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STOCK MARKET CONSEQUENCES OF MACRO ECONOMIC FUNDAMENTALS

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ABSTRACT

It is concluded in the study that the Valuation Ratio will be independent from the Equities if equity-elasticity is equal to one. However, Market Capitalization depends on the investment in equities and the market liquidity. The model has been tested in the context of Pakistan and the Monetary and Fiscal policies have been found as the significant determinants of the Market Capitalization.

STOCK MARKET CONSEQUENCES OF MACRO ECONOMIC FUNDAMENTALS

I. INTRODUCTION

The impact of monetary and fiscal policies cannot be ignored in stock market analysis. The stock market is not a “cause” of economic growth but it is a reflector of the economic growth. The effects of public policies on economic growth can be measured by the growth of the stock market.

Day to day events and news are reflected in the stock market, some of them may be relevant to the stock market as they indicate the changes in the economic and financial fundamentals. Other may be irrelevant. Although, stock market is often viewed as “informationally efficient”, negative events and “ bad news” develop their impact consistently faster than positive elements and “ good news”. Despite this, the fundamental changes in economic structure and policies are more important than the current news. Although, day-to-day fluctuations in stock prices depend on the news largely, the long-term changes in market capitalization are directly related to the fundamental variables. The average prices for one year do not reflect the effects of the news or rumors. They reflect the effects of the economic fundamentals.

The net profit, expectation about future returns, dividend announcements, changes in corporate governance and expected change in the market share of the firm's products are the factors which can affect the market capitalization of a company. At macro level, the magnitude of the investment in equities and market liquidity are more important. So, it is necessary to study the macro economic variables and their relation with the stock market.

The effects of economic changes on market capitalization have been tested in the study. The relevant economic factors have been classified in two broad categories: (1) demand factors, and (2) supply factors.

It is hypothesized that market capitalization depends on the total funds invested in the listed companies' (EQUITIES) and market liquidity (LIQUIDITY) in the long-term.

II. MODEL SPECIFICATION

(A) The funds invested in equities (Supply of shares):

According to the Keynesian approach, investment has a direct correlation with change in Gross Domestic Product (GDP). It has been concluded in the finance literature that change in GDP must be reflected in the equities of joint stock companies [Blanchard (1981); Bosworth (1975); Breshnahan (1992); Diamond (1967); Fair (1979); Fischer and Merton (1984);]. Similarly, ‘GDP’ can also affect the market capitalization and its effects can also be captured through the equities (Blanchard: 1981).

Equities appear in balance sheets at historical cost. So, they show the effects of economic growth in real term. Funds in the equity market may be raised through sponsor's equities, public offerings, right or bonus issues and retained earnings. A higher amount of investment in equities shows a higher amount of available stocks or supply of shares.

It is a common view that market capitalization should increase with the growth in equities. The change in equities may be an outcome of higher retention. In this case investment will be raised without additional funding. The same is the case with the issuance of bonus shares. In case of the bonus, the number of shares will increase, but the new funds will not be injected in the market. The addition in the equities through right issues requires additional investment from available funds. The growth of equities may increase the market capitalization.

(B) The available funds in the market (Demand for shares):

The change in market capitalization also depends on liquidity in the market. By market liquidity, we mean funds available for investment. The funds may be generated through individual savings, surplus funds available in financial institutions, and inflow of foreign investment. The funds indicate the demand for available stock.

It is notable that liquidity in the market is always created by change in the money supply. Liquidity has been defined in the study, as a residual of the change in money supply after deduction of public borrowing and time deposits. In this way the effects of monetary and fiscal policies can be tested. On the bases of the above discussion we have established the following propositions:

- **Proposition (I): " Market Capitalization (MC) is determined by the interaction of the magnitudes of market liquidity (LIQUIDITY) and the listed equities (EQUITIES)".**

It is obvious that market liquidity cannot be equal to zero; otherwise market capitalization will also be zero. Similarly a positive value of the listed equities should also be assumed for a positive market capitalization. So, the model should incorporate the condition of zero market capitalization in case of the non-positive equity or liquidity.

- **Proposition (II): "The Liquidity-elasticity (ϵ_L) and the Equity-elasticity (ϵ_E) of the Market Capitalization (MC) are constants. So, Market Capitalization (MC) has a double-log (Cobb-Douglous) type of functional form".**

According to this proposition, Market Capitalization (MC) will be zero if either equity or market liquidity is zero. So, to incorporate this condition, we adopted the double log form of equation. In the prescribed functional form, if, equity or market liquidity is equal to zero the market capitalization will also be zero. According to the specified model, Market Capitalization (MC) can be written in the following functional form:

$$MC = f (EQUITY, LIQUIDITY) \text{ ----- (1)}$$

$$MC = \alpha EQUITY^{\beta1} LIQUIDITY^{\beta2} \text{ ----- (2)}$$

Where, ' α ', ' $\beta1$ ' and ' $\beta2$ ' are the parameters

$$VR = MC / EQUITY \text{ ----- (3)}$$

Where, 'VR' is the valuation ratio.

$$VR = (\alpha EQUITY^{\beta1} LIQUIDITY^{\beta2}) / EQUITY \text{ --(4)}$$

$$VR = \alpha EQUITY^{\beta1 - 1} LIQUIDITY^{\beta2} \text{ ----- (5)}$$

Now, we can establish the following corollaries.

Corollary (1):

" The valuation ratio (VR) will be independent from equities (EQUITIES) if equity-elasticity ($\beta1$) is equal to one. In this case the valuation ratio (VR) will not be affected by any change in the equities (EQUITIES). If, equity-elasticity ($\beta1$) is less than one, then a positive change in equities (EQUITY) will negatively affect the valuation ratio, and if it is greater than one, the increase in equities (EQUITIES) will be a cause of a positive change in the valuation ratio (VR)".

Corollary (2):

" The percentage change in Market Capitalization (MC) will be equal to the percentage change in equity (EQUITIES), if equity-elasticity (β_1) is equal to one. The percentage change in the value (MC) will be less than the percentage change in equities (EQUITIES), if ' $\beta_1 < 1$ '. Similarly, if equity-elasticity (β_1) is greater than one, the percentage change in the market capitalization (MC) will be greater than the percentage change in the equities (EQUITIES)."

Corollary (3):

" Excess market liquidity and a liquidity crunch in the market will not affect the market capitalization (MC), if market liquidity-elasticity (β_2) is equal to zero. The percentage change in market capitalization (MC) will be less than the percentage change in market liquidity (LIQUIDITY), if $\beta_2 < 1$. Similarly, if liquidity-elasticity (β_2) is greater than one, the percentage change in the market capitalization (MC) will be greater than the percentage change in the market liquidity (LIQUIDITY)".

(C) The Role of Monetary and Fiscal Policies

For simplification purpose, we divide the sources of market liquidity into two components namely,

- 1) Supply of Money (M1)
- 2) Public borrowing by the government and new issue of corporate or government bonds (PDBT).

Several studies show - or often simply assume - the existence of a public borrowing, which is linked to funds' supply constraints. Many research studies consistently underline the role, at the macroeconomic level of liquidity constraints.

Public debt (PDBT) is a major cause of decline in the market liquidity. In the estimation of market capitalization, we applied Public Debt (PDBT) as an explanatory variable. The public Debt (PDBT) is directly related with Budget Deficit. The determinants of Budget Deficit have also been shown in figure 2. This figure has been taken from (Mehtar: 1992).

It can be concluded that any thing that can change the size of available funds in the market will change market capitalization. The available funds in the market are invested in equities and risk free debts instruments. Government offers gilt-edged securities, which divert funds from equities to government bonds. The out flow of funds from equity market will be an obvious cause of decline in stock prices. An attractive offer in gilt-edged securities always creates a selling pressure in the equity market. The fiscal deficit of the government is the basic reason for public borrowing.⁵

The central bank of a country can also play an important role in the determination of stock prices (or market capitalization) through change in the money supply. A higher liquidity in the market creates higher demand for shares in the market. Thus, increases market capitalization.

Money supply is a liability, it always appeared in the credit side of the central banks' balance sheet. The balance sheet of a central bank shows three major factors of change in money supply. These factors are:

- 1) Change in foreign exchange reserves and approved stocks of gold and silver (FEX).
- 2) Change in bank credits to private and public sectors (CR).
- 3) Financing facility to government for budget deficit and commodity operation (UCB).

Any change in the above-mentioned variables, will be a cause of change in the money supply and the change will lead to the change in market capitalization.

Inflow of foreign portfolio investment is also considered as an important source of foreign exchange; it is a part of money supply.

III. THE DATA AND ESTIMATION METHODOLOGY

To test the hypotheses we developed an econometric model. The simultaneity in the model has been shown in figure: 1. The model consists of one behavioral equation and five accounting identities. The six endogenous variables are explained by the accounting identities and the behavioral equation. Budget Deficit (BUDE), Foreign Exchange Reserves (FEX), Banks Credits to Public and Private Sectors (CR), Equities (EQUITIES), External Borrowing, Use of Cash Balance (UCB), Time Deposits (TD) and last year's Money Supply ($M2_{(T-1)}$) are the exogenous (or policy) variables. The list of variables has been presented in table: 1. The complete model has been shown by figure: III.

The money supply can be estimated by monetary assets (M2). However, Time Deposits (TD) is a part of money supply (M2), which is not available for investment in marketable securities, because commercial banks are not allowed to invest the deposits in the stock market. As a result, time deposits cannot affect the market capitalization. So, it should be excluded from the money supply (M2). So to say, a narrow definition of money supply (M1) should be applied as an explanatory variable.

The hypothesis has been tested in the context of the Pakistan economy. However, it can be tested in international context. A cross-country comparison will also be appropriate. We adopted a time series approach in the analysis and the annual data is used. The data have been extracted from a variety of sources, covers the period of 1980-2000. Data on market capitalization has been extracted from the 'Balance Sheet Analysis' (SBP). Money supply has been taken from the annual reports of the State Bank of Pakistan. The other macro-economic variables have been extracted from the various issues on Economic Survey (Government of Pakistan). The data on equities have been taken from the annual reports of the Karachi Stock Exchange.

We have 21 observations for each variable. The number of observation is adequate for our analysis, because we are estimating only three parameters. We simulated the data to measure the prediction power of the model. Ex-anti simulations³ have also been made for the year of 2001-03.

We applied a double-log functional form to estimate constant elasticity parameters. After transformation of data into natural logarithms, we tested the co-integration and causality in the model. To test the co-integration among the variables, we applied Johansen's technique. Results of the co-integration tests are shown in table: 3. Non-stationarity in the individual series is a necessary condition for co-integration among the variables. For this purpose, we applied Augmented Dickey-Fuller (ADF) approach without intercept and trend at the first level lag differences to perform Unit Root Test (URT). The hypothesis of Unit Root has been re-tested through Phillip Person (PP) test. The results of Unit Root Test (URT) are shown in table: 2. Results confirm that the data is applicable for the above-mentioned model and there is no problem of 'Non-stationarity' or 'Unit Root'.

Before estimation of the parameters, we tested the causality through Granger's approach. The tests conclude that 'Equity' and 'Liquidity' are Granger causes of Market Capitalization.

The model is valid only for normal changes. The heavy changes in the market capitalization because of the abnormalities have been captured by dummy variables (DUM2 and DUM3). Those dummy variables in the model explain the increasing role of brokerage houses in Pakistan capital market in 1994 (DUM2) and the adverse effects of conditionalities and sanctions since 1998, after nuclear detonation (DUM3).

FIGURE: I
SIMULTANEITY IN THE MODEL
ECONOMIC POLICY IMPACT ON THE STOCK MARKET

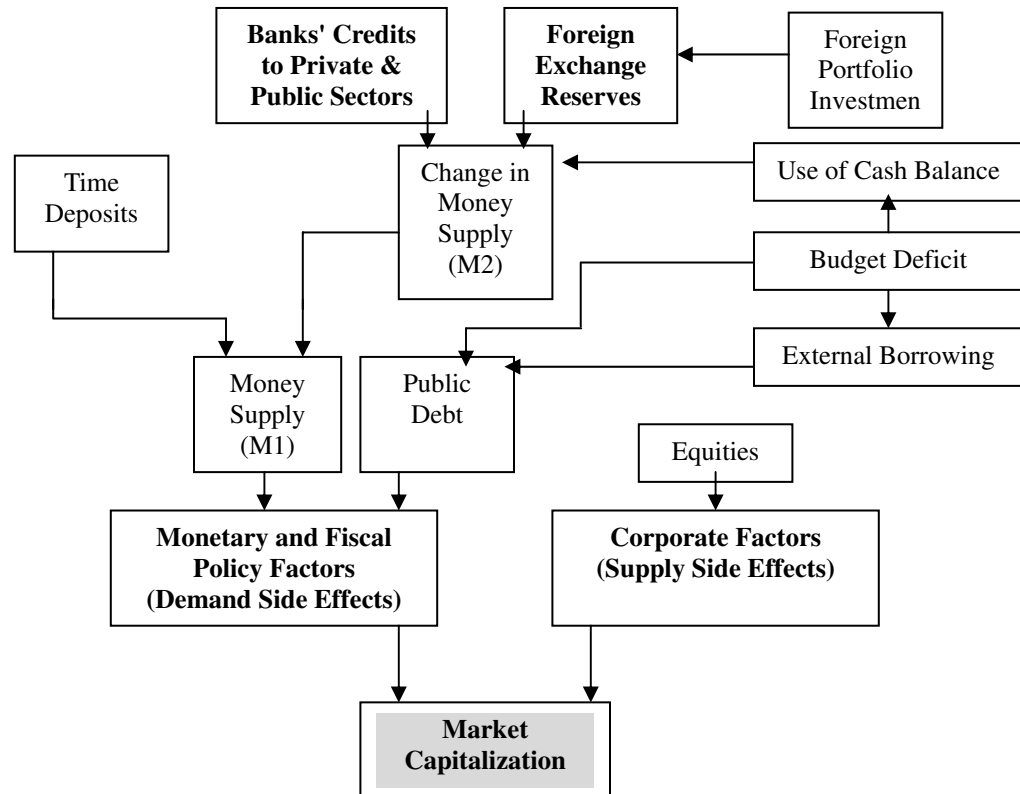


FIGURE: II
PUBLIC FINANCE LINKAGES

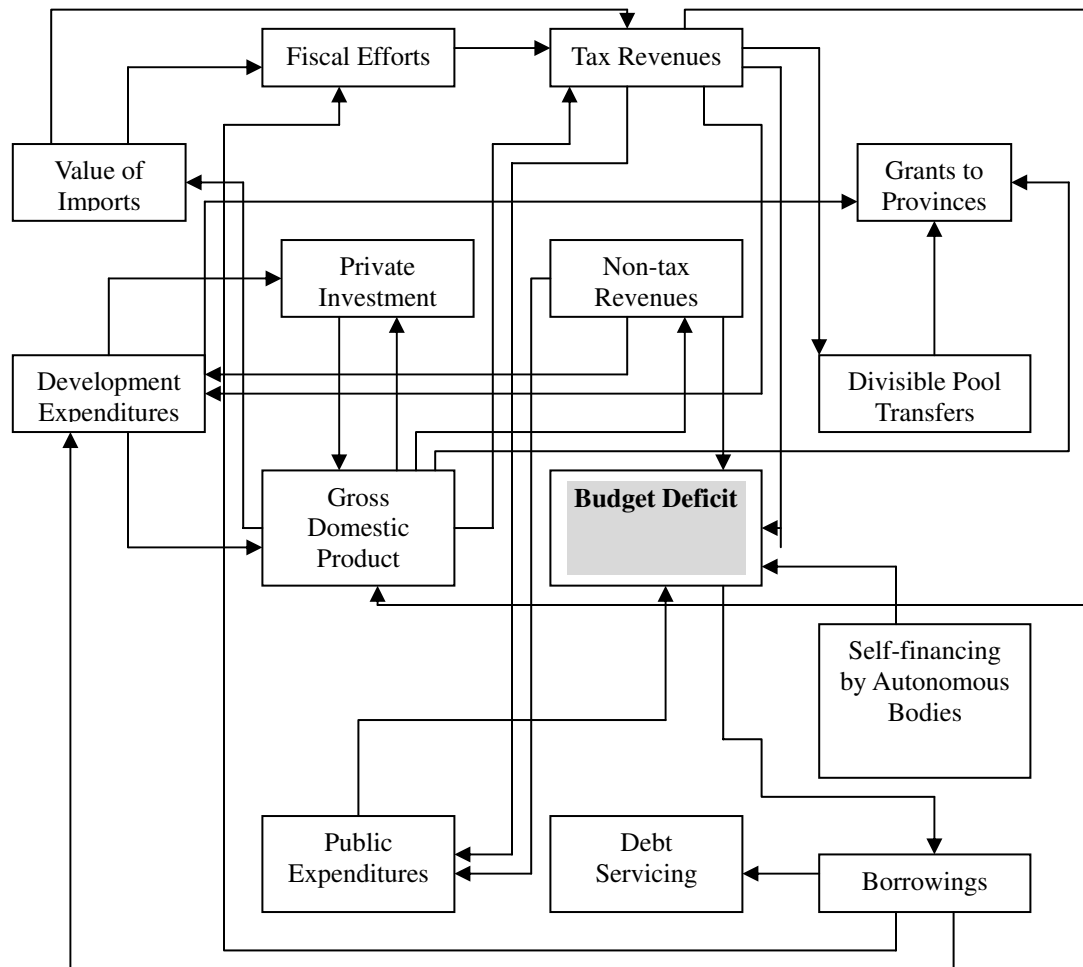


TABLE: 1
DESCRIPTION OF VARIABLES

SR. NO.	VARIABLE	DESCRIPTION
1	$\Delta M2$	Change in money supply/ monetary assets
2	BUDEF	Budget deficit of federal government including expenses on commodity operation
3	CR	Banks' credit to private and public sector
4	DUM2	Dummy variable equal to one for 1993-94, shows the effect of entry of a large number of local and foreign brokerage houses in the Pakistan capital market
5	DUM3	Dummy variable equal to one for 1997-98 and onward, shows the effect of conditionalities and sanctions after nuclear detonation
4	EQUITY	Aggregate equities of the companies listed on Karachi Stock Exchange
5	FEX	Foreign Exchange reserves
6	GEB	Gross external borrowing
7	LIQUIDITY	Money supply (M1) minus public borrowing
8	M1	Money supply = Currency in circulation plus demand deposits
9	M2	Money supply = M1 plus time deposits
10	$M2_{(T-1)}$	One year lagged of M2
11	MC	Aggregate market capitalization
12	PDBT	Domestic borrowing including public accounts ¹ (Non-Bank borrowing)
13	TD	Time deposits
14	UCB	Use of cash balance; it includes bank borrowing to finance budget deficit and loans for the commodity operation
15	VR	Valuation Ratio

FIGURE: III
ECONOMETRIC MODEL:
FISCAL AND MONETARY DETERMINANTS OF MARKET CAPITALIZATION

Accounting Identities:

- 1) $\Delta M2 = UCB + FEX + CR$
- 2) $M2 = M2_{(T-1)} + \Delta M2$
- 3) $M1 = M2 - TD$
- 4) $PDBT = BUDEF - GEB - UCB$
- 5) $LIQUIDITY = M1 - PDBT$

Behavioral Equations :

- 6) $MC = \psi_0 + \psi_1 EQUITY + \psi_2 LIQUIDITY$

Exogenous Variables:

- 7) BUDEF
- 8) EQUITIES
- 9) FEX
- 10) CR
- 11) UCB
- 12) GEB
- 13) TD
- 14) $M2_{(T-1)}$

FIGURE: IV ESTIMATED RESULTS	
$\ln(\text{MC}) = -4.646 + 0.555 \ln(\text{EQUITIES}) + 1.254 \ln(\text{LIQUIDITY})$ <p style="text-align: center;"> (- 5.024) (2.696) (3.808) </p> $+ 0.809 \text{DUM2} - 0.651 \text{DUM3}$ <p style="text-align: center;"> (3.436) (-3.655) </p>	
Adjusted R-Square = 0.9779 F-Statistics = 222.16	
* Figures in parentheses are t-statistics	

**TABLE: 2
UNIT ROOT TEST (URT)**

Variable	Augmented Dickey- Fuller (ADF) Test (Level; Number of lags=1; No intercept; No. trend)	Phillip Person (PP) Test (Level; No intercept; No trend; Truncation lag 2)
ln (MC)	2.007 (5%)	2.255 (5 %)
ln (EQUITY)	2.830 (1%)	5.079 (1%)
ln (LIQUIDITY)	3.386 (1%)	6.456 (1%)
Ln (M1)	3.542 (1 %)	8.267 (1 %)
<i>Figures in parenthesis are level of significance.</i>		

**TABLE: 3
JOHENSEN'S CO-INTEGRATION TEST**

[Test assumption: Linear deterministic trend; Test allows for quadratic deterministic trend in data:
ln(MC), ln(EQUITY), ln(LIQUIDITY)]

Eigenvalue	Likelihood Ratio	Critical Values		Rejected at significant level of:
		5 %	1 %	
0.7971	51.868	34.55	40.49	1%
0.5182	21.565	18.17	23.46	5 %
0.3330	7.693	3.74	6.40	1 %

**TABLE: 4
GRANGER CAUSALITY TESTS
(Number of lags: 5)**

Null Hypothesis	F-Statistics	Accepted/ Rejected
Equity does not Granger cause of Market capitalization	10.8977	Rejected
Market Capitalization does not Granger cause of Equity	82.0198	Accepted
Liquidity does not Granger cause of Market capitalization	7.8391	Rejected
Market Capitalization does not Granger cause of Liquidity	139.269	Accepted

**TABLE: 5
PREDICTIVE POWER OF THE MODEL**

INDEX	VALUE
Mean Absolute Error (MAE)	22.34
Root Mean Square Percentage Error (RMSPE)	0.032
Thiel index	0.073

TABLE: 6
POLICY SIMULATION
MARKET CAPITALIZATION IN DIFFERENT SCENARIOS

(Rs/ Billion)

Year	Market Capitalization		Effects of changes in economic and financial conditions			
	Actual	Simulated	10% reduction in public debt	10% increase in money supply	10% increase in equities	* Additional \$100 Million injected in capital market
Ex-post (Historical) Simulation ²						
1999-00	500	463	471	586	488	468
Ex-anti Simulation** ³						
2000-01	----	581	593	741	613	588
2001-02	----	728	745	934	767	735
2002-03		908	932	1175	957	915

* One time addition of \$100 million (Rs.5.8 billion) will affect the market for long term.

** It is assumed that public borrowing will remain constant; and 10 percent growth in the equities and the money supply.

IV. THE RESULTS AND THEIR IMPLICATIONS

The estimated parameters with their t-statistics have been shown in figure: IV. Results show that parameters are significant and have correct signs. The magnitude of adjusted R-square confirms the validity of model.

We conclude that investment decision by the firms and market liquidity are two important determinants of the stock market. With some qualifications, the results indicate that monetary and fiscal policies affect the market capitalization.

In the context of Pakistan, it has been observed that equity-elasticity is less than one (0.55) and liquidity-elasticity is greater than one (1.25). The results explain why valuation ratios are negatively affected by the increase in equities. The accounting theory ⁴ will be valid only if equity-elasticity is equal to one. No doubt, equities have a positive correlation with the market capitalization, but the magnitude of equity-elasticity shows that marginal change in market capitalization with respect to equities will be less than the change of equities. The effects of change in the equities and market liquidity have been shown in the simulation exercise in table: 7.

The results provide a logical explanation for change in the market capitalization. To some extent, results contradict the Miller and Modigliani theorem. The model provides adequate explanation for the fluctuations in the value of firm. Unless matching funds are available any raise in equities will be a cause of decline in the valuation ratio. Profits, dividends, positive and negative news, social and political events may affect the market capitalization for a short-term, but the present situation of the stock market in Pakistan can not be classified as an effect of those short-term events. A continuous long-term decline is indicating the changes in economic fundamentals.

TABLE: 7
SIMULATION ANALYSIS
EFFECTS OF EQUITY AND MARKET LIQUIDITY
ON VALUATION RATIO

YEAR	Market Capitalization	Equities	Market Liquidity	%Change in Market Capitalization	Valuation Ratio
Base Scenario					
1999-00	463	409	637	-	0.73
2000-01	581	488	707	-	0.82
2001-02	728	582	782	-	0.93
2002-03	908	694	862	-	1.05
Equities raised by 10 %; Liquidity Raised by 10 %					
1999-00	550	450	701	18.82	0.78
2000-01	691	537	777	18.82	0.89
2001-02	865	640	860	18.82	1.01
2002-03	1078	764	949	18.82	1.14
Equities raised by 30 %; Liquidity Raised by 10 %					
1999-00	603	532	701	30.36	0.86
2000-01	758	634	777	30.36	0.98
2001-02	949	757	860	30.36	1.10
2002-03	1183	903	949	30.36	1.25
Equities raised by 10 %; Liquidity Raised by 30 %					
1999-00	678	450	828	46.51	0.82
2000-01	852	537	919	46.51	0.93
2001-02	1066	640	1016	46.51	1.05
2002-03	1330	764	1121	46.51	1.19
Equities raised by 30 %; Liquidity Raised by 30 %					
1999-00	744	532	828	60.74	0.90
2000-01	934	634	919	60.74	1.02
2001-02	1170	757	1016	60.74	1.15
2002-03	1459	903	1121	60.74	1.30

(A) The Implications in the results:

The results indicate that the effect of macro economic changes (LIQUIDITY) is almost twice of the effect of firm's decision of capitalization (EQUITY). In an economy where valuation ratio is less than one, the growth rate of the capital stock must be compatible with the market liquidity. A rise in equity means the increase in the supply of shares and, in opposition to many accounting models, excess supply of share leads to decrease in market capitalization.

Market will be affected in positive way only if Money Supply (M1) is greater than Public Borrowing⁵. It implies that change in market liquidity should be positive. The factors of money supply are substitute to each other. For example, in the present context, the effects of decrease in foreign investment can be normalized through the expansion in Credit to Private and Public Sectors. Similarly, the Use of Cash Balance is a better option to finance the budget deficit than Public borrowing, from the stock market perspectives.

(B) The Simulation Analysis:

In this section, we briefly examined the results of the simulation. Simulations are usually considered an important part of the construction and the validation of a dynamic model. We simulated the model over the period 2000-03 with exogenized the Public borrowing (PDBT), Equities of the Joint Stock

Companies (EQUITIES) and Money Supply (M1). In estimation of the endogenous variables, exogenous variables are projected on their historical growth rates.

We measured also the predictive power of the model, through historical simulations. The magnitudes of predictive power have been presented in table: 5. We applied Mean Average Absolute Error (MAE), Root-Square Percentage Error (RSPE) and Thiel (THEIL) index. The parameters show that model can be applied for prediction of the market capitalization.

The simulations were designed to show the effects of a single policy measure, under the assumption that all the other policy variables were unchanged. Simulation results for selected variables are presented in table: 6, which we consider particularly interesting in the present context. It is found that market capitalization will be increased only by 5 percent by a 10 percent increase in equities. It will be raised by 27 percent if money supply will be increased by 10 percent. Market capitalization will be increased by 2 percent if public borrowing decreased by 10 percent. Similarly, by inflow of a \$100 million in foreign portfolio investment, the market will be improved only by 1 percent.

FOOT NOTES

1. *'Public Accounts' means the government liabilities in accounts of General Provident Funds, pensions and other such liabilities either interest bearing or interest free. Such liabilities are included in unfounded debts, which is a part of public borrowing to finance the budget deficit.*
2. *'Ex-post or Historical Simulation' is a tool to test the validity of a model. It generates predicted (or expected) values of dependent variables through estimated parameters. Actual values of exogenous variables are applied in the historical projections.*
3. *'Ex-anti Simulation' is a tool of forecasting. The values of dependent variables are projected on the basis of assumed value of exogenous variables.*
4. *According to the 'Accounting Theorem', realized value of the assets is a true indicator of the value of a firm (or its market capitalization). Accountants apply this approach in the financial analysis and this theory is popular in the accounting literature.*
5. *We defined market liquidity as a residual of narrow money after subtracting of public borrowing. Savings in financial institutions will not affect the liquidity, because they will transfer into investible funds ultimately. Borrowing to finance the government's budget and corporate bonds (or certificates of investments) are the element of debt market. However, to simplify the model we included government borrowing only. The size of corporate debt market is negligible in Pakistan.*

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APPENDIX:**Growth in Money and Capital Markets**(Rs./
Billion)

Fiscal Year	Market Capitalization		Equities	Market Liquidity	Public Debt	Money Supply (M1)	Time and Other Deposits	Money Supply (M2)
	Simulated	Actual						
1979-80	7	7	12	61	1	62	30	92
1980-81	8	7	14	69	5	74	31	105
1981-82	10	9	16	75	6	81	36	117
1982-83	12	13	18	83	14	97	49	146
1983-84	15	20	22	91	12	103	60	163
1984-85	20	22	25	106	13	119	65	184
1985-86	23	24	31	108	27	135	76	211
1986-87	31	32	33	133	27	160	80	240
1987-88	40	38	37	155	30	185	84	269
1988-89	48	44	44	168	37	205	77	282
1989-90	75	49	60	207	30	237	80	317
1990-91	96	68	67	241	24	265	136	401
1991-92	148	218	86	304	-1	303	203	506
1992-93	163	214	100	308	20	328	267	595
1993-94	406	405	124	304	55	359	344	703
1994-95	348	293	254	373	50	423	402	825
1995-96	389	365	279	391	57	448	491	939
1996-97	405	469	307	387	57	444	609	1053
1997-98	231	259	338	398	82	480	726	1206
1998-99	354	289	372	537	107	644	636	1280
1999-00	463	383	409	637	93	730	591	1321
2000-01	453	296	410	707	135	761	765	1526
2001-02	535	412	411	782	163	877	884	1761
2002-03	902	756	598	862	189	1106	973	2079
2003-04	1465	1428	690	1267	105	1372	1115	2487
Base Year Scenario								
2004-05	1858	--	759	1468	103	1571	1277	2848
Forecasted								
2005-06	2250	--	835	1639	100	1739	1413	3152
2006-07	2714	--	918	1825	100	1925	1565	3490
2007-08	3370	--	1010	2079	100	2179	1771	3950
2008-09	4228	--	1111	2389	100	2489	2022	4511
2009-10	5330	--	1222	2756	100	2856	2320	5176

