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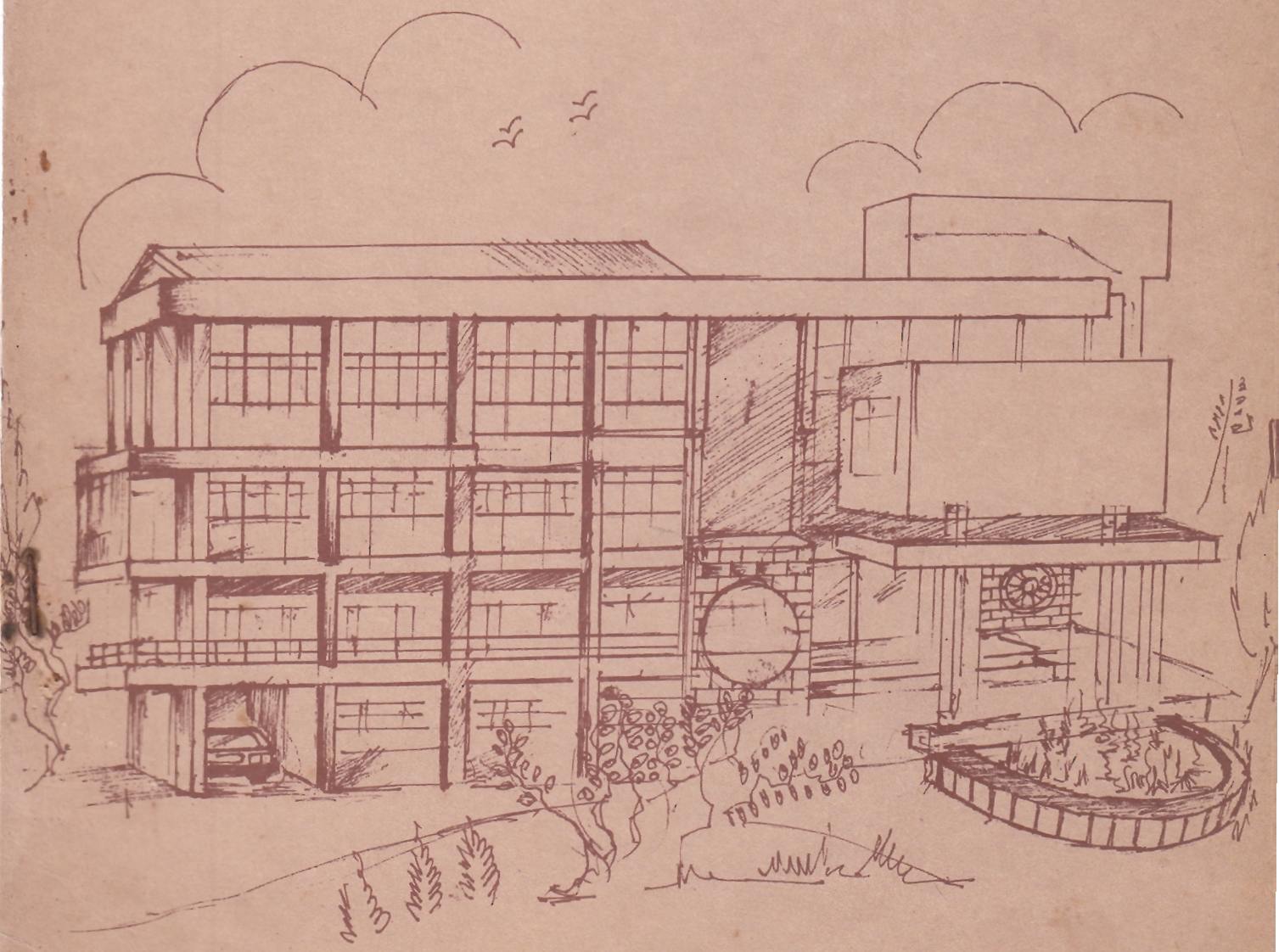
No. 2

MACRO ECONOMIC INFLUENCES ON EQUITY MARKET -INDIAN EVIDENCE

Prof.Ganesh Kumar N.
and
Dr.M.Obaidullah



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TAPMI WORKING PAPER SERIES NO.2
SEPTEMBER 1993

The objective of TAPMI working paper series is to help faculty members of TAPMI to test out their research ideas/findings at the pre-publication stage.

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ABSTRACT

This paper documents the impact of macro economic forces on stock prices. The empirical evidence available mainly relates to the developed stock markets and the ones in developing countries which are in transition. The lower level of efficiency of such markets and the frequent policy changes underscore the need for an alternative model. This paper proposes a model for one such developing market viz. the Indian market and observes that money supply, monsoon and industrial policy explain about fifty per cent of movements in the aggregate market.

MACRO ECONOMIC INFLUENCES ON EQUITY MARKET -INDIAN EVIDENCE

Stock prices are determined by investors' expectations which in turn are driven by economic fundamentals. However, these may also be purely irrational in a market dominated by 'noise traders'. The magnitude of impact of macro economic factors on stock prices is, thus an empirical question.

A large body of literature examines the relationship between stock prices and macro economic variables. Studies conducted for developed stock markets hypothesize that the two ultimate determinants of stock prices are the expected level of corporate earnings and the investors' required rate of return (see Box). A more complete explanation, however is offered in terms of macro economic variables which influence the above two and hence, stock prices. Of these, the ones which have received maximum attention of researchers are money supply and inflation.

The impact of money supply on stock prices is assumed to be an offshoot of the money supply's influence on the aggregate economy. The relationship between the growth rate of the stock of money and subsequent changes in the aggregate economic activity has been well-documented by Miltron Friedman and Anna Schwartz (1963). This work led several other researchers to investigate a hypothesised relationship between monetary variables and stock prices. According to this hypothesis, the initial impact of a change in money supply through open market operations of the monetary authorities is on the government bond market, then on corporate bonds, then on common stocks, and

subsequently on the real goods market. This transmission process would imply that changes in the growth rate of money supply should precede changes in the level of stock prices. Empirical evidence supporting this hypothesis is documented in some studies [Sprinkel (1964) and Palmer, (1970)] which concluded that changes in money supply generally lead stock prices. Several other studies [Cooper (1974) and Rozeff(1975)] found supporting evidence for the existence of relationship but noted a reverse lead-lag relationship. These studies found that stock prices in fact, lead money supply changes.

There are two contrasting hypotheses relating to the impact of inflation on stock prices. The "inflation illusion hypothesis" asserts that investors are not able to see through the nominal accounting statements of the company and respond to the reported rather than the real profits. It thus, hypothesises a positive relationship between inflation and stock prices. According to the "tax effects hypothesis," firms which show high profits due to inflation are penalised by extra tax burden (Summers, 1981). A negative relationship between inflation and stock prices is, therefore, expected. Researchers have also analysed the relationship between expected inflation, unexpected inflation and changes in expected inflation, and stock prices [Fama and Schewert (1977), Lintner (1975), Jaffe and Mandelka (1976) and Nelson (1976)]. All of them found that the relationship is negative, though the causality is in the reverse direction (i.e from stock prices to inflation.)

BOX

Theoretical Framework for Valuation of Aggregate Market

Expected value of a market is affected by (i) the expected price earnings (P-E) multiple and (ii) expected earnings, since it is essentially a product of the two.

$$P = \frac{P}{E} * E$$

The determinants of the P-E multiple are derived from the well known theoretical model which appears as follows:

$$P/E = \frac{D/E}{k-g}$$

Where D/E represents dividend pay-out ratio

g represents the growth rate individends or earnings

k represents the required rate of return

Thus, the P-E multiple is seen to have a direct relationship with the payout and growth rate and an inverse relationship with the required rate of return. The required rate of return, in turn, has two components; the rate of interest and the risk premium,. A change in either will have an impact on the P-E multiple in the opposite direction. Since risk premium is difficult to measure, empirical studies generally ignore this component and consider the rate of interest as a proxy for the required rate of return. Further, the pay out for the aggregate market is not likely to undergo major changes and hence, is ignored (it is however an important variable when the model is applied for valuation of individual stocks.) The ultimate determinants of stock prices are, therefore, taken to be expected earnings and the rate of interest.

The problem of explaining stock prices becomes more complex in developing countries which are in transition. The standard models from the western developed markets do not fit into the context of developing countries' underdeveloped markets for i) the markets are not efficient, and ii) investors may not be well informed, and iii)there are frequent policy changes. This problem is particularly important among those countries which are liberalising and globalising their economies. Indian economy perfectly fits into the above description. Thus, there is a need to develop an alternative model to explain the influence of macro economic variables on stock prices in India.

Several researchers of the west have hypothesized that it is the stock market activity which influences macro economic variables such as money supply. However, for a country like India, where stock market has gained prominence only recently, to say that stock prices influences the macro economic variables may be overstretching of one's imagination. One would rather tend to think that the stock prices are likely to reflect the influence of macro economic variables. Hence, in the proposed model below we don't account for the reverse causality of stock prices on macroeconomic variables. Evenn if there is some effect of stock prices on the macro variables, we assume that it is marginal.

The Proposed Model of Macro Economic Stock Prices Interface

We start of by saying that stock prices are determined by the expected corporate earnings (see the model given below). The expected corporate earnings in turn, is influenced by i) expected

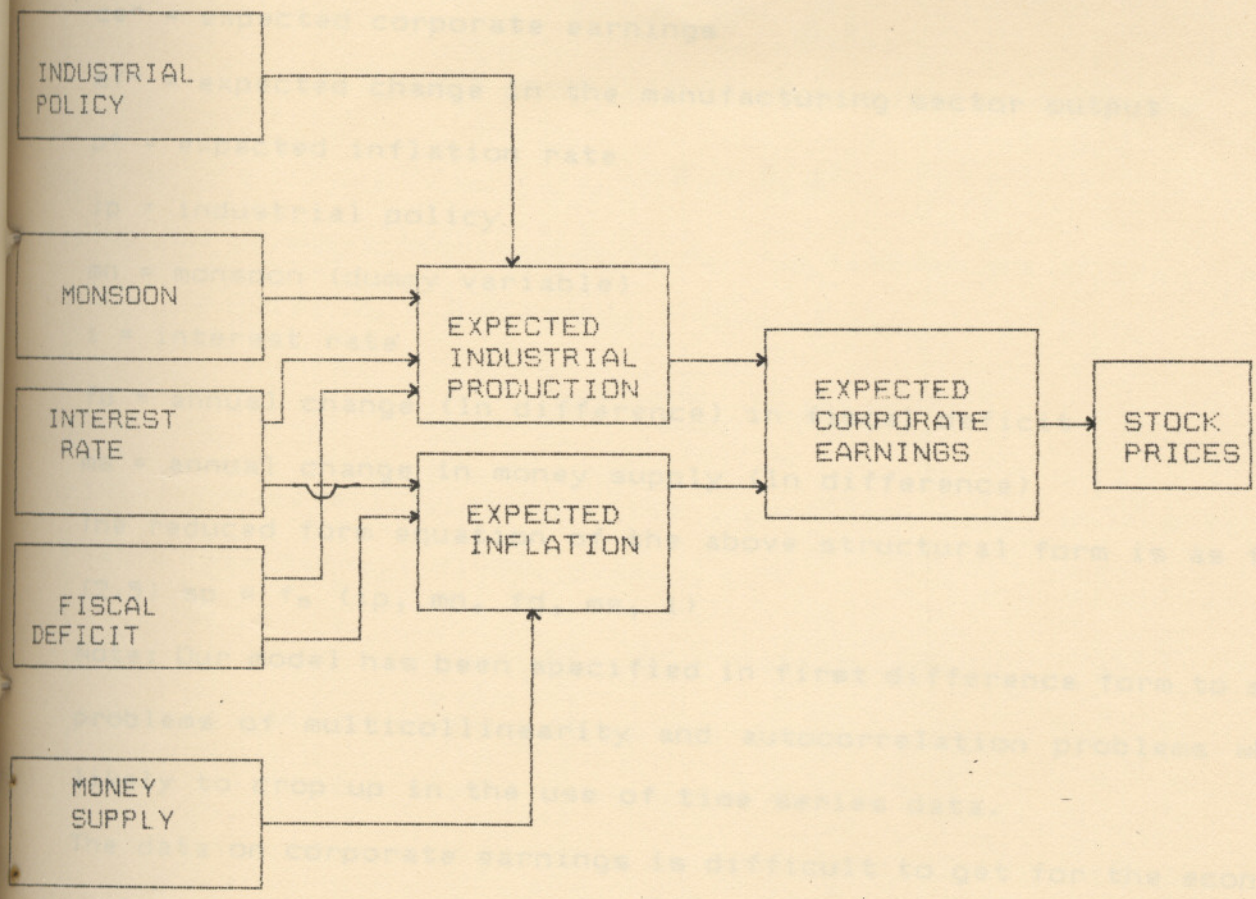
inflation and iii) expected industrial production. Higher the expected industrial production, higher will be the expected corporate earnings and vice-versa.

Expected industrial production is determined by a) industrial policy, b) interest rate (monetary policy), and c) fiscal deficit (fiscal policy), and d) monsoon conditions. It is necessary to include industrial policy separately because India has witnessed unprecedented liberalization of the economy since Rajiv Gandhi took over as Prime Minister in 1985. This is likely to have had substantial influence on investors' expectation. Fiscal deficit is an important summary measure of government's fiscal policy. Higher the government spending, it is likely that higher will be the fiscal deficit. Besides it is argued that fiscal deficit leads to 'crowding out' of private investment. There is also another argument that in developing countries government investment 'crowds in' rather than crowding out investment. Hence the relationship would be ambiguous and does not lend to any concrete hypothesis. Any macro model in India would be incomplete without bringing in the weather gods. Industry has got strong backward and forward linkages with the agricultural sector. Hence monsoon which affects agriculture, indirectly influences expectation about industrial production.

Expected inflation is influenced buy several variables. In our simple model, we hypothesize that it is influenced by money supply and fiscal deficit. The influence of money supply need not be argued by here as by now its influence is well recorded in

standard text books and many empirical studies. However, fiscal deficit's influence is less clear. To the extent that fiscal deficit is monetized we may see a direct link between increase in money supply and fiscal deficit. But it is argued that even if fiscal deficit is financed through borrowings, the agents feel that it will ultimately be financed through printing of money and hence incorporate that into their expectations. Some empirical studies, however, dispute this claim. They claim that in determination of inflation it is the monetized part of the fiscal deficit (i.e. budget deficit) which is relevant [See for example Modi (1992)].

Diagramatic Representation of the Proposed Model of Stock Price Determination



METHODOLOGY

We translate the simple model outlined in our previous section into structural form equations as follows:

(2.1) $sp = f_1 (ce^*)$

(2.2) $ce^* = f_2 (mf^*, p^*)$

(2.3) $mf^* = f_3 (ip, mn, i, fd)$

(2.4) $p^* = f_4 (fd, ms)$

Where the notations are as follows:

sp = annual change (ln difference) in stock prices.

ce* = expected corporate earnings

mf* = expected change in the manufacturing sector output

p* = expected inflation rate

ip = industrial policy

mn = monsoon (dummy variable)

i = interest rate

fd = annual change (ln difference) in fiscal deficit

ms = annual change in money supply (ln difference)

The reduced form equation of the above structural form is as follows:

(2.5) $sp = f_5 (ip, mn, fd, ms, i)$

Note: Our model has been specified in first difference form to avoid the problems of multicollinearity and autocorrelation problems which are likely to crop up in the use of time series data.

The data on corporate earnings is difficult to get for the economy as a whole. Hence, the question of estimating expected corporate earning does not arise. Hence, we substitute equation (2.2) into (2.1) and estimated the equation of the following form-

(2.6) $sp = a_0 + a_1 mf^* + a_2 p^* + u1_t$

When we estimate equation (2.6), we have to first estimate the expected changes in manufacturing sector output (mf*) and expected inflation (p*). Expected inflation rate series have been generated based on the

inflation series generated from the the data on wholesale prices. We tried several alternative ways of estimation of mf* and p*. These were as follows:

i) $X_t^* = X_{t-1}$

ii) $X_t^* = X_{t-1} * (X_{t-1} / X_{t-2})$

Note: Subscipt denotes time and superscript 'e' means expected value.

iii)Adaptive expectations model. We use a distributed lag model with Koyk's geometrically declining weights. The basic model can be stated as follows [see Maddala(1989, p.341)]:

$$X_t^e = \sum_{i=1}^{m} \beta_i X_{t-i}$$

If β_is are goemetrically decreasing we can write,

$$\beta_i = \beta_0 \lambda^i$$

The sum of indefinite series is β_0 /(1- lambda) and if this sum is equal to 1 we have, β_0 = 1 - lambda. Thus we get,

$$X_t^e = \sum_{i=1}^{m} (1-\lambda)\lambda^i X_{t-i}$$

This is essentially an adaptive expectation model of the form given below (see Maddala (1989, p.341):

$$X_{t+1}^e - X_t^e = (1-\lambda)(X_t - X_t^e)$$

We tried out different values for lambda ranging from 0.1 to 0.9 to arrive at various expectation series.

Most of the models of expectation take into account only the past data into account while estimating the expected values with varying weights attached to the values of different values. However, in the real life setting, particularly the players in the stock market, this could be only one set of data considered by the investors in their decisions. In the Indian context, this assumes all the more importance because of drastic changes in the industrial policies announced by the government every year since 1985. The investors look at the possible enhancement in

inflation series generated from the the data on wholesale prices. We tried several alternative ways of estimation of mf* and p*. These were as follows:

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earnings of corporate sector subsequent to the liberalisation. It may or may not turn out to be true. But, the expectations influence the stock prices. Thus past data may be poor indicator of the future performance. We estimated the reduced form model from the system of equations (2.1) through (2.4), which is given below.

(2.7) $sp = b_0\ ip + b_1\ mn + b_2\ fd_t + b_3\ ms + b_4\ i + u2_t$

The reduced form of the model (2.7) is fairly simple and does not require us to estimate any expected values. Yet it gives us idea about the price formation process in the stock markets. It is often argued that liquidity overhang influences other macro economic variables. Hence, we tried out lags (1 year and 2 years) in case of money supply.

Measurement of Variables and Data Base of the Study

The study pertains to the period 1953-54 to 1990-91. The upper and lower bounds to the data base were dictated by the availability of data. Since we are looking at the effect of macro economic forces on the stock market in general, we considered index for the market as whole. We took the RBI index for industrial security prices as an index of stock market activity in the economy. Since most of the macroeconomic data are available only on an annual basis we had to take the RBI securities index also on an annual basis. Other variable were measured as follows:

Industrial Policy (ip) : Indian economy has seen substantial changes in economic policies year after year since 1984-85[1]. We took this as a dummy variable as it is not possible to measure this variable very accurately. The dummy variable 'ip' takes on the value 0 for the years up to 1983-84 and 1 thereafter.

Monsoon (mn) : Despite over 40 years of planned development, the economy continues to depend on the agricultural sector for the overall health of the industry in particular and the economy in general. Thus, the

[1]CMIE, 1990, Liberalisation Process, gives a chronology of industrial polciy changes in the Indian economy. Major changes commence from the year 1985

expectationary process of industrial output for any given year is strongly influenced by the monsoon conditions. We consider a year to be a bad monsoon year if the rainfall falls below the normal by over 10 per cent. The dummy variable for monsoon (mn) takes on the value 0 during the normal years and 1 during bad monsoon year.

Interest Rate

Interest rate is perhaps a crucial variable in the determining the stock prices. The problem is: what interest rates to chose when myriads of interest rates are available. We considered the following interest rates : SBI lending rate, Deposit interest rates (less than 1 year. 1-3 year, 3-5 years) and the bank rate. For the period 1960-61 to 1990-91 data on all these interest rates could be obtained. Whereas, for the years prior to 1960-61 reliable data on all these variables were not available. To avoid the use of many interest rates which can result in the problem of multicollinearity, we extracted the first principal component of the five different interest rates and used it as the representative interest[2].

Fiscal Deficit (fd): This is another important macro variable which captures fiscal policy aspects in a summary. Here 'fd' is defined as follows:

Fiscal deficit = Revenue expenditure + Capital disbursements - Revenue receipts - Recovery of loans and advances.

Money Supply(ms): We have taken the broad money (M3) for our analysis. The variable 'ms' for any year is the ln difference of stock of M3 as on March 31 of year over that during the previous year. The data sources for these variables are given in appendix.

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[2]This approach is recommended by Maddala (1989, p.238). He argues that such principal components could be considered as the 'latent interest rate.

FINDINGS AND DISCUSSION

We ran the two models (2.6) and (2.7) for two periods 1953-54 to 1990-91, and 1960-61 to 1990-91 separately. As discussed already this was necessitated by the non-availability of data relating to all interest rates for the period prior to 1960-61. This will also help us to examine the stability of the parameters.

The model (2.6) produced poor results. All the expectation series of price as well as industrial output turned to be statistically non-significant (refer Tables 1 and 2). This only brings out the limitations of generating expectation series through adaptive expectations method using past data.

Alternatively, we estimated the model (2.,7) . The results of this experiment, reported in Tables 3 (for the period 1953-54 to 1990-91) and Table 4 (1960-61 to 1980-91), are encouraging. We can make the following inferences from the two tables:

1. The variables included explain the stock price formation reasonably well, with highest adjusted R-squared values of 0.40 (equation 3, Table 3) and 0.50 (equation 5, Table 4) for the two periods. However, it appears that our model excludes some more crucial variables.
2. Since the equations 3, Table 3, and equation 5, Table 4 show highest adjusted R-squared, we use these for our further inferences. As expected, the variables money supply (with a lag of one period), monsoon, and industrial policy variables are all statistically significant and are of expected signs. Fiscal deficit has only a weak relationship with the stock prices as it is significant at 10% level for the period 1953-54

to 1990-91 but not significant even at 10% level for the period 1960-61 to 1990-91.

Interest rate as first principal component or other wise was not found to be statistically significant.

3. What is interesting to note is that, the actual growth of output in the manufacturing sector or the growth of GDP had no significant influence on the stock prices (*). Whereas the industrial policy variable has significant influence. This essentially means that in determination of stock prices, it is not the actual growth of the manufacturing sector that is important but the expectation of the investors that the economy is likely to grow faster with liberalization.

Explanation of the Post 1985 Stock Market Boom

During the Post 1984-85 period the Indian stock market has shown unprecedented boom. As per our finding, the main reasons for this are : a) consistently favourable monsoons; b) augmented money supply; c) the policy of liberalization; and d) enhanced government spending. If we examine the data for these variables for the period before and after 1984-85, marked differences are noticeable (see Table 5).

Even though the policy of expanding money supply and having larger fiscal deficit (which are at least partially related to each other) seem to have positive impact on the stock prices, the

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(*) We have not reported all these results in the paper for the sake of brevity.

government could not have continued with this policy too long as it had resulted in Balance of payments deficit and spiralling inflation towards the end of 1980s. As a part of the New Economic Policy package the government has taken firm measures to cut the growth of fiscal deficit and money supply. As per our results these measures are likely to check the rise in stock prices. However continued policy of liberalization should give a boost to stock prices which had bottomed out subsequent to the scam.

For quite some time to come, the new booms are unlikely to reach anywhere near the pre-scam iundex for the simple reason that two important variables which have positive influence on stock prices will be under check as the government is likely to continue with its policy of reduction of fiscal deficit and keeping the growth of money supply under control for some more time in its efforts to stabilize the economy.

The event of scam brings to the fore another factor which has not been considered in the simplified model discussed above. A shift in the risk premium resulting from changes in perceived risk in equity investment may change the required rate of return and affect the P-E multiple. As noted earlier, studies conducted for the developed markets consider interest rate as a proxy for the required rate of return. In effect they assume risk premium to remain constant. The assumption does not hold good when an event like scam results in a dramatic increase in the perceived risk of investors in equity and thus adversely affects the P-E multiple.

Under such circumstances, the stock price level would not move in correspondence with the expected earnings only, this has been observed in the post scam phase where stock prices have not moved up even though expected earnings have gone up due to strong fundamentals. However, a scam is a an aberration in the normal functing of stock markets. Similar abberrations may take place due to technical factors where demand and supply of securities are not in balance. Indian markets have witnessed a period when demand for scrips far outstripped the supply of scrips in the market. This was due to an increase in the flow of funds into the market coupled with artificial erstwhile CCI restrictions on raising of funds from the market. The result was a high P-E multiple not justified by the underlying fundamentals and hence high sock prices. In the long run, however, such aberrations do not matter in the determination of the level of stock prices and the model does well to ignore these.

Conclusion

In this paper we attempted to explore the impact of macro economic variables on stock prices. The variables that had significant influence on stock prices are: money supply, industrial policy, monsoon, and fiscal deficit. This study is only exploratory in nature and requires further investigation through more complicated models. Such models may include more variables and take into account the possibility of reverse casuality, if any, among the variables, particularly from stock prices to other variables. Since stock market has assumed

importance in the economy only recently, such models could be tried out using monthly or quarterly returns data. Such analysis could be of use to policy makers, mutual funds and the investing public at large.

Data Sources

1. RBI, Report on Currency and Finance, Various issues.

   Interest rates, Money supply, Budget related data, Index of security prices (1980-81 to 19890-91)

2. Chopra S., (1988), Inflation, Household Savings and Economic Growth, Unpublished Ph.D. thesis submitted to M.S.Univ., Baroda.

   Index of security prices (1950-51 to 1979-80). Chopra worked out continuous series of stock price index for the period 1950-51 to 1979-80, with 1970-71 as the base, after making some adjustments for the change of composition of index.

3. CSO, National Accounts Statistics, Various issues.

   Data relating to total GDP, GDP originating from industrial sector.

4. Chandok B.L. and The Policy Group, India Database - The Economy, New Delhi. Whole sale price index

References

Cooper, R.V.L., (1974), "Efficient Capital Markets and the Quantity Theory of Money," **Journal of Finance**, June.

Fama, F.E. and G.W.Schewert (1977), "Asset Returns and Inflation", **Journal of Financial Economics**, 5, Nov.

Friedman M. and A.J.Schwartz, (1963), "Money Supply and Business Cycles," Reviewed in **Economics and Statistics**, 45, No.1, Feb.

Jaffe, J.F. and G.Mandelker, (1976), "The 'Fischer Effect' for Risk Assets: An Empirical Investigation", **Journal of Finance**, 31, May.

Lintner, J., (1975), "Inflation and Security returns", **Journal of Finance**, 30, May.

Modi, R.J., (1992), " Fiscal Deficit and Stabilisation Policy", **Economic and Political Weekly**, 27(7), Feb 15, pp 325-6.

Maddala, G.S.,(1989), **Introduction to Econometrics**, Macmillan Publishing Co., New York.

Nelson C.R., (1976), "Inflation and Rates of Return on Common Stocks," **Journal of Finance**, 31, May.

Palmer, M., (1970), "Money Supply, Portfolio Adjustments and Stock Prices," **Financial Analysts Journal**, 26, No.4, July-Aug.

Rozeff,M.S., (1975), "Money Supply and Stock Market," **Financial Analysts Journal**, 31, 5, Sept.-Oct.

Sprinkel,B.W., (1964), **Money and Stock Prices**, Homewood, Richard D.Irwin.

Summers, L.H., (1981), **Inflation and the Valuation of Corporate Equities**,National Bureau of Economic Research, Working paper no.824.

Table 1. Relationship between Stock Prices and Expected Industrial Production (1960/61 - 90/91)

Expectation Var.	Const.	Coeff	R^2	DW
iet1	0.0540	0.3744	0.0081	1.5120
	(1.1042)	(0.4860)		
iesq	0.0827	-0.0446	0.0303	1.3480
	(3.0586)	(0.9514)		
iel1	0.0488	0.4725	0.0109	1.5205
	(0.9389)	(0.5643)		
iel2	0.0473	0.5855	0.0139	1.5272
	(0.7694)	(0.6393)		
iel3	0.0362	0.7096	0.0166	1.5310
	(0.6020)	(0.7007)		
iel4	0.0292	0.8410	0.0185	1.5302
	(0.4430)	(0.7393)		
iel5	0.0221	0.9772	0.0190	1.5248
	(0.2990)	(0.7498)		
iel6	0.0154	1.1080	0.0176	1.5139
	(0.1800)	(0.7199)		
iel7	0.0089	1.2406	0.0142	1.4192
	(0.0852)	(0.6475)		
iel8	-0.0134	1.6988	0.0132	1.4941
	(0.0937)	(0.6240)		
iel9	-0.3112	8.3142	0.1019	1.7135
	(1.4551)	(1.8140)		

Note:

iet1 refers the expectation model : $Xt^e = Xt-1$

iesq : $Xt^e = Xt-1 * (Xt-1/Xt-2)$

iel1 to iel9 respectively refer to Koyk's model of adaptive expectation with lambda values ranging from 0.1 to 0.9.

Table 2. Relationship between Stock Prices and Expected Inflation (1960/61 - 90/91)

Expectation Var.	Const.	Coeff	R^2	DW
pet1	0.1030	-0.3991	0.0243	1.4489
	(2.4255)	(0.8499)		
pesq	0.0731	0.0007	0.0016	1.4683
	(2.7704)	(0.2179)		
pel1	0.1056	-0.4357	0.0249	1.441
	(2.3693)	(0.8602)		
pel2	0.1086	-0.4788	0.0254	1.4457
	(2.3037)	(0.8691)		
pel3	0.1118	-0.5242	0.0251	1.4457
	(2.2145)	(0.8639)		
pel4	0.1143	-0.5615	0.0230	1.4437
	(2.0802)	(0.8254)		
pel5	0.1147	-0.5701	0.0181	1.4394
	(1.8767)	(0.7306)		
pel6	0.1076	-0.4751	0.0092	1.4355
	(1.5514)	(0.5191)		
pel7	0.0814	-0.1044	0.0003	1.4443
	(1.0402)	(1.0726)		
pel8	0.0230	0.7859	0.0154	1.5023
	(0.2863)	(0.6729)		
pel9	-0.0349	2.0374	0.0990	1.6505
	(0.5296)	(1.7851)		

Note:

pet1 refers the expectation model : $X_t^e = X_{t-1}$

pesq : $X_t^e = X_{t-1} * (X_{t-1}/X_{t-2})$

pel1 to iel9 respectively refer to Koyk's model of adaptive expectation with lambda values ranging from 0.1 to 0.9.

Table - 3 Regression Results of Model (2.7) : 1953/54 - 1990/91

Constant	msl1	mn	ip	fd	wpi	ms	bri	sbi	R^2	$Adj.R^2$	DW Stat
1. -0.0029	0.7395	-0.1116*	0.1106@	-	-	-	-		0.4169	0.3638	2.0919
(0.0491)	(1.6158)	(2.9694)	(2.1506)	-	-	-	-		(7.863)		
2. -0.0096	0.6382	-0.1136*	0.1087@	-	-	0.1592	-	-	0.4179	0.3452	2.0802
(0.1445)	(1.0241)	(2.9138)	(2.0613)	-	-	(0.2438)	-	-	(5.744)		
3. -0.032	0.8494#	-0.1335*	0.1@	0.1691#	-	-	-	-	0.4667	0.4001	2.1269
(0.5309)	(1.8919)	(3.4562)	(1.9892)	(1.7298)	-	-	-	-	(7.002)		
4. -0.0164	1.0354#	-0.1072*	0.0984#	-	-0.3556	-	-	-	0.4338	0.363	2.121
(0.2681)	(1.8869)	(2.8303)	(1.8593)	-	(0.9788)	-	-	-	(6.129)		
5. 0.0005	1.1187#	-0.1115*	0.1327@	-	-	-	-0.0053	-	0.4281	0.3566	2.1202
(0.0084)	(1.6853)	(2.9491)	(2.2583)	-	-	-	(0.7988)	-	(5.988)		
6. 0.0229	1.2581#	-0.1105*	0.1373@	-	-	-	-	-0.0139	0.4361	0.3656	2.1434
(0.3559)	(1.8636)	(2.9494)	(2.3930)	-	-	-	-	(1.0438)	(6.186)		

Note:

1. Figures in parenthesis are t-ratios for the coefficients and F-ratios for R
2. Notations are as follows
   - ms : money supply (current)
   - msl1 : Money supply with lag of one period
   - msl2 : Money supply with lag of two periods
   - mn : Dummy for monsoon
   - ip Dummy for industrial production
   - fd Fiscal deficit
   - Wpi Inflation based on wholesale price index
   - bri Bank rate of interest
   - Sbi SBI lending rate

* 1 percent level
@ 5 percent level
\# 10 percent level

Table 4 Regression Results of Model (2.7) : 1960/61 - 1990/91

Constant	msl1	mn	ip	fd	wpi	ms	msl2	bri	pci	R^2	Adj.R^2	DW Stat.
1. -0.1118	1.4715@	-0.1144@	0.0994#	-	-	-	-	-	-	0.5255	0.4686	2.4466
(1.3383)	(2.4981)	(2.7666)	(1.9623)	-	-	-	-	-	-	(9.230)		
2. -0.101	2.0693@	-0.1151*	0.1044@	-	-	-	-0.7112	-	-	0.5423	0.466	2.4357
1.1946	(2.3813)	(2.7774)	(2.0438)	-	-	-	(0.9376)			(7.109)		
3. -0.1115	1.4479@	-0.1153@	0.1006#	-	0.0397	-	-	-	-	0.5257	0.4467	2.4518
(1.3071)	(2.2321)	(2.6705)	(1.8976)		(0.0970)					(6.650)		
4. -0.1086	1.5149#	-0.1141@	0.0998#	-	-	-0.0668	-	-	-	0.5256	0.4466	2.4519
(1.1448)	(1.8562)	(2.6986)	(1.9227)			(0.0786)				(6.649)		
5. -0.1098	1.3698@	-0.1434*	0.0919#	0.187	-	-	-	-	-	0.5733	0.5021	2.379
(1.3577)	(2.3883)	(3.2768)	(1.8649)	(1.6386)	-	-	-	-	-	(8.060)		
6. -0.0674	2.025@	-0.1131@	0.1267@	-	-	-	-	-0.0163	-	0.5451	0.4693	2.5146
(0.7155)	(2.5255)	(2.7359)	(2.2111)					(1.0166)		(7.190)		
7. -0.1705	1.8708@	-0.1129@	0.1225@	-	-	-	-	-	0.0279	0.5369	0.4598	2.5013
(1.5007)	(2.3724)	(2.7045)	(2.0681)	-	-	-	-	-	(0.7697)	(6.957)		

Note:

1. Figures in parenthesis are t-ratios for the coefficients and F-ratios for R
2. Notations are as follows
   - ms : money supply (current)
   - msl1 : Money supply with lag of one period
   - msl2 : Money supply with lag of two periods
   - mn : Dummy for monsoon
   - ip Dummy for industrial production
   - fd Fiscal deficit
   - Wpi Inflation based on wholesale price index
   - bri Bank rate of interest
   - Sbi SBI lending rate
   - Pci First principal component of interest rates

* 1 percent level
@ 5 percent level
\# 10 percent level

TABLE 5. Average Values of the Important Variables

Period	Growth of M3	Growth of Fiscal Deficit	Monsoon #	Industrial Policy
1953-54 to 1983-84	0.1184	0.1184	0.3871	0
1960-61 to 1983-84	0.1270	0.1173	0.3750	0
1984-85 to 1990-91	0.1621	0.1639	0.2857	1

This is a dummy variable. Higher the value in this column, the higher is the incidence of drought.