Determination of Share Price: Evidence from Karachi Stock Exchange

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Share price determination is a contradictory task, affected by lots of factors. However some methods and techniques under different schools of thought have been developed for this purpose. Study reviews the important factors and philosophical developments on the subject. It discusses determination of share price using Ohlson (1995) model. Two forms of the model are employed; one is linear valuation model and second is the non-linear product model. Latter uses the product of earnings and book value as third independent variable, in addition to traditional linear valuation model. Research employs book value per share (BVPS) and earnings per share (EPS) as used by several other authors. Empirical findings are based on the sample of fifty two companies from the Karachi Stock Exchange (KSE) drawn systematically on the basis of highest market capitalization. Eight years of 21st century (2002 to 2009) are chosen as study period. Statistical investigation using Fixed Effects Model (FEM) shows strong evidence for applicability of Ohlson model for KSE listed companies. It also shows that the published financial information is useful for shareholders, and fundamental analysis is pertinent with

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KSE to a larger extent. However product model of valuation has small improvement for valuation of companies. Adoption of more fair value accounting rules could increase this determination power.

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1. Introduction

Determining share prices is a complex and conflicting task. According to theory of economics, price of any asset is usually determined by the market forces. Similarly in case of shares prices, it emerges by trading between the investors in stock markets. Major forces working in this case include the firm's key performance indicators (fundamentals), market efficiency, investor's perception, and some macroeconomic variables like GDP, inflation and oil prices. However, in-spite of the determination by these factors, forecasting and estimation of share prices is also possible to a certain level by use of some tools and techniques. There are two schools of thoughts related to this determination; one is the fundamental analysis and other is called technical analysis. Former is the method of stock valuation by using financial information with the help of a specific model. Whereas later is purely a statistical tool used to predict share price by the use of past share prices data. Use of these methods is dependent on the market characteristics. Fundamental analysis techniques are based on the random walk hypothesis (RWH), which is also consistent to the efficient market hypothesis (EMH), but proponents of technical analysis argue that stock prices follow a trend on time series basis and can be predicted; this is against the market efficiency. Current study employs the tools of fundamental analysis to determine share prices.

The study is important to check the extent of share prices determinable in context of Karachi stock exchange using Ohlson

model. It is also helpful to check whether information reported by PLCs (Public Limited Companies) in Pakistan is useful to investors.
Rest of the paper is divided into five parts. After giving a brief introduction, second section gives the background of the EMH and fundamental analysis. Third section reviews the previous studies on the determination of stock prices, role of EMH and use of fundamental analysis in this task. Section four discusses the research methodology and statistical methods used in the study to draw inferences. Part five addresses the data analysis and empirical findings. Last section provides the conclusions drawn, recommendations made, and implications given for further research.

EMH and Fundamental Analysis

Investors in the stock market put their money to earn return on their investment. Shares are sold by one investor to another. This sale purchase is based on the level of information possessed by each participant. According to rational choice theory (RCT) a shareholder who foresees declining performance by the company in future may sale shares. Similarly an investor with an improving performance prediction for a company may want to purchase shares of that company. In this way it depends on the level of information to some extent. The situation when all the market participants have equal level of information is considered as one basic prerequisite for market efficiency.
The concept of market efficiency was borrowed from the term of perfect markets in economics. The expression of efficient market, however, was presented with the name of efficient market hypothesis by Fama in 1970. It asserts that at any point in time, price of securities reflect all available information and shares are valued fairly. In this way, EMH implies that no investor can beat the market; there is no abnormal gain of estimating the stock price. What makes a market

efficient is the perception by investor that market is not efficient and they can earn abnormal returns.

There are three categories of the EMH made for different situations of market efficiency as presented by Fama (1970):

Strong form of Efficiency – This is the extreme and rare case of the market efficiency. It argues that no one can earn excessive return even in availability of insider information.

Semi-strong form of Efficiency – This form remains limited to the public level information. Investors having publically announced information can't earn extra profits.

Weak form of Efficiency – This type of hypothesis is weakest form of efficiency. It states that stock prices cannot be determined using past share prices.

In light of EMH and its forms, we used the fundamental analysis techniques for our study. Fundamental analysis is defined by Thomsett (1998) as: "Fundamental analysis is a method of research that studies basic financial information to forecast profits, supply and demand, industry strength, management ability, and other intrinsic matters affecting a stock's market value and growth potential." Fundamental analysis involves the use of financial ratios, discounted cash flows, and certain equity valuation models. These models show a lot of work in fundamental analysis done till now. Most famous models used for evaluation of investments are Dividend Discount Model (DDM), Binomial Pricing Model, Linear Information Model, and Black-Scholes Option Pricing Model. Moreover Residual Income Valuation (RIV) model and Discounted Cash Flows (DCF) models are also used. Ohlson model is the model derived on the basis of above mentioned models.

Literature Review

Ball & Brown (1968) is considered first study to test the relationship between the financial information and stock prices. This studied the relationship of abnormal returns with accounting variables, and found

the significant correlation. However most of the literature from those days was based on the DDM. Leroy & Porter (1981) and Shiller (1981) broke the early beliefs. They found that stocks prices are too much varying that these variations are not predictable by dividends. This conclusion, usually regarded as the excess volatility hypothesis which implies that stock market measures reveal too much instability to be defensible by fundamental variables. Many researches started to criticize these results on the ground that dividends were assumed constant. These studies were Flavin (1983); Kleidon (1986); Marsh & Merton (1986); and Mankiw, Romer, & Shapiro (1991). Subsequent researches used to determine the stock price by DDM after relaxing the assumption of constant discounting.

Other wave of research started in 1990s. These studies were the reaction of decreasing relevance of financial information in investment decisions. Structural changes in the economies were categorized as the reason of decreasing value relevance; Collins, Maydew & Weiss (1997). Other researches which tested the overall direction of the financial information's relation to stock market measures include Francis & Schipper (1999), and Brown, Lo & Lys (1999). Results of these researches were not consistent. Collins, Maydew & Weiss (1997) and Francis & Schipper (1999) found the increasing relationship, whereas Brown, Lo & Lys (1999) shown declining trend.

Kadri, Aziz & Mohamed (2009) uses the Ohlson (1995) traditional linear model for share price determination in Malaysia. This study found significant positive relationship of stock price with earnings and book value. Callao, Jarne & Lainez (2007); and Gaston, et al. (2010) also commented that both earnings and book value of equity are best to check the share price determination power among fundamentals. Nazir et al. (2010) also investigated the determinants of share price in context of Pakistan using 73 firms from KSE 100 Index. They used six years (2003-2008) data and employed pooled ordinary least squares,

fixed effects model and random effects model. They found dividend payout as the most significant determinant of stock price.
Malik (2011) tested the statistical relationship of nine fundamentals with stock price. Study is based on the sample of nine most representative food sector firms from KSE for the study period of 2005-09. Research employed the OLS regression and fixed effects model and claims that earnings per share (EPS) has most significant relation to stock price in food sector companies of Karachi stock exchange which defines 49.2% variations. Azeem & Kouser (2011) used the Ohlson model to observe the impact of International Accounting Standards on the relationship of stock price with financial information. Study used the OLS and fixed effects model. It found that fundamentals' determination power is subject to financial reporting practices. However study doesn't discuss comparative share price determination and neither it used product model.
Literature shows that share price determination is very much diverse and conflicting area of finance. Every aspect of this phenomenon has disagreement. From the basic philosophy to the econometric models there are different schools of thought. In Pakistan, there is not sufficient literature to explain the contextual features of financial information and stock market. All of these facts create the need for further studies with simple models, large sample data and wider span.

Research Methodology

Based on the literature reviewed and issues discussed, focus of study is to find whether financial information is useful in stock price determination. Formally stated study is aimed at answering the question, "Is share price significantly determinable by the book value and earnings?"
Study used the three variables. These variables are earnings, book value of equity and share price. Proxies used to measure variables are

earnings per share (EPS), book value per share (BVPS), and market value per share (MVPS) respectively.

Sample of the study is chosen on the base of market capitalization. Non-Financial public listed companies quoted on Karachi stock exchange (KSE) constitute its population. Sampling employs the stratification technique. Stratification approach is borrowed from the statistical periodical "Balance Sheet Analysis of PLCs at KSE" issued by State Bank of Pakistan (SBP). Then Companies with higher market capitalization in each stratum are taken in sample. Total fifty two (52) companies are included in the analyses. Total of 08 years [2002-09] data is used in the statistical analysis.

Data is collected from multiple sources. Data for independent variables, BVPS and EPS, is collected from "Balance Sheet Analysis of Public Listed Companies at KSE" which is issued by SBP. Data for MVPS is collected from "Historical Data" page of KSE website. Some of the data is collected from the annual reports of concerned companies. Some circulars are taken from the website of Institute of Chartered Accountants Pakistan (ICAP) and website of Securities and Exchange Commission of Pakistan (SECP).

Following hypotheses are formulated to test statistically:

H_1: *MVPS is significantly determined by EPS and BVPS collectively (Ohlson Model).*

H_2: *MVPS is significantly determined by EPS, BVPS and the product (EPS*BVPS) term collectively (Product Model of Ohlson).*

Above mentioned two hypotheses are based on two studies. First is much popular and classic approach for the determination. The mathematical form of as given by Ohlson (1995) model is expressed below:

$$MVPS_{it} = a + \beta_1 EPS_{it} + \beta_2 BVPS_{it} + \varepsilon_{it} \qquad [Eq.\ 1]$$

Here dependent variable is the share price of "i" security at the three months later of "t" financial year end. Similarly "a" is the intercept; β_1

is the slope coefficient of Earnings per Share, EPS is value of Earnings per Share of "i" security at end of "t" year. Same is the case for the Book Value.

There is another model derived from Ohlson (1995). This model is called product model as used by a latest study Clarkson et al. (2011). It includes the product of BVPS and EPS as third independent variable. It is included due to likely improvements in the valuation model. It can be expressed mathematically as following:

$MVPS_{it} = a + \beta_1 EPS_{it} + \beta_2 BVPS_{it} + \beta_3 EPS_{it} * BVPS_{it} + \varepsilon_{it}$ *[Eq. 2]*

Step by step statistical techniques are used to draw conclusions and test the empirical relationships in data. At first descriptive statistics is used to check the features of variables. Secondly, Pearson's coefficient of correlation is used to check the causal relationship between the variables. At third step regression is used to test the collective relationship as elaborated in hypotheses. As used data is of panel type, so panel regression techniques were considered for use. Panel regression include pooled OLS (Ordinary Least Squares), Fixed Effects Model (FEM), and Error Correction Model (Random Effects Model). Hausman test is used to diagnose that which technique of panel regression is more appropriate for study.

Empirical Findings and Conclusion

As per research methods described in previous section, empirical findings show that there is high determination power shown by Ohlson models of valuation. It is also inferred that there is very small improvement in the measurement by adding the cross product term (BVPS*EPS). Empirical findings and discussion about the results are provided for step by step statistical analysis below.

Descriptive statistics (see table 1) are employed at first level. Standard deviation, range, and standard error used for the data shows high variability and skewness in data. Same characteristics in the MVPS column show the instability of stock market. After descriptive statistics

correlation analysis is conducted. Pearson's coefficients of correlation (see table 2) show that there is high causal relationship between the variables of study. EPS and MVPS have highest degree of positive correlation (66%). Then cross product term (BVPS*EPS) has the positive correlation of 64% with MVPS. The correlation between the BVPS and MVPS is 47%. However study is not dependent on these results only.

In-spite of these significant values and one to one relationship between the variables, we also conducted the regression analysis to check the explanatory power for MVPS in shape of valuation models expressed mathematically in equation 1, and 2. However as mentioned earlier a diagnostic test was required to choose between the panel data analysis techniques, we conducted Hausman test for it. The Hausman specification test is the classical test of whether the fixed or random effects model should be used. The research question is whether there is significant correlation between the unobserved cross sectional unit-specific random effects and the regressors. If there is no such correlation, then the random effects model may be more powerful and parsimonious. If there is such a correlation, the random effects model would be inconsistently estimated and the fixed effects model would be the model of choice. The Hausman test is a kind of Wald χ^2 test with k-1 degrees of freedom (where k=number of regressors) on the difference matrix between the variance-covariance of the FEM with that of the Random Effects model.

We conducted the test for both of hypotheses. It resulted in rejection of null hypotheses (p-value less than 1%). It means that there is the correlation between the regressors produced under two different methods. We employed FEM regression for our study. FEM produced attractive results for both of the hypotheses. For both cases, R square is 73% (Rational Linear Model) and 74% (Non-Linear Product Model). Adjusted R square is also pretty much close to R square. All the variables are significant in both models. However BVPS is

significant at 5% in Non-Linear Product Model. Y-intercept is lesser (80.35) in first equation. But in second equation it is 97.54. Results prove that addiction of cross product term in traditional linear model doesn't improve share price determination in Pakistan.

Results described above for fixed effects method used the LSDV (Least Squares Dummy Variable) technique. LSDV is most common and important method of Fixed Effects Model. It uses to create unit specific dummies. To avoid the perfect multicollinearity, we created 51 dummies instead of 52. Only small number of companies has p-value of less than 0.05. But overall effect of this dummy creation is shown in the R squared and adjusted R squared. We also reported the random effects regression results although this test is not applicable as shown by Hausman test. The conclusion of correlation between the unobserved unit-specific random effects and the regressors leads to the selection of FEM.

On overall basis some implications can be inferred from this study. Price determination models used in this study are relevant for KSE. Security analysis is possible to larger extent, which in turn shows that security analysis is pertinent in Pakistan. Financial information reported by companies is of sufficient quality and reported under quality accounting and reporting standards. Regulatory activities are helpful for investors. However to get full advantage of fundamental analyses techniques investors must be provided with needed awareness by government and regulatory authorities so that they may not indulge in irrational investments and make informed financial decisions.

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Appendix

Table 1

Descriptive Statistics for Variables

Description	BVPS	EPS	BVPS*EPS	MVPS
Mean	91.04	17.10	3364.85	163.65
Standard Error	5.93	1.40	595.86	13.36
Median	56.43	10.95	624.66	82.95
Standard Deviation	121.00	28.61	12153.19	272.50
Minimum	-1172.35	-265.70	-26631.34	2.86
Maximum	836.87	203.50	154954.89	2381.42
Range	2009.22	469.20	181586.23	2378.56

Table 2

Correlation Matrix for Variables

	BVPS	EPS	BVPS*EPS
EPS	.524**		
BVPS*EPS	.623**	.770**	
MVPS	.471**	.660**	.639**

** Correlation is significant at the 1% (2-tailed).

Table 3a

Hausman Test for Traditional Linear Model

Chi-square Statistic	Chi-square d.f.	Prob.
27.78	2	<0.0001

Table 3b

Hausman Test for Non-Linear Product Model

Chi-square Statistic	Chi-square d.f.	Prob.
24.35	3	<0.0001

Table 4a

Regression Statistics (FEM-LSDV) for Traditional Linear Model

Dependent Variable: MVPS Method: LSDV				
R-Square = 0.731 Adjusted R-Square = 0.691 Standard Error = 151.421				
	Coefficient	Std. Error	t statistics	Prob.
(Constant)	58.271	53.707	1.085	.279
BVPS	.347	.090	3.860	.000
EPS	3.022	.397	7.611	.000
d1	-44.119	75.713	-.583	.560
d2	-54.455	75.869	-.718	.473
d3	-46.200	75.731	-.610	.542
d4	-98.811	77.444	-1.276	.203
d5	-93.212	76.571	-1.217	.224
d6	-24.870	75.855	-.328	.743
d7	-69.776	75.914	-.919	.359
d8	134.392	75.940	1.770	.078
d9	-76.402	75.823	-1.008	.314
d10	-61.577	75.755	-.813	.417
d11	-114.638	77.170	-1.486	.138
d12	39.784	77.266	.515	.607
d13	27.614	75.761	.364	.716
d14	42.193	76.538	.551	.582
d15	31.545	75.770	.416	.677
d16	-3.425	75.798	-.045	.964
d17	5.736	76.041	.075	.940

d18	56.891	75.848	.750	.454
d19	-45.102	75.725	-.596	.552
d20	-14.703	76.017	-.193	.847
d21	-69.977	77.449	-.904	.367
d22	1.939	75.999	.026	.980
d23	2.999	77.161	.039	.969
d24	-9.355	75.775	-.123	.902
d25	90.864	75.892	1.197	.232
d26	403.395	86.652	4.655	.000
d27	-42.317	75.780	-.558	.577
d28	-29.711	75.740	-.392	.695
d29	-43.892	75.729	-.580	.563
d30	-52.002	75.778	-.686	.493
d31	8.495	76.725	.111	.912
d32	-46.869	75.767	-.619	.537
d33	-10.475	76.058	-.138	.891
d34	-52.506	75.731	-.693	.489
d35	-48.673	75.791	-.642	.521
d36	110.896	76.389	1.452	.147
d37	-25.628	75.749	-.338	.735
d38	-33.845	75.752	-.447	.655
d39	36.744	75.829	.485	.628
d40	784.979	76.556	10.254	.000
d41	85.299	77.839	1.096	.274
d42	641.789	84.168	7.625	.000
d43	64.247	76.299	.842	.400
d44	-2.669	75.766	-.035	.972
d45	-63.585	75.828	-.839	.402
d46	-66.982	76.278	-.878	.380
d47	-55.563	75.764	-.733	.464
d48	19.102	75.778	.252	.801
d49	22.257	75.921	.293	.770
d50	-57.764	75.723	-.763	.446
d51	-3.495	75.791	-.046	.963

Table 4b
Regression Statistics (FEM-LSDV) for Non-Linear Product Model

Dependent Variable: MVPS Method: LSDV				
R-Square = 0.747 Adjusted R-Square = 0.710 Standard Error = 146.866				
	Coefficient	Std. Error	t statistics	Prob.
(Constant)	70.593	52.153	1.354	.177
BVPS	.203	.092	2.206	.028
EPS	1.628	.480	3.394	.001
BVPS.EPS	.006	.001	4.879	.000
d1	-43.923	73.436	-.598	.550
d2	-39.850	73.648	-.541	.589
d3	-46.189	73.453	-.629	.530
d4	-85.603	75.163	-1.139	.256
d5	-74.352	74.368	-1.000	.318
d6	-13.848	73.607	-.188	.851
d7	-58.698	73.665	-.797	.426
d8	141.808	73.671	1.925	.055
d9	-64.613	73.582	-.878	.380
d10	-62.058	73.477	-.845	.399
d11	-95.575	74.950	-1.275	.203
d12	27.166	74.986	.362	.717
d13	33.338	73.491	.454	.650
d14	63.835	74.368	.858	.391
d15	40.646	73.514	.553	.581
d16	7.513	73.552	.102	.919
d17	24.047	73.849	.326	.745
d18	71.093	73.624	.966	.335
d19	-47.028	73.448	-.640	.522
d20	3.119	73.821	.042	.966
d21	-43.641	75.313	-.579	.563
d22	20.465	73.810	.277	.782

d23	33.482	75.100	.446	.656
d24	-1.577	73.513	-.021	.983
d25	106.635	73.680	1.447	.149
d26	262.973	88.837	2.960	.003
d27	-38.009	73.505	-.517	.605
d28	-29.837	73.461	-.406	.685
d29	-40.464	73.454	-.551	.582
d30	-64.294	73.542	-.874	.383
d31	32.473	74.579	.435	.664
d32	-54.579	73.504	-.743	.458
d33	11.586	73.909	.157	.876
d34	-55.686	73.456	-.758	.449
d35	-60.754	73.553	-.826	.409
d36	127.244	74.167	1.716	.087
d37	-23.098	73.472	-.314	.753
d38	-39.001	73.480	-.531	.596
d39	46.277	73.574	.629	.530
d40	814.178	74.494	10.929	.000
d41	107.720	75.637	1.424	.155
d42	624.941	81.709	7.648	.000
d43	54.954	74.028	.742	.458
d44	1.802	73.492	.025	.980
d45	-53.616	73.575	-.729	.467
d46	-50.469	74.061	-.681	.496
d47	-62.065	73.497	-.844	.399
d48	11.364	73.515	.155	.877
d49	37.952	73.707	.515	.607
d50	-58.839	73.445	-.801	.424
d51	2.826	73.522	.038	.969

Table 5a
Random Effects Regression Statistics (ECM) for Traditional Linear Model

Dependent Variable: MVPS Method: GLS				
	Coefficient	Std. Error	t statistics	Prob.
(Constant)	65.254	19.8790	3.283	0.000
BVPS	0.380	0.0881	4.314	0.000
EPS	3.729	0.3841	9.707	0.000

Table 5b
Random Effects Regression Statistics (ECM) for Non-Linear Product Model

Dependent Variable: MVPS Method: GLS				
	Coefficient	Std. Error	t statistics	Prob.
(Constant)	85.746	20.170	4.251	0.000
BVPS	0.218	0.0908	2.401	0.0168
EPS	2.189	0.4730	4.628	0.000
BVPS*EPS	0.0061	0.0011	5.130	0.000