



RATE OF INTEREST AND CONSUMER PRICE INDEX: AN INDIAN EXPERIENCE

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Abstract

The following research paper brings about prominent features of different inter-related concepts of rate of interest, rate of inflation, bank rate and monetary policy. Recently, Reserve Bank of India (RBI) has adopted inflationary targeting approach. Prior to inflationary targeting approach, RBI considered Wholesale Price Index (WPI) as the measure of headline inflation. However, internationally, Consumer Price Index (CPI) is used as a measure of headline inflation. Wholesale Price Index (WPI) is also associated with many limitations while measurement of inflation. As a result, Central Statistical Office (CSO) has introduced a new concept of measurement of CPI called Consumer Price Index-Combined includes all Indian rural and urban households.

This research paper uses Granger causality Test. This test is widely used in Econometrics to study the time series data. The test results shows that whenever there is change in the Consumer Price Index, it brings about a significant change in the rate of interest.

Keywords: Fractional-Reserve Banking, Quantity theory of money, Granger causality, Wholesale Price Index (WPI), Consumer Price Index (CPI), Price Stability, Monetary Policy, Bank Rate, Inflation



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1) INTRODUCTION:

Interest rates and inflation rates are frequently linked and are used as references to explain various macroeconomic events. Inflation refers to a continuous rise in average price level of goods and services in an economy over a period of time. In India, interest rate refers to the rate charged by the lender to the borrower, and predominantly based on Bank rate determined by the Reserve Bank of India.

Normally, when interest rates are reduced, more people are able to borrow more money. As a result, the consumers have more money to spend resulting in economic growth and inflation. When interest rates are rising, the consumers tend to increase savings as the returns would be higher resulting in fall in disposable income. This leads to slowdown of the economy and inflation falls.

Under a system of fractional-reserve banking, there exists an relationship between interest rates and inflation. This forms the central pillars of contemporary monetary policy. Reserve Bank of India manipulates the interest rates to affect the inflation rate in the economy. It also uses different policy rates such as Repo rate, Reverser Repo rate as instruments to handle the situation of inflation or deflation. In this paper we want to study the relationship between Bank Rate and Consumer Price Index(CPI).

2) CONCEPTS AND DEFINITIONS:

In order to understand, how the relationship works, it is important to understand some basic concepts as follows:

2.1 Fractional-Reserve Banking:

In India, banks follow fractional-reserve banking. In simple words, under this system, banks only keep a fraction of bank deposits as cash on hand and are used to satisfy the withdrawal demand of the customers. The remaining amount of deposits is used by the banks for lending purposes. In India, banks are required to maintain Cash Reserve Ratio as per the regulations of RBI. The excess of deposits over the CRR are used by the banks for lending purposes. This process is called multiple credit creation. The rate of CRR is decided by the RBI from time to time.

2.2 Quantity theory of Money:

In Economics, quantity theory of money states that, supply of money and demand for money determines the rate of inflation. If there is an expansion of money supply, prices tend to rise as each individual unit of money becomes less valuable.

2.3 Rate of Interest:

Rate of interest acts as a price for holding money or lending money. In order to attract more deposits from depositors, banks pay an interest on savings. Banks also receive interest on the loans given by them to the customers. When rate of interest is low, customers demand more loans from the banks. When the bank gives loan it results in expansion in money supply. According to Quantity theory of money, expansion in money supply results in higher inflation. Thus, a lower rate of interest results in higher rate of inflation and vice versa.

2.4 Consumer Price Index(CPI):

Consumer Price Index (CPI) is the most commonly used measure of inflation. It studies the weighted average of prices of a basket of consumer goods and services. Changes in the CPI are used to measure price changes associated with the cost of living over a period of time.

2.5 Bank Rate:

The bank rate is used by the Central bank (RBI) to influence the quantity of credit in the economy. The bank rate refers to the long term rate of interest charged by the Central bank i.e. RBI to commercial banks while giving loans to them against eligible securities or by rediscounting bills of exchange. A change in bank rate leads to a change in the cost of availability of credit to commercial banks. When the bank rate is increased, also known as *Dear Money Policy*, the cost of borrowing from central bank goes up. This forces the commercial banks to charge higher lending rate to cover up their increased cost. Dear Money Policy discourages businessmen and industrialists to borrow more money from banks. This would lead to contraction in bank credit and a decrease in money supply in the economy. As a result of this aggregate demand would fall and inflation can be controlled. The reverse will happen when RBI follows *Cheap Money Policy* i.e. when the bank rate is reduced in order to overcome the problem of recession or depression in the economy.

3) DATA AND METHODOLOGY:

In order to check the long-term relationship and Causality between rate of interest and CPI in India, we use quarterly data trends of both the variables over the period under study i.e. from 1968 to 2019.

Figure 1.1: Quarterly Data on Interest Rate and CPI

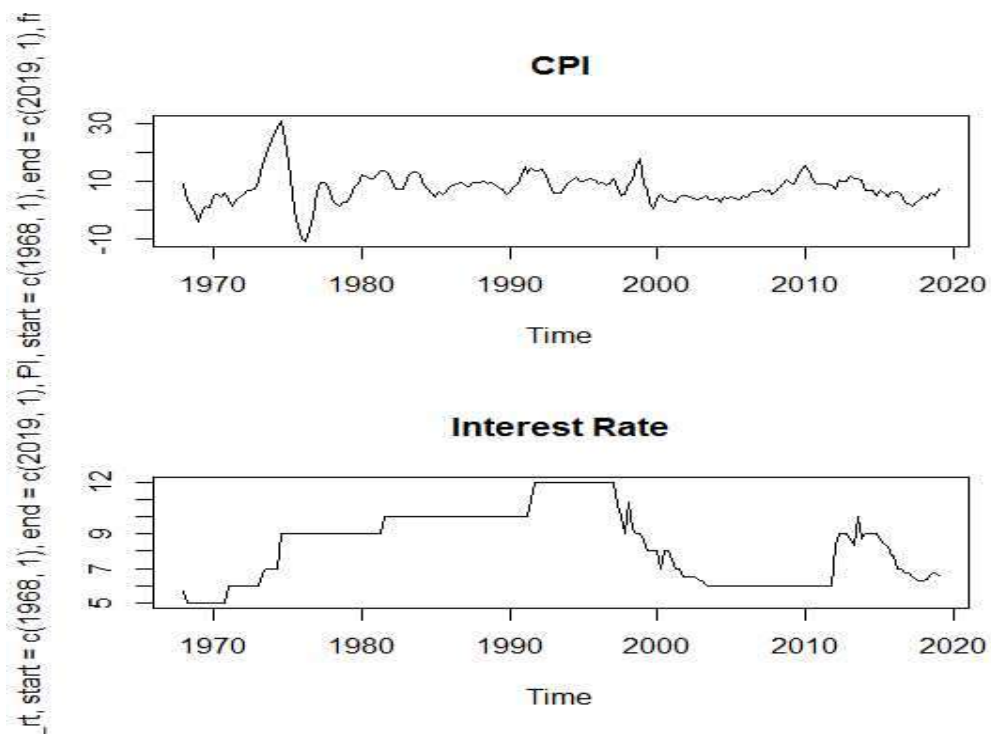


Figure 1.1 shows the quarterly data on Interest rate and Consumer Price Index for the period 1968 to 2019. Figure shows many ups and downs in CPI as well as in Interest rates. Initially Interest rate was 5 percent. It was increased to 6 percent in 1970s. Further it was raised to 10 percent during 1980s and reached 12 percent in 1990s. However, due to the conditions prevailing in India during this period it was reduced post 1990s. It was further reduced to 6 percent in 2003. This rate was stable till 2011, after which we could again see small fluctuations in the interest rate. Interest rate in the last quarter of 2018 was 6.58 percent.

4) EMPIRICAL RESULTS:

For this analysis we have used Granger causality Test. This test is widely used in Econometrics to study the time series data. We say that the time series X Granger causes another time series Y if predictions of the value of Y based on its own past values and on the past values of X are better than predictions of Y based only on its own past values. For this analysis we have used the following data.

Table 1: Quarterly Data on Interest Rate and CPI

Observation Date	Interest Rate	CPI
1/1/1968	5.67	9.21
1/4/1968	5	3.38
1/7/1968	5	1.2
1/10/1968	5	-0.37
1/1/1969	5	-4.2
1/4/1969	5	-0.25
1/7/1969	5	1.14
1/10/1969	5	0.99
1/1/1970	5	4.76
1/4/1970	5	5.18
1/7/1970	5	4.43
1/10/1970	5	5.98
1/1/1971	6	3.53
1/4/1971	6	1.1
1/7/1971	6	3.4
1/10/1971	6	4.26
1/1/1972	6	5.22
1/4/1972	6	6.63
1/7/1972	6	6.91
1/10/1972	6	6.96
1/1/1973	6	10.03
1/4/1973	6.67	15.22
1/7/1973	7	19.03

1/10/1973	7	22.89
1/1/1974	7	26.08
1/4/1974	7	28.73
1/7/1974	9	30.92
1/10/1974	9	28.35
1/1/1975	9	20.63
1/4/1975	9	11.39
1/7/1975	9	-0.2
1/10/1975	9	-5.54
1/1/1976	9	-10.07
1/4/1976	9	-11.03
1/7/1976	9	-6.96
1/10/1976	9	-2.26
1/1/1977	9	6.27
1/4/1977	9	9.31
1/7/1977	9	9.56
1/10/1977	9	8.09
1/1/1978	9	3.99
1/4/1978	9	2.19
1/7/1978	9	1.43
1/10/1978	9	2.56
1/1/1979	9	2.82
1/4/1979	9	5.08
1/7/1979	9	7.95
1/10/1979	9	9.06
1/1/1980	9	12.05
1/4/1980	9	11.94
1/7/1980	9	10.86
1/10/1980	9	10.64
1/1/1981	9	12.22
1/4/1981	9	13.64
1/7/1981	10	13.74
1/10/1981	10	12.83
1/1/1982	10	10.02
1/4/1982	10	7.08
1/7/1982	10	7.23
1/10/1982	10	7.38
1/1/1983	10	8.95
1/4/1983	10	12.31
1/7/1983	10	12.99
1/10/1983	10	13.06
1/1/1984	10	12.35
1/4/1984	10	8.5

1/7/1984	10	7.06
1/10/1984	10	5.79
1/1/1985	10	4.58
1/4/1985	10	6.19
1/7/1985	10	5.23
1/10/1985	10	6.2
1/1/1986	10	8.01
1/4/1986	10	8.44
1/7/1986	10	8.86
1/10/1986	10	9.54
1/1/1987	10	8.43
1/4/1987	10	8.05
1/7/1987	10	9.36
1/10/1987	10	9.3
1/1/1988	10	9.46
1/4/1988	10	9.8
1/7/1988	10	8.89
1/10/1988	10	9.41
1/1/1989	10	8.41
1/4/1989	10	7.69
1/7/1989	10	7.16
1/10/1989	10	5.19
1/1/1990	10	6.05
1/4/1990	10	8.1
1/7/1990	10	9.2
1/10/1990	10	12.33
1/1/1991	10	15.02
1/4/1991	10	12.43
1/7/1991	11	14.39
1/10/1991	12	13.68
1/1/1992	12	13.39
1/4/1992	12	13.98
1/7/1992	12	11.5
1/10/1992	12	8.62
1/1/1993	12	5.69
1/4/1993	12	5.71
1/7/1993	12	5.64
1/10/1993	12	8.21
1/1/1994	12	9.66
1/4/1994	12	10.39
1/7/1994	12	11.07
1/10/1994	12	9.86
1/1/1995	12	9.81

1/4/1995	12	10.15
1/7/1995	12	10.79
1/10/1995	12	10.13
1/1/1996	12	8.82
1/4/1996	12	9.32
1/7/1996	12	8.57
1/10/1996	12	9.2
1/1/1997	12	10.63
1/4/1997	10.67	7.72
1/7/1997	10	5.07
1/10/1997	9	5.55
1/1/1998	10.83	9.04
1/4/1998	9.33	10.37
1/7/1998	9	15.4
1/10/1998	9	17.86
1/1/1999	8.67	8.99
1/4/1999	8	7.09
1/7/1999	8	2.81
1/10/1999	8	0.46
1/1/2000	8	3.68
1/4/2000	7	5.26
1/7/2000	8	4.14
1/10/2000	8	2.99
1/1/2001	7.5	2.93
1/4/2001	7	2.73
1/7/2001	7	4.65
1/10/2001	6.5	4.76
1/1/2002	6.5	5.1
1/4/2002	6.5	4.5
1/7/2002	6.5	4.02
1/10/2002	6.33	3.62
1/1/2003	6.25	3.78
1/4/2003	6.08	4.73
1/7/2003	6	3.38
1/10/2003	6	3.36
1/1/2004	6	3.99
1/4/2004	6	2.7
1/7/2004	6	4.2
1/10/2004	6	4.17
1/1/2005	6	4.23
1/4/2005	6	4
1/7/2005	6	3.71
1/10/2005	6	5.03

1/1/2006	6	4.51
1/4/2006	6	5.95
1/7/2006	6	6.22
1/10/2006	6	6.46
1/1/2007	6	7
1/4/2007	6	6.32
1/7/2007	6	6.7
1/10/2007	6	5.51
1/1/2008	6	6.28
1/4/2008	6	7.75
1/7/2008	6	9.05
1/10/2008	6	10.2
1/1/2009	6	9.36
1/4/2009	6	8.87
1/7/2009	6	11.75
1/10/2009	6	13.32
1/1/2010	6	15.32
1/4/2010	6	13.66
1/7/2010	6	10.31
1/10/2010	6	9.16
1/1/2011	6	8.98
1/4/2011	6	8.91
1/7/2011	6	9.16
1/10/2011	6	8.39
1/1/2012	8.33	7.17
1/4/2012	9	10.14
1/7/2012	9	9.76
1/10/2012	9	10.1
1/1/2013	8.75	11.71
1/4/2013	8.33	10.66
1/7/2013	10	10.76
1/10/2013	8.75	10.55
1/1/2014	9	6.89
1/4/2014	9	6.86
1/7/2014	9	6.76
1/10/2014	9	4.98
1/1/2015	8.67	6.58
1/4/2015	8.42	5.87
1/7/2015	8.25	4.62
1/10/2015	7.75	6.46
1/1/2016	7.75	5.65
1/4/2016	7	6.19
1/7/2016	7	5.3

1/10/2016	6.75	2.72
1/1/2017	6.75	2.36
1/4/2017	6.5	1.46
1/7/2017	6.33	2.4
1/10/2017	6.25	3.73
1/1/2018	6.25	4.74
1/4/2018	6.33	3.95
1/7/2018	6.67	5.61
1/10/2018	6.75	5.11
1/1/2019	6.58	7.08

Source: Consumer Price Index: All Items for India, Percent Change from Year Ago, Quarterly, Not Seasonally Adjusted, Federal Reserve Economic Data, Link: <https://fred.stlouisfed.org>, Economic Research Division, Federal Reserve Bank of St. Louis

Here we check the relationship between CPI and Interest rate using Granger test.

For this we use the following equation:

$$y_t = \alpha + \sum_{i=1}^p \beta_i y_{t-i} + \sum_{i=1}^p \gamma_i X_{t-i} + \varepsilon_t \dots\dots\dots \text{here } p=4, y=\text{CPI}, x=\text{Interest rate}$$

$$H_0 : \gamma_1 = \gamma_2 = \dots = \gamma_p = 0$$

$$H_1 : \gamma_i \neq 0$$

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grangertest(CPI~Int_rt,order=4,data=C_P_I)
Granger causality test
Model 1: CPI ~ Lags(CPI, 1:4) + Lags(Int_rt, 1:4)
Model 2: CPI ~ Lags(CPI, 1:4)
Res.DfDf    F Pr(>F)
1    192
2    196 -4 0.832 0.5063
grangertest(CPI~Int_rt,order=3,data=C_P_I)
Granger causality test
Model 1: CPI ~ Lags(CPI, 1:3) + Lags(Int_rt, 1:3)
Model 2: CPI ~ Lags(CPI, 1:3)
Res.DfDf    F Pr(>F)
1    195
2    198 -3 0.526 0.6649
grangertest(CPI~Int_rt,order=2,data=C_P_I)

```

Granger causality test

Model 1: $CPI \sim Lags(CPI, 1:2) + Lags(Int_rt, 1:2)$

Model 2: $CPI \sim Lags(CPI, 1:2)$

Res.DfDf F Pr(>F)

1 198

2 200 -2 0.274 0.7606

`grangertest(CPI~Int_rt,order=1,data=C_P_I)`

Granger causality test

Model 1: $CPI \sim Lags(CPI, 1:1) + Lags(Int_rt, 1:1)$

Model 2: $CPI \sim Lags(CPI, 1:1)$

Res.DfDf F Pr(>F)

1 201

2 202 -1 0.099 0.7533

Above results show that Interest rate does not granger cause CPI as all p -values are insignificant. Thus we accept H_0 . In other words, Interest rate does not affect CPI.

$$x_t = \alpha + \sum_{i=1}^p \beta_i x_{t-1} + \sum_{i=1}^p \gamma_i y_{t-1} + \varepsilon_t \dots \dots \dots \text{ here } p=4, y = \text{CPI}, x = \text{Interest rate}$$

$$H_0 : \gamma_1 = \gamma_2 = \dots = \gamma_p = 0$$

$$H_1 : \gamma_i \neq 0$$

`grangertest(Int_rt~CPI,order=4,data=C_P_I)`

Granger causality test

Model 1: $Int_rt \sim Lags(Int_rt, 1:4) + Lags(CPI, 1:4)$

Model 2: $Int_rt \sim Lags(Int_rt, 1:4)$

Res.DfDf Pr(>F)

1 192

2 196 -4 2.3967 0.05177 .

Signif.codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

`grangertest(Int_rt~CPI,order=3,data=C_P_I)`

Granger causality test

Model 1: $Int_rt \sim Lags(Int_rt, 1:3) + Lags(CPI, 1:3)$

```
Model 2: Int_rt ~ Lags(Int_rt, 1:3)
Res.DfDfF Pr(>F)
1 195
2 198 -3 2.9108 0.03568 *
---
Signif.codes: 0 '****' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
grangertest(Int_rt~CPI,order=2,data=C_P_I)
Granger causality test
Model 1: Int_rt ~ Lags(Int_rt, 1:2) + Lags(CPI, 1:2)
Model 2: Int_rt ~ Lags(Int_rt, 1:2)
Res.DfDf F Pr(>F)
1 198
2 200 -2 4.5148 0.0121 *
---
Signif.codes: 0 '****' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
grangertest(Int_rt~CPI,order=1,data=C_P_I)
Granger causality test
Model 1: Int_rt ~ Lags(Int_rt, 1:1) + Lags(CPI, 1:1)
Model 2: Int_rt ~ Lags(Int_rt, 1:1)
Res.DfDf F Pr(>F)
1 201
2 202 -1 6.9883 0.008852 **
---
Signif.codes: 0 '****' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

The above results show that CPI granger causes Interest rate. Here we reject H_0 . Hence, we can conclude that CPI granger causes Interest rate. In other words, CPI affects Interest rate.

5) SUMMARY AND CONCLUSIONS:

In the beginning of the paper, we discussed that rate of interest and rate of inflation are frequently linked and are used to explain different macro-economic events. Price stability is also one of the most significant objectives of macroeconomic policy formulation. In this regard, it is very significant to know that which measure of inflation is selected by the

Reserve Bank of India to target and control to achieve the objective of price stability. In India, Wholesale Price Index (WPI) and Consumer Price Index (CPI) are mostly selected for any data analysis.

In India, retail prices are measured by CPI and are calculated under four different categories i.e. industrial worker, agricultural labour, rural labour, and urban non-manual employees. Mostly, WPI was considered as the measure of headline inflation as it is available at a higher frequency. But, the problem is WPI does not include prices of services. Moreover, most of the international agencies that does analysis related to economic policy making, CPI is considered to be more correct and relevant measure than WPI.

The above study clearly indicates that the changes in Consumer Price Index(CPI) lead to a change in the Bank rate. The Central bank(RBI) also uses other policy rates such as Repo rate or Reverse repo rate as instruments to control Inflation in the economy. Changes in CPI can also have an impact on these policy rates. Further analysis on other policy rates is hence called for.

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