International Journal of Economics and Finance; Vol. 7, No. 4; 2015
ISSN 1916-971X E-ISSN 1916-9728
Published by Canadian Center of Science and Education

Do Financial Ratios Affect Index Constitution?

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Received: January 12, 2015 Accepted: February 28, 2015 Online Published: March 25, 2015

doi:10.5539/ijef.v7n4p191 URL: http://dx.doi.org/10.5539/ijef.v7n4p191

Abstract

The inclusion or exclusion of a stock from an index is important with regard to be considered as a positive signal for both institutional and individual investors. The index inclusion reflects a positive situation about the quality, risks and possible future return of the stock. Financial ratios reflect the financial solidity of the enterprise. Starting from this statement, in this study we aim to research whether financial ratios have any effect on the inclusion of the stock in the Istanbul Stock Exchange (BIST 100) index. The research on which ratios and ratio groups are effective on the stock inclusion in the index has been anaylzed by using panel logit model. It has been noted that, among the models, the one with the most significant impact on inclusion in or exclusion from the index are the activity ratio variables. This result indicates that the impact of the allocation of resource financing on the probabilities of being included in/excluded from the index is too strong with positive and negative effects of debts on the operating profit. Besides, in order to illustrate the success of the estimated results obtained from the models, the probability of inclusion or exclusion of each stock in the index is determined. The empirical results, on the basis of the financial solidity of enterprises has a significant impact on the inclusion in/exclusion from the index, show that the financial ratios are effective - indirectly- on the inclusion/exclusion.

Keywords: discrete regression and qualitative choice model, financial market, financial ratio, panel data model

1. Introduction

The stock exchange markets; provide liquidity to securities, enable the securities to be processed with a single price in the market, radiate property to the base, provide assurance as they smooth the structural change in the industry by facilitating movement of capital, and act as a guide in the economy. Due to all of these facts, stock market indices are good benchmarking tools for stock investment and they are the focus of attention of investors. The announcement of the inclusion of a stock in one of the main indices of the stock exchange is considered as a positive signal by both institutional and individual investors in terms of its quality, risks and potential future return. Investors comment on the declared data and decide on their positioning. They have to make financial decisions depending on the institutional and individual relations with the enterprise and their opinion. For example, a potential investor may decide on whether buying or not the stocks of an enterprise by examining the financial tables. The legal rules of selecting the stocks which will be included in BIST 30, BIST 50 and BIST 100 indices; except the ones in exactly custody, stocks under Takasbank custody is selected starting from the first rank after the listing from the great to the small as per the end of the stock valuation period according to the market values (number of stocks∗ final quotation). The calculation of the market values is based on the daily average number of stocks under Takasbank custody during the valuation period (IMKB, 2010). Considering the studies relevant to this subject, we can observe that, usually the factors that affect stock returns which are included in or excluded from the index (trading volume, stock price etc...) are examined. In these studies the validity of the hypothesis used to explain the abnormal returns is investigated. Although the studies in the literature do not focus on the impact of the financial ratios, we believe that they have an indirect impact on stocks being included in the indices.

According to the efficient market hypothesis financial markets reflect the whole information to the price and consequently, financial ratios also have an impact on the price. Financial ratios are the indicators of the success, reliability and structural solidity of the enterprises. The financial ratios effective in the evaluation of enterprises have significant impact on the inclusion/exclusion in indices by increasing or decreasing the interest and demand

in the stock exchange. We believe that the solidity of the financial structure of an enterprise which can be determined by the financial ratios is effective on the iclusion in the BIST 100 index. To this end, in this study, the impact of the financial ratios of the enterprises traded in stock exchange on being included in/excluded from the BIST 100 index has been examined. Whereby, the examination on which ratios and ratio groups are effective on the inclusion in the stock exchange index has been realized using panel logit models. Besides, the probability of inclusion/exclusion of each stock in the index, has been determined. As far as we know, the examination of the situation of being included in the index from this point of view is a unique study in Turkey that has not been done before. Due to this feature, the study will contribute to the literature.

2. Literature

The situation of inclusion in/exclusion from the stock exchange index and the changes in the stock has been studied by many researchers for different countries. The studies can be divided in two categories such as "the ones studying the impact of inclusion/exclusion status on the stock return" and "the ones determining the probability of inclusion in/exclusion from the index by examining impacts on inclusion/exclusion". Considering the study in the first group we can see that there are four hypotheses to explain abnormal returns. These hypotheses are "the information hypothesis", "the price pressure hypothesis", "the downward-sloping demand hypothesis" and "the liquidity hypothesis" (Lynch & Mendenhall, 1997). Shleifer (1986) and Harris and Gurel (1986) are the first ones to state that stock prices react positively to its inclusion in S&P index. Whereas in some of the studies examining the data on price and trading volume of the index, some evidence of temporary price pressure is obtained (Lynch & Mendenhall, 1997; Elliott, Ness, Walker, & Warr, 2006; Mazouz & Saadouni, 2007; Chakrabarti, Huang, Jayaraman, & Lee, 2005), in some others, it is stated that inclusion in the index causes positive permanent abnormal returns (Becker-Blease & Paul, 2010; Parthasarathy, 2011; Jog & Okumura, 2003; Yun & Kim, 2010). Although Wouters (2012) observe that the inclusion in or exclusion from World ESG index cause significant positive abnormal return, Anton, Rodriguez and Alonso (2012) state that prices rise in case of the inclusion, this situation continues for the two subsequent weeks but no abnormal positive return occurs prior to inclusion, no clear conclusion can be stated in the case of exclusion from the index. Chen (2004) comes to the conclusion that there is an asymmetric reaction in cases of inclusion in/exclusion from the index. In his study, it is stated that while there is a permanent increase in the price of the stock included in the index, no permanent decline occurs in case of exclusion. In the literature, there are also studies supporting the hypothesis of downward sloping demand curve, among these are Keratithamkul (2005), Carter (2013), Chakrabarti (2001) and Hedge and McDermott (2003).

Among the works included in the second group are Andrade, Bressan, Iquiapaza and Moreira (2013), Fernandes and Mergulhao (2013), Geppert, Ivanov and Karels (2010). Andrade et al. (2013) aim to determine the factors affecting the inclusion of the enterprises in BM&FBOVESPA Corporate Sustainability Index (CSI) and whether this inclusion is related to their market value in Brazil. The results state that larger scale, highly profitable, environment friendly enterprises have got higher probability of being included in CSI index. Fernandes and Mergulhao (2013) investigated the price impact of trading as expected changes in the FTSE 100 index composition. They estimate probit model and they offer a panel-regression event study and find that anticipative trading explains about 40 % and 23 % of the cumulative abnormal returns of inclusions and exclusions. Sarma (2010) propose a multidimensional index that can be used to compare the extent of financial inclusion across different economies and computed the index for 49 countries. This index captures information on various dimensions of financial inclusion in one single number lying between 0 and 1, where 0 denotes complete financial exclusion and 1 indicates complete financial inclusion in an economy. Geppert, Ivanov and Karels (2010) analyze the probability of being excluded from the index, of the enterprises on S&P using survival analysis and neural networks methods. Additionally although Guris, Metin and Caglayan (2009) have compared the forecasting success of the logit and panel logit models they have estimated in their study where they studied the impact of the financial ratio on the profitability of the enterprises on the BIST 100 index, they have not investigated the situation of being included in/excluded from the index.

3. Methodology

Based on the fact that financial ratios are the indicators of the strength of the financial structure of the enterprise, we believe that these ratios have significant impact on the inclusion of the stock in BIST 100 index. With this aim, in this study, the impact of financial ratios of the enterprises traded in the stock exchange, on the inclusion in/exclusion from the BIST 100 index will be examined using panel logit model. A short brief on, first classic logit model estimated using Maximum Likelihood Method and then about panel logit model.

Classic Logit Model grounded logistic distribution can be formulated as;

$$y_i = \beta' x_i + e_i \quad i = 1, \dots, N \tag{1}$$

Here, the dependent variable y_i has two different values. If the success criterion that has been set for the time period t for the unit i is true, then $y_i = 1$, if it is false, then $y_i = 0$ and x_i is the k number of expalanatory variable, β is the parameter vector and e_i is the error term. Logit model is estimated via maximum likelihood method in this study. The log-likelihood function for the logit model is;

$$logL = \sum_{i=1}^{N} y_i \beta' x_i + \sum_{i=1}^{N} log(1+e^{\beta' x_i}) \tag{2}$$

In here β parameters are estimated by the maximization of this function (Greene, 2011).

Binary panel logit models can be grouped in two different categories as fixed effects and random effects. Fixed effects binomial panel logit models can be,

$$y_{it} = \alpha_i + \beta' x_{it} + e_{it}$$
$$e_{it} = IID(0, \sigma_\varepsilon^2), \quad i=1,\dots,N, \quad t=1,\dots,T \tag{3}$$

In here i subscript denotes the cross-section dimension, t denotes the time-series dimension. Binary dependent variable is,

$$y_{it} = 0 \quad otherwise \tag{4}$$

α is scalar, β is the parameter vector with the dimension $Kx1$, x_{it} is the i^{th} observation on k number of explanatory variable and e_{it} is the error term. c represents the value of the success criterion. The effect of the unit is considered fixed in the fixed effects panel logit models (α_i). The estimation of the fixed effects logit models depend on the method of conditional likelihood in line with Chamberlain (1980). It relies on the maximization of the log likelihood function,

$$logL = -\sum_{i=1}^{N} \sum_{t=1}^{T} log\left[1+exp(\beta' x_{it}+\alpha_i)\right] + \sum_{i=1}^{N} \sum_{t=1}^{T} y_{it} (\beta' x_{it}+\alpha_i) \tag{5}$$

where β and α_i are estimators (Hsiao, 2003).

An alternative approach to fixed effects is to assume that the changes are not constant and treated as random in random effects models. The effects in these models are added to the model as part of the error term. These models are stated as,

$$y_{it} = \alpha_i + \beta' x_{it} + v_{it}, \quad \alpha_i = IID(0, \sigma_\alpha^2), \quad v_{it} = IID(0, \sigma_v^2) \tag{6}$$

In here α_i and x_{it} are independent. Estimating the models as fixed or random will make changes in parameters (Verbeek, 2000).

In the random effects models, the effects that belong to the unit are independent and come from a common distribution, and assumed that they are distributed normally. The log-likelihood function for the random effects logit model, in the event of incidental parameters are independent from $\alpha_i(x_i)$ and they are a random sample from a univariate H distribution, indexed by a finite number of parameters δ, will be,

$$logL = \sum_{i=1}^{N} log \int \prod_{t=1}^{T} F\left(\beta' x_{it}+\alpha\right)^{y_{it}} \left[1-F\left(\beta' x_{it}+\alpha\right)^{1-y_{it}}\right] dH(\alpha|\delta) \tag{7}$$

In here $F(.)$ is the distribution of the error term condtional on both x_i and α_i. The maximization of the log likelihood ensures consistent estimators to β and δ (Chamberlain, 1980, 1984).

4. Empirical Findings

In this implementation the aim is to determine whether the financial ratios are effective on the probability of being included in BIST 100 index. To this end, panel logit models are estimated with 46 financial ratios for 133 enterprises which have been included in and excluded from the BIST 100 index (Note 1). Annual data between the years 2006-2013 have been used. As dependent variable with two levels it can be expressed as follows,

$$y_{it} = \begin{cases} 1, & \text{if enterprise i is included in BIST 100 index} \\ 0, & \text{if enterprise i is excluded from BIST 100 index} \end{cases} \tag{8}$$

Financial ratios are important in terms of giving information about the financial situation of the enterprise, which will help the management to avoid fiscal ambiguities and business failures. It is possible to make different groupings in ratios calculated for the financial ratios analysis. The ratios used for analysis in this study are regrouped under four titles; liquidity ratios, financial structure ratios, efficiency ratios and profitability ratios.

Liquidity ratios measure the liquid position which can easily be encashed and sufficient to meet the enterprise's

current liabilities (Aktas, 2001). Liquid assets that can readily be converted into cash, on the assumption that they form a cushion against default. Briefly, it is a measure of the payment ability of the enterprise in terms of its short-term debts (Helfert, 2001). Financial ratios are used to determine enterprise's source structure and the ability to pay long term debts (Berk, 2000). Financial ratios try to measure the efficiency, effectiveness or efficacy of an enterprise (Bull, 2008). Activity ratios, measure the effectiveness of the enterprises that uses its assets effectively and it is usually used for comparing the enterprises operating in the same sector. Profitability ratio measures the profit achieved by the company during the period of a calendar for all its operating activities, in other words whether it is satisfactory or not.

Among the 46 financial ratios used in the implementation, 6 are of liquidity, 18 of financial structure, 7 of activity and 15 are profitability ratios. The random effects and fixed effects models are estimated with different ratio combinations. Furthermore, considering the possibility of independent variables' past values having some impact on the matter, dynamic models are also estimated. Among the estimated models, the four most significant models are shown on the Table 1 (Note 2).

Table 1. The results of panel logit models

Dependent variable: BIST100	Random Effects		Fixed Effects	
Independent Variables	Model 1	Model 2	Model 3	Model 4
Constant	-2.5222***	-4.3526***		
	(0.8832)	(1.2353)		
CR(-1)		-0.1034**		
		(0.0513)		
CRCAR	-2.0492*	-3.3849**		
	(1.1121)	(1.3629)		
LTAR	8.6623***	12.2907***	4.5398***	6.1731***
	(2.2959)	(2.9162)	(1.5958)	(2.2204)
CLTLAR	-3.6621**	-5.4013**		
	(1.8258)	(2.2151)		
LTLLTSR(-1)				-1.9589*
				(1.0274)
BCTAR	-11.9831***	-16.4308***	-10.1586***	-14.5082***
	(3.4971)	(4.5182)	(3.6038)	(4.8823)
BCLR	4.2952**	7.2329***	3.5325*	7.4489***
	(1.7546)	(2.3117)	(1.9642)	(2.7272)
ETR	-0.1017*			
	(0.0587)			
NPER			-0.0734*	
			(0.0444)	
NPTAR		4.2212*		5.1512*
		(2.3705)		(2.6726)
N and # of groups	1064-133	931-133	376-47	259-37
Wald Statistics (df)	19.70 (6)***	25.50 (7)***		
LR Chi2	593.68	508.62	14.26 (4)	19.86 (5)
Log likelihood	-364.5612	-299.3908	-140.7439	-97.7083

Note. Figures under estimated coefficients in parenthesis are standard errors.

***, ** and * indicates significance at 1 %, 5 % and 10 % statistical levels respectively.

Model 1 on table 1 is random effects model, Model 2 is dynamic random effects model, Model 3 is fixed effects model, Model 4 is dynamic fixed effects model. Variables on Table 1 are respectively: Cash Ratio (CR), Current Receivables/Current Assets Ratio (CRCAR), Liabilities/Total Assets Ratio (LTAR), Current Liabilities/Total Liabilities and Equity Ratio (CLTLAR), Long Term Liabilities/Long Term Sources Ratio (LTLLTSR), Bank Credits/Total Assets Ratio (BCTAR), Bank Credits/Liabilities Ratio (BCLR), Equity Turnover Ratio (ETR), Net Profit/Equity Ratio (NPER) and Net Profit/Total Assets Ratio (NPTAR).

Cash Ratio (CR) variable in Model 2 is a ratio measuring the amount of the short term liabilities the enterprises can

pay using their liquid assets in case of an unpredictable economic difficulty such as having problems in getting the stocks off and collecting receivables. Cash ratio seems to affect the probability of being included in excluded from the index, negatively. The cash ratio is required to be at the optimum level depending on the sector, when this ratio is too high the enterprises are considered as to hold idle money. Current Receivables/Current Assets Ratio (CRCAR) appearing significant in Model 1 and Model 2. This ratio indicates which part of the current assets are derived from the futures sales. The result of the analysis show that enterprise's the high term sales have negative impact on the inclusions and exclusions to the index. The fact that this ratio is too high reflects the cash collecting difficulties of the enterprise. In all the models on Table 1 Liabilities/Total Assets Ratio (LTAR) variable has a positive impact on the inclusion in/exclusion from the index. This ratio, measures the percentage of the enterprise's assets financed by the liabilities. The business partners prefer this ratio to be rather high. Because the high ratio indicates that the liabilities are used in a larger scale compared to the equities. This allows them to get higher dividend by increasing the profitability of business with the leverage effect of financing but this situation has an optimal point (Akdogan & Tenker, 2007). In terms of financial structure the financing of the assets with the equities is considered to be reasonable therefore the enterprises that are likely to be included in BIST 100 are usually financed with liabilities. Current Liabilities / Total Liabilities and Equity Ratio (CLTLAR) variable in Model 1 and Model 2 have negative impact on the inclusion in/exclusion from the index. This ratio is the percentage of the short term liabilities used for the financing of the assets of the enterprise. The fact that this ratio is high shows that the active is mostly financed with the short term liabilities. Only Long Term Liabilities/Long Term Sources Ratio (LTLLTSR) in Model 4, as the variable's value increases the probability of being included in/excluded from the index is affected negatively. This ratio measures long-term liabilities' concern in the constant capital. Constant capital is the sum of equity and long-term resources. The increase in the LTLLTSR ratio shows that the enterprise's long term liabilities and financing is higher than the equities. This ratio should be equal to or above the total sum of short and long term equities because equities not only show the ownership rights of the business partners over the assets but they are also a guarantee for the creditors. The variable that represents Bank Credits/ Total Assets Ratio (BCTAR), present in all the models is determined to be the one with higher negative impact on the inclusion in/exclusion from the index. This ratio measures the amount of bank credit used to finance the assets of the enterprise. The negative value of this ratio increases the interest burden of the enterprises with bank loans and reduces the possibility of entering into this index. The variable that represents Bank Credits/ Liabilities Ratio (BCLR), presented in all the models indicates the amount of liabilities consisted of bank loans. This ratio has a positive impact on the inclusion in/exclusion from the index. The higher is the value of the variable Equity Turnover Ratio (ETR) only present in Model 1, the lower is the probability of the inclusion/exclusion from the index. This ratio measures the effectiveness of the usage of the assets. Normally, the high value of this ratio expresses the effective and economical usage of the enterprise's equity, but the abnormal high value of this ratio reflects the fact that the equity of the enterprise is insufficient and it widely uses the liabilities. The variable Net Profit/Equity Ratio (NPER) only present in Model 3, indicates the return on the investment that the shareholders are receiving based on the equity they have in the business. This ratio is affected by both the profit margin and the turnover of the total assets. The increase of prices or decrease of the unit cost is provided by the increase in operating profit. The adequacy of the net profit/equity ratio in enterprises changes depending on the alternative usage areas of the capital. Net Profit/ Total Assets Ratio (NPTAR) are used to determine how effective the actives are used. It has been observed that the ratio value has a positive impact on the probability of inclusion in/exclusion from index. As mentioned before, beside researching which ratios and ratio groups are effective on taking part in the BIST 100 index, to show the success of the estimation results obtained from the models fitted values of the models are used as below and the successful estimation ratios are calculated.

$$\hat{y}_{it} = \begin{cases} 1, & if \geq 0.5 \\ 0, & if < 0.5 \end{cases} \tag{9}$$

When the fitted values of the estimated models are analyzed the probability of reliable choice of stocks included in/excluded from the index in BIST 100 are; 66 % for model 1, 63.5% for model 2, 72.5% for model 3 and 54.5% for model 4. The model with the highest estimation power is the fixed effects model. The probability of inclusion in/exclusion from the BIST 100 index of the stock, will be calculated by placing its financial ratios in this estimated fixed effects model. The investors will consider this situation as a negative or positive signal concerning the future of the stock.

5. Conclusion

Investors closely follow the stocks in terms of their quality, risks, the probable returns in the future and the inclusion in/exclusion from the stock market by reviewing or changing their positions. In this study, 46 financial ratios are used as independent variables and the static and dynamic panel logit models are estimated for the 133

enterprises included or not in the stock market between the years 2006-2013, dependent variable is 1 for the enterprise is included in BIST 100 and 0 for excluded from. The best models with significant results have been declared.

Among the models, mostly the activity ratio variables have been shown to be statistically significant. This result indicates that the impact of the allocation of resource financing on the probabilities of being included in/excluded from the index is too strong with positive and negative effects of debts on the operating profit. While Cash Ratio, Current Receivables/Current Assets Ratio, Current Liabilities/Total Liabilities and Equity Ratio, Long Term Liabilities/Long Term Sources Ratio, Bank Credits/ Total Assets Ratio, Equity Turnover Ratio, Net Profit/Equity Ratio variables in models have a negative effect on the inclusion/exclusion probabilities from the index, Liabilities/Total Assets Ratio, Bank Credits/Liabilities Ratio, Net Profit/ Total Assets Ratio variables have a positive effect on the situation. This situation shows that the probability of the inclusion of the enterprises is higher than the others that; hold the money idle, believed to have cash proceeds problems, under pressure of third persons in terms of running its operations, under interest burden with too much bank credit, highly in dept with insufficient equity, have good self financing, provide comfortable working conditions to the management, facilitate the distribution of profit to the share holders as interest-free and non repayable source. This situation is usually reflects the fact that enterprises are financed with liabilities and are subject to a high interest rate.

When the estimated models are examined, the probability of determining the stock being included in/excluded from the BIST 100 index truely is 66 % for Model 1, 63.5 % for Model 2, 72.5 % for Model 3 and 54.5 % for Model 4. Among the determined models the one with the highest forecast ability is fixed effects model.

Although being included in or excluded from the index is determined by the trading volumes and the prices, as the financial ratios are the indicators of the strength of the enterprises, usually the stocks of the enterprises that have good financial ratios are likely to be more frequently traded and their price can increase. In our implementation realized with the presumption that the financial solidity of the enterprise has a significant impact on being included in the index, we have concluded that financial ratios are –even- indirectly effective on the inclusion in/exclusion from the index.

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Notes

Note 1. Financial ratios are calculated using the financial tables published in forex.

Note 2. 46 different finacial ratios can be obtained from the authors upon request.

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