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Tobin's q, RoA, Diversification and Risk

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ABSTRACT

This study aims to explain the link between corporate diversification, firm performance and risk. To test the research hypotheses, a sample of 63 companies listed in Tehran Stock Exchange over the period 2008-2012 was taken. We construct two models with Tobin's q, RoA, Size, Debt, Growth and Standard deviation of stock returns. Analysis of the research models is based on panel(data) analysis. In these models the presence or absence of effect model (fixed or random) is reviewed and finally the best model is estimated. Inference is based on significant level or p-value, thus likely that any value or significance level of the test is less than 0.05 is rejected at the 95 percent confidence level. The results indicate that there is no significant relationship between diversification strategy, firm performance and risk.

1. INTRODUCTION

Diversification is one significant method that firms use to maintain their competitiveness and enhance their profitability. Firms seek diversification strategy in order to achieve value creation through economic of scope, financial economies, or market power(Chen and Yu, 2012).
Since the 70th the academic research tried to check the relation between diversification and firm performance(Kahloul,2010). Previous studies showed different foundings about the relation between diversification and firm performance. Some studies found a negative relation between diversification strategy and performance(e.g.,Berger and Ofek,1995;Wernerfelt and Montgomery, 1988; Martin and Sayrak 2003) while other found a positive relation(e.g; Maksimovic and Phillips, 2007; Villalonga,2004).
The diversification strategy constitutes a field of investigation for management risk researches(Kahloul,2010).It's often perceived by both practical and academicians that corporate diversification always reduces firm risk. However, the literature contains little empirical evidence on the important of corporate diversification on firm risk(Anderson et al.,2011).

2. THEORETICAL BACKGROUND

The theme of the diversification-performance relation, probably one of the most studied in the literature, is not far from being exhausted (Palich and al, 2000). Since the 70th the academic research tried to check the relation between diversification strategy and firm performance. Nowadays, the problematic of the firm activity perimeter evolution is an interesting subject so much in industrial economy, in strategy or in finance.

Researches show that some factors have been caused the trend toward diversification during 1960 and 1970. Studies indicate that diversity in companies cause to reduce internal management costs. Rapid growth of management science led to this idea that extract of management is not employing experimental knowledge of one specific industry, but to apply the tools and principles of management. Overall at the global level management principles suggest that professional management can control different companies in financial terms. Subsequent research indicates companies during 1980 and 1990 have again have turned into centralization. Studies show that

factors such as increased volatility and turmoil in the industry, managers' centralization to increase share value, to accommodate growth and the emergence of new ideas about the management of the company, has been caused refocusing the company.

The present paper is interested to the double impact of the performance and risk. In Lang and Stulz (1994) and Kahloul and Hallara (2010) an objective continuous measure of the strategic diversity of the firm based on the Herfindahl index has been used. In the present work, we also use the Herfindahl index. Our work is concentrated on panel modeling analyses.

3. LITERATURE REVIEW

The literature of corporate diversification and the puzzle surrounding whether diversification gives rise to discount or premium, was previously surveyed by three prominent articles [illegible]in and Sayrak (2003), Stein (2003) and Maksimovic and Phillips (2007). Martin and Sayrak (2003) survey the literature on corporate diversification through two separate channels: cross sectional studies of the link between corporate diversification and firm value on one hand and longitudinal studies in patterns of corporate diversification through time on the other. Their survey suggests that diversification discount may not be the result of corporate diversification after all. In contrast, diversification discount may result from measurement issues or simply because of sample bias. Stein (2003) studies the strand of literature which questions the efficiency of corporate investment in the presence of asymmetric information and agency problems. His focus was mainly on the literature, which addresses the issue of efficient capital allocation across firms through external capital markets and within firm allocation of capital through its internal capital market.

Diversification discount or premium is explained by various costs and benefits arising from corporate diversification. The costs arising from corporate diversification are theoretically justified by agency arguments (Amihud and Lev, 1981; Jensen, 1986; Shleifer & Vishny, 1989; Jensen & Murphy, 1990), inefficient investment due to rent seeking activities (Scharfstein, 1998; Scharfstein & Stein, 2000; Rajan et al., 2000; Choe & Yin, 2005) and by more recent theories that suggest the existence of a discount is consistent with the value maximizing behavior of the firm (Fluck & Lynch,1999; Zuckerman,1999;Matsusaka, 2001;Gomes & Livdan,2004). Similarly the benefits of corporate diversification, which give rise to diversification premium, can originate from the theories of an efficient internal capital market (Williamson,1975; Williamson,1970; Stein,1997), debt coinsurance (Shleifer & Vishny,1992), economies of scope (Teece,1980; Teece,1982) and market power (Scott,1982; Tirole, 1985; Villalonga, 2000).

Theoretical literature on diversification discount argues that firms diversify in order to reduce risk. Mansi and Reeb (2002) argue in their empirical paper that diversification discount arises due to the risk-reducing tendencies of the conglomerates. They further argue that diversification reduces shareholder value on the one hand but increases the bondholder value due to the reduction in risk. As a result it may be expected that more diversification discount exists in firms with debt as compared to all equity firms. After using the Berger and Ofek (1995) methodology they find a discount of 4.5% in firms with more than average debt levels whereas no discount is found for all equity firms. This result suggests that debt is an important factor in determining firm diversification. They also show that using book values of debt instead of market values of debt for calculating excess value undervalues diversified firms. Finally they try to examine the joint impact of diversification on debt and equity holders. Their results show that diversification reduces shareholder value, increases bondholder value but has no impact on total firm value.

Tobin's q became the most common measure of firm performance after Lang and Stulz (1994). They use three different measures of diversification to compare the q ratio of single segment firms with multi-segment firms for various levels of diversification. The first two measures are Herfindahl indices constructed from sales and assets. The third measure is the number of segments in the firm since more diversified firms have more segments. Lang and Stulz (1994) use cross-sectional regressions for each year from 1978 to 1990. They use a dummy variable to estimate the statistical contribution to q of diversification. However, they argue that since this method does not take into account the industry effects, a firm belonging to an industry with low q will automatically

have lower q irrespective of diversification. This short coming is corrected for by using industry-adjusted measures of discount.

Berger and Ofek (1995) use asset and sales multiplier14 instead of Tobin's q in order to measure the value effect of diversification. In order to show the possible association between value loss and diversification they estimate pooled regressions using multi-segment dummy and control for firm size, profitability and growth opportunity of the firm. Khanna and Palepu (2000) use Tobin's q and rate of return on assets (ROA) as a measure of firm performance. Four different diversification measures are used in their analysis: (a) INDCNT: a count of industries represented in a group, (b) ENTROPY: sum of entropy index of related diversification and an entropy index of unrelated diversification, (c) CONCENTRIC: a weighted average of each firm's share of group sales and (d) HERFINAHL: sum of squares of each industry's sales as a proportion of total group sales. Both Univariate comparisons and Multivariate regression analysis are performed using Tobin's q and ROA.

Schoar (2002) adopts a different methodology to address the issue of whether diversification destroys value or not. He uses micro level data for manufacturing firms from the Longitudinal Research Database from the U.S. Bureau of the Census. Instead of using market valuation measures such as excess value of the firm he uses productivity measures of firm performance like total factor productivity (TFP). TFP measures of firm performance are obtained at the plant level by estimating a log-linear Cobb-Douglas production function for each industry and year. Number of segments and Herfindahl index are used as measures of diversification. He also controls for firm size and segment size in his regressions. Schoar (2002) tests several different hypotheses in his paper and uses different dummies to do so.

Anderson et al.(2011) reviewed that whether corporate diversification decreases or increases the risk of the diversifying firm is an important empirical question. They investigate this issue using a sample of diversifying acquisitions and various risk measures. They find that corporate diversification tends to decrease the risk of some firms but increase the risk of many others, and on average corporate diversification does not lower firm risk. These findings call into question the notion that corporate diversification strictly reduces firm risk.

Raei et al(2015) examined the relation between diversification, performance and risk. They used ROE as a proxy of performance and Herfindahl as a proxy of diversification. They found any relation between diversificand with firm performance and risk.

4. THE PROPOSED STUDY

Based on the development of the literature, several hypotheses are developed. The first hypothesis is stated:

H_1: There is a significant relationship between diversification strategy and firm performance.

The second hypothesis is as follows:

H_2: There is a significant relationship between diversification strategy and risk.

In this paper we use Herfindahl index for measure of diversification. The **HERFINDAHL** coefficient for firm in year t is calculated as follows:

$HERF_{i,t} = \sum (SSALE/SALE)^2$

Where:

$HERF_{i,t}$: sales revenue according to HERFINDAHL indicator for firm i in year t.

SSale: seles a certain portion of the company

Sale: The total sales (i.e., the total sales of parts)

HERF variable for one part companies equal to 1. For companies that are more than one part is less than 1. So, the smaller coefficient indicates a greater extent of corporate diversification.

Also Tobins'q and ROA as measures of firm performance are as follows:

Tobins'q = Total market value of firm/ Total asset value

ROA = Net profit/Total assets

The risk (STD)**:** The total risk of the firm is estimated from the market data. It is appreciated by the standard deviation of stock returns.

In this paper three variables are control variables:
The size of firm (SIZE): It is essential to control the size of the firm sample that is supposed to act on the performance. We kept as variable of control the size of every firm measured by the logarithm of the total asset of the group.
The growth of the firm (GROWTH): The growth of the company is one of the explanatory factors the most important of the performance of firms. This variable is measured by the average variation of the turnover on the reporting period. That is:

$$GROWTH = \frac{Sales_n - Sales_{n-1}}{Sales_{n-1}}$$

The debt (DEBT): The variable of the debt is measured as the ratio of the total debts and the shareholders equity.
We choose 63 firms from companies listed in Tehran Stock Exchange. The data used in the testing model is extracted from TSE that provide from 2008 to 2012. The panel model is used in this paper.
The results
As it is mentioned, the sample is composed of 63 companies listed in Tehran Stock Exchange. The methodology for analyzing data is based on panel modeling. In the first the Herfindahl index is based on distribution of the sales by activity which allows the definition of the diversification strategy level for each firm. The data being in both time series and cross sectional. We have thus made regression using a panel data.
Table 1, hereafter resumes the descriptive statistics of the variables on the whole period (2008-2012): mean, median, maximum, minimum and standard deviation. The diversification variable is measured by Herfindahl index (HERF). The performance is evaluated by the ROE. The risk is measured by standard deviation of the return equity (STD). The log of total asset measures the size of the firm (SIZE). The (DEBT) variable corresponding to total debt/ total equity, presents the debt of the firm. The growth (GROWTH) is measured by the variation of the turnover of the company. The number of observation is 315.

Table 1. Descriptive Statistics

Variables	N/valid	Mean	Median	Std. Deviation	Maximum	Minimum
Tobin's q	315	1.[illegible]	1.05	0.22	2.50	0.25
Ln(Tobin's q)	315	0.18	0.[illegible]	0.25	1/01	-0.40
ROA	315	9.20	7.02	10.3	30.2	-5.2
STD	315	10.95	9.82	6.91	44.08	0.00
Ln(STD)	315	[illegible]2	2.38	0.61	3.81	0.00
HERF	315	0.[illegible]	0.64	0.24	1.00	0.08
SIZE	315	5.88	5.77	0.62	7.70	4.29
DEBT	315	2.36	1.87	2.18	13.19	-3.68
GROWTH	315	0.21	0.15	0.35	1.60	-0.80

- Normal distribution of the dependent variables

Normality of a regression model remaining is one of the regression assumptions that illustrate the validity of the regression tests. Then using Kolmogorov- Smironov test normality of dependent variables distribution is investigated. Because the normality of dependent variables leads to normality of remains of model (Difference between the estimated values of the real data) So, it is necessary control the dependent variable controlled before the estimate parameters and if this condition was not available take good solution for making them normal (conversion). The null hypothesis and hypothesis 1 in this test is written as follow:

H_0: Data for the dependent variable follows a normal distribution.

H_1: Data for the dependent variable not follows a normal distribution.

Meaningful value for return standard deviation and tobin's q variables during studied years are less than 0.05. so, null hypothesis is rejected for these variables. Normal distribution of variables in

different years is not normal but the values of these variables logarithm in these years are more than 0/05. So their distribution has been normal and Meaningful value for ROA variable during studied years is more than 0.05.

Table 2. Test Kolmogorov – Smironov

Variable	Number	Normal parameters		Most Extreme Differences			Kolmogorov-Smironov Z	Asymp. Sig. (2-taile)
		Mean	Std. deviation	Absolute	Positive	Negative		
Tobin's q	315	1.2	0.22	0.2	0.2	-0.12	1.32	0.01
Ln(Tobin's q)	315	0.18	0.25	0.15	0.1	-0.15	1.15	0.08
ROA	315	9.2	10.3	0.11	0.11	-0.09	1.01	0.15
STD	315	10.95	6.91	0.11	0.11	-0.07	1.87	0.002
Ln(STD)	315	2.32	0.61	0.07	0.05	-0.07	1.25	089

In this study we have two hypotheses. For each hypothesis, we analyze data.

- Panel Analysis H_1

For data analysis of the panel analysis (Panel) without fixed effects, with fixed effe and with random effects is used. To determine the effectiveness of model with fix or ra dom eff ts Limer (Chav) test and Houseman test is used. As the table 3 shows, the re lts Chav tes is indicated that the model with fixed effects is better than pooled model.

The results of the first model for the first hypothesis test

Table 3. Redundant Fixed Effects T sts of Hypoth 1

Effects Test	Statisti	d.f.	Prob.
Cross- section F	6.10	(62,53)	0.000
Cross- section Chi- square	300.1	62	0.000

After that we used Hausman test for determin that the m with fixed effects is appropriate or model with random effects. As the results of ble s hows, the results of Hausman test indicates that the model with fixed effects is appropriate The sig icance level for the test of Hausman is 0.012 that indicates the model with dom ef cts is appropriate. The below table shows the results:

Table 4. Correla ed and Effects- Hausman Test of Hypothesis 1

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross- section r dom	8.029	3	0.012

The supposed model 1 o tes e hypoth ses is as follow:

$$Ln(Qto\,in)_{it} = \alpha_0 + DIVER_{it} + \alpha_2 SIZE_{it} + \alpha_3 DEBT_{it} + \alpha_4 GROWTH_{it} + \varepsilon_{it}$$

The results of fix d effect show tha probability of significant of F is equal 0.000. This result means that there is a sig ficant mo el. The coefficient of determination is equal to 0.07. The t-statistics for HERF is equal t 1.56(m aningless), for SIZE is equal to 0.6(meaningless), for DEBT is equal to -4.37(mea gful an egative), for GROWTH is equal to -0.78(meaningless)). The below table show e resu s:

Table 5. Cross- section random effects of model 1 for Hypothesis 1

Variables	Coefficient	t-Statistics
C	1.4	3.154
HERF	0.057	0.732
SIZE	-0.201	-2.690
DEBT	-0.004	-1.427
GROWTH	0.012	1.20
Weighted Statistics		
R-Squared	0.701	
Prob (F- statistics)	0.000	
Durbin- Watson stat	1.806	

The results of model 1 indicate that there is no significant relationship between Tobin's q and Herfindahl.

The supposed model 1 to test the hypotheses is as follow:

$$ROA_{it} = \alpha_0 + \alpha_1 DIVER_{it} + \alpha_2 SIZE_{it} + \alpha_3 DEBT_{it} + \alpha_4 GROWTH_{it} + \varepsilon_{it}$$

The results of fixed effect show that probability of significant of F is equal 0.000. This result means that there is a significant model. The coefficient of determination is equal to 0.695. The t-statistics for HERF is equal to 1.676(meaningless), for SIZE is equal to -1.3(meaningless), for DEBT is equal to -0.19(meaningless), for GROWTH is equal to -0.60(meaningless)). The table 6 shows the results:

Table 6. Cross- section random effects of model 2 for Hypothesis 1

Variables	Coefficient	t-Statistics
C	30.07	1.15
HERF	3.68	1.676
SIZE	-3.26	-1.3
DEBT	-0.017	-0.19
GROWTH	0.2	-0.6
Weighted Statistics		
R-Squared	0.695	
Prob (F- statistics)	0.000	
Durbin- Watson stat	1.87	

The results of model 2 indicate that there is no significant relationship between Tobin's q and Herfindahl.

So, the results of hypothesis 1 indicate that there is no significant relationship between diversification strategy and firm performance.

- Panel Analysis H_2

For data analysis of the panel analysis (panel) without fixed effects, with fixed effects and with random effects is used. To determine the appropriateness of model with fixed or random effects Limer (Chav) test and Houseman test is used. As the table 7 shows, the results of chav test is indicate that the model with effects is better than pooled model.

The results of the second hypothesis test

Table 7. Redundant Fixed Effects Tests of Hypothesis 2

Effects Test	Statistic	d.f.	Prob.
Cross- section F	2.194	(62,15)	0.000
Cross- section Chi- square	260	62	0.000

After that we used Hausman test for determined that the model with fixed effects is appropriate or model with random effects. As the results of table 8 shows, the results of Hausman test indicates that the model with random effects is appropriate. The significance level for the test of Hausman is 0.90 that indicates the model with random effects is appropriate. The below table shows the results:

Table 8. Correlated Random Effects- Hausman Test of Hypothesis 2

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f	Prob.
Cross- section random	0.430	3	0.901

The supposed model to test the hypotheses is as follow:

$$RISK_{it} = \alpha_0 + \alpha_1 DIVER_{it} + \alpha_2 SIZE_{it} + \alpha_3 DEBT_{it} + \varepsilon_{it}$$

The results of random effect show that probability of significant of F is equal 0.901. This result means that there is no a significant model. The coefficient of determination is equal to 0.003. The t-statistics for HERF is equal to -0.51(meaningless), for SIZE is equal to 0.7(meaningless) and for DEBT is equal to 0.45 (meaningless). The below table shows the results:

Table 8. Cross- section random effects of Hypothesis 2

Variables	Coefficient	t-Statistics
C	7.87	2.108
HERF	0.129	0.225
SIZE	0.002	0.008
DEBT	-0.032	-0.479
Weighted Statistics		
R-Squared		0.000
Prob(F- statistics)		0.9[illegible]
Durbin- Watson stat		[illegible]70

The results of hypothesis 2 indicate that there is no significant relationship between diversification strategy and risk.

5. CONCLUSION

This paper has examined the relationship between diversification strategy, firm performance and risk. For examined the firm performance, we used Tobin's q and ROA. The results shown that there is no significant relationship between diversification strategy, firm performance and risk.

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