Comparison between fixed effect and random effect model for stock's market value determination: Applied study on insurance companies listed in Tadawul Saudi Market.

مقارنة بين نموذج التأثير الثابت والعشوائي في تحديد سعر السهم السوقي: دراسة تطبيقية لشركات التأمين المدرجة في سوق تداول السعودي.

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Abstract:

The study seeks to compare which panel regression model is the appropriate model for determining the Stock price of the Saudi insurance companies listed at the Tadawul capital market in Saudi Arabia, also the study test the collinearity between the explanatory variables. The study implemented on 34 insurance companies, over two years from 2017-2018, using cross-sectional regression, and the time series, the companies represented all Saudi insurance industry, and they composed the minor index for the insurance sector. The study reached to accepted some hypotheses; the other hypotheses were rejected, The results reached that net income and price to the book value have positive also market capitalization have significant relationship on the stock's market value, and number of stocks issued have a negative and statistically significant relationship with stock's market value. Finally, the paper proved that the fixed effect model is the appropriate model.

Key words: **Stocks price**, **Insurance companies**, **fixed and random effect models**.

JEL Code: **C31**,**C32**,**G32**,**L25**.

الملخص:

تسعى الدراسة إلى المقارنة بين أي نموذج إنحدار للبيانات التطويقية (البيانات المقطعية والسلاسل الزمنية) أفضل في تحديد القيمة السوقية لسعر سهم شركات التأمين المدرجة في سوق رأس المال – تداول السعودي)، كما تختبر الدراسة الإرتباط

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بين المتغيرات المستقلة، طبقت الدراسة على أربعه وثلاثين شركة تأمين مدرجة ضمن المؤشر الفرعي لقطاع التأمين و ضمن المؤشر الرئيسي لمؤشر تاسي ، باستخدام الإنحدار المقطعي وإنحدار السلاسل الزمنية، توصلت الدراسة إلى وجود علاقة تأثير إيجابية ومعنوية بين صافي الدخل وكل من القيمة السوقية لكل أسهم المؤشر والسعر للقيمة الدفترية وبين القيمة السوقية للسهم ، وكذا وجود علاقة سلبية ومعنوية مع عدد الأسهم المصدرة وقيمة السهم السوقية ،أخيراً توصلت الدراسة إلى أن نموذج التأثير الثابت هو النموذج المناسب في تحديد القيمة السوقية للسهم.

الكلمات المفتاحية: سعر السهم، شركات التأمين ، نموذج التأثي الثابت والتأثير العشوائي.

1. Introduction

There are many ways and approaches to assess the firm stock, some of which depend on the Book value approach, others based on the market value approach, which in turn depends on the structure of financing the firm's investment in a case of no tax (Modigliani &Miller,1958),and the corrected model of (Modigliani &Miller,1963), in case of company taxes, M&M indicated to the financial leverage risk which is increasing the bankruptcy cost and decline the firm value. Here Altman (1968) presented a model for predicting corporate bankruptcy based on a range of financial ratios. Where the other evaluations models depend on the intrinsic value when calculating the price of the stock, based on the dividends pay-out model (Gordon,1962 and M&M,1992), in which the stock gets cash flows during his life using the required rate of return by investor (Fama&Harvey,1968). Other Scientists used the Economic value-added approach. The firm's Evaluation methods differ from each other. But the adoption of a particular method depends only on the objectives and the purposes of the evaluation for the purpose of. If the valuation for mergers objectives, or the valuation for the objectives of liquidation or the Evaluation for bankruptcy purposes.

2. The Literatures review

Rajhans's study (2013) investigated the determinants of firm value for sixteen companies of forty listed on the Bombay Stock Exchange (BSE) from 2002 to 2011. The explanatory variables are net sales, Profit, Fixed Assets, dividend pay-out ratio, and capital structure, the study reached to that the weighted average cost of capital has a significant impact on firm value. Other significant factors are fixed assets, net sales, and profit.

Whereas Ayuba, and others (2019), used several explanatory variables to test the variables that effect on firm's value of twenty-seven insurance companies listed at Nigerian Stock Exchange, their study covered a period of 6 years, they concluded that the financial structure and the firm size have positive statistically significant relationship with the firm value.

In a related context, Maxwell and Kehinde's study(2012), investigated the relationship between capital structure and firm's value, of firms listed on the Nigerian Stock Exchange (NSE), the study covered 124 companies, the study proved a positive relationship between long-term debt and the firm's value.

Meta's paper (2018) tested the impact of corporate governance and the firm's market value of the insurance sector listed at the Nairobi stock market, which consisted of 6 companies, the study proved a positive relationship between corporate governance and market value for the insurance companies.

Also, Black and others (2006) applied their study on Russian companies using time series data, and they reached the same result of Mweta's study(2108). Where they found an economically and statistically strong relationship between governance indicators and shares prices.

Yemi & Sericin study's (2018) used the multi-regression for 75 of non-financial firm listed at the Nairobi stock market between 3013 and 2014. The study found the earning per share and retained earnings, also the payout dividends had a positive relationship with stock's market value.

According to Aggarwal and Pradhan's study (2017), applied on the BSE listed Indian hospitality firms, which covered the period from 2001-2015, the results found a reveal significant relationship between firm quality, leverage, liquidity, and growth on firm's value.

Ducháčková and Hrdý (2017), Illustrated the theoretical approaches toevaluate the insurance companies, to choose the best practice approaches to assess them, consisted from the standards and evaluation methods such income approach, market comparison method, and asset-based valuation method.

Wolfrom and Jean's study (2016), provided an overview of the analytical tools used by the insurance sector, regulators and supervisors for the purposes of

the market. It largely based on responses of 24 OECD and non-OECD countries to a questionnaire on the use and relative importance of a set of common, indicators and analytical tools that provide information on the soundness, performance, and competitiveness of the insurance market. The article, therefore, provides a point of reference on the use of analytical tools for market surveillance and is intended to inform the further development of the OECD Global Insurance Statistics framework.

Whereas Matthew and Odularu (2009), concluded that the firm value had a significant relationship on financial performance represented by dividends and profit after tax.

3.The hypotheses :

3.1 the stock price of Saudi insurance companies cannot determine from the independent variables.

3.2 . There is no collinearity between the independents variables.

3.3 . There is no autocorrelation cross-sectional heteroscedasticity in regression

3.4. The random effect regression model is appropriate to model for determining the stock price of Saudi insurance companies.

4.Data and methodology

The Saudi insurance companies composed listed in Tadawul Saudi market, from all 34 companies composed the index of the insurance sector as a minor index of the Tasi main index the study covered two years for each company, the total observation number was 68 observations. The study applied the cross-sectional regression, and time-series regression, to compare and then choose the appropriate model (the fixed effect or random effect model) to determine the market stock's price, using the Stata version. 14.

4. 1.ndependents variables

PBV (stock price divided by stock book value)

MV(market capitalization)

NI (Profitability): the net income after tax

NS:(the stocks issue number)

4.2. The dependent variable: the market stock's price

4.3. The Mathematical model

Fixed effect model:

$Y_{it} = (\alpha + u_i) + X_{it}\beta + v_{it}$(1)

The random effect model:

$Y_{it} = \alpha + X_{it}\beta + u_i + v_{it}$, (2)

Where;

u_i is a fixed or random effect specific to individual (group), or time period that is not included in the regression, and errors are independent identically distributed, $v_{it} \sim IID(0, \sigma^2)$; Cov $(X_{it}, V_{is}) = 0$; ∀ t and s.

A fixed group effect model examines individual differences in intercepts, assuming the same slopes and constant variance across individuals (group and entity). Since an individual specific effect is time-invariant and considered a part of the intercept, u_i is allowed to be correlated with other regressors.

Here the unobservable component, (v_i), is treated as a component of the random error term. (v_i) is the element of the error which varies between groups but not within groups. (ε_{it}) is the element of the error which varies over group and time, (Sherron and Allen2000).

5.Findings

5.1.reject the first null hypothesis and accept the alternative hypothesis. the stock price of an insurance company is determined by (net income, the ratio of price to book value, the number of stocks issued), all exploratory Variables are positively correlated with stock price, only stocks issued are negatively correlated, all variables statistically significance where the coefficient of betas equals zero. Also, the adjusted R^2 is equal (0.865), that means the exploratory factors interpret the dependent variable with around 87% , and statistically significance of regression equation equals (0.000). that means the model is highly statistically significant. (Table1and Tab2) summarized the test result of the first hypothesis.

(**Table.1**): **ANOVASummary**

Source	SS	df	MS	Number of obs	68
				F(4, 63)	108.74
Model	18200.25	4	4550.063	Prob > F	0.000
Residual	2636.194	63	41.84435	R-squared	0.8735
				Adj R-squared	0.8654
Total	20836.45	67	310.9917	Root MSE	6.4687

(**Table.2**): **The Pooled regression model summary**

SMV	Coef.	Std. Err.	t	P>t	[95%	Interval]
MV	0.00849	0.000634	13.39	0.00***	0.007223	0.009758
PBV	2.052156	0.921866	2.23	0.03**	0.209954	3.894357
NI	0.012799	0.006379	2.01	0.049*	5.12E-05	0.025548
NS	-0.15639	0.02535	-6.17	0.00***	-0.20704	-0.10573
_cons	16.60345	2.149385	7.72	0.00***	12.30825	20.89866

*** P< 0.01, ** P< 0.05.

5.2 .acceptance the test result of the null hypothesis , there is no collinearity between the exploratory Variables, as shown in (table.3). The variance inflation factor equals (1.66), and it is statistically desirable.

(**Table.3**) :**The Variance inflation factor test**

Variable	VIF	1/VIF
MV	2.41	0.415742
NI	1.65	0.606038
NS	1.4	0.716835
PBV	1.2	0.833478
Mean VIF	1.66	

5.3. acceptance of the third hypothesis that there is no autocorrelation nor heteroscedasticity in the cross-sectional regression, where the Prob > chi2 is statistically Significant and equals (0.0000),(table.4), summarizes the third hypothesis test result.

(**Table**.4): **The GLS Cross-Sectional time-series regression**

Coefficients: generalized least squares						
Panels: heteroskedastic						
Correlation: common AR(1) coefficient for	All panels (1.1521)					
Estimated covariances = 34	Number of obs = 68					
Time periods periods = 2						
Wald chi2(4) = 2126.12						
Prob > chi2 = 0.0000						
Estimated autocorrelations = 1	Number of groups = 34					
SMV	Coef.	Std. Err.	Z	P>z	[95%	Interval]
MV	0.006863	0.001873	3.66	0.00	0.003193	0.010534
PBV	2.332544	0.469705	4.97	0.00	1.411941	3.253148
NI	0.011090	0.006931	1.6	0.11	-0.00249	0.024676
NS	-0.273647	0.026597	-10.29	0.00	-0.3257	-0.2215
_cons |	35.46	1.723	20.58	0.00	32.08	38.8376

*** **P< 0.01**, ** **P< 0.05**

5.4.Reject the fourth hypothesis and accept the alternative hypothesis that ,the fixed effect panel regression model is appropriate to determine the market stock's price. Table(5)illustrated the Comparison between fixed effect and random effect model, the overall R.q Random effect equals (0.8729) ,and the overall fixed effects R.q equals (0.738). The Coefficients of a random and a fixed effect of the independents Variables highly statistically significant between (0.00) and (0.05), and all have positive relationship with market stock price, except stocks issued is correlated negatively with market stock price, the (table. 5) and (table .6), summarized this results, and Hausman test result which proved with that the value of Prob>chi2 equals (0.038 >0.05), that means the fixed effects panel model is appropriate, while the difference in the coefficients is systematic.(Fig.1) showed the panel regression using the years and the companies ID.

(**Table .5**): **Comparison between fixed effect and random effect model**

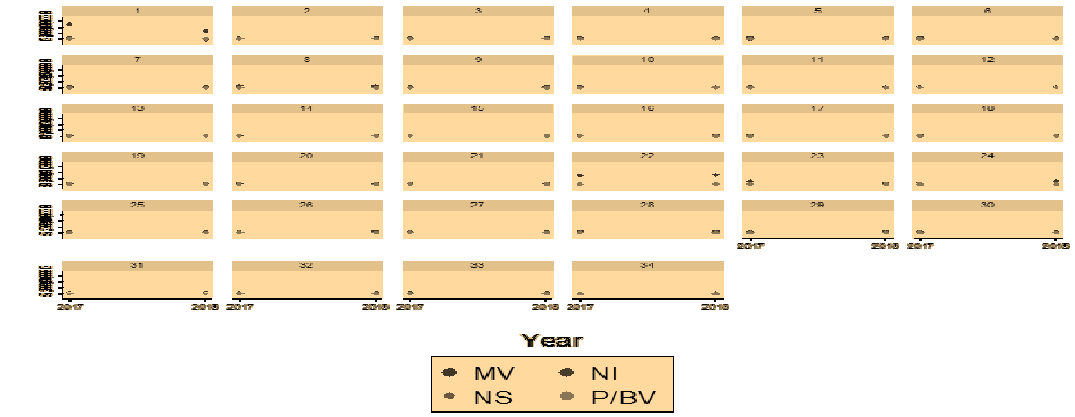
Model	within	between	overall	corr(u_i, X) (assumed)	
Random effects	0.6666	0.9082	0.8729	0	
Fixed effects	0.6978	0.7382	0.7321	-0.1291	
	Random effects			Fixed effects	
variables	Coef.	P>z		Coef.	P>t
SMV	0.01	0.00***		0.01	0.00****
MV	2.05	0.02**		2.31	0.05**
PBV	-0.16	0.00***		-0.34	0.01***
NS	0.01	0.12		0.00	0.94
NI	16.76	0.00***		23.13	0.00***
_cons	0.01	0.00***		0.01	0.00****
sigma_u	3.19			8.52	
sigma_e	5.41			8.52	
rho	0.26 (fraction of variance due to			0.71 (fraction of variance due to u_i)	
				test that all u_i=0: F(33, 30) = 1.83 Prob > F = 0.0497	

*** P< 0.01, ** P< 0.05

(**Table.6**):**Hausman test**.

Coefficients	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	re	fe	Difference	S.E.
MV	.0089	.008614	.00038	.00249
PBV	2.3057	2.05105	.25469	.69248
NS	-.338	-.159931	-.17868	.11451
NI	.00081	.00945	-.0086	.0088
Test: Ho: chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B) =10.12 Prob>chi2 = 0.038				

Fig.1(panel regression through years and company ID)



6. The Conclusion

This study proved that there is a positive and significant relationship between stock price and stock price to book value, net income, and the number of stocks issued. The results of this study agreed with Yuba, others (2019), Yemi & Sericin study's (2018), Aggarwal and Pradhan's study (2017). This study proofed that there is neither a heteroscedasticity nor autocorrelation problem in the cross-sectional panel data model. Finally, the result of this study proved that the fixed-effect model is an appropriate model to determine the stock price of Saudi insurance companies.

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