate on interest rate in Hybrid McCallum- Taylor rule.

1.10 Scope of the Study

To study the application of McCallum rule, Taylor rule and Hybrid McCallum-Taylor rule, its effectiveness in Indian monetary policy. GMM & OLS analysis tools has used and 24 years annual data in the span of 1991-92 to 2014-15 has been taken. The data for this study has sourced from Reserve Bank of India (RBI) & Central Statistical Organization (CSO) database.

1.11 Organization of the Study

The organization of the study is as follows

Chapter 1: Introduction

Chapter 2: Review of Literature

Chapter 3: Research Methodology of Study

Chapter 4: Trends and Pattern of Macroeconomic Variables-Target Variables and Policy Instrument Variables

Chapter 5: McCallum and Taylor Monetary Policy Reaction Function in India

Chapter6: Major Findings, Conclusion, Policy Implications and Limitations of the Study

Bibliography

Appendix