TESTING INDIA'S SHORT-RUN INTEREST RATES' COMPATIBILITY WITH TAYLOR'S RULE

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ABSTRACT

Our aim here is to determine if India's monetary policy is falling in line with the famous Taylor's rule. We've first calculated short term interest rates by using the formula given by Taylor. Then compared it with the rates that were actually prevailing in the economy. Data on monthly inflation rates (CPI combined), the monthly index of industrial production growth (IIP, as a proxy for output growth) and weighted average call money rates from January 2014 to January 2020 has been used. Findings reflect, calculated values are not in tandem with rates that prevailed. We've also derived that while deciding what should be the short-term interest rate, greater emphasis should be given on growth in output gap than on the inflation gap since CPI assigns more weight to food items, prices of which are highly stochastic.

Key Words: Inflation targeting, neutral rate, short term interest rates, weighted average call money rate
Theme: India's Monetary Policy

INTRODUCTION AND MOTIVATION:

India opted for inflation targeting in the second half of 2016 with a broad consensus. It had already been adopted in many developed countries as well as in developing economies with the utmost success by then. However, its efficacy has been in question since 2018 when it was realized that Reserve Bank of India's (RBI) estimates of inflation have been on a higher side which means the core of inflation targeting i.e. inflation is overestimated leading to further over-estimation of interest rates. It is speculated that these higher interest rates could be the reason behind the achievement of lower inflation these past years and hampering the government's fiscal capacity.

The goal of monetary policy is to minimize the disturbance in the economy by ensuring price stability. When India opted for an inflation-targeting framework it automatically chose inflation to be the goal which had to be adjusted through short term interest rate changes based on the framework given by Taylor in 1993. Taylor in his paper suggested a formula to guide the central bankers about the interest rates when the economic changes take place such as movement in Gross Domestic Product growth rates (GDP) and inflation. This framework tells that the interest rates are ought to be set to keep output and price level stable. Now, very recently the efficacy of inflation targeting and the credibility of India's move towards inflation targeting has been in question in India has been in question so we through this paper want to look at an alternate framework of monetary policy rule that is Taylor's rule's, applicability in India.

Most of the research in this area has been conducted for the years prior to 2016, mainly to check if India is ready to adopt inflation targeting in the future. However, there is very little literature to verify the rule post the adoption of the framework. We try to fill this void by finding the short-term interest rate using the Taylor rule for the country and comparing it with the actual short term interest rates. As the two years post-2020 are unprecedented circumstances due to the Covid-19 pandemic, the study limits the analysis up to 2020 to avoid any selection bias.

LITERATURE REVIEW:

There is a debate in the monetary policy arena about rules vs discretion. Rules are usually categorized as either instrument rules or as Targeting Rules. Instrument rules are simple and explicit reaction functions that give sufficiently good results for an economic decision without the employment of large amounts of human capital and only by a mechanical use of the instrument. Inflation targeting is a targeting rule (Svensson (2002)) which gives some discretion to the central bank about employing the instruments to achieve the target rate. This is constrained discretion as mentioned by Bernanke and Mishkin (1997) which can further be classified as general targeting wherein the banks minimize a loss function, and specific targeting wherein there are specific targets to be achieved. Most central banks of the developed countries use the latter rule with specific targets. However, as Malik W. S. & Ahmed A. M.(2007) mentioned, simple instrument rules may prove better for developing countries as there are weak institutional structures, small information sets, lack of sufficient human capital to make decisions and deliberations on the rule and policy targets multiple objectives. In fact, since these rules are easily verifiable there is an incentive for such countries to improve the credibility of the policies.

Taylor Rule acting as a guide in policymaking is not new. In fact, it has been a steerer for many developed countries for a long time. The USA too had used it for policy decisions for a long period from 1990 to 2001. It was only after the 2008 crisis that it moved away by increasingly employing quantitative easing instead. However, the post-crisis interest rates too were at a near-zero level in line with the results provided by Taylor's Rule for that period (Sawhney B. et al. (2017)). In Indian Context too, on testing Taylor's Rule, Sawhney B.

et al. (2017) establish that there is no attempt to follow Taylor Rule as a policy guide by the Indian Central Bank- RBI from the years 2000 to 2015.

In the original Taylor rule, it is assumed that banks have perfect information about the past and present values of the output and the inflation gaps. By analyzing the data from 1998 to 2007, the coefficient of the output gap under the Taylor rule came out to be statistically significant and its sign was also consistent with theoretical rationale under the closed economy but not the inflation gap coefficient Takeshi Inoue (2009). Although the Indian economy opened up in 1991 and the role of setting the short-run interest rate started depending on the exchange rate as well in addition to output and inflation gap. In his paper, all the coefficients came out to be statistically significant except the inflation gap coefficient and hence partially rejecting Taylor's rule. It made a result of how inflation targeting is not suitable for a country like India because the coefficient of inflation gap was not statistically significant even after considering the exchange rate in the equation. He further stated that assigning equal weights to the output and inflation gap would be inappropriate for developing countries where the shocks are usually from the demand side rather than the supply side.

RBI for long had been giving a higher emphasis on Wholesale Price Index (WPI) in its inflation measures. In 2014, it moved to adopt Consumer Price Index (CPI) (combined) as its key inflation measure. Raj et al. for April 2015 to September 2018 found that CPI combined forecasts in India were prone to large forecasting errors. The main reasons associated, according to them, are a significant share of food items in the CPI and large fluctuations in food prices especially vegetable oil and other common food items such as vegetables and pulses. This impacts the CPI projections. On conducting a cross country comparison, they also discovered the existence of a positive correlation between the share of food in the CPI basket and the errors incurred while forecasting. This requires special attention in India as the gap between the actual and forecasted inflation has widened here, especially after the 2008 crisis pointing towards the need for rethinking CPI as a measure to make inflation targeting decisions. According to Asso P. F. et al. (2010), the presence of lagged values of the policy rate in the right-hand side of Taylor's equation turns out to be statistically significant resulting in the concern of the presence of other variables in Taylor's equation which could turn out to be statistically significant and yet not identified.

The reason, which led to such a great deviation of the actual rate from the target rate could be the greater weight that might have been assigned to discretion than to rule in the constrained discretion framework while determining monetary policy (Frederic S. Mishkin,2018). Why would a policymaker do that even after he/she would, as an economist, be forbearing from doing? The answer is political pressure. Politicians are short-sighted as their political interests come way above the welfare of the common in their priority ordering. They are usually interested in maximising their re-election chances. For instance, they are willing to capitalize upon

the short-run trade-off between inflation and unemployment remaining ignorant about the long-run consequences it might have.

OBJECTIVE:

This study aims to test whether India's monetary policy is in line with the popular guiding tool for the central banks all over the world - The Taylor's Rule.

METHODOLOGY:

In order to achieve this, we took a monthly time series data for a period from January 2014 to January 2020. The reason underlying is, just to have a clearer picture of the rate movements in the economy.

We used the simplified version of Taylor's formula for calculating the target rate given below:

Target Rate = Neutral rate + 0.5(GDPe - GDPt) + 0.5($\Pi_e - \Pi_a$)

Here, the target rate is the rate that the central banks ought to fix in the short run.

The neutral rate is a sum of neutral real rate and inflation, a rate which, according to the central bankers, will keep the economy in equilibrium i.e. neither boosting the growth nor receding it. We have taken a mean of Weighted Average Call Money rate (WACMR) over the years as a proxy for neutral real rate considering the fact that it is the official anchor of the operating target of RBI around the policy rate (repo rate), adjusted regularly. A relatively safe and liquid asset despite being an uncollateralized borrowing, this seems to be a perfect neutral rate when our target inflation of 4% is added to it and the neutral rate is obtained. Π_e is the expected inflation rate and Π_a is the actual inflation rate prevailing in that period. We calculated the target rate according to this equation.

Weights of the output gap and inflation gap were originally taken to be equal to 0.5 by Taylor. However, we also took extreme cases of zero weights to both output and inflation gaps in separate cases to look at best-case scenarios and have a conclusion regarding RBI's choice of weights to the two gaps.

We took the index of industrial production (IIP) as a proxy for GDP and applied the Hodrick Prescott filter to obtain the output growth gap by taking the cycle variable as the output gap. HP filter is used to remove the short-run fluctuations in a business cycle. By applying this filter we have removed fluctuations from the index of industrial production because by removing such fluctuations we are able to observe the long term trends and it facilitates the forecasting of such data for economic purposes. Inflation was obtained from the combined CPI

by taking the growth rate of CPI as inflation. Target inflation was taken to be 4% which is the current medium-term target decided by the RBI to be achieved till 2021.

RESULTS:

In order to check whether RBI uses Taylor Rule as its policy guide, we find the target rate through Taylor's equation by substituting the values of different variables on the right-hand side and compare the resulting rate with the actual rates announced by the RBI for that period. Since Taylor in his equation assigns weights to the inflation gap and the output gap, we too take different cases for coefficient assignment as follows:

ASSIGNMENT OF THE COEFFICIENTS

CASE 1: COEFFICIENTS OF INFLATION GAP AND OUTPUT GAP FIXED AT 0.5

Initially, we study how the actual rate and the Taylor rate moved with the coefficients of the inflation gap and output gap as 0.5, as given by Taylor. Using the equation as given below we articulated our results.

Target Rate = Neutral real rate +4% + 0.5(GDPe - GDPt) + 0.5(Π −)

= Neutral real rate + 0.04 + 0.5(GDPe - GDPt) + 0.5(Π −)

Here, the neutral real rate is the average of the monthly WACMR for the considered period. It came around 6.57%. Substituting all the values of the variables in the above equation and then comparing with the prevalent interest rates, the following graph was obtained:

Figure -1: Movement of actual and taylor rates with coefficient of output gap=coefficient of inflation gap=0.5

We then move towards assessing extreme cases.

CASE-2: COEFFICIENT OF OUTPUT GROWTH GAP SET AT 0 AND INFLATION GAP SET AT 1

Here we assigned 0 numeric value to the coefficient of output growth gap and numeric value 1 to the coefficient of the inflation gap variable.

Target rate = neutral real rate + 4% + 0 *(GDPe - GDPt) + 1*(Π −)

After determining the values of the target rate from the above formula, we plotted it against time with prevailing WACMR. As can be seen from the diagram (figure - 2), the gap still remained more or less the same between WACMR and target rate as was in the previous case with an equal assignment of weights to the two variables. However, the fluctuations in the target rate seem to have reduced here.

Figure -2: Movement of actual and taylor rates with coefficient of output gap=0 and coefficient of inflation gap=1

CASE -3: COEFFICIENT OF OUTPUT GROWTH GAP SET AT 1 AND INFLATION GAP SET AT 0

In this case, we put the output growth gap coefficient equal to 1 and the inflation gap coefficient equal to zero so the formula turned out as follows:

Target rate = neutral real rate + 4% + **1*(GDPe - GDPt) + 0*($\Pi\square - \square\square$)**

After calculating the values of the target rate, we plotted it against time with WACMR. The diagram (figure -3) reflected that there was a contraction in the gap between the calculated target rate and the given values of WAMCR with a very frequently varying target rate.

Figure -3: Movement of actual and taylor rates with coefficient of output gap=1 and coefficient of inflation gap=0

FINDINGS:

Case 1:

In the initial case, when equal weights (0.5) are assigned to the output growth gap and inflation gap variables we observed a huge gap between the target interest rate obtained from the Taylor equation and the prevailing interest rate as measured by WACMR.

Case 2:

When complete weight is given to the inflation gap again the gloomy result passes our view. It again gives a similar picture as in figure 1 but with lesser fluctuations. Case 3:

When complete weight is given to the output gap the target interest rate crosses the prevailing rate several times indicating successful achievement of target rate by actual rates. This means that the output growth gap could be the target variable for the RBI rather than the inflation gap. Although there is still a gap, the intersection of the two graphs at certain points indicates successful overlapping of the target rate over actual rates. And the difference between the target rate and the actual rate diminishes in this case. A major takeaway is that the target rate is closer to the weighted average call money rate when the coefficient of the output gap is 1. Hence it is evident, since 2014, that Indian monetary policy has given more emphasis on the output gap than the inflation gap.

This indicates that Taylor's rule is clearly not the instrument guiding RBI's policy decisions.

DISCUSSION:

1. A commonality in all the above diagrams is the decline in the actual interest rates over the entire period. However, the real rates set by RBI are nowhere close to either what Taylor recommends i.e. 2% or what RBI seeks to achieve i.e. a rate between 1.5-2%. In fact, our study reveals that this rate is approximately 6.57% which can be considered to be quite high against what is entailed. It has to be realized that it is this rate through which RBI injects liquidity into the system. A high real rate means that consumers will resort to saving more, investments will lower (it also depends how smooth the transmission mechanism is) and most importantly the cost of borrowing for the government will increase. This hampers the state's capacity to spend on public welfare.

2. Another thing that requires attention is the target of 2% that RBI aims to achieve. This is a very low target relative to what is prevalent right now. Attainment of such low target real rate is highly desirable for the economy and should not come without the strengthening of its monetary transmission capacity which is currently staggered due to fixed term-deposit rates and administered rates on term deposits. This is simply because unless the changes in interest rate are transmitted to the rest of the economy via appropriate market signals to increase investment, bringing a change towards the improvement of transmission is difficult.

3. The lower gap between the target and the actual rate that has been observed in figure 3 when the coefficient of inflation gap is zero and the coefficient of the output gap is one i.e. when the central bank is a strict output growth gap targeting bank is probably because the output gap harbingers the future inflationary pressures. The output growth gap being given the weight equal to one incorporates both inflation and output variables. Hence the WACMR and the target rates in figure 3 are found to be closer. Output fluctuations because of the demand side shocks have beforehand incorporated the inflation shocks, thus making the case of taking any positive coefficient for the inflation gap as a futile exercise.

4. Our plots of target interest rates are found to be highly spiked, indicating high volatility of the interest rate values as compared to the actual rate values. These could be attributed to RBI fixing inflation using the CSO released data for all India CPI combined (Rural+Urban) as CPI inflation gives a higher weightage to food items in its calculation(which varies frequently). Hence, there might be a need to reconsider CPI combined as the right policy tool in the Indian context.

5. Our results as mentioned before indicate that Indian interest rate policy decisions, unlike those of most developing countries are not guided by simple instrument rules such as Taylor rule. What is guiding the Indian policymakers is not yet clear, it could be output growth or it could be pure discretion. Similar

research conducted in the case of Pakistan spanning over 15 years from 1991 to 2006, testing whether the monetary policy followed Taylor Type rules, concluded that the conduct of the policy has been through pure discretion for Pakistan. However, they also concluded that adherence to an instrument such as Taylor Rule could have improved the performance of the Pakistan economy significantly. This could also have been true in our case where despite adopting the inflation-targeting framework, we don't seem to be adhering to its backbone- the Taylor Rule. This could probably be the reason for achieving the desired inflation rate for some time till 2018 which by some researchers is attributed to fewer fluctuations in the prices of essentials over these two years post the incorporation of inflation targeting framework and absence of such sheer luck post-2018.

6. The actual inflation which has been found to be less than the expected inflation during the considered period could be due to the forecasting errors in inflation as found by Raj et al. in their study. Further, our period saw the inflation rate is much higher than 4% for most of the period resulting in high target rates which could have led to ambiguity in the use of target rate by the RBI.

CONCLUSIONS:

We find that the Short term interest rate calculated from Taylor's rule is showing a great divergence from the actual interest rates. It gives an indication that RBI is following more discretion than Taylor's rule or there might be more variables in the right-hand side or some other formula might have been used as a basis to decide short term interest rates. The results showed interest rate was more congruent with movements in the output growth gap than with those in the inflation gap, but divergence from the actual data was there in both cases. One reason for this difference could be a bigger mandate that needs to be satisfied by the RBI than Taylor's rate. Central banks might be using the Taylor rate as one of the inputs for monetary policy but it is not the only one. Modifying the equation a little bit gives different results as stated above.

Inflation targeting framework that India has been following since 2016 is an elaborate framework based on several prerequisites that are required to be fulfilled such as transparent monetary policy, independent and accountable central bank. However, the independence of our Central Bank has always been in question. Hence, it is necessary to rethink our current system and think about the adoption of simple instrument rules such as a Taylor Rule which have been found to be useful, especially in the case of developing countries where it has not only acted as a benchmark for monetary policy but has also improved transparency of the system. Hence, before moving towards advanced systems such as inflation targeting the way we did, it is better to adopt simple rules. With this in hindsight, on checking whether India has been following Tayor's rule, we found that our policy decisions are not what Taylor Rule predicts, in fact, RBI seems to be following pure discretion. This

calls for a room for improvements in macroeconomic performance that could be attained on adherence to an instrument rule like Taylor Rule.

LIMITATIONS OF THE STUDY:

1. Taylor in his original paper proposes the adoption of a policy rule for a reasonably long period before discarding it or changing it as it takes some time for the economy to adjust to any policy rule and for the policy rule to become credible. So the time period considered might be a short one to come to any conclusion regarding our Central bank's ability to adjust interest rates according to Taylor's Rule.

2. Our study is based on the primitive Taylor rule. However, Taylor's rule has been modified by several researchers to include variables such as exchange rates and lag values of target interest rates in their model. Such inclusion of variables might influence our current results.

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Data Sources:
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Figure -1: Movement of actual and taylor rates with coefficient of output gap=coefficient of inflation gap=0.5
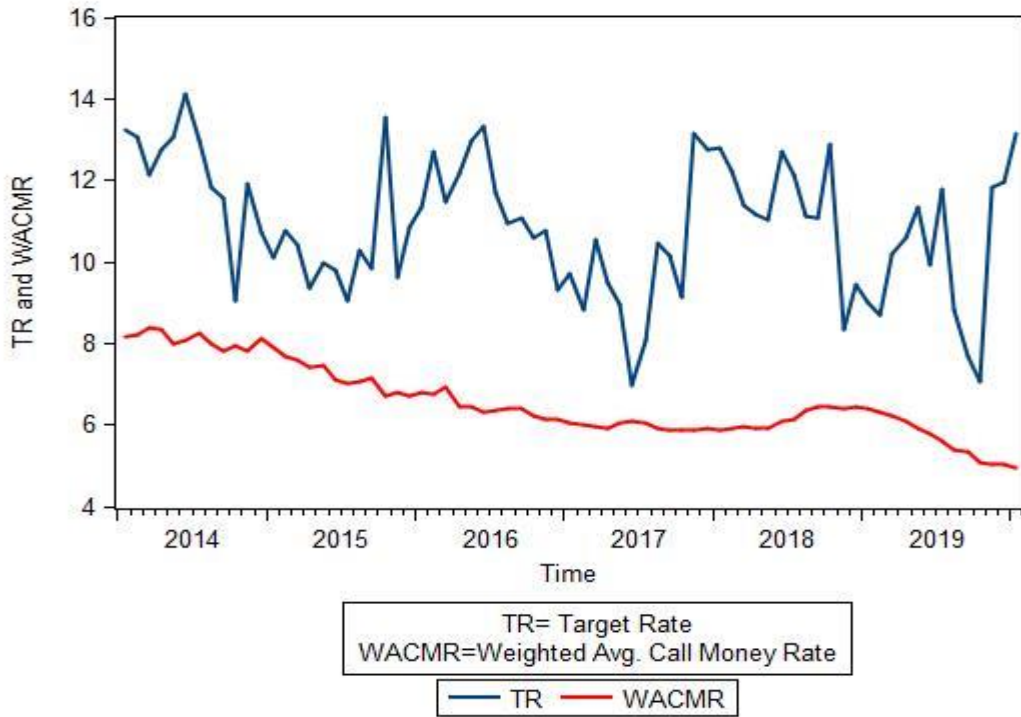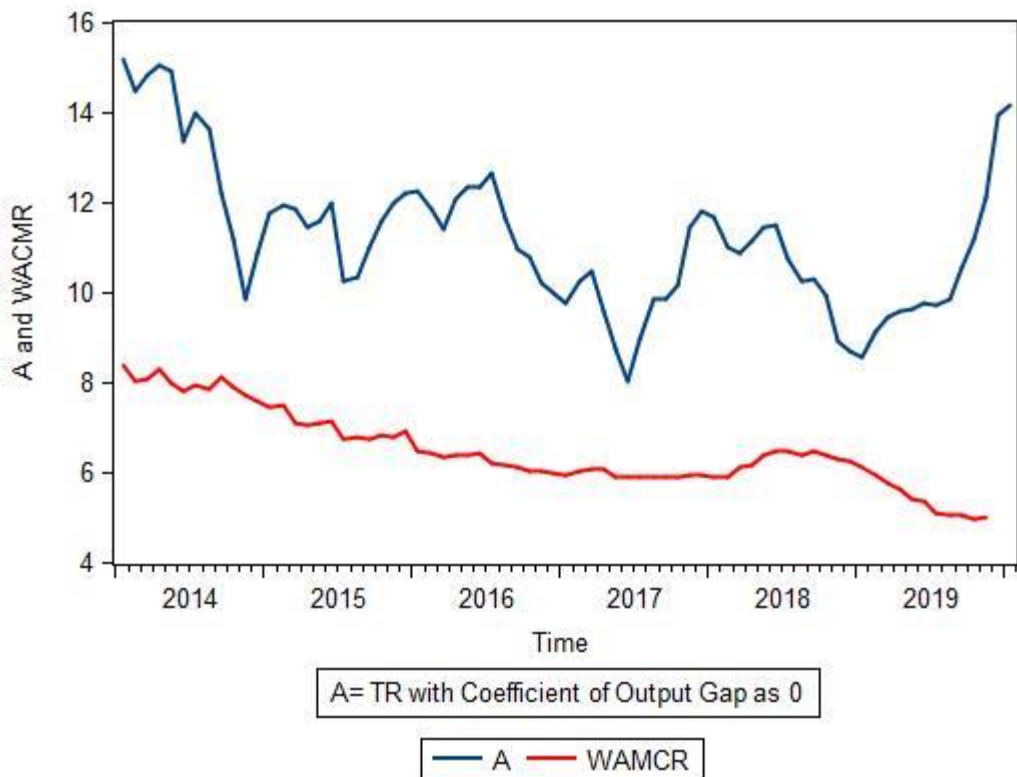

Figure -2: Movement of actual and taylor rates with coefficient of output gap=0 and coefficient of inflation gap=1

Figure -3: Movement of actual and taylor rates with coefficient of output gap=1 and coefficient of inflation gap=0