Determinants of Inflation in India

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Abstract

The present study is an attempt to identify the key determinants of inflation in India. Meanwhile it tries to empirically investigate the recently boasted argument that India's inflation is mainly attributed to higher purchasing power of the people due to better economic growth amid increased social sector spending. To serve the purpose, annual time series data is utilized ranging from 1981 to 2011. Co-integration method is used to identify the long-run relationship followed by error correction model for short-run relationship among the inflation and other macro-economic indicators. It is found that there is presence of long-run relationship between inflation, money supply, private and social spending and exchange rate in India. Money supply, exchange rate and private final consumption expenditure contribute the inflation significantly. Moreover, the results exhibit the short-run relationship for select variables.

Key Words: *Inflation, social spending, private consumption expenditure, co-integration.*

1. Introduction

The emergence of Asian economies in the World market has attracted the series attention of the policy makers. Intuitive reasons are explained as higher economic growth mainly associated with prudent policy initiations in the form of more conducive environment for investment and saving, launching of gradual economic reforms of opening up the economies, etc. Asian region has been able to maintain a growth rate of more than 7 per cent in Gross Domestic Product (GDP) for last few years even in the uncertain economic environment at global level happening either from financial crisis or sovereign debt crisis. In Asia, the Indian economy has showed a remarkable growth in the beginning of 21st century. The economy recorded an average growth of 8 per cent during 2005-2008 which came to be termed the golden era of economic reforms. Now,

it is the world's tenth largest in terms of nominal GDP and the third largest in terms of purchasing power parity. However, the onset of the global financial crisis in 2009 followed by sovereign debt crisis has put the economic fundamentals on volatile situation. The economy is found handling the challenge of decline in economic growth, investment, saving, widening fiscal deficit, deteriorating current account balance, rising inflation, volatile exchange market, etc. Keeping into account the policy makers are trying hard to manage the economic instability of India. In this direction the economy looks forward the active role of monetary policy as the scope of fiscal policy as stabilizer is limited with the huge fiscal deficit. On ground of inflation, things are worrisome as increase in the prices for primary articles and fuel and power have been 9 percent and 11 percent respectively, in July 2013. CPI for

industrial workers has also stood on a higher side. For the two months June and July, the level of inflation was in a comfortable zone; however same showed an increase to 6.1 per cent in August 2013. On the other hand retail inflation has been continuously shooting up and stands at 18 per cent. The reasons for such inflation has been identified by existing literature as an outcome of fiscal stimulus for maintain growth during global financial crisis and lacking of policies in terms of under procurement, lower level of infrastructure facilities related to food storage, etc.

Fiscal policy and monetary policy are considered to be the two major stabilizers of every economy. Indian economy finds itself in a situation of conundrum on both these grounds, as high fiscal deficit is a warning against any future fiscal expansion, while on the other hand high inflation restrains the monetary authority from easing the policy. The fiscal deficit for the year 2012-13 stood at 4.8 per cent of GDP and taking into account the experiences of world economies, the country has approached towards fiscal consolidation. The excessive spending in the country during the global financial crisis might have helped the economy to maintain its growth momentum, but put the economy on high inflationary level. Recently, the Reserve Bank of India has seriously attended the problem of depreciating rupee, increasing inflation and lower economic growth. In recent times, the monetary authority has been exclusively focusing on taming inflation in India. Therefore, substantial changes have been introduced in Liquidity Adjustment Facility (LAF) and Marginal Standing Facility (MSF). The repo rate has been raised by 25 basis points under tight monetary policy, but eased the banks on holding daily cash reserve requirement from 99 percent to 95 percent and the rate on MSF has been reduced from previous level of 10.25 to 9.50 percent. Overall the net reduction is more which indicates relatively liberal monetary policy.

2. Review of Literature

2.1. Theoretical Literature

The theoretical explanation for the determinants of inflation has been given by Keynes and Milton Friedman. The Keynesian economists, state that the main determinants of inflation is aggregate demand in the economy. The increase in gross domestic product beyond natural level accelerate the inflation as suppliers increase their prices keeping into account the rising purchasing power of the people. On the other hand the lower level of GDP compared to its natural once decelerates the inflation as suppliers come across with the increased inventory and tries to cash the opportunity by selling at lower price. Milton Friedman, the founder of monetarism school of thought argued that inflation is always and everywhere a monetary phenomenon. Whereas Neo-Keynesians and other critics of monetarism argue that the demand for money is directly linked to supply and that the demand for money cannot be predicted.[1]

Under cost push theory, prices rise due to increase in cost of production. Prices rise either because of increase in wages or interest rate in the country, or due to increase in price of inputs imported from other countries as a result of inflation in foreign countries or depreciation of the domestic currency. Demand pull theory says that the inflationary process arises because of increase in demand of goods and services, either due to some unforeseen circumstances or due to expansionary fiscal and monetary policies. Increase in demand leads to increase in profit that generates additional excess demand for goods and services. This in turn increases the demand for factors of production leading to increase in their prices. This generates wage price spiral and inflation continues. In order to control this, a tight monetary and is

[1]   Fariba Chavoshzadeh Tafti (2012). Determinants of Inflation in Islamic Republic of Iran. International Journal of Business and Social Science. Vol. 3 No. 6; (Special Issue - March 2012).

required. Another development in the theory of inflation is rational expectation theory. According to this theory, expectation also plays an important role in influencing price level in an economy. It is viewed that economic agents, on the basis of past and current relevant information, form their macroeconomic expectations rationally. Thus simply announcing a policy to contain inflation will not check inflation. People on the basis of past and present information forecast about the expected price. Policy credibility and reputation thus forms an integrated part of any disinflationary policy.[2]

An important reason for sustained rates of high inflation in the EMEs is the vicious nexus between fiscal deficits, monetary growth and inflation (Montiel (1989), Dornbusch (1992) and Bruno (1993)). Differences in inflation performance cannot be attributed to differences in fiscal performance alone. The adaptability of fiscal systems to external shocks has been a contributing factor. For example, a low fiscal deficit and a relatively equal distribution of income (which facilitates sharper adjustment of fiscal deficits) in the East Asian economies are cited as important factors in their better inflation performance than the Latin American economies, which lack these conditions (IMF (1996)). A sound fiscal balance, though necessary, is not, however, a sufficient condition to rein in inflation if monetary policy remains loose and accommodates the private sector's excess demand for credit, as was the case in many East Asian countries before the 1997-98 crisis. Whatever the cause, excess demand arises if monetary growth remains higher than needed to support growth. A straightforward implication of this is that inflation will rise until real demand falls to the level consistent with potential output.

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[2] Khalid Al. Khathlan (2011). Inflation in the Kingdom of Saudi Arabia: The bound test analysis. African Journal of Business Management Vol. 5(24), pp. 10156-10162.

Conversely, a sustained decline in inflation can be identified with a long-term improvement in the fiscal position and a lower rate of monetary growth that push actual output closer to potential. Changes in the output gap should, therefore, explain most of the policy-driven changes in inflation.

The balance of payment view emphasises the role of the exchange rate in the determination of domestic prices. Conventional wisdom holds that countries that are prone to large external shocks should allow their exchange rate to move to correct the external disequilibrium. An important consequence of opting for a flexible exchange rate is that domestic prices are partly determined by the exchange rate. As a first-round effect, movements in the exchange rate directly affect inflation by changing the domestic currency price of imports. The second-round effect depends on how this initial shock is transmitted into other sectors through changes in costs and inflation expectations. Where maintaining domestic price stability takes precedence over external stability and the authorities opt for a fixed exchange rate regime, the exchange rate, of course, has no impact on inflation. In fact, the burden of adjustment to external shocks falls on fiscal policy.

A particularly important factor in the EMEs context is the role that relative prices play in the inflation process. In classical models of inflation, relative price changes do not affect aggregate inflation, since industry level price variations are expected to be mutually offsetting in nature; only aggregate demand changes have implications for the rate of inflation. Recent research has confirmed that relative prices did have a significant impact on inflation in the transition economies and that this impact was not necessarily temporary (Coorey et al. 1998).

2.2. Empirical Evidences

Based on above theoretical justification, various empirical studies captured the behavior of inflation worldwide. These

studies have focused on some external and domestic factors causing inflation. Over the period of time, numerous studies have exploited different indicators of inflation in the form of money supply, import price index, government spending, interest rate, exchange rate, etc. Brouwer and Ericsson (1998) identified the role of supply side factors for inflation process in Australia.

Wang and Wen (2006) investigated the short-run inflation dynamics across eighteen developed countries. They found a significant average correlation of inflation across these countries. Darrat (1985) investigates the relationship between money and inflation in three developing countries. He asserted that a high inflation is associated with a low real income growth and a high money supply. Al-Raisi and Pattanaik (2003) investigates the impact of pass-through of exchange rate on Omani general price level. They find partial CPI responses to changes in the nominal effective exchange rate (NEER). Al-Mutari (1995) examined the influence of money supply, government expenditure, and import prices on inflation in Kuwait and concluded that government expenditure plays a key role in inflation in Kuwait.

Osorio and Unsal (2011) highlighted that over the last two decades, the main driving forces of inflation in Asia have been supply shocks and monetary shocks, while demand pressures have played a relatively smaller role. Also, the relative roles of key inflation drivers appear to be changing over time. The role of supply shocks in driving inflation appears to have fallen slightly in recent years, while the role of output gaps has increased. The impact of monetary shocks on inflation in Asia has diminished, particularly in economies that have relatively clear monetary objectives and flexible exchange rate regimes (such as Indonesia, Korea, the Philippines, and Thailand). Third, demand-driven inflation spillovers from China to the region are both significant and large, directly from higher imported goods prices and indirectly through higher commodity prices.[3]

In the context of India, John (2003)[4] tried to find out the relative contribution of monetary aggregate in explaining the inflation in a better way. The study highlighted that the broad money measure (M3) is relatively better indicator however the explanatory power of different monetary aggregates have been weak. Callan and Chang, (1999)[5], identified that developments in the monetary aggregates remain an important indicator of future inflation along with the exchange rate and import prices. In an attempt to investigate the effect of supply shocks on inflation in India, it was highlighted that supply shocks have only a transitory effect on both headline inflation and core inflation (Srinivasan et.al 2006).[6]

Patnaik (2010)[7] showed that inflation in Indian economy is a mix of both demand and supply side factors. In the very recent literature, it was pointed out that GDP and broad money have positive effects on inflation while exchange rate and interest rates have negative association with inflation (Sahadudhen, 2012)[8]. In order to

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[3] Carolina Osorio and D. Filiz Unsal (2011). Inflation Dynamics in Asia: Causes, Changes, and Spillovers from China. IMF Working Paper. No. WP/11/257.

[4] John., R. M. (2003). Inflation in India: An analysis using post liberalized data. IGIDR Working Paper.

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[7] Anuradha Patnaik (2010). Study of inflation in India: A co integrated vector auto-regression approach. *Journal of Quantitative Economics*, Vol. 8 (1).

[8] I. Sahadudhen (2012). A cointegration and error Correction approach to the determinants of

understand the inflation dynamics, Madhu & Giri (2013)[9] utilized the Index of Industrial Production (IIP) as an indicator of volume of demand in the economy, the Reserve Money (RM) & Broad Money (M3) representative of money supply in the economy, and the Crude oil price, Gold and silver prices for measurement of the external influences on the domestic prices. They commented that both crude oil price and index of industrial production are most important variables in explaining the variation in inflation. In the recent debate relating to growth and redistribution in India, Bhagwati and Panagariya highlighted that the annual growth rate of GDP increased significantly after the economic reforms. There has been observed substantial decline in the poverty ratio (From nearly 40 percent in the immediate pre-reform years, 1987–1988, to just around 20 percent in 2009–2010).[10] Recently on the ground of inflation in India, there is argument that India's inflation is attributed to the higher purchasing power of the people due to better economic growth amid increased social sector spending. The present study is an inquiry of the same argument and attempt to empirically estimate the magnitude of impact of private final consumption expenditure and social spending on inflation in India.

3. Research Methodology

3.1. Data and Resources
In order to identify the determinants of inflation in India, annual time series data is used for the period 1981 to 2011. Wholesale price index is used as an

inflation in India. *International Journal of Economic Research,* Vol.3 (1), pp. 105-112.

[9] MadhuSehrawat & A. K. Giri (2013). Inflation in India: Empirical analysis using VAR approach. *Journal of Economics and Finance,* Vol. 2, (1), pp.1-08.

[10] Jagdish Bhagwati and Arvind Panagariya, (2013). *Why Growth Matters: How Economic Growth in India Reduced Poverty and the Lessons for Other Developing Countries*, Public Affairs.

indicator to measure the inflation and denoted with WPI in the study. The key determinants for inflation have been explored based on the existing literature. These include money supply, exchange rate, private final consumption expenditure, social spending as percentage of GDP. There may be other indicators influencing the behaviour of inflation, but present study mainly tries to empirically address the argument of higher inflation associated with increase in private consumption due to increased social spending and better economic growth. The data on above mentioned indicators is collected from the Reserve Bank of India publications (e.g. Monthly Bulletin and Handbook of Statistics on Indian Economy, Monetary Statistics of Indian Economy).

3.2. Method of Analysis:
At first stage the study checks the integration order of the series. After that it employs Johansen co-integration method to investigate the relationship between inflation and other macro-economic indicators.

3.2.1. Co-integration and Vector Error Correction Models
It is well documented that most economic variables are non-stationary in their levels (integrated of order 1) but stationary, I(0), in their first difference. Engle and Granger (1987) introduced the concept of co-integration in which economic variables may reach a long-run equilibrium that depicts a stable relationship.

In present study we are using different variables such as log of whole sale price index (LWPI), log of money supply (LM), log of private final consumption expenditure (LPFCE) log of exchange rate (LEX) and social sector spending as percentage of GDP (SSE_GDP). These variables are said to be co-integrated of order one if three variables are integrated of order 1 and there exists a linear combination of these variables that is stationary, I(0). The linear combination is given by either equation from (1) to (5):

$LWPI_t = \beta_0 + \beta_1 LM_t + \beta_2 LPFCE_t + \beta_3 LEX_t + \beta_4 SSE\_GDP_t$ (1)

$LM_t = \alpha_0 + \alpha_1 WPI_t + \alpha_2 LPFCE_t + \alpha_3 LEX_t + \alpha_4 SSE\_GDP_t$ (2)

$LPFCE_t = \delta_0 + \delta_1 LM_t + \delta_2 LWPI_t + \delta_3 LEX_t + \delta_4 SSE\_GDP_t$ (3)

$LEX_t = \lambda_0 + \lambda_1 LM_t + \lambda_2 LPFCE_t + \lambda_3 LWPI_t + \lambda_4 SSE\_GDP_t$ (4)

$SSE\_GDP_t = \gamma\beta_0 + \gamma_1 LM_t + \gamma_2 LPFCE_t + \gamma_3 LWPI_t + \gamma_4 WPI_t$ (5)

Johansen's test enables estimating and testing for the presence of multiple co-integration relationships, *r*, in a single-step procedure. The numbers of co-integrated equations are identified with the help of trace and max statistic developed by Johansen.

One identifying the co-integration behaviour among the specified variables, the short-run dynamics is investigated using the Error Correction Model (ECM). In general, an ECM derived from the Johansen test can be expressed as follows:

$\Delta LWP_i =$

$\beta_0 + \sum_{i=1}^{p} \psi_i \Delta LWPI_{t-i} + \sum_{i=1}^{p} \phi_i \Delta LM_{t-i} +$

$\sum_{i=1}^{p} \lambda_i \Delta LPFCE_{t-i} + \sum_{i=1}^{p} \lambda_i \Delta LEX_{t-i} +$

$\sum_{i=1}^{p} \lambda_i \Delta SSE\_GDP_{t-i} + \alpha ECM_{t-1} + U_t$

(6)

The error correction model result indicates the speed of adjustment back to long-run equilibrium after a short-run shock.

4. Results and Interpretation

Based on above methodology following results are obtained.

4.1. Testing for Integration

While investigating the long-run relationship using co-integration approach, it is necessary to identify the integration order of all the series namely LWPI, LPFCE, LM, LEX and SSE_GDP. In order to check the stationary behaviour of the series, we utilized Augmented Dickey Fuller (ADF) and Phillips Perron (PP) test. The test statistics reported in Table 1 highlight that most of the series are non-stationary in level form while first difference of the series indicates stationary process based on the PP test.

Table 1: Unit Root Test Statistic

Variable	ADF Test		Phillips Perron Test	
	Level	1st Difference	Level	1st Difference
LWPI	-1.1459	-2.0300	-1.0558	-3.2347[b]
LPFCE	0.0539	-1.6443	0.1625	-3.5073[b]
LM	-0.0250	-3.4231	0.0683	-5.0317[a]
LEX	-2.0978	-2.6199	-2.1987	-3.5961[b]
SSE_GDP	-2.9087	-3.4127	-2.7013	-3.8083[b]

Note: 'a' and 'b' indicate statistically significant at 1 and 5 percent level respectively.

4.2. Testing for Co-integration

It is observed that the integration order of all the series is one and produce a possibility to check the co-integration behaviour among the series. We use the Johansen approach to detect the co-integration. The lag length of the level vector auto-regressive (VAR) system was determined by Schwarz Bayesian Information Criteria (SBIC). Accordingly, the model selects the one lag length for the given variables. The co-integration rank was testing using trace statistic. The trace statistic reported in Table 2 indicates the acceptance of null hypothesis of one co-

integrating equation while taking the inflation as dependent variable.

Table 2: Johansen Co-integration Test

Maximum Rank	LL	Eigenvalue	Trace Statistic	Critical Value[1]
0	242.10	.	85.48	68.52
1	265.69	0.8145	38.30*	47.21
2	276.86	0.5498	15.96	29.68
3	281.73	0.2938	6.22	15.41
4	284.82	0.1980	0.04	3.76

Note: [1] implies 5 percent level.

Having established a unique co-integrating vector, the next step is to estimate the long-run behaviour for the select variables. It helps in understanding the directional impact and respective magnitudes of explanatory variables on the inflation. The estimates are presented in Table 3. It is found that the money supply, exchange rate, per-capita final consumption expenditure are having positive coefficient values with respective magnitude of 0.25, 0.33, 0.05. It can be inferenced that these variables are significantly adding to the inflation level in Indian economy. Money supply and exchange rate are found for higher magnitude in influencing the inflation phenomenon in India. These results are aligned with the economic theories, and suits well to the existing literature. It is intuitive that the expansionary monetary policy, appreciated exchange rate and increase in the private final consumption expenditure leads to higher inflation on the ground of higher liquidity, increased import cost and demand pull inflation, respectively. The result for positive impact of private spending on inflation, look intuitive and well support to the argument that the inflation in India might have taken place as an outcome of increased purchasing power of the people amid high economic growth. The study also tried to investigate the impact of social sector expenditure as percentage of GDP on inflation. This indicator bears the coefficient value inconsistent to the economic theory and, is found with negative value, but it is statistically insignificant (Table 3). It can be argued that the improved social spending might have helped in increasing to the private consumption expenditure to the people. The same may be observed with the positive coefficient value of social spending variable on private spending in the short-run estimation (Table 4).

Table 3: Long-run Estimates (Dependent Variable LWPI)

Variable	Coefficient	Standard Error	Z-value	P-value
LM	0.2562	0.0484	5.2900	0.0000
LEX	0.3309	0.0268	12.3400	0.0000
SSE_GDP	-0.0086	0.0053	-1.6300	0.1030
LPFCE	0.0465	0.0933	0.5000	0.6180
_cons	0.8239	.	.	.

Note: "-" Not available.

The results of causality analysis are presented in Table 3. It can be seen that the error-correction term with LWPI as the dependent variable is significant at 5% level of significance. Therefore, in the long run money supply, exchange rate, private final consumption expenditure Granger-cause the inflation. The coefficient value for past error term is having negative sign and it is statistically significant. The magnitude for the same indicates that it corrects to the short-run disequilibrium and

takes only two years to restore the long-run equilibrium among the select variables. The error-correction terms with other variables as dependent variables except private sector capital formation are insignificant, implying that the select variables do not Granger-cause money supply, exchange rate and social sector spending.

The short-term dynamics can be seen by looking at the coefficients of lagged differenced terms (Table 4). It can be seen that all these coefficients are statistically significant except those of lagged LM and social sector spending in the inflation determining equation. It implies that short-run changes in past inflation level, exchange rate and private spending are significant in influencing inflation in the country. For other variables of the study, most of the indicators appear statistically insignificant in the short-run phenomenon. These findings suggest that there is no relationship in either direction among rest of the variables.

Table 4: Results of Granger Causality in a Multivariate Framework

Variable	Coefficient	Standard Error	Z Statistic	P-value
Dependent Variable: ΔLWPI				
ECM	-0.54	0.22	-2.47	0.0140
ΔLWPI	0.68	0.24	2.79	0.0050
ΔLM	-0.09	0.21	-0.43	0.6670
ΔLEX	-0.16	0.08	-2.11	0.0350
ΔSSE_GDP	0.02	0.02	1.02	0.3060
ΔLPFCE	0.42	0.20	2.12	0.0340
_cons	-0.06	0.05	-1.23	0.2180
Dependent Variable: ΔLM				
ECM	0.15	0.24	0.61	0.5450
ΔLWPI	-0.11	0.27	-0.39	0.6930
ΔLM	-0.02	0.23	-0.10	0.9230
ΔLEX	-0.03	0.08	-0.32	0.7510
ΔSSE_GDP	0.00	0.02	0.23	0.8200
ΔLPFCE	0.05	0.22	0.24	0.8100
_cons	0.18	0.05	3.48	0.0010
Dependent Variable: ΔLEX				
ECM	0.41	0.79	0.52	0.6060
ΔLWPI	1.62	0.88	1.84	0.0650
ΔLM	-0.55	0.75	-0.73	0.4640
ΔLEX	0.08	0.27	0.30	0.7630
ΔSSE_GDP	0.03	0.06	0.61	0.5450
ΔLPFCE	0.31	0.72	0.43	0.6660
_cons	0.05	0.17	0.28	0.7790
Dependent Variable: ΔSSE_GDP				
ECM	4.55	2.91	1.56	0.1190
ΔLWPI	-4.33	3.24	-1.34	0.1810

ΔLM	7.76	2.75	2.82	0.0050
ΔLEX	1.61	1.00	1.60	0.1090
ΔSSE_GDP	0.06	0.21	0.28	0.7780
ΔLPFCE	-4.72	2.65	-1.78	0.0750
_cons	-0.03	0.64	-0.05	0.9580
Dependent Variable: ΔLPFCE				
ECM	0.54	0.25	2.11	0.0350
ΔLWPI	0.40	0.28	1.41	0.1590
ΔLM	0.01	0.24	0.03	0.9750
ΔLEX	0.04	0.09	0.45	0.6510
ΔSSE_GDP	0.03	0.02	1.77	0.0780
ΔLPFCE	-0.06	0.23	-0.24	0.8110
_cons	0.14	0.06	2.46	0.0140

Note: 'a' indicates statistically significant at 1 percent level.
ECM represents error correction term

5. Conclusion

The present study is an attempt to identify the key determinants of inflation in India. Meanwhile it tries to empirically investigate the recently boasted argument that India's inflation is attributed to the higher purchasing power of the people due to better economic growth amid increased social sector spending. The above results hail that there is presence of long-run relationship between inflation, money supply, private and social spending and exchange rate in India. It is found that money supply, exchange rate and private final consumption expenditure contribute the inflation significantly. However, the social sector spending has not added to the inflation explicitly rather these spending might have contributed indirectly to the inflation by enhanced private expenditure. Moreover, the results exhibit the short-run relationship for select variables. And the speed of adjustment to the long-run equilibrium through correction to the short-run disequilibrium is found very high. The results suggest for appropriate balance between the fiscal spending, money supply and exchange rate management for maintaining the economic growth in the country.

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