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The relationship between inflation and stock index in ten the last ten years, in Tehran stock exchange[1]

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ABSTRACT

The present study investigated the relationship between inflation and stock index at Tehran Stock Exchange for the last ten years. For access to this aims are selected total of companies that their share is accepted in Tehran stock exchange in years 2005-2014. This research is based on the objective and the method of data collection is descriptive. Pearson correlation, regression equation and path analysis were used to determine the relationship between variables. The results of this study are indicated there are positive and meaningful correlations between inflation and stock index as well as industry index. With increase of inflation these index increase too.

***Keywords*:** Inflation index; stock index; industry index; Tehran Stock Exchange

1. INTRODUCTION

The relationship between stock market prices and inflation is of great relevance from the policy point of view. Whether monetary policy can be effective by impacting on the real variables is an age old question in the macroeconomics literature. While the adaptive expectation school pointed to the possibility of trade-offs between inflation and unemployment rate in the short run, the rational expectation school ruled out any positive

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impact of price rise on production and employment. However, as we bring in the stock market prices the relationship between price and quantity may turn out to be more complex than a simplistic one, as though usually. The stock market prices may be related to the domestic inflation and even if domestic inflation may not affect quantity produced directly there can be substantial impact of stock market prices on quantity produced. Hence, two important questions that we are bothered about from empirical standpoint are whether domestic inflation and stock market prices are in any manner connected – and if so what is the nature of relationship – and secondly whether stock market prices affect the real variables in a significant way and again if so, what is the nature of relationship? In the developed world the stock market controls the real sector hugely whereas in the Iranian context the stock market used to be quite superfluous in this respect. That is because the stock market was controlled by only a few players (Chakravarty and Mitra, 2010). However, over time the government intervention has tried to rule out such "bull effect" and has made stock market more competitive which in return is expected to have made both the stock market and other macro variables sensitive to each other. This motivation prompts us to delve into the questions posed above.

The early survey on the behavior of stock return was done by Fama (1970). The Fama theory of efficient market hypothesis suggests that stock markets are efficient because they reflect the fundamental macroeconomic behavior. The term efficiency implies that a financial market incorporates all relevant information (including macroeconomic fundamentals) in the market and thus the observed outcome is the best possible one under the circumstances. Chakravarty (2006) explore the relationship between stock price and some key macro variables and gold price in India for the period 1991-2005. The study used Granger non-causality test procedure developed by Toda and Yamamoto (1995).Bhattacharya and Mukherjee (2002) showed a two-way causation between stock price and the rate of inflation, while index of industrial production lead the stock price. Studies suggesting a negative relationship between stock prices and inflation (Fama, 1981) envisage that high inflation predicts an economic downturn and keeping in view this the firms start selling off their stock. An increase in the supply of stock then reduces the stock prices. Since stocks reflect firms' future earning potential an expected economic downturn prompts firms to sell off the financial stocks and thus high inflation and low stock prices tend to go together. On the other hand, a positive relationship is also possible between inflation and stock prices as unexpected inflation raises the firms' equity value if they are net debtor (Kessel, 1956; Ioannidis et al., 2005).

Based on the data for the Greek economy Ioannidis et al. (2004), used ARDL integration technique in conjunction with Granger causality tests to detect possible long-run and short-run effects between inflation and stock market prices and also the direction of these effects. The results provide evidence in favour of a negative long-run causal relationship between the series after 1992. In the context of Turkish economy the coefficients of IPI and CPI do not turn out to statistically significant in the equation for stock prices implying that they do not explain the stock prices (Aga and Kocaman, 2006). The stock traders are made up of professional traders who buy and sell shares all day long, hoping to profit from changes in share prices. They are not really interested in the long-term profitability or the value of assets of the company. When traders believe that others will buy shares (in the expectation that prices will rise), then they will buy as well, hoping to sell when the price actually rises. If others believe the same thing, then the wave of buying pressure will, in fact, cause the price to

rise (Aga and Kocaman, 2006). Thus the stock demand and so also the stock prices rise when the economy is about to enter an upswing and on the other hand they all fall when the economy is about to experience a downswing. Thus just before the upswing occurs an increased stock price and a modest inflation can coincide and similarly just before the downswing starts a depressed stock price accompanied by a high inflation may co-exist. In the Iranian context the growth boom since 2003-04 has been accompanied by a rise in savings and investment rate of the corporate sector, stock price increase, and foreign investment and so on. The financial and monetary market policies must try to keep in view the private investment that is required to maintain the growth tempo (see Desai, 2011). For the structural development of the capital market and for growth to take place it is important that the RBI's monetary policy must look into the issue of inflation management (Desai, 2011). Price stability should be the main goal of the monetary policy because it is only slow and stable inflation which is conducive to growth.

As a quick review on the inflation-growth literature the positive association between them has its origin in the Keynesian strand on non-neutrality of money which suggests that an increase in money supply resulting in a price rise reduces real wage which in turn raises the level of economic activity and labour demand. Thus price stability can actually be growth hampering. However, the Keynesian view came under severe attack in the seventies when high inflationary pressures led to sharp deceleration in employment and growth levels in a persistent manner. The rational expectations revolution, as mentioned above, opposed the non-neutrality proposition of Keynesians by arguing that, under flexible markets, repeated monetary shocks given to facilitate growth could only result in recurrent price rise in the long run (Rangarajan, 1998). The evidence on an inverse relationship between inflation and growth became significant since the beginning of the eighties: Kannan and Joshi (1998) cite a large number of empirical studies (Fischer, 1993; Barro, 1995) confirming the negative impact of inflation on growth. Hence, in our analysis of inflation-stock prices interaction it is pertinent to examine relationship between growth and price rise from empirical standpoint.

Monetary policy impacts on the stock market as well. As Ioannidis and Kontonikas (2008) point out, monetary policy influences stock returns by influencing the discount rate (the weighted average cost of capital) and the future stream of cash flows. Tightening of the monetary policy raises the rate of interest and thus reduces net profits. It also reduces supply of bank loans. Hence, it may be inferred that tightening of monetary policy reduces the inflation rate and also stock prices as it leaves less money in the hands of the individuals to demand goods or to buy stocks. From this point of view inflation and stock prices may move in the similar direction.

At a time of low share prices, firms are reluctant to tap the capital market. Unless bank finance can substitute adequately for the capital markets, firms' investment plans are bound to be hit. Thus production may decline. Similarly FII is an important determinant of economic activity in the country. And decline in FII, as noted during the financial crisis, can reduce investment and growth. Besides, the variations in exchange rate can influence the quantum of economic activity. With depreciation export demand is expected to rise which may in turn contribute to domestic production. However, there can be more complex situations. For example, during the financial crisis there was a flight of capital from India as well as the drying up of dollar credit abroad. This meant that both rupee and dollar liquidity were tightly squeezed. The sharp depreciation of the rupee with respect to the dollar required the RBI to intervene with dollar sales and this also impacted negatively on rupee liquidity. And all this in

turn affected investment and growth adversely. In response to a crunch in dollar liquidity in the international market the Iranian multinationals borrowed from the Iranian money market to settle their off-share debts. They borrowed in terms of rupee and converted them into dollar. This resulted in a decline in rupee liquidity in the domestic market which indeed affected the level of economic activity negatively (Patnaik and Shah, 2010).

Our analysis is based on monthly data from April 2005 to December 2014 drawn from the following sources: latest RBI's weekly statistical bulletin, website and press reports. The revised WPI with base 2004-2005 has been included here. The government revealed recently that the WPI new series has had a programming error and the WPI for metal products was not getting incorporated in the index of basic metals, alloys and metal products and manufactured products. As a result of this correction the rate of inflation for March and April 2011 witnessed a significant change. If this is the case then our analysis which is based on the price data prior to correction may involve an error margin though it is likely to be highly negligible. This is because we have considered the aggregate price data of which index of metal products is only a small component.

2. EMPIRICAL ANALYSIS

Keeping in view the interactions stated above our empirical analysis considers the following macro variables: stock prices, wholesale price index (WPI), exchange rate (ER), index of industrial production (IIP) and foreign institutional investment (FII) as the five major macro variables. The stock prices show a high correlation with respect to both indexes of industrial production and the wholesale price index (Table 1).

Table 1. Correlation Matrix.

	Stock Price	**WPI**	**ER**	**IIP**	**FII**
Stock Price	1.0	0.86	0.26	0.91	0.35
WPI	0.86	1.0	0.63	0.96	0.28
ER	0.26	0.63	1.0	0.57	0.07
IIP	0.91	0.96	0.57	1.0	0.31
FII	0.35	0.28	0.07	0.31	1.0

In terms of Granger causality test it is noted that stock prices Granger cause WPI though the reverse is not correct (Table 2). This is found to be true irrespective of the period we consider, that is, whether we take the entire reform period from 2005 to 2014 or just the recent period (2010 to 2014). Though the co-integration test shows that there are two co-integrating vectors the variables are found to be individually significant only in the case of one equation. The integrating equation between WPI on the one hand and stock prices (BSE), IIP, ER, FII and a trend (with a constant term) on the other, shows that stock prices are statistically

insignificant.[2] So what we may conclude that the impact of stock prices on inflation is seen only in the short run while in the long run the relationship is not significant. Rather in the long run WPI tends to have a positive impact on the stock prices as evident from the co-integrating equation between stock prices on the one hand and the rest of the variables on the other.

Table 2. Pair-wise Granger Causality Tests.

Null Hypothesis:	F-Statistic	Probability
ER does not Granger Cause BSE	8.90343	0.00020
BSE does not Granger Cause ER	0.82366	0.44035
WPI does not Granger Cause BSE	2.71663	0.06861
BSE does not Granger Cause WPI	5.57104	0.00444
IIP does not Granger Cause BSE	4.86213	0.00870
BSE does not Granger Cause IIP	1.91641	0.14991
FII does not Granger Cause BSE	4.11945	0.01770
BSE does not Granger Cause FII	11.3145	2.3E-05
WPI does not Granger Cause ER	0.39754	0.67252
ER does not Granger Cause WPI	1.09748	0.33577
IIP does not Granger Cause ER	0.20889	0.81167
ER does not Granger Cause IIP	1.02931	0.35920
FII does not Granger Cause ER	0.64202	0.52733
ER does not Granger Cause FII	3.46444	0.03322
IIP does not Granger Cause WPI	21.4372	3.9E-09
WPI does not Granger Cause IIP	14.6055	1.2E-06
FII does not Granger Cause WPI	1.46603	0.23339

[2] WPI = -15.22 + .001BSE + 0.003FII - 0.457IIP + 0.040ER
(0.0004) (0.0008) (-0.042) (0.19) Loglikelihood = -4125.285
Figures in parentheses are t-ratios.

WPI does not Granger Cause FII	6.28786	0.00226
FII does not Granger Cause IIP	2.36854	0.09632
IIP does not Granger Cause FII	7.40654	0.00079

Sample: April 2005 to December 2014. The number of lags considered is two.

In the next step we have carried out the vector auto-regression analysis, which is done on stationary series of the variables (Table 3). Since most of the variables in the level form are not stationary the VAR model has considered the variables in their first difference form. Four lags have been considered in the model using the log likelihood criterion. Since the coefficients in the VAR model are not directly interpretable we move on to the impulse response function and the variance decomposition exercises carried out subsequently.

In analyzing the impulse response and the variance decomposition we may focus on the following considerations:

(a) the impact of stock market shock on inflation,
(b) the effect of inflation shock on stock prices,
(c) the inflation-growth relationship,
(d) the effect of exchange rate shocks on growth and inflation,
(e) foreign institutional investment and growth.

As regards the stock market shocks it impacts the stock market itself to the maximum extent (Table 4). However, these shocks tend to stabilise in course of time. In about two years timeone standard deviation shock in stock prices reduces the effect to less than 1 though in the beginning it is around 8.6. On the other hand, the impact on inflation starts increasing and reaches a maximum of -4.36 at the eleventh year, after which it again starts declining and almost after 16 months the magnitude declines to less than 1. The nature of effect however turns out to be negative. On the other hand, one standard deviation shock in inflation does not affect either inflation itself or stock prices sizably. Immediately after six months the impact on itself comes down to less than 0.5.

On stock prices the impact is seen to be -0.13 in the first month itself. In terms of variance decomposition also the impact of stock prices on inflation increases substantially to almost one-fourth (25 per cent) in about one year time while the impact on stock price itself declines to around 60 per cent over the same time duration (Table 5). In fact the magnitude of variation in inflation due to stock price is largest among the rest of the endogenous variables (excluding stock prices). On the other hand, the variance decomposition of inflation shows that a large magnitude is confined to inflation itself even after 36 months (68 per cent). Variation in stock prices due to inflation goes up to a maximum of only 16 per cent after almost one and half year.

These figures on the whole are suggestive of the direction of causality being from stock prices to inflation rather than the other way round. These figures on the whole are suggestive of the direction of causality being from stock prices to inflation rather than the other way round.

Turning to inflation-growth relationship we note that price rise shows only a negligible effect on production in the immediate short run. It slowly goes up to a maximum of only 0.19 at the 15th month after which it starts declining. However, the nature of relationship as shown in terms of impulse response is positive, implying the role of price rise as an incentive for production though the overall impact is not sizable. On the other hand, one standard deviation shock in production impacts on price rise in a relatively stronger way. On the 11th month the impulse attains a maximum of -0.20; the direction being negative we may conclude that setbacks in production are likely to aggravate the price rise. However, the variance decomposition analysis tends to show a stronger impact of price rise on quantity in the long run (between one to three years), implying that producers may react to price changes in the long run while the short run fluctuations may not impact on production in any significant manner.

Exchange rate shocks affect production negatively and reach a maximum impulse of -0.4386 on the 18th month. On the other hand, one standard deviation shock in foreign exchange impacts on domestic prices only negligibly. In terms of variance decomposition also the domestic production shows a steady increase over time and by the end of one year it is already above 15 per cent. As exchange rate variations influence the export and import demand the domestic production also tends to vary. In the case of domestic price rise on the other hand the maximum variance is only 1 per cent at around one year time period. Hence the impact of foreign exchange fluctuations on domestic inflation is marginal. Rather domestic price rise seems to have a slightly greater impact on the exchange rate, in the opposite direction though, as revealed by the impulse response function.

What is most important to note is the impact of foreign institutional investment on all the macro variables under consideration. Domestic production, inflation, stock prices all show sizable impact of foreign institutional investment though the magnitudes of impact are highly volatile. This could be because the growth in FII itself is highly fluctuating. In fact when it comes to variance decomposition much of the variations in FII is explained by its own variations even at the end of three year.

Table 3. Vector Auto regression Model: April 1994 to December 2010.

	GBSE	GFII	GIIP	GWPI	ER
GBSE(-1)	0.893388	-11.42814	0.065479	0.010735	-0.006703
	(11.5576)*	(-0.51231)	(3.33231)*	(1.60445)	(-1.26928)
GBSE(-2)	0.013003	7.613472	-0.048956	-0.004671	0.012876
	(0.12409)	(0.25177)	(-1.83785)	(-0.51497)	(1.79856)
GBSE(-3)	-0.004059	6.606231	-0.021184	-0.004941	-0.011506
	(-0.03902)	(0.22008)	(-0.80117)	(-0.54880)	(-1.61912)
GBSE(-4)	-0.024507	-2.418549	0.010639	0.005843	0.006176
GFII(-1)	-0.000318	-0.000104	-1.02E-05	1.82E-05	1.80E-05
	(-1.21971)	(-0.00139)	(-0.15446)	(0.80625)	(1.01175)

GFII(-2)	9.85E-05	-0.037818	-5.93E-05	2.77E-05	-1.48E-05
	(0.37874)	(-0.50387)	(-0.89732)	(1.23188)	(-0.83014)
GFII(-3)	-0.000112	-0.007638	-5.06E-05	-9.82E-06	2.67E-07
	(-0.43070)	(-0.10161)	(-0.76419)	(-0.43554)	(0.01501)
GFII(-4)	0.000169	-0.004919	-4.29E-05	2.65E-05	2.23E-05
	(0.67705)	(-0.06838)	(-0.67699)	(1.22646)	(1.31237)
GIIP(-1)	-0.001713	42.86602	0.256223	0.014492	-0.006188
	(-0.00568)	(0.49246)	(3.34160)	(0.55509)	(-0.30028)
GIIP(-2)	0.727947	-132.3799	0.438770	-0.001085	-0.038432
	(2.35970)	(-1.48700)	(5.59509)	(-0.04064)	(-1.82352)
GIIP(-3)	-0.071339	150.9257	0.137487	0.029881	-0.001103
	(-0.22158)	(1.62445)	(1.67990)	(1.07228)	(-0.05013)
GIIP(-4)	-0.232468	-46.89354	-0.009329	-0.038735	-0.000934
	(-0.74081)	(-0.51784)	(-0.11695)	(-1.42610)	(-0.04355)
GWPI(-1)	-2.463695	-236.8326	0.419572	1.212343	-0.034001
	(-2.81169)*	(-0.93660)	(1.88365)	(15.9847)	(-0.56798)
GWPI(-2)	1.691412	96.51463	-0.176537	-0.204986	0.164560
	(1.23264)	(0.24373)	(-0.50610)	(-1.72589)	(1.75540)
GWPI(-3)	-0.204586	334.6506	-0.423962	-0.074065	-0.133566
	(-0.14802)	(0.83901)	(-1.20666)	(-0.61909)	(-1.41450)
GWPI(-4)	-0.473163	-314.0479	0.204327	-0.031646	0.019922
	(-0.54891)	(-1.26248)	(0.93246)	(-0.42415)	(0.33829)
ER(-1)	-4.360160	199.9112	-0.313683	0.240235	1.237654
	(-3.94822)*	(0.62729)	(-1.11739)	(2.51325)	(16.4044)
ER(-2)	4.520548	3.996399	0.731391	-0.334734	-0.414310
	(2.60576)*	(0.00798)	(1.65846)	(-2.22917)	(-3.49568)*
ER(-3)	0.259563	-556.3393	-0.791499	-0.027075	0.188936
	(0.14631)	(-1.08670)	(-1.75509)	(-0.17632)	(1.55889)
ER(-4)	-0.465840	297.3662	0.343377	0.109254	-0.037369
	(-0.40685)	(0.89996)	(1.17973)	(1.10239)	(-0.47772)
C	8.360338	2886.329	2.385983	0.965799	1.370765

	(1.03598)	(1.23938)	(1.16307)	(1.38266)	(2.48630)*
R-squared	0.914096	0.059549	0.686452	0.932111	0.986710
Adj. R-squared	0.904334	-0.047320	0.650822	0.924396	0.985199
F-statistic	93.63948	0.557212	19.26591	120.8232	653.3348
Log likelihood	-702.6506	-1818.651	-432.8380	-220.6000	-173.9860
Akaike AIC	7.346707	18.67666	4.607492	2.452791	1.979553
SchwarzSC	7.696693	19.02664	4.957478	2.802778	2.329539

Figures in parentheses are t-ratios. * denotes significance at 5 per cent level.

Table 4. Impulse Response Function.

Response of GBSE:					
Period	GBSE	GFII	GIIP	GWPI	ER
1	8.566130	0.000000	0.000000	0.000000	0.000000
2	8.406769	-0.636047	0.083328	-1.709933	-2.520080
3	8.206726	-0.679355	1.620280	-2.279422	-3.136141
4	7.725698	-1.047897	2.150889	-3.096609	-2.555770
5	7.072085	-0.636784	2.141220	-3.915566	-1.964882
6	6.248322	-1.246715	2.657520	-4.610460	-1.821211
7	5.424958	-1.523529	2.532817	-4.925158	-1.593873
8	4.509234	-1.610137	2.668238	-5.021117	-1.202677
9	3.651568	-1.574958	2.533590	-5.007346	-0.830248
10	2.817371	-1.626245	2.420371	-4.758704	-0.438798
11	2.025825	-1.574314	2.237382	-4.364593	-0.111389
12	1.322107	-1.476242	2.023194	-3.826988	0.199207
13	0.690697	-1.342581	1.783391	-3.242075	0.477209
14	0.156326	-1.175769	1.535134	-2.615702	0.705607
15	-0.281137	-1.001951	1.283275	-1.987958	0.882961
16	-0.622477	-0.813536	1.030304	-1.387869	1.015422
17	-0.872292	-0.628600	0.794311	-0.838512	1.102107

18	-1.036037	-0.451212	0.570084	-0.354290	1.147174
19	-1.124870	-0.288326	0.367900	0.055231	1.156941
20	-1.149099	-0.142182	0.187481	0.384667	1.136086
21	-1.120423	-0.016894	0.031313	0.634892	1.091620
22	-1.050997	0.087165	-0.100640	0.808876	1.029249
23	-0.951898	0.169698	-0.208729	0.913571	0.954762
24	-0.833763	0.231409	-0.294395	0.957138	0.873399
25	-0.705860	0.274072	-0.359447	0.949309	0.789708
26	-0.576116	0.299616	-0.406071	0.900214	0.707423
27	-0.450972	0.310537	-0.436862	0.819983	0.629576
28	-0.335417	0.309377	-0.454284	0.718223	0.558387
29	-0.232975	0.298756	-0.460953	0.603702	0.495345
30	-0.145890	0.281147	-0.459259	0.484103	0.441310
31	-0.075234	0.258870	-0.451441	0.365856	0.396551
32	-0.021098	0.233962	-0.439471	0.254113	0.360876
33	0.017220	0.208170	-0.425050	0.152728	0.333720
34	0.041033	0.182924	-0.409576	0.064347	0.314242
35	0.052082	0.159325	-0.394158	-0.009494	0.301417
36	0.052372	0.138175	-0.379626	-0.068219	0.294124
Response of GFII:					
Period	GBSE	GFII	GIIP	GWPI	ER
1	-195.1935	2464.300	0.000000	0.000000	0.000000
2	-68.79891	-8.078576	96.10154	-176.7864	115.5444
3	-70.53622	-71.86600	-267.9357	-114.9640	133.4455
4	-4.835024	-54.42450	247.7157	124.2148	-163.1611
5	79.72612	5.791321	-162.6100	16.23364	-99.55417
6	-7.127350	-4.947488	55.92980	-70.23974	22.27819
7	19.41716	22.30854	35.82580	-92.70654	-75.30855
8	38.38297	-33.35334	-9.629704	-40.77948	-40.40222
9	2.208007	-8.927834	14.90342	-75.12541	-26.84799

10	11.80800	-8.831809	19.70149	-55.26164	-33.84972
11	4.356671	-27.13336	11.96514	-45.49832	-24.21348
12	-4.238813	-10.42099	13.30774	-36.82603	-18.77972
13	-6.806161	-14.62868	18.29455	-25.84685	-18.55630
14	-9.852970	-12.43186	11.26009	-16.29454	-14.50394
15	-13.06299	-9.612792	15.24223	-7.618847	-12.80114
16	-13.08962	-7.466864	12.69853	-0.304523	-12.88785
17	-13.16058	-6.391401	12.29387	5.989436	-11.62536
18	-12.45474	-4.176610	12.11763	10.10163	-12.04264
19	-10.55256	-3.164226	11.59324	13.62887	-12.49173
20	-8.648272	-2.261019	11.34280	15.38743	-12.99209
21	-6.293270	-1.405806	11.39106	16.22224	-13.80894
22	-3.804161	-1.162621	11.48208	16.11885	-14.64185
23	-1.382481	-0.961704	11.66631	15.24191	-15.39991
24	0.927020	-1.036226	12.08740	13.81333	-16.14181
25	3.044043	-1.280509	12.46616	12.00342	-16.75767
26	4.868066	-1.648457	12.96600	9.964681	-17.22153
27	6.397889	-2.091521	13.46704	7.834032	-17.55437
28	7.608639	-2.599843	13.96416	5.741707	-17.71894
29	8.495476	-3.113259	14.43868	3.762440	-17.73445
30	9.085287	-3.616426	14.86770	1.979013	-17.61080
31	9.398685	-4.087524	15.23448	0.431059	-17.36018
32	9.471336	-4.503321	15.53159	-0.852478	-17.00335
33	9.342532	-4.857690	15.75188	-1.862315	-16.56130
34	9.052073	-5.141209	15.89084	-2.603845	-16.05371
35	8.639817	-5.352056	15.95190	-3.093739	-15.50162
36	8.144102	-5.491372	15.93650	-3.357000	-14.92389
Response of GIIP:					
Period	GBSE	GFII	GIIP	GWPI	ER
1	0.363113	-0.148573	2.141933	0.000000	0.000000

2	0.628536	-0.061749	0.540954	0.312383	-0.181302
3	0.440482	-0.281497	1.089042	0.211064	0.043947
4	0.447179	-0.181338	0.949552	0.014007	-0.274720
5	0.506384	-0.314539	0.861300	0.119324	-0.213384
6	0.409646	-0.198968	0.804505	-0.062682	-0.187714
7	0.416780	-0.185052	0.772264	-0.099613	-0.194809
8	0.377327	-0.248825	0.706438	-0.155169	-0.183421
9	0.335990	-0.207270	0.650882	-0.178160	-0.164062
10	0.296714	-0.215256	0.622523	-0.195193	-0.151338
11	0.256848	-0.204332	0.557883	-0.200511	-0.127845
12	0.212139	-0.197247	0.528467	-0.193527	-0.108221
13	0.174788	-0.183449	0.480428	-0.178751	-0.093234
14	0.137941	-0.172996	0.442162	-0.156712	-0.074095
15	0.104553	-0.157224	0.404259	-0.133778	-0.060126
16	0.076981	-0.143520	0.368363	-0.106229	-0.047579
17	0.052831	-0.129087	0.334233	-0.080000	-0.037012
18	0.033692	-0.114207	0.302870	-0.054227	-0.028890
19	0.018928	-0.100803	0.273673	-0.030702	-0.022913
20	0.008171	-0.087696	0.246616	-0.009933	-0.018684
21	0.001015	-0.075852	0.222379	0.007559	-0.016257
22	-0.002959	-0.065135	0.200141	0.021605	-0.015218
23	-0.004427	-0.055729	0.180413	0.032182	-0.015267
24	-0.003842	-0.047545	0.162794	0.039423	-0.016229
25	-0.001751	-0.040673	0.147259	0.043662	-0.017760
26	0.001346	-0.034962	0.133627	0.045210	-0.019664
27	0.005047	-0.030352	0.121742	0.044535	-0.021732
28	0.008971	-0.026728	0.111412	0.042059	-0.023790
29	0.012822	-0.023948	0.102467	0.038237	-0.025702
30	0.016371	-0.021891	0.094729	0.033490	-0.027371
31	0.019448	-0.020418	0.088021	0.028204	-0.028725
32	0.021945	-0.019406	0.082192	0.022717	-0.029726

33	0.023807	-0.018738	0.077091	0.017312	-0.030360
34	0.025021	-0.018311	0.072591	0.012214	-0.030633
35	0.025612	-0.018036	0.068578	0.007592	-0.030568
36	0.025631	-0.017840	0.064956	0.003562	-0.030203
Response of GWPI:					
Period	GBSE	GFII	GIIP	GWPI	ER
1	-0.129386	-0.015183	-0.023655	0.729537	0.000000
2	-0.083781	0.018220	0.000782	0.879632	0.138851
3	-0.033680	0.097792	0.011211	0.894616	0.119137
4	0.029362	0.073063	0.089542	0.857053	0.004303
5	0.106904	0.121337	0.059382	0.764322	-0.062048
6	0.171792	0.133781	0.098590	0.616306	-0.098729
7	0.241453	0.119404	0.104444	0.453090	-0.145324
8	0.296214	0.078388	0.123031	0.307553	-0.177004
9	0.331600	0.049003	0.138146	0.166887	-0.199697
10	0.352434	0.017116	0.154741	0.045545	-0.208374
11	0.355256	-0.014061	0.168318	-0.058734	-0.207704
12	0.344571	-0.040063	0.179768	-0.139351	-0.200133
13	0.322285	-0.062909	0.188089	-0.198578	-0.186906
14	0.291358	-0.079807	0.192193	-0.237417	-0.169010
15	0.254542	-0.092187	0.193825	-0.257907	-0.148718
16	0.214751	-0.099622	0.191396	-0.262436	-0.127295
17	0.174004	-0.102849	0.186375	-0.253871	-0.105713
18	0.134375	-0.102141	0.178670	-0.235219	-0.085151
19	0.097395	-0.098412	0.168970	-0.209138	-0.066191
20	0.064135	-0.092179	0.157726	-0.178379	-0.049404
21	0.035389	-0.084159	0.145508	-0.145196	-0.035095
22	0.011538	-0.075005	0.132775	-0.111631	-0.023403
23	-0.007310	-0.065251	0.119979	-0.079300	-0.014319
24	-0.021297	-0.055419	0.107512	-0.049470	-0.007727

25	-0.030756	-0.045904	0.095665	-0.023041	-0.003407
26	-0.036167	-0.037034	0.084694	-0.000587	-0.001086
27	-0.038095	-0.029037	0.074756	0.017615	-0.000450
28	-0.037158	-0.022071	0.065957	0.031539	-0.001168
29	-0.033985	-0.016212	0.058337	0.041359	-0.002912
30	-0.029183	-0.011478	0.051887	0.047408	-0.005371
31	-0.023316	-0.007833	0.046556	0.050128	-0.008262
32	-0.016888	-0.005200	0.042259	0.050031	-0.011336
33	-0.010329	-0.003475	0.038891	0.047661	-0.014387
34	-0.003990	-0.002532	0.036329	0.043561	-0.017247
35	0.001855	-0.002236	0.034445	0.038252	-0.019795
36	0.007011	-0.002450	0.033110	0.032210	-0.021943
Response of ER:					
Period	GBSE	GFII	GIIP	GWPI	ER
1	-0.085699	-0.025254	-0.006587	-0.020051	0.577979
2	-0.164851	0.014599	-0.020602	-0.049621	0.715338
3	-0.149226	-0.000726	-0.111180	0.043381	0.661254
4	-0.200861	-0.009891	-0.173329	0.067840	0.646002
5	-0.226743	0.075529	-0.210277	0.078913	0.641111
6	-0.227297	0.096749	-0.250264	0.087413	0.629717
7	-0.227406	0.114221	-0.304174	0.088449	0.617421
8	-0.224747	0.122710	-0.325835	0.091235	0.594923
9	-0.215253	0.131490	-0.358347	0.091682	0.573129
10	-0.207474	0.138932	-0.379534	0.087810	0.557296
11	-0.198911	0.145725	-0.396435	0.079618	0.538550
12	-0.189391	0.148048	-0.410739	0.072137	0.520951
13	-0.181423	0.150055	-0.421311	0.062657	0.504449
14	-0.173692	0.151375	-0.428795	0.053058	0.488572
15	-0.166853	0.150908	-0.434064	0.043368	0.473750
16	-0.161045	0.150169	-0.437291	0.034098	0.459869

17	-0.156124	0.148709	-0.438552	0.025598	0.446746
18	-0.152074	0.146886	-0.438626	0.018016	0.434514
19	-0.148879	0.144811	-0.437323	0.011495	0.423053
20	-0.146347	0.142602	-0.435099	0.006106	0.412217
21	-0.144388	0.140298	-0.432059	0.001870	0.402001
22	-0.142876	0.138017	-0.428345	-0.001298	0.392277
23	-0.141659	0.135765	-0.424089	-0.003453	0.382972
24	-0.140631	0.133571	-0.419388	-0.004726	0.374018
25	-0.139678	0.131456	-0.414313	-0.005244	0.365342
26	-0.138707	0.129408	-0.408927	-0.005145	0.356889
27	-0.137643	0.127427	-0.403281	-0.004569	0.348615
28	-0.136429	0.125496	-0.397408	-0.003650	0.340483
29	-0.135026	0.123602	-0.391341	-0.002510	0.332467
30	-0.133411	0.121726	-0.385103	-0.001257	0.324550
31	-0.131576	0.119853	-0.378715	1.83E-05	0.316723
32	-0.129525	0.117968	-0.372197	0.001242	0.308983
33	-0.127272	0.116060	-0.365564	0.002357	0.301332
34	-0.124840	0.114119	-0.358833	0.003324	0.293776
35	-0.122256	0.112139	-0.352021	0.004117	0.286325
36	-0.119550	0.110116	-0.345143	0.004727	0.278989

Table 5. Variance Decomposition.

Variance Decomposition of GBSE:						
Period	S.E.	GBSE	GFII	GIIP	GWPI	ER
1	8.566130	100.0000	0.000000	0.000000	0.000000	0.000000
2	12.39913	93.69958	0.263146	0.004516	1.901846	4.130911
3	15.46631	88.37653	0.362063	1.100408	3.394398	6.766606
4	17.90918	84.52026	0.612389	2.263081	5.521200	7.083071
5	19.87299	81.30525	0.600012	2.998817	8.365989	6.729932

6	21.61405	77.09126	0.839948	4.046905	11.62253	6.399362
7	23.06797	73.21036	1.173601	4.758407	14.76211	6.095517
8	24.26591	69.61351	1.500870	5.509267	17.62217	5.754177
9	25.23551	66.46072	1.777259	6.102019	20.23127	5.428740
10	26.00210	63.77372	2.065170	6.613982	22.40529	5.141838
11	26.58495	61.58869	2.326289	7.035436	24.12898	4.920605
12	27.00862	59.91124	2.552630	7.377583	25.38567	4.772881
13	27.30686	58.67370	2.738910	7.643842	26.24381	4.699735
14	27.50941	57.81607	2.881401	7.843100	26.76286	4.696571
15	27.64469	57.26194	2.984631	7.982011	27.01869	4.752731
16	27.73621	56.93507	3.051000	8.067412	27.09107	4.855449
17	27.80291	56.76063	3.087495	8.110369	27.05219	4.989312
18	27.85759	56.67634	3.101621	8.120440	26.96227	5.139324
19	27.90826	56.63321	3.101044	8.108360	26.86486	5.292534
20	27.95863	56.59822	3.092464	8.083663	26.78706	5.438594
21	28.00958	56.55253	3.081262	8.054408	26.74108	5.570719
22	28.06016	56.48913	3.071128	8.026684	26.72786	5.685197
23	28.10867	56.40901	3.064182	8.004519	26.74133	5.780966
24	28.15336	56.31777	3.061218	7.990061	26.77208	5.858870
25	28.19289	56.22264	3.062090	7.983926	26.81044	5.920912
26	28.22652	56.13040	3.066065	7.985608	26.84830	5.969624
27	28.25413	56.04623	3.072156	7.993916	26.88008	6.007614
28	28.27610	55.97323	3.079354	8.007308	26.90284	6.037277
29	28.29317	55.91247	3.086788	8.024190	26.91590	6.060645
30	28.30625	55.86347	3.093801	8.043099	26.92028	6.079351
31	28.31628	55.82463	3.099969	8.062823	26.91792	6.094660
32	28.32410	55.79385	3.105080	8.082444	26.91110	6.107527

33	28.33044	55.76893	3.109090	8.101338	26.90197	6.118671
34	28.33583	55.74790	3.112074	8.119146	26.89224	6.128639
35	28.34068	55.72919	3.114171	8.135715	26.88306	6.137857
36	28.34521	55.71170	3.115550	8.151049	26.87504	6.146660
Variance Decomposition of GFII:						
Period	S.E.	GBSE	GFII	GIIP	GWPI	ER
1	2472.019	0.623487	99.37651	0.000000	0.000000	0.000000
2	2483.851	0.694281	98.43305	0.149696	0.506578	0.216395
3	2506.485	0.760993	96.74551	1.289700	0.707845	0.495955
4	2527.621	0.748686	95.18068	2.228690	0.937560	0.904382
5	2536.114	0.842504	94.54478	2.624897	0.935388	1.052427
6	2537.816	0.842163	94.41843	2.669948	1.010737	1.058723
7	2541.050	0.845860	94.18597	2.683035	1.141271	1.143863
8	2542.225	0.867874	94.11613	2.681989	1.165948	1.168063
9	2543.536	0.867054	94.02031	2.682657	1.251982	1.178000
10	2544.481	0.868564	93.95173	2.686661	1.298221	1.194824
11	2545.179	0.868381	93.91154	2.687397	1.329464	1.203219
12	2545.575	0.868388	93.88405	2.689295	1.349980	1.208287
13	2545.890	0.868888	93.86407	2.693792	1.359952	1.213300
14	2546.058	0.870271	93.85408	2.695393	1.363869	1.216386
15	2546.199	0.872806	93.84512	2.698678	1.364613	1.218779
16	2546.308	0.875374	93.83796	2.700934	1.364498	1.221236
17	2546.413	0.877973	93.83083	2.703042	1.364938	1.223219
18	2546.524	0.880288	93.82290	2.705070	1.366393	1.225349
19	2546.642	0.881924	93.81441	2.706893	1.369131	1.227642
20	2546.762	0.882994	93.80561	2.708621	1.372652	1.230128

21	2546.885	0.883519	93.79659	2.710360	1.376577	1.232949
22	2547.007	0.883658	93.78762	2.712132	1.380450	1.236136
23	2547.127	0.883604	93.77884	2.713976	1.383901	1.239675
24	2547.244	0.883536	93.77020	2.715977	1.386714	1.243577
25	2547.360	0.883598	93.76168	2.718124	1.388808	1.247791
26	2547.476	0.883883	93.75319	2.720468	1.390212	1.252248
27	2547.593	0.884433	93.74465	2.723012	1.391030	1.256880
28	2547.712	0.885242	93.73599	2.725762	1.391407	1.261600
29	2547.834	0.886269	93.72720	2.728713	1.391493	1.266325
30	2547.957	0.887455	93.71830	2.731853	1.391418	1.270979
31	2548.083	0.888728	93.70933	2.735159	1.391284	1.275496
32	2548.209	0.890022	93.70039	2.738604	1.391158	1.279822
33	2548.333	0.891278	93.69157	2.742156	1.391075	1.283920
34	2548.456	0.892454	93.68296	2.745780	1.391045	1.287765
35	2548.575	0.893520	93.67463	2.749441	1.391062	1.291344
36	2548.690	0.894461	93.66667	2.753104	1.391111	1.294656
Variance Decomposition of GIIP:						
Period	S.E.	GBSE	GFII	GIIP	GWPI	ER
1	2.177568	2.780605	0.465516	96.75388	0.000000	0.000000
2	2.358762	9.470361	0.465275	87.71966	1.753905	0.590798
3	2.658856	10.19776	1.487052	85.81243	2.010477	0.492281
4	2.877444	11.12243	1.666863	84.15987	1.718993	1.331849
5	3.071913	12.47610	2.510908	81.70280	1.659120	1.651068
6	3.214101	13.02109	2.676883	80.89911	1.553606	1.849312
7	3.344048	13.58212	2.779108	80.06709	1.523941	2.047748
8	3.455969	13.90871	3.120401	79.14352	1.628426	2.198946

9	3.547094	14.10049	3.303583	78.49648	1.798106	2.301344
10	3.628332	14.14489	3.509269	77.96452	2.007900	2.373418
11	3.693277	14.13545	3.693024	77.52837	2.232652	2.410504
12	3.748686	14.04091	3.861521	77.24080	2.433656	2.423114
13	3.793192	13.92569	4.005333	77.04303	2.598949	2.427000
14	3.829206	13.79475	4.134452	76.93402	2.717783	2.419005
15	3.857902	13.66374	4.239262	76.89181	2.797748	2.407443
16	3.880615	13.54361	4.326563	76.89542	2.840029	2.394377
17	3.898475	13.43817	4.396653	76.92750	2.856177	2.381502
18	3.912517	13.34930	4.450356	76.97554	2.854921	2.369890
19	3.923605	13.27628	4.491244	77.02762	2.844931	2.359925
20	3.932391	13.21745	4.520930	77.07710	2.832871	2.351648
21	3.939445	13.17017	4.541827	77.11997	2.823103	2.344937
22	3.945153	13.13214	4.555952	77.15432	2.817938	2.339644
23	3.949832	13.10117	4.565071	77.18026	2.817904	2.335598
24	3.953703	13.07562	4.570597	77.19874	2.822332	2.332712
25	3.956935	13.05429	4.573701	77.21119	2.829899	2.330918
26	3.959652	13.03639	4.575222	77.21915	2.839053	2.330186
27	3.961953	13.02142	4.575779	77.22392	2.848392	2.330489
28	3.963914	13.00905	4.575799	77.22653	2.856833	2.331786
29	3.965599	12.99905	4.575559	77.22769	2.863703	2.334006
30	3.967060	12.99118	4.575234	77.22782	2.868720	2.337047
31	3.968341	12.98519	4.574928	77.22718	2.871920	2.340779
32	3.969476	12.98082	4.574701	77.22588	2.873552	2.345048
33	3.970494	12.97776	4.574583	77.22398	2.873980	2.349692
34	3.971415	12.97571	4.574587	77.22156	2.873593	2.354552
35	3.972256	12.97438	4.574713	77.21869	2.872742	2.359477

36	3.973026	12.97351	4.574955	77.21549	2.871709	2.364342
Variance Decomposition of GWPI:						
Period	S.E.	GBSE	GFII	GIIP	GWPI	ER
1	0.741454	3.045110	0.041931	0.101780	96.81118	0.000000
2	1.161955	1.759812	0.041660	0.041488	96.72907	1.427967
3	1.474955	1.144303	0.465445	0.031526	96.82008	1.538646
4	1.710050	0.880779	0.528814	0.297632	97.14748	1.145300
5	1.882016	1.049833	0.852251	0.345281	96.69838	1.054257
6	1.997172	1.672164	1.205508	0.550299	95.39147	1.180563
7	2.073300	2.907877	1.450283	0.764400	93.29068	1.586764
8	2.129205	4.692602	1.510663	1.058670	90.54245	2.195614
9	2.175474	6.818504	1.497826	1.417359	87.32047	2.945838
10	2.219601	9.071272	1.444810	1.847590	83.92513	3.711199
11	2.264499	11.17628	1.391941	2.327532	80.69746	4.406781
12	2.310861	12.95569	1.366706	2.840243	77.85558	4.981777
13	2.357466	14.31741	1.384413	3.365607	75.51724	5.415323
14	2.402244	15.25966	1.443652	3.881396	73.70499	5.710304
15	2.443413	15.83501	1.537760	4.380955	72.35632	5.889952
16	2.479520	16.12732	1.654727	4.850134	71.38459	5.983226
17	2.509828	16.22083	1.782928	5.285132	70.69412	6.017000
18	2.534211	16.19134	1.911232	5.680989	70.20177	6.014670
19	2.553051	16.09879	2.031714	6.035484	69.84056	5.993448
20	2.567064	15.98593	2.138535	6.347289	69.56301	5.965232
21	2.577137	15.88006	2.228491	6.616550	69.33766	5.937233
22	2.584189	15.79550	2.300587	6.844474	69.14636	5.913075
23	2.589060	15.73692	2.355456	7.033492	68.98023	5.893904
24	2.592455	15.70248	2.394989	7.187069	68.83610	5.879366
25	2.594913	15.68680	2.421749	7.309376	68.71366	5.868408
26	2.596811	15.68328	2.438549	7.405067	68.61326	5.859850
27	2.598388	15.68574	2.448078	7.478852	68.53459	5.852742

28	2.599776	15.68942	2.452673	7.535233	68.47615	5.846515
29	2.601033	15.69133	2.454187	7.578252	68.43524	5.840988
30	2.602177	15.69011	2.453975	7.611350	68.40828	5.836280
31	2.603206	15.68574	2.452942	7.637321	68.39132	5.832677
32	2.604114	15.67901	2.451630	7.658329	68.38053	5.830504
33	2.604903	15.67108	2.450323	7.675981	68.37259	5.830023
34	2.605582	15.66315	2.449141	7.691421	68.36492	5.831367
35	2.606167	15.65617	2.448115	7.705435	68.35576	5.834517
36	2.606679	15.65074	2.447241	7.718541	68.34417	5.839311
Variance Decomposition of ER:						
Period	S.E.	GBSE	GFII	GIIP	GWPI	ER
1	0.585224	2.144432	0.186217	0.012668	0.117384	97.53930
2	0.940463	3.902911	0.096204	0.052893	0.323836	95.62416
3	1.165435	4.181044	0.062686	0.944520	0.349431	94.46232
4	1.360384	5.248647	0.051294	2.316593	0.505141	91.87833
5	1.539230	6.269809	0.280845	3.675811	0.657412	89.11612
6	1.702078	6.910782	0.552771	5.167991	0.801384	86.56707
7	1.855635	7.316161	0.843957	7.035002	0.901438	83.90344
8	1.994336	7.603871	1.109234	8.759810	0.989690	81.53739
9	2.122804	7.739584	1.362716	10.58126	1.060056	79.25638
10	2.242984	7.788028	1.604260	12.34092	1.102765	77.16402
11	2.354849	7.779175	1.838412	14.03040	1.114795	75.23722
12	2.459350	7.725158	2.047879	15.65267	1.108105	73.46619
13	2.557290	7.648067	2.238327	17.19090	1.084884	71.83782
14	2.649188	7.556525	2.412229	18.63875	1.051034	70.34147
15	2.735606	7.458657	2.566541	19.99743	1.010811	68.96656
16	2.817072	7.360321	2.704407	21.26716	0.967845	67.70027
17	2.893950	7.265501	2.826685	22.44870	0.924930	66.53418
18	2.966677	7.176415	2.934937	23.54755	0.883825	65.45727
19	3.035566	7.094926	3.030811	24.56640	0.845599	64.46226

20	3.100917	7.021766	3.115891	25.51063	0.810721	63.54099
21	3.162989	6.957257	3.191542	26.38510	0.779248	62.68686
22	3.222007	6.901358	3.259185	27.19476	0.750979	61.89372
23	3.278164	6.853670	3.319998	27.94461	0.725581	61.15614
24	3.331632	6.813626	3.375024	28.63945	0.702680	60.46922
25	3.382562	6.780510	3.425190	29.28379	0.681920	59.82859
26	3.431082	6.753523	3.471254	29.88187	0.662994	59.23036
27	3.477312	6.731827	3.513856	30.43764	0.645655	58.67102
28	3.521354	6.714592	3.553520	30.95468	0.629713	58.14750
29	3.563304	6.701017	3.590666	31.43629	0.615023	57.65700
30	3.603247	6.690360	3.625623	31.88545	0.601475	57.19709
31	3.641264	6.681957	3.658652	32.30486	0.588981	56.76555
32	3.677431	6.675227	3.689947	32.69692	0.577465	56.36044
33	3.711820	6.669679	3.719657	33.06382	0.566854	55.97999
34	3.744502	6.664915	3.747892	33.40751	0.557081	55.62260
35	3.775544	6.660622	3.774732	33.72974	0.548078	55.28683
36	3.805014	6.656565	3.800239	34.03207	0.539775	54.97135

3. CONCLUSIONS

In this paper we have explored the relationship between inflation and stock prices. The analytical literature mentions the possibility of a negative and a positive relationship both. Using the VAR framework based on monthly data for wholesale price index, index of industrial production, exchange rate, stock prices and foreign institutional investment we note that stock prices have an impact on inflation whereas the causality in the reverse direction is not prominent. The results from the impulse response function tend to suggest that the nature of relationship is rather negative. When stock prices are low the firms are reluctant to tap the capital market. Unless bank finance can substitute adequately for the capital market, firm's investment plans would be hit and production would decline. This may result in a price rise as the market demand may exceed the supply. An important policy implication is augmentation of production by encouraging investment through inexpensive bank finance. However, in the very long run as we observe from the co-integrating equation, inflation influences stock prices and that too in a positive direction. Unexpected inflation raises the firm's equity value if they are net debtor. Similarly tightening of monetary policy can reduce inflation and stock prices both, as individuals will be left with less money to buy goods or buy stocks.

Turning to inflation-growth relationship we note that price rise shows only a negligible effect on production in the immediate short run. It slowly goes up for a little more than one

year, after which it starts declining. However, the nature of relationship as shown in terms of impulse response is positive, implying the role of price rise as an incentive for production. On the other hand, one standard deviation shock in production impacts on price rise in a relatively stronger way and the direction being negative we may conclude that setbacks in production are likely to aggravate the inflationary situation.

Exchange rate shocks affect production negatively though the impact on domestic prices is only negligible. What is most important to note is the impact of foreign institutional investment: it affects domestic production, inflation and stock prices sizably though the magnitudes of impact are highly volatile. This could be because the growth in FII itself is highly fluctuating. While removal of capital market restrictions and a more stable financial market may be conducive to the flow of foreign institutional investment it is equally important to explore possibilities for utilising the foreign funds more productively.

An important policy implication is to augment production by encouraging investment through inexpensive bank finance. This can curb inflation. Similarly tightening of monetary policy can reduce inflation and stock prices both as individuals will be left with less money to buy goods or stocks. This can reduce speculative activities and the cascading effects on price rise. It will also be worthwhile to explore how FIIs can be utilized to enhance investment on infrastructure which in turn can raise production.

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