

Key Fundamental Factors and Long-run Price Changes in An Emerging Market ---A Case Study of Karachi Stock Exchange

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Abstract

This paper identifies the joint effect multiple factors exert on share prices in Karachi Stock Exchange (KSE) using annual balance sheet data of listed firms during 1981 to 2000. Out of six theory suggested fundamental variables (dividend yield, payout ratio, size, asset growth, leverage and earning volatility) the significant joint factors observed are payout ratio, size, leverage and dividend yield. Together these four factors explain one-fourth variation in share prices at KSE. The explanatory power of fundamental factors is found to be different in pre-reform period (1981-1990) and post-reform period (1991-2000). In pre-reform period three factors i.e. payout ratio, size and dividend yield explain about half of the variation in share prices whereas during post-reform period these factors explained about one-third of the variability in these prices. The correct sign of size effect is only observed in the pre-reform period.

Key Words: Fundamental factors; Share price volatility; Valuation theories; Financial reforms.

JEL Classification: F14, G10

“Key Fundamental Factors and Long-run Price Changes in An Emerging Market” ---A Case Study of Karachi Stock Exchange (KSE)

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1. Introduction

Share prices are the most important indicator readily available to the investors for their decision to invest or not in a particular share. Theories suggest that share price changes is associated with changes in fundamental variables which are relevant for share valuation like payout ratio, dividend yield, capital structure, earnings size of the firm and its growth, [Wilcox (1984), Rappoport (1986), Downs (1991)]. Linter (1956) linked dividend changes to earnings while Shapiro valuation model (1962) showed dividend streams discounted by the difference in discount rate and growth in dividend should be equal to share price. This predicts direct relation between pay out ratio and the price-earning multiple. Conversely it means that there is an inverse relation between pay out ratio and share price changes. Several event-based studies established direct relation between share price changes and either earnings or dividend changes (Ball and Brown 1968: Baskin 1989). Sharpe (1964) and Hamada (1972) suggested direct relation between share price changes and capital structure. Beaver, Kettler and Sholes (1970) showed that firms appear to pay less of their earnings if firms have higher earning volatility. This suggests payout ratio as relevant factor for share price changes. Investigations of share price changes appear to yield evidence that changes in fundamental variable(s) should jointly bring about changes in share prices both in developed and emerging markets. However, the actual fundamental factors found to be relevant may vary from market to market. For example, changes in asset growth of firms are significant in the case of Japanese shares while earnings appear to be universally a relevant factor (Ariff et al., 1994). However, it is widely agreed that a set of fundamental variables as suggested by

individual theories is no doubt relevant as possible factors affecting share price changes in the short and the long-run (Ariff and Khan, 2000).

The link between fundamental factors and share price changes has been extensively investigated over short horizons but only few studies attempted to model it over lengthy periods of time. Studies over short windows commonly apply cross-sectional tests using event-based research methodology. The cases of studies examining this relation cross-sectional or inter-temporally are few, and these have one common feature i.e., the fundamental factors used in a specific study are either one or two although there is a long list of fundamental factors. Furthermore, while price revisions at the time of announcements of price relevant disclosures are valid as announcement effects shown over short horizons, it is equally important to test the effect over a lengthier period of time using data over several years as measure of the variables (Ariff and Khan, 2000). Black and Sholes (1973) support the idea, that the value of security will be higher, the higher is the volatility of security's return. The relation between dividend and earning follows that the greater the volatility of earnings of a firm, the less is the likelihood of dividend yield being changed by the firm's management. Hence earnings volatility is directly related to share price volatility.

Another relevant factor in affecting the share prices is the capital structure of the firm. The level of debt financing by the firm has impact on the value of firm's assets. Hamada (1972) and Sharpe (1964) specify their theories regarding the capital structure. A high-risk firm (a firm with debt) must generate high return consistent with the investor's expected return. It follows that with higher debt firm should have greater rate of change in its share price. Hence capital structure (DA as debt to asset ratio) changes must be directly related to the share price volatility. Modigliani and Miller (1958) emphasized that in competitive capital markets the value of a firm is independent of its financial structure. But if markets are imperfect

(transaction cost, taxes, informational asymmetry, agency cost etc.) then capital structure matters and influences the share prices.

Size of a firm does have effect on the valuation of the firm assets. Smaller stocks have higher average returns. Introduction of size, as a multiplicative term to dividend, provides a significant improvement in the explanation of share prices (Karathanassis and Philiappas, 1988). The size of the firm if captured through total capital employed, is expected to influence the share prices positively as large firms are better diversified than small ones and thus are less risky (Benishy, 1961). Atiase (1985) showed that as the size of the firm increases, their share price volatility declines.

(Ariff et al, 1994) established the joint linear effect of these six variables for the three markets using data relating to samples of firms over 16 or more years in Japan, Malaysia and Singapore. In general, the six variables are significantly related to share price volatility in the three markets although some were not significant in particular markets. In the case of more analytically intensive Japanese market, changes in the fundamental factors accounted for two-fifth of the variation in share price volatility. The same was not the case in the less analytically intensive developing markets of Malaysia and Singapore. Obviously, larger portions of price variation appear not to be explained by the variation in the six firm-specific fundamental variables in the less developing markets. Perhaps, prices in the latter two markets, it may be suggested, are more responsive to macroeconomic factors, which were not included in the cross-sectional tests. Alternatively, investors in such markets are not pricing the shares on the basis of fundamental factors, perhaps preferring to price on speculative information. The US Investors are known to price the securities much more on the basis of analysis made widely available by the financial analyst community and the mass media. In another study (Ariff, 2000) on a sample of hundred homogenous industrial firms, four out of these six factors were found significant and explained two-third of share price volatility over a window of twenty years for US market.

Karachi stock exchange is an important emerging capital market of the region among the developing countries. KSE is termed as high-risk high return market where investors seek high-risk premium (Nishat, 1999). Few studies have attempted to analyse the long run behavior of the market (Nishat, 1991) and no work has been done to explore the fundamental variables affecting the share prices. Factors affecting share prices has been identified for the short run (Nishat, 1995; Nishat and Saghir, 1991). It is also important to study these factors in the Pakistani context after the introduction of reforms, which emphasized more towards openness to foreign investor and competition. Under reforms emphasis has been on information disclosure by companies, documentation, increasing role of brokerage houses and investment companies which provide more feedback to investor. The objective of this study is to investigate the joint effect fundamental factors may have on share prices in the long run. It also attempts to see the impact of these factors in two sub periods to assess the reform impact on the share price changes. This paper is a modest first attempt in Pakistan in this direction using the data of all the firms' (160) that are continuously listed for last 20years.

The rest of the paper is organized as follows. The second section describes the econometric model and estimation methods. The data description and variable construction is discussed in section three followed by results and discussion in section four. Section five provides summary and conclusion.

2. Econometric Model and Estimation methods

Keeping in view these six factors an approximation of the relation between share price volatility (PV) and the identified fundamental variables namely dividend yield (DY), payout ratio (POR), Leverage (DA), asset growth (ASg), Size of the firm (SZ) and earning volatility (EV). can be given in the following form

$$PV = f(DY^{-}; POR^{-}; DA^{+}; ASg^{-}; SZ^{-}; EV^{+})$$

The directions of the predicted relations between share price changes and the factors are indicated by the + or – signs placed as superscripts above the symbols used for the factors. These factors will be identified on an annual basis over a lengthy period of twenty years to estimate a valid relation using all the continuously twenty year listed companies at KSE. The analysis utilized cross-sectional weighted least square regression. First test involved regressing the dependent variable PV against all the independent variables separately. This provides a crude test of the relationship between common stock volatility and the theory suggested fundamental variables individually. Thus providing the impact of each variable on stock price change if no other factor is considered.

In an attempt to find the collective impact of these six factors on price variability all the factors are regressed against the dependent variable PV. The test model can now be specified using observations per firm, j , where $j = 1, \dots, 160$ during t period where $t = 1981$ to 2000

$$PV_{jt} = I_{0t} + I_1(DY)_{jt} + I_2(POR)_{jt} + I_3(DA)_{jt} + I_4(EV)_{jt} + I_5(ASg)_{jt} + I_6(SZ)_{jt} + e_{jt}$$

The expectation was that the DY, POR, ASg and SZ would be negatively related to the PV whilst EV and DA would be positively related to PV. The sign for the ASg and SZ and EV found to be contrary to the theory.

The firms selected are heterogeneous in character ranging from big firms like as in energy sector to smaller ones as in textile sector. Because of the presence of heteroscedasticity in the data we are using Weighted Least Squares (WLS). The first set of estimation is from running the regression using all the variables. Adding more variables biases the researcher in favour of acceptance of the test model. Therefore, it is necessary to carry out a selection procedure to

choose a parsimonious model. We use the Akaike selection statistical procedure to eliminate errors that could arise from multi collinear independent variables. The results after this selection, which is a step-wise regression procedure, are presented separately.

3. Data and Variables Construction

Price change (PV) is represented by a price volatility measure, using extreme value method developed by Parkinson (1980) somewhat similar to the standard deviation, but superior to the traditional measure of standard deviation. Parkinson (1980) showed that the extreme value method developed by him is 2.5 to 5 times superior as a measure of variance in a variable. The year's high and low share prices of a firm are used to calculate the rate of changes in prices over the test period. This measure is appropriate to capture the changes in share prices on an annual basis, and it is expressed as a rate of change measure but it has greater amplitude than in case with the more common standard deviation. Tests showed that this variable has produced reliable results reported in other studies.

The six independent variables are measured on an annual basis, each firm providing a total of twenty annual observations. Dividend yield for the cross sectional regression test using the sample of firms will be the averages of the dividend yields of individual firms, the average being taken over the estimation year per firm.

Dividend Yield

This variable was calculated by summing all the annual dividends paid to common shareholders and then dividing this sum by the market value of the common stock. The average of all available years was utilized.

Earning volatility

First, the average of the total earnings to total asset ratios for all years was obtained. Then, the average of the squared deviation from the overall average was calculated. A square root transformation was applied to the mean squared deviation to obtain estimates of standard deviations.

Payout ratio

Total cumulative individual company earnings and dividends were calculated for all years. Payout is the ratio of total dividends to total earnings of the firm. The use of this procedure means that the problem of extreme value in individual years due to low or possibly negative net income is reduced. Furthermore the payout ratio was set to one in cases where total dividends exceeded total cumulative profits.

Size

The variable size was constructed in a form that reflects the order of magnitude in real terms. The variable was constructed by taking the average market of common stock for the period 1981 to 2000. The value (in millions) of real size was averaged over the period.

Leverage

The ratio of long term debt to total assets was calculated. The average of all years was used in the analysis.

Growth in assets

The yearly growth rate was calculated by taking the ratio of the change in total assets. The average over all years was used in analysis.

The behaviour of the variables over the long run as defined in an earlier section is presented in Tables 1.a, 1.b and 1.c the descriptive statistics of the of the data in overall, pre-reform and

post-reform periods respectively. All the firms that are continuously listed on the Karachi Stock Exchange from 1981 to 2000 has been taken for the purpose. The annual data of these firms is taken from the various issues of “balance sheet analysis” published by State Bank of Pakistan. Price data has been taken from the annual reports and annual publications of Karachi Stock Exchange.

4. Results and Discussion

Table 2 reports the test results of regression between price change variable (PV) and each of the six independent variables. This generates the kind of results most commonly found in existing literature investigating one fundamental variable at a time. The results of this regression show that two variables Earning volatility (EV) and Asset growth (ASg) are not significantly explaining the price volatility. The other four variables are significant but not substantial enough to explain a large portion of price variation. The explained variation ranges from as low as 1 per cent in case of asset growth to as high as 16 per cent for payout ratio. Earning volatility, which is significant factor in most of the markets, is insignificant in case of KSE. Individually the highest impact is of pay out ratio which is 16 per cent while lowest is of size if we consider the significant variables only. Highest impact is of POR followed by leverage, dividend yield and size. Contrary to theory, size has a sign that is opposite to that predicted by theory in this simple regression test. This is due to market imperfections (Nishat, 1999). Sign of earning volatility is also wrong theoretically but the variable is statistically insignificant. Taken together these results are consistent with prior studies for developing markets.

The joint effect on share price variable from the six variables is tested running regression presented in table 3. The explained variation in the price is not very substantial, about 28 per cent. However this is consistent with the findings regarding the developing markets where firm related factors are not priced fully. Rather speculative forces and macro economic

environment plays more dominant role (Ariff et al 1994). Noticeably the largest impact comes from pay out ratio (coefficient of 0.26) followed by dividend yield, size and leverage closely. Thus four of the six factors are statistically relevant for the pricing of the shares in the Karachi stock exchange in this joint test using a lengthy period data.

To control the multicollinearity and to select only significant variables, the procedure suggested by Mendenhall and Sincich (1989) is used. The results shown in table 4 are obtained by applying the step-wise regression to remove the effect multiple factors have on the model's specificity. These results indicate that the joint-effect of only four variables dominate this relationship. However there are a number of important differences. The variables selected are more reliable as the variable selection is carried out using step-wise regression method of entering one variable at a time, then adding variables only if the variable being added marks a substantial difference to the results. Overall, four variables namely payout ratio, size of the firm, dividend yield and leverage are statistically significant in that order of importance as determined by the size of the coefficient. Overall the model fit is significant with the F-ratio of 29.962. The explained variation by these four variables is 25.9 per cent. Our results are consistent with the results observed in less developed markets of Singapore and Malaysia where goodness of fit obtained were about 25 per cent (Ariff et al 1994). Individual factors were found to be significant, consistent with theoretical predictions, even in the institutionally less developed markets. However, compared with the results for developed markets the goodness of fit of the model is far inferior. It is very likely that the stable economic environment in developed markets coupled with their more analytically inclined investing institutions drive prices more than 60 per cent on the basis of key fundamental variables. Such may not be the case of investors pricing shares in the more volatile economic environments in the less analytically intensive investment dominated by individuals trading on uninformed basis in the less developed capital markets like Pakistan.

The results for pre-reform and post-reform periods are presented in tables 5 to 8. The significance of three fundamental factors is found to be more prominent, namely pay out ratio, size and dividend yield. In pre-reform period (1981-1990) as presented in table 5 and 6 the explaining power of these variables is high as compared to overall study period. These three variables jointly explain more than two-fifth of the price variation in share prices in the market. Also, the sign of the size variable is different from the sign observed for the overall results. In pre-reform period the negative sign of size shows that larger firms were having lower volatility in their share prices while in post reform period the positive sign indicates that the larger firms are more volatile after the introduction of reforms. The results appear to vindicate the intuition given by common belief that fundamental factors drive share prices to change in the long run, though the power of model to explain the price variation is not as robust as found in case of developed markets. This may be due to greater instability in the economic environment as well as both insufficient institutional progress in investment culture and the apparent lack of analytically intensive market practices in Pakistan.

5. Summary and Conclusions

This study attempts to explain the price changes due to the six theory-suggested fundamental variables (dividend yield, payout ratio, size of the firm, leverage, earning volatility and asset growth) in Karachi Stock Exchange during 1981 to 2000 using annual balance sheet data. This paper identifies the joint- effect multiple factors exert on share prices in the long run. The significant joint factors observed are payout ratio, size, leverage and dividend yields. Together these four factors explain one-fourth variation in share prices at KSE. The explanatory power of fundamental factors is found to be different in pre- reform (1981 to 1990) and post-reform (1991 to 2000) periods. In pre-reform period three factors pay out ratio, size and dividend yield explain more than two-fifth of the variation whereas during post reform period these factors explained about only one-third of the variability in prices. The correct sign of

size effect is only observed in the pre-reform period, which shows that market has become more volatile after the reform period, which made prices of larger firms more volatile. The explanatory power of the variables has reduced in the post reform era. The analysis indicates that variables other than fundamental variables may be more important and relevant to explain the share price variation in Pakistan and need further investigation.

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Table 1
Descriptive Statistics

Table 1.b
Overall period

variable	Min	Max	Mean	Std
PV	0.123	0.906	0.497	0.146
DY	0.000	0.162	0.041	0.032
EV	0.135	0.866	0.101	0.141
POR	-0.533	1.858	0.265	0.304
SZ	0.718	8666.291	395.174	1107.773
DA	0.000	3.478	0.152	0.319
ASg	-0.048	12.181	0.193	0.959

Table 1.b
pre reform period

variable	Min	Max	Mean	Std
PV	0.121	0.927	0.453	0.153
DY	0.000	0.217	0.054	0.043
EV	0.000	0.401	0.018	0.057
POR	-0.326	3.716	0.326	0.043
SZ	0.495	2067.124	115.641	252.791
DA	0.000	1.333	0.132	0.172
ASg	-0.155	7.883	0.134	0.108

Table 1.c
Post reform period

variable	Min	Max	Mean	Std
PV	0.013	1.133	0.54	0.22
DY	0.000	0.165	0.0302	0.0346
EV	0.000	1.142	0.0422	0.1798
POR	-1.401	1.72	0.204	0.3295
SZ	0.783	16692.99	674.71	2031.17
DA	0.000	6.875	0.172	0.58
ASg	-1.74	23.297	0.245	1.8408

where

PV: Price Volatility
 EV: Earning Volatility
 DY: Dividend Yield
 DA: Leverage
 POR: Payout Ratio
 ASg: Asset Growth.
 SZ: size of the firm

Table 2

Estimated relation between share prices and Fundamental Variables: simple regressions

Variables	Coefficients	t-value	R-squared
DY	-0.30	-3.94	0.09
EV	-0.043	-.539	0.02
POR	-.40	-5.47	0.16
SZ	-0.17	2.25	0.03
DA	0.32	4.29	0.10
ASg	0.10	1.30	0.01

$$PV_{jt} = I_{ot} + I_1(DY)_{jt} \quad (1)$$

$$PV_{jt} = I_{ot} + I_1(EV)_{jt} \quad (2)$$

$$PV_{jt} = I_{ot} + I_1(POR)_{jt} \quad (3)$$

$$PV_{jt} = I_{ot} + I_1(SZ)_{jt} \quad (4)$$

$$PV_{jt} = I_{ot} + I_2(DA)_{jt} \quad (5)$$

$$PV_{jt} = I_o + I_2(ASg)_{jt} \quad (6)$$

where

PV: Price Volatility
 EV: Earning Volatility
 DY: Dividend Yield
 DA: Leverage
 POR: Payout Ratio
 ASg: Asset Growth.
 SZ: size of the firm

Table 3

Joint-Effect of the Fundamental Variables on Share Price Variable.

$$PV_{jt} = I_{ot} + I_1(DY)_{jt} + I_2(POR)_{jt} + I_3(DA)_{jt} + I_4(EV)_{jt} + I_5(ASg)_{jt} + I_6(SZ)_{jt} + e_{jt}$$

Variables	Coefficients	t- values
DY	-0.231	-2.985
EV	-0.044	-0.598
POR	-0.266	-3.350
SZ	0.219	2.971
DA	0.192	2.547
ASg	0.073	1.009

R-squared = 0.28
Adjusted R-squared = 0.25
F- ratio = 10.07 D.W = 2.02

Where

PV: Price Volatility
EV: Earning Volatility
DY: Dividend Yield
DA: Leverage
POR: Payout Ratio
ASg: Asset Growth.
SZ: size of the firm

Table 4

Parsimonious Test Results of Price to Fundamental Relation: Stepwise Regressions:

Steps	Variables entered	Variables in Test Model	Coefficients (t-values)	R-squared
1	POR	-	-0.400 (-5.471)	0.155
2	SIZE	POR SZ	-0.410 (-5.71) 0.193 (2.685)	0.187
3	DY	POR SZ DY	-0.332 (-4.449) 0.236 (3.308) -0.232 (-3.046)	0.22
4	DA	POR SZ DY DA	-0.259 (-3.331) 0.2477 (3.526) -0.220 (-2.947) 0.203 (2.726)	0.25

F ratio for step 4 is 29.96 significant at or better than 0.0001 level.

$$PV_{jt} = I_{0t} + I_1(POR)_{jt} \quad (1)$$

$$PV_{jt} = I_{0t} + I_1(POR)_{jt} + I_2(SZ)_{jt} \quad (2)$$

$$PV_{jt} = I_{0t} + I_1(POR)_{jt} + I_2(SZ)_{jt} + I_3(DY)_{jt} \quad (3)$$

$$PV_{jt} = I_{0t} + I_1(POR)_{jt} + I_2(SZ)_{jt} + I_3(DY)_{jt} + I_4(DA)_{jt} \quad (4)$$

Where

PV: Price Volatility
 DY: Dividend Yield
 POR: Payout Ratio
 SZ: size of the firm
 DA: Leverage.

Table 5

**Joint-Effect of the Fundamental Variables on Share Price Variable in
Pre Reform Era**

$$PV_{jt} = I_{0t} + I_1(DY)_{jt} + I_2(POR)_{jt} + I_3(DA)_{jt} + I_4(EV)_{jt} + I_5(ASg)_{jt} + I_6(SZ)_{jt} + e_{jt}$$

Variables	Coefficients	t- values
POR	-0.371	- 5.994
SZ	-0.474	- 6.794
DY	-0.427	-6.76
Asg	-0.001	-.015
DA	-0.009	-.128
EV	0.075	1.132
R-squared	=0.471	F = 22.797
Adj. R-squared	=0.450	DW = 1.89

Where

PV: Price Volatility
 DY: Dividend Yield
 EV: Earning Volatility
 POR: Payout Ratio
 SZ: size of the firm
 ASg: Asset Growth.
 DA: Leverage

Table 6

**Parsimonious Test Results of Price to Fundamental Relation for the Pre Reform Period
Stepwise Regressions**

Steps	Variables entered	Variables in Test Model	Coefficients (t-values)	Adj R- squared
1	POR	-	-0.359 (-4.839)	0.124
2	SIZE	POR SIZE	-0.397 (-5.838) 0.392 (-5.773)	0.272
3	DY	POR SIZE DY	-.371 (6.304) 0.493 (-8.173) -.442 (-7.341)	0.456

F stat is 23.418 for the third step at or better than 0.0001

$$PV_{jt} = I_{0t} + I_1(POR)_{jt} \quad (1)$$

$$PV_{jt} = I_{0t} + I_1(POR)_{jt} + I_2(SZ)_{jt} \quad (2)$$

$$PV_{jt} = I_{0t} + I_1(POR)_{jt} + I_2(SZ)_{jt} + I_3(DY)_{jt} \quad (3)$$

Where

PV: Price Volatility
 POR: Payout Ratio
 SZ: size of the firm
 DY: Dividend Yield

Table 7

**Joint-Effect of the Fundamental Variables on Share Price Variable for the
Post Reform period**

$$PV_{jt} = I_{0t} + I_1(POR)_{jt} + I_2(SZ)_{jt} + I_3(DY)_{jt} + I_4(AS)_{jt} + I_5(DA)_{jt} + I_6(EV)_{jt} + e_{jt}$$

Variables	Coefficients	t- values
POR	-0.274	- 3.284
SZ	0.375	5.371
DY	-0.252	-3.069
Asg	0.054	0.802
DA	0.083	1.222
EV	-0.129	2.033
R-squared:	0.403	F = 17.117
Adj. R-squared:	0.38	D.W :1.94

Where

PV: Price Volatility
 POR: Payout Ratio
 SZ: size of the firm
 DY: Dividend Yield
 ASg: Asset Growth.
 DA: Leverage
 EV: Earning Volatility

Table 8

**Parsimonious Test Results of Price to Fundamental Relation in Post Reform period:
Stepwise Regressions**

Steps	Variables entered	Variables in Test Model	Coefficients (t-values)	Adj R- squared
1	DY	-	-0.475 (-6.761)	0.221
2	SIZE	DY SIZE	-0.441 (-6.687) 0.325 (4.925)	0.321
3	POR	DY SIZE POR	-0.262 (3.202) 0.392 (5.896) -.289 (-3.503)	0.367

F stat is 31.514 for the third step at or better than 0.0001

$$PV_{jt} = I_{0t} + I_1(DY)_{jt} \quad (1)$$

$$PV_{jt} = I_{0t} + I_1(DY)_{jt} + I_2(SZ)_{jt} \quad (2)$$

$$PV_{jt} = I_{0t} + I_1(DY)_{jt} + I_2(SZ)_{jt} + I_3(POR)_{jt} \quad (3)$$

Where

PV: Price Volatility
 POR: Payout Ratio
 SZ: size of the firm
 DY: Dividend Yield