



## Fundamentals and Stock Return in Pharmaceutical Companies: a Panel Data Model of Iranian Industry

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### Abstract

Stock return is usually considered to be affected by firm's financial ratios as well as economic variables. Fundamental method assume that stock returns is not solely related to the stock market. Most result come from the company condition, industry situation and whole economy. In this paper, this relationship between stock return and fundamentals is studied using the data for 22 pharmaceutical companies in Tehran Stock Exchange over a 7 year period, and effective factors on stock return are investigated. Because of our data natural we used panel data model from econometric methods. The results show that 80 percent of change in stock return can be explained with 9 fundamental variables factors including debt-equity ratio, working capital to total asset, current ratio, net profit margin, operating cycle, market share, inflation rate of medicinal products prices, total asset, and exchange rate have significant effect on stock return. This factors can be used in decision making in pharmaceutical industry.

*Keywords:* Economic variables, Fundamental analysis, Panel data, Pharmaceutical companies, Stock exchange, Stock return.

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### 1. Introduction

One of the essential tools used by investors in the capital market is fundamental analysis. This method assumes that the stock quotation is not solely related to the stock market [1], [2]. The movement of the stock price comes from the company condition, industry situation, and the status of economy

[3], [4]. This method assumes that the current market value of stock does not depict an accurate picture of the company's status and differs from its real value. In other words, this method assumes that the market is not efficient and market value doesn't reflect all the existing information about the company (in contrast with technical method). So, this method for forecasting the price of stock, analyses the economy, industry, and firm level data together, then tries to extract the real value of company. Main information sources for fundamental analysis are balance sheet, income statement, statement of cash flow, accounting announcement, prospectus and economic reports [5].

In this paper, the researcher investigated the relation between stock return and fundamentals in Iranian pharmaceutical industry.

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The data used in this study contains the panel data of 22 pharmaceutical companies listed in Tehran exchange during seven years (2004-2010). The results show that the fundamentals have a significant impact on the stock return.

Section 2 contains the literature review. Section 3 presents the model used in this paper. In section 4, we present the results and discuss the tests to investigate the validity of the model. Section 5 contains conclusion and summaries.

## 2. Materials and Methods

Fundamental analysis has been conducted in the last two decades mostly focusing on companies listed in stock exchanges in the US [6]. There is no research that uses econometric methodology for fundamental analysis using Iran market's data.

Most models, explain the stock return with financial variables [2], [7]. Some models tried to incorporate economic variables, such as inflation and economic growth. But most researches focus on financial data as fundamentals [8].

Generally, there are two approaches for fundamental analysis:

Fama and French (1992) focus on the risk factors that determine the value of the companies. They report that beta coefficient has little ability to explain the variation in stock returns. They reported that firm size and book to market equity can capture average return on US market [9]. Many researches (Fama & French, 1995) followed and examined this method in different asset markets around the world [11].

Another method initiated by Penman & Ou (1989) used financial information as fundamental variables to explain future stock return [11]. Moreover, Thiagarajan & Lev (1993) examined 12 fundamental variables using a cross-sectional data for each year in 1974-1988 and then average over the period to extract the effect of each variable [2]. Using this method, other researches such as Piotroski (2000) and Abarbandell & Bushee (1998) examined the relation of fundamental variables with stock return in US stock exchange [1], [3].

Models have identified different funda-

mentals with various degrees of significance. This may be either because of low ability of fundamental variables to explain the changes in capital market or the heterogeneity of firms under investigation. In order to overcome the second problem, the researcher limits the investigation on the Tehran exchange market and will examine whether fundamentals (both financial ratios and macroeconomic data) have explanatory power for the stock return. This research is an attempt to understand the role of fundamentals in determining the stock return and can be utilized by the managers to improve their company's financial performance and the investors to choose their portfolio.

The fundamental variables are calculated for 22 pharmaceutical's companies listed in Tehran stock exchange over 2004-2010 (for methods see [12]).

Table 1 introduces the variables with the expected effects on the stock return.

Stock return is calculated according to this formula:

- $D_t$ : Dividend distributed between share holders in period  $t$
- $P_t$ : Stock price at the end of period  $t$
- $\alpha$ : Percent of increasing capital from

$$r_{it} = \frac{D_t + P_t(1 + \alpha + \beta) - (P_{t-1} + C\alpha)}{P_{t-1} + C\alpha}$$

- new issue (right issue)
- $\beta$ : Percent of increasing capital from capitalization issue
- $C$ : Face value

To analyze the relationship between stock return and fundamental variables for pharmaceutical companies on the Tehran stock exchange, panel data model is employed. Panel data method is able to model the changes in time and cross-sectional dimensions. In this paper, the two approaches of fixed and random effect are both used for panel data model.

Panel data can be written as follows :

$$Y_{it} = \alpha + \beta X_{it} + \epsilon_{it}$$

Some variables change only between the firms ( $i$  index) and are considered unchanged

**Table 1.** Fundamental variables and their expected effect on stock return.

Fundamental Variable	Calculation method	Expected ffect
Current ratio	$\frac{\text{Current asset}}{\text{Current debt}}$	-
Capital in work to total asset	$\frac{\text{Capital in work}}{\text{total asset}}$	+
Market's share	$\frac{\text{company's sale}}{\text{whole sale of market}}$	-
Medical care inflation		-
Operating cycle	Inventory turn over period + Average collection period	-
Debt equity ratio	$\frac{\text{total debt}}{\text{shareholder's equity}}$	+
Net profit margine	$\frac{\text{Netprofit}}{\text{Sale}}$	+
Exchange rate	exchange rate	+
Company size	$\text{Log}(\text{total asset})$	+

for a firm over the time. For example, managerial methods differ from company to company and changes very slowly in time dimension and it's not easily detectable by quantitative methods.

One solution to this problem is fixed effect method. In the fixed effect model all the variables that have only i index, will be in the intercept:

$$\alpha_i = \alpha + \mu_i \quad \mu_i = \theta_1 S_i + \theta_2 Z_i + \dots$$

$\mu_i$  is sum of all cross-sectional variables that does not change in the time dimension. In fixed effect model intercept is specific for each cross-sectional variables (companies) but the slope for all cross-sectional variables is the same.

In other words, in fixed effect models we assume that individual effects do not change over the time and they are specific for each individual. Other assumption of this method is about error compo

nent. Moreover,  $e_i$  should be white noise. Besides, Fixed effect method works

on population not on a sample of population. In other words, fixed effect method should be applied for samples where the units are, not randomly drown from a population.

Other solution to this problem is random effect. In this method, error of variable elimination have been seen in error component instead of intercept.

The whole model can be written as follows:

$$\begin{aligned} Y_{it} &= \alpha + \beta X_{it} + w_{it} \\ w_{it} &= u_i + e_{it} \\ u_i &= \theta_1 Z_i + \theta_2 S_i + \dots \end{aligned}$$

In this model,  $u_i$  should be uncorrelated with  $x_{it}$  like  $e_{it}$ . Otherwise, the estimation will be biased. In this approach, it is assumed that the econometrician works with sample of population not the whole of population. In this model, we believe that sampled cross-sectional units were drown from large populations.

In random effect method, the correlation between two error component at two point

**Table 2.** Results of stationary test (p-values are reported).

Variable	ADF-Fisher	Levin, Lin & Chu	Im, pesaran and shin
Stock return	0.000	0.000	0.000
Debt to equity ratio	0.002	0.000	0.000
Capital in work to total asset	0.0155	0.000	0.002
Current ratio	0.6844	0.000	0.6100
Net profit margine	0.0421	0.000	0.000
Log (total asset)	0.4979	0.000	0.9966
Market share	0.002	0.000	0.0115
Medical inflation	0.0001	0.000	0.004
Exchange rate	0.7434	0.000	0.4398
Operating cycle	0.0001	0.000	0.000

of time for each specific cross-section unit is equal (unlike autoregressive models). So, that model cannot be estimated with OLS and must be estimated with FGLS (feasible generalized least square) [13].

In our case, since we studied all of pharmaceutical companies that listed in Tehran stock exchange, fixed effect model is better than the random one but for comparison we estimated both of them.

### 3. Results and Discussion

The data used in this paper includes 22 pharmaceutical companies on the Tehran stock exchange for 7 years (2004-2010).

The explanatory variables were calculated based on financial statements authorised by Tehran Stock Exchange. The historic price driven from the internet portal TEPIX.

First, We need to check the stationarity of the variables using the unit root test. All variables were tested with Levin, Lin and Chu test, Im, Pesaran and Shin test as well as ADF-fisher test. All results are presented in table 2. Null assumption in ADF-Fisher test and Im, pesaran and shin test is that at least one series are non-stationary or I (1). But in Levin, Lin and chu, null assumption is that all time series in panel data are non-stationary or I (1).

If  $y_{it}$  and  $x_{it}$  are non stationary or I (1) and cross-section error component or  $u_{it}$  is I (1), we have spurious regression. If  $y_{it}$  and  $x_{it}$  are I (1) and  $u_{it}$  is I (0) we have co-integration regression. In our research,  $y_{it}$  is I (0), so there is no concern to check for co-integration [14], [15].

The analysis was performed with EViews7. Table 3 displays the results of estimation for two classes of panel data models.

The coefficient's signs are in line with the expectations. The test mentioned in the last line of the table 3, also verify that our model is correctly identified.

We run the model with stock returns on one year lag of fundamental variables, the coefficients and the fitness of the model were worse than the presented results. Hence, in this industry, lagged fundamental variables have not any significant explaining power for stock returns.

Our results show that debt-equity ratio has significant effect on stock return and its coefficient was 0.0133. This represents the fact that in our sample when a company uses debts for its financial resources, its stock return will be better.

Working capital to total asset ratio has also a significant effect and its coefficient was 0.8701. This means that if a company has much capital in work to its volume, its stock return will be better. It makes sense that when capital flows in the company more frequently, company should show a better performance.

Current ratio had -0.3225 coefficient and was significant. This represents that if current asset to current liability ratio increases, the stock return will decrease. Although according to the theory high current ratio is good for supplier but according to our results it has a negative effect on the stock holder's return.

**Table 3.** Panel data estimations for fixed and random effect models.

Variable	FE model	RE model
	Coeff	Coeff
Debt to equity	0.0133*** (7.38)	0.00128 (0.34)
Capital in work to total asset	0.8701*** (10.27)	0.3508** (2.44)
Current ratio	0.3225*** (10.27)	0.1467** (-2.43)
Net profit margine	0.6363*** (10.27)	0.2062** (2.93)
Operatig cycle	$-8.23 \times 10^{-5}$ *** (-2.09)	$-9.95 \times 10^{-5}$ *** (-2.17)
Market share	2.1272*** (4.40)	0.9138*** (1.49)
Medical care inflamation	-0.0271*** (-21.90)	-0.0278*** (-10.12)
Log (total asset)	-0.1380*** (-4.77)	-0.0813** (-2.57)
Exchange rate	0.00019*** (9.57)	0.00014*** (4.75)
C	2.49*** (4.13)	1.467** (2.45)
	R <sup>2</sup> = 0.84 adj – R <sup>2</sup> = 0.80 F – stat = 21.36 Prob (F-stat) = 0.000 Durbin Watson = 2.46	R <sup>2</sup> = 0.48 adj – R <sup>2</sup> = 0.44 F-Stat = 14.04 Prob (F-stat) = 0.000 Durbin Watson = 2.10

\*\*\*, \*\*, and \* indicate significance at level of 99%, 95%, and 90% respectively.  
t-value are in paranteses

As it is expected the net profit margin also has a significant positive effect on stock return. Total asset that shows company's size has decreasing effect on the stock return. It may be explained by the fact that big pharmaceutical copmanies have lower return since they invested in different production lines, and small ones are new and invested in niche markets with high returns [16].

Market share has strong effect on the stock returns. As it can be expected, firms with market power have higher returns.

Between the macroeconomic factors, medical care inflation has decreasing effect on stock return and exchange rate has significant positive effect on return.

#### 4. Conclusion

This research shows that there is a significant relationship between fundamental variables and the stock return in pharmaceutical companies listed in Tehran Stock Exchange. We find that 80 percent of change in stock return can be explained with 9 fundamental variables (including debt-equity ratio, working capital to total asset, current ratio, net profit margin, operating cycle, market share, inflation rate of medicinal products prices, total asset, and exchange rate). Also we exceed the parsimony rule in this work but goodness of fit is better than previous works and most of the fundamental variables have significant and expected effects on stock return. This can be explained by

the choice of pharmaceutical industry which firms using similar technology and operate in the same market.

## References

- [1] Abarbandell J, Bushee B. Abnormal Returns to a fundamental analysis strategy. *The Accounting Review*, 1998, 1(73): 19-45.
- [2] Thiagarajan R, Lev B. Fundamental information analysis. *Journal of Accounting*, 1993(31): 190-215.
- [3] Piotroski JD. Value Investing: The Use of Historical Financial Statement Information to Separate Winners from Losers. *Journal of Accounting Research* 2000: 1-41.
- [4] Johnson R, Soenen L. Indicator of Successful Company. *European Management Journal* 2003: 364-369.
- [5] Keshavarz K, Kebriaeezadeh A, Hahemi Meshkini A, Nikfar SH, Mirian I, Khoonsari H. Financial perspective of private pharmacies in Tehran (Iran); is it Lucrative business? *DARU Journal of Pharmaceutical Sciences* 2012: 20,62.
- [6] Witkowska M, Fundamental and Stock Returns on the Warsaw Stock Exchange. the Application of Panel Data Models. Department of Applied Economics, Warsaw University Working Papers 2007.
- [7] Martani D, Khairurizka R. The Effect of Financial Ratios, Firm Size, and Cash Flow from Operating Activities in the Interim Report to the Stock Return. *Chinese Business Review* 2009: 44-55.
- [8] Yahyazadefar M, Pournaghshband H. The Comparison of Methods Artificial Neural Network With Linear Regression Using Specific Variables for Prediction Stock Price in Tehran Stock Exchange. *International Journal of Computer Science and Information Security* 2010: 38-46.
- [9] Fama E, French K. Size and Book-to-Market Factors in Earning and Returns. *Journal of Finance* 1995 (50): 131-155.
- [10] Drew M. E, Naughton T, Veeraraghavan M. Firm size, Book-to Market Equity and Security Returns: Evidence from the Shanghai Stock Exchange. *Australian Journal of Management* 2007: 119-140.
- [11] Penman S. H, Ou J. A. Financial Statement Analysis and the Prediction of Stock Returns. *Journal of Accounting and Economics* 1989: 295-329.
- [12] Jones C P, Investments: Analysis and Management. North Carolina: Willey, 2007.
- [13] Green W. Econometric Analysis. Testing for Unit Root in Heterogeneous Panels. *Journal of Econometrics* 2003(115): 53-74.
- [14] Fisher A. R. (1932). *Statistical Methods for Research Workers*. Edinburg: Oliver & Boyd, York University, Toronto, Ontario 2005.
- [15] Levin A, Lin C.F, Chu C.S. Unit Root Tests in Panel Data: Asymptomatic and Finite-Sample Properties. *Journal of Econometrics* 2002,(108): 1-24.
- [16] Kebriaeezadeh A, Koopaei N N, Abdollahi Asl A, Nikfar S, Mohammadi N, Trend analysis of the pharmaceutical market in Iran ;1997-2010; Policy implications for developing countries. *DARU journal of pharmaceutical Sciences* 2013: 21(1) : 52.