Internal Drivers of Firm Value: A Case of Publicly Traded Companies in Nigeria.

By: Uchechukwu Okonkwo

Abstract:

Firm value evaluation has attracted much attention from rational investors, analysts, and researchers/academics. Several countries have also analyzed the internal and external factors that affect investors decisions. This research looks into the effects of internal quantitative factors on the firm value using a dataset with 473 observations of cross sectional publicly traded companies that are part of the 11 industry classifications of the Nigerian Stock Exchange (NSX) from 2015-2020. This was conducted by exploiting the S&P Capital IQ Global Market Intelligence Database, which contains annual observations on private and public companies. Stata version 2014 is employed as the software tool for the descriptive statistics and panel data regression analysis to evaluate the internal factors that drives firm value. The control variables include the profitability, revenue, liquidity, firm size, capital structure, and log-lin firm value as the dependent variable. The results show that profitability, liquidity, firm size, and capital structure significantly affect firm value, while revenue does not considerably impact firm value. Furthermore, the capital structure seems to determine firm value significantly negatively. This empirical evidence may be utilized to substantially forecast stock price volatility in Nigeria and help investors limit their losses.

Keywords: Firm Value, Firm Size, Profitability, Internal Factors, Publicly Traded Companies

1. Introduction:

Investment decisions constitute one of the most vital decisions of a rational investor. Decisions on which signal to look at while investing follow high prosperity for shareholders. Therefore, the concept of firm value has attracted the interest of investors and the public (Qureshi, 2007). This underlines the importance of revealing companies' performance and rating shows the magnitude of investors a company can have in both the short-run and long-run (Oktarina 2018).

Hence, it's essential to understand what factors influence firm value and how this relationship attracts investors. A significant number of studies has addressed this question on the stock exchange of different countries (Sukesti et al., 2021). Pangestuti et al. (2020), for example, discovered the internal and external factors that control business value. The Internal determinants include liquidity, firm size, profitability, operating capital, capital structure, and managerial ownership, whereas external determinants include inflation, interest rates, and other macroeconomic indices. (Adaramola 2006). This study analyses the different internal factors that impact firm value using five years sample.

The empirical research assesses the determinants of profitability, revenue, liquidity, firm size, and capital structure on the firm value of all the available publicly traded firms of the Nigerian stock exchange market. See Figure 1 for a concise summary of the variables used. The study makes several contributions to the discussion on the correlation between internal factors and the firm value of publicly traded companies. First, this analysis examines the internal factors that greatly influence the firm value. The introduction of panel data estimation of fixed and random effects

using Stata allows us to include variables that affect companies annually for five (5) years. Also, panel data present more informative data and generate a greater degree of freedom.

Second, this study employs a more significant number of companies, including all the available industries in Nigeria and a more recent data set than previous studies that researched on a few industries. In addition, since publicly traded companies in the NSX remain essential for investment, this study will shed light on the best variable that might pique the interest and trust of a company's investors.

The rest of the paper is organized as follows: The following section reviews the concepts and hypotheses. The research methodology is presented in Section 3. The section 4 introduces and discusses the empirical findings. The study ends with Section 5, which addresses the essentials for future research.

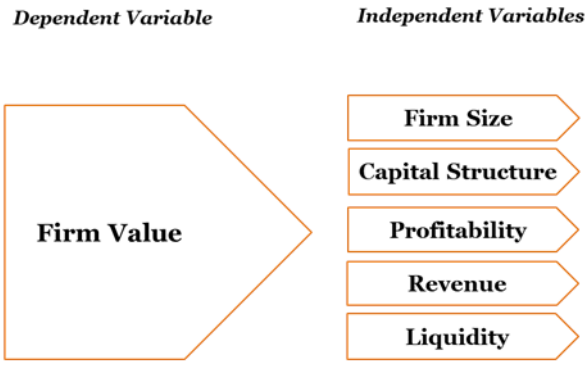

Figure 1: The Internal Factors of Firm Value

2. Concepts and Hypothesis:

2.1: Concepts

This study will use the total equity to measure firm value since total equity is a residual interest in a business. Equity is the ownership of any asset after any liability associated with the asset are settled. The research variables and their proxies are shown in table 1.

Table 1: The Regression Models

Parameter	**Proxy**	**Determining Factor**	**Symbol**
lnFMV	Firm Value	Total Equity	α
SIZE	Firm Size	Total Assets	β1
CS	Capital structure	Total Debt to Equity ratio	β2
ROA	Profitability	Return on Assets	β3
SALES	Revenue	Total Revenue	β4
LR	Liquidity	Current Ratio	β5

2.2: Hypothesis

2.1.1: The effect of firm size on the firm value of a company:

Enterprise value is the present value of prospective retained earnings that the company will generate in the future. (Hirdius 2019). Company size is a measurement of how a business is based on its assets regardless of its size. (Benyamin & Endri, 2019).

H_1: Firm size has a positive correlation with firm value.

2.1.2: The effect of capital structure on the firm value of a company:

Capital structure is one of the company's strategies for financing operations and reflects the overall growth and effectiveness in suing debt (Khairina and Yusbardini 2019). The ratio of total debt to equity also determines capital structure. It is calculated as:

$$Debt\ to\ Equity\ Ratio\ (\text{DER}) = \frac{\text{Total Debt}}{\text{Total Equity}}$$

H_2: Capital structure has a positive correlation with firm value.

2.1.3: The effect of profitability on the firm value of a company:

Profitability is a measurement of a firm's capability to make money and an assessment of its management performance. (Daeli & Endri, 2018). The profitability of a company is represented using the ROA. The return on assets is dividing net income after taxes by total assets. It is calculated as:

$$Return\ On\ Assets\ (\text{ROA}) = \frac{\text{Net Income After Tax}}{\text{Total Assets}}$$

H_3: Profitability has a positive correlation with firm value.

2.1.4: The effect of firm sales on the firm value of a company:

Revenue is the gross inflow arising during the ordinary activities of a company from the sale of goods or services. Firm sales is the income received by a company from its sales of goods or the provision of services.

H_4: Firm size has a positive correlation with firm value.

2.1.5: The effect of liquidity on the firm value of a company:

The ability of a corporation to fulfil short-term debt obligations defines its liquidity status. The current ratio, computed by dividing current assets by current liabilities, is liquidity value. It is calculated as:

$$\text{Liquidity} = \frac{\text{Current assets}}{\text{Current liabilities}}$$

H_5: Liquidity has a positive correlation with firm value.

3. Research Methodology

3.1: Analytical Techniques and Data

First is logging in to the Capital IQ Company Screening Report website to define the Nigerian publicly traded companies. Based on the criteria for classifying firms that trade on the stock market in NSX, financial services, services industry, natural recourses, information communication and technology (ICT), construction/real estate, oil & gas, industrial goods, consumer goods, conglomerates, healthcare, and agriculture industries were selected. Following that, the dataset was gathered and compiled from the listed companies' annual financial reports for 2015 - 2020, then imported into Excel Office 365.

After collecting the data, firm size, firm sales, profitability, capital structure, and liquidity were all complied as the research indicators. Some observations from the data were neglected because they did not include enough annual financial values to estimate these indicators. As a

result, there are 473 observations of cross sectional publicly traded companies in the final data set. After completing data preparation, Stata version 14 was used to import the Excel spreadsheet of the 473 observations for the panel data regression analysis. Stata uses panel data regression analysis to choose the optimal model for the research. At the same time, the panel data regression analysis findings might reveal the elements that influence firm value. Also, a few of the datasets contain some empty or zero values. It is important to note that some companies do not have total debts values in some years; this impacted the analysis and the conclusion of this research.

3.2. Empirical Models

The author will use the quantitative research approach to conduct this study, using capital structure (CS), firm size (SIZE), liquidity (LR), revenue (SALES), and profitability (ROA) as the explanatory variables and firm value (lnFMV) as the explained variable.

The regression model might be designed as follows to test the hypotheses provided in Section 2:

$$\ln FMV = \alpha + \beta 1 \times Size + \beta 2 \times CS + \beta 3 \times ROA + \beta 4 \times Sales + \beta 5 \times LR + u_i$$

Where the parameters of explanatory variables are α, $\beta 1$, $\beta 2$, $\beta 3$, $\beta 4$, $\beta 5$, and the error term is u_i.

4. Results

The log-linear transformation was used on the dependent/target variable -Firm value (FMV)- to reduce or remove the skewness of the original data. The independent/predictor variables were left in their ordinary form. This will help ensure that the coefficients can be explained in percentages. Therefore, the model functional form will then be a log-lin model.

The panel data regression results in OLS, FEM, and REM models are shown in Table 2. Several tests must be performed to determine the appropriate model, including the Breusch and Pagan Lagrangian multiplier test for random effects and the Hausman test.

Table 2: Estimation Results for Firm Value			
Variable	**OLS**	**FEM**	**REM**
SIZE	3.08e-06*** (7.28e-07)	2.09e-06* (1.09e-06)	2.65e-06*** (9.22e-07)
CS	-.1020229*** (.0353361)	-.0433249* (.0233519)	-.0514508** (.0230149)
ROA	6.890144*** (1.18432)	1.843199 (1.126945)	2.853613*** (1.066131)
SALES	1.08e-06 (1.13e-06)	-6.91e-07 (1.72e-06)	4.78e-07 (1.42e-06)
LR	.0517299* (.0294707)	.0225067 (.0193886	.0243742 (.0192312)
Constant	8.427303*** (.0961844)	8.806581*** (.0891127)	8.644643*** (.1648383)
R-squared	0.3571	0.3390	0.3447
Adj R-squared	0.3502		
F (5,389)		2.74	2.44
Wald chi2(5)			56.25
chibar2(01)			575.59

F (5, 467)	51.87		
N	79	79	79
Hausman test		14.32**	
Breusch and Pagan Lagrangian multiplier test for random effects			575.59**
Notes: Dependent Variable: lnFMV. Values in () indicate standard errors. ***, ** and * show the significance levels at the 1%, 5% and 10% respectively.			

First, The Breusch and Pagan Lagrangian multiplier test for random effects proves that the random effect result is better than the pooled OLS test. As a result, OLS regression will not help explain the correlations between dependent and independent variables. The Fixed Effect Model (FEM) controls the effect of time-variant differences between the firms; to ensure that the value of the variable does not change across time and have the same impact across time. The PCSEs test was done because of the presence of heteroscedasticity; meanwhile, the FEM has no statistically significant P-values. Therefore, we will interpret the new panel FEM coefficient; gotten from the PCSEs test. Lastly, The Random Effect Model (REM) implies that the time-invariant variables that are not included are uncorrelated with the included time-varying covariates. According to the Hausman test, the fixed effect model is preferable to the random effect model; since the probability value is less than 0.05. As the Hausman test shows that FEM is preferable, there will no need to explain the REM result.

The OLS, FEM, and REM results show that the R-squared is low because we only have a few time series of 5 years (2015-2020). Therefore, the heterogeneity of cross-section makes R-squared low. Also, for F (5,389), since Prob = 0.0000 < 0.05, we conclude that parameters are jointly statistically significant, and the independent variables are correlated.

Table 3: Time Fixed Effects Test

. testparm _IYears*
(1) _IYears_2016 = 0
(2) _IYears_2017 = 0
(3) _IYears_2018 = 0
(4) _IYears_2019 = 0
(5) _IYears_2020 = 0
H0: there is time fixed effects
F (5, 384) = 2.10 Prob > F = 0.0649

Supposition:

H_0: There is no time fixed effects; clearly, from the table Prob>F = 0.0649 > 0.05. Hence, we failed to reject the null (H_0) that the coefficients for all years are jointly equal to zero and conclude that no time fixed effects is needed in this study.

Table 4: Hausman Fixed Random

. estimates store random
H_0: difference in coefficients not systematic
chi2(3) = (b-B)'[(V_b-V_B) ^ (-1)] (b-B) = 14.32 Prob>chi2 = 0.0025

Supposition:

H_0: Unique errors (u_i) and control variables are not associated; since Prob = 0.0025 < 0.05. we reject H_0. In other words, u_i is related to the control variables. Hence, we choose the fixed effect model (FEM).

From Table 4, we can see that the Hausman statistic (p-value = 0.0025) is significant at 5% level, thus, rejecting the random effects theory. This implies that the fixed effects theory, which holds that u_i correlates with independent variables, is consistent with the panel data. Thus, in the case of the panel data, the unobserved enterprise-specific effects are not only significant determinants of firm value but also correlate with the predictors in the specified model.

Table 5: Breusch and Pagan Lagrangian multiplier test for random effects

. xttest0
Breusch and Pagan Lagrangian multiplier test for random effects
lnFMV[C_ID,t] = Xb + u[C_ID] + e[C_ID,t]

H_0: Variance across entities is zero (no panel effect)		
Estimated results:		
	Var	**sd = sqrt (Var)**
lnFMV	3.465139	1.861488
E	.6057489	.7782987
U	1.679934	1.296123
Test: Var(u) = 0 chibar2(01) = 575.59 Prob > chibar2 = 0.0000		

Supposition:

H_0: Variance across entities is zero (no panel effect); hence, we reject the null and conclude that residuals across entities are correlated. This is due to the significant differences across firms; therefore, Random Effect is appropriate.

Table 6: Cross Sectional Dependences (CD) Test/ Contemporaneous Correlation

. xtcsd, pesaran abs
H0: residuals across entities are not correlated (there is no CD)
Pesaran's test of cross-sectional independence = 13.944, Pr = 0.0000
Average absolute value of the off-diagonal elements = 0.573

Supposition:

H_0: Residuals across entities are not correlated (there is no CD); Since Prob>F = 0.0000 < 0.05. Hence, we reject H_0 and conclude that there is cross-sectional dependence. Datasets of firms in NSX are cross-sectional dependent. Cross-sectional dependence will be corrected using Panels Corrected Standard Errors (PCSEs).

Table 7: Heteroscedasticity Test

. xttest3
Modified Wald test for groupwise heteroskedasticity in fixed effect regression model
H0: sigma(i)^2 = sigma^2 for all i
chi2 (79) = 3.1e+06 Prob>chi2 = 0.0000

Supposition:

H_0: The error variance is constant; since p-value = 0.0000 < 0.05. Hence, the error variance is inconstant due to the disability in the fixed-effect model. This shows a heteroscedasticity problem and will be fixed with the PCSEs test.

Table 8: Serial Correlation result

. xtserial lnFMV SIZE CS ROA SALES LR
Wooldridge test for autocorrelation in panel data

H_0: no first order autocorrelation
F (1, 78) = 2.475
Prob > F = 0.1197

Supposition:

H_0: no first-order autocorrelation; from the test, the p-value is 0.1197 and more than 0.05, the fixed effect model has no disability and does not have first-order autocorrelation.

Table 9: Estimation Results for Firm Value corrected of Heteroscedasticity and Cross-Sectional Dependences

Variables	**Panel FEM**	**Panel PCSE**
SIZE	2.09e-06*	3.08e-06***
	(1.09e-06)	(3.99e-07)
CS	-.0433249*	-.1020229**
	(.0233519)	(.0466918)
ROA	1.843199	6.890144***
	(1.126945)	(1.398233)
SALES	-6.91e-07	1.08e-06
	(1.72e-06)	(7.34e-07)
LR	.0225067	.0517299***
	(.0193886	(.0156108)
Constant	8.806581***	8.427303***

	(.0891127)	(.0961844)
Wald chi2(5)	-	341.00
Notes: Dependent Variable: lnFMV. Values in () indicate standard errors. ***, ** and * shows the significance levels at the 1%, 5% and 10% respectively.		

As N>T, the PCSEs thus corrects for panel heteroscedasticity and spatial correlation.

The chi-squared value of 341.0 yields a 0% degree of significance, less than 5%, indicating that the total multiple regression is statistically significant. According to the R-squared value, only 35.71% of the variation in lnFMV can be explained by firm-specific independent variables. The result of the Panel PCSE shows that: -

a. Effect of SIZE on lnFMV

The calculated probability value of the total assets variable represented as the firm size (SIZE) is 0.000, which is less than the 0.05 significance level, according to Table 9. This finding suggests that, over the period 2015-2020, firm size has a significant positive influence on the value of publicly traded companies on the Nigerian Stock Market. Meanwhile, the SIZE coefficient is 3.98×10^{-6} (0%), implying that for every 1 unit increase in firm size, firm value increases by 0.00. This hypothesis's findings are like that of Dang et al. (2019), who found that firm size significantly determines firm value. There are some indications that large companies are more likely than small companies to adopt risk management. (Liow, 2010).

b. Effect of CS on lnFMV

The calculated probability value of the total debt to equity ratio variable represented as the Capital Structure (CS) is 0.029, which is less than the 0.05 significance level, according to Table

9. This finding suggests that, over the period 2015-2020, capital structure has a significant negative influence on the value of publicly traded companies on the Nigerian Stock Market. Meanwhile, the CS coefficient is 10%, implying that for every 1 unit increase in firm size, firm value decreases by 0.10. This hypothesis's findings are like that of Antwi et al. (2012) and Ater (2017), who found that capital structure significantly influences firm value negatively.

c. Effect of ROA on lnFMV

The calculated probability value of the profitability variable represented as the return on assets (ROA) is 0.000, which is less than the 0.05 significance level, according to Table 9. This finding suggests that, over the period 2015-2020, firm size has a significant positive influence on the value of publicly traded companies on the Nigerian Stock Market. Meanwhile, the ROA coefficient is 689%, implying that for every 1 unit increase in ROA, firm value increases by 6.89. This hypothesis's findings are like that of Brigham and Houston (2019), who found that profitability significantly influences firm value.

d. Effect of Sales on lnFMV

The calculated probability value of the total revenue variable represented as the firm sales (SALES) is 0.142, which is less than the 0.05 significance level, according to Table 9. This finding suggests that, over 2015-2020, the company's revenue did not affect the firm's value of publicly traded companies on the Nigerian Stock Market. Meanwhile, the SALES coefficient is 1.08×10^{-6} (0%), implying that for every 1 unit increase in firm revenue/sales, firm value increases by 0.00. This hypothesis's findings are like that of Zaenal et al. (2021) and Nguyen et al. (2021), who found that revenue significantly influences firm value.

e. Effect of LR on lnFMV

The calculated probability value of the current ratio variable represented as the liquidity (LR) is 0.001, which is less than the 0.05 significance level, according to Table 9. This finding suggests that, over the period 2015-2020, liquidity has a significant positive influence on the value of publicly traded companies on the Nigerian Stock Market. Meanwhile, the LR coefficient is 51%, implying that for every 1 unit increase in firm size, firm value increases by 0.51. This hypothesis's findings are like that of Sondakh (2019), who found that liquidity significantly influences firm value. This means that the larger the company's liquidity ratio, the more current assets are used to cover liabilities, thus enhancing public confidence.

5. Conclusion

The present worth of a firm's future cash flows is known as its value, and it has a direct influence on investment decisions. As a result, evaluating a company's worth is critical. The goal of the research is to find out how internal factors affect the value of a firm. Over five years, from 2015 to 2020, this study aims to determine the internal variables that influence the firm value of Nigerian publicly traded enterprises on the NSX. According to the study's findings, profitability, liquidity, firm size, and capital structure all positively affected firm value in the companies that represented the industries from 2015 to 2020. In contrast, the firm sales had no impact on the value of the publicly traded companies represented from 2015 to 2020. The suggestions here are:

1. First, because the research focuses on the trading industries, this study only looks at internal factors that influence the value of trading enterprises in Nigeria. Because each industry has its peculiarities, the research cannot explain all companies.

2. The research focuses only on the internal determinants of firm value. A further study that includes internal and external factors may be required.

3. Research time should be expanded to provide a better picture because the results will likely differ when using different periods.

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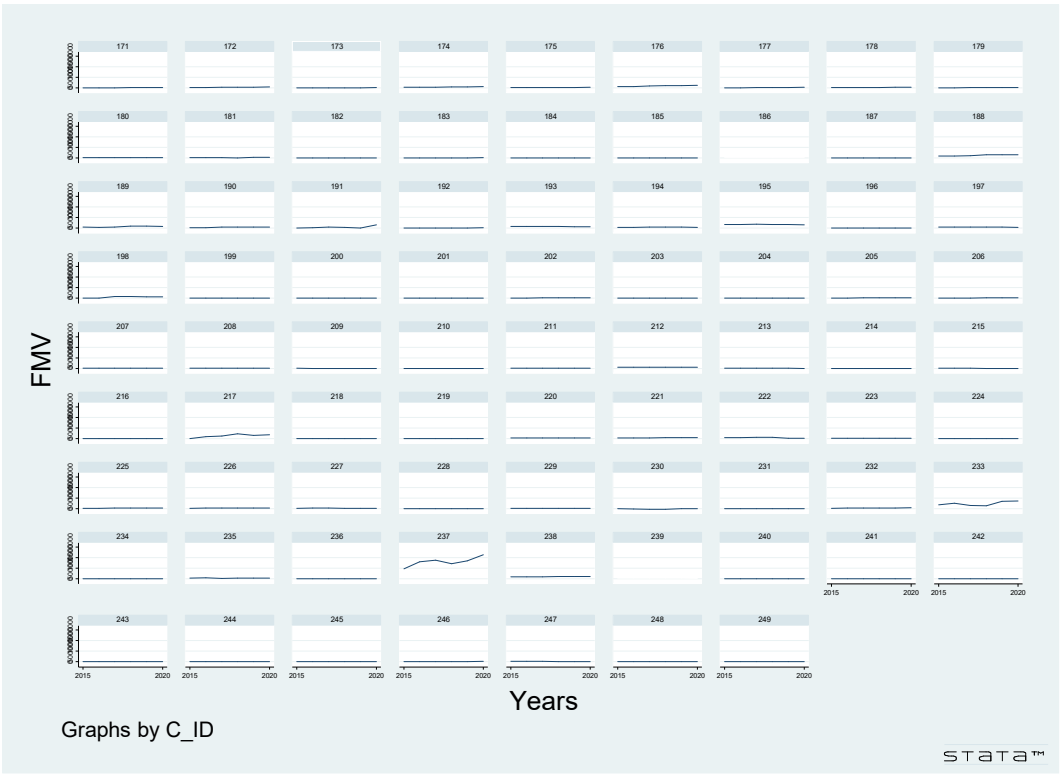
FMV
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Notes:
      1.  Unicode is supported; see help unicode_advice.

 1 . import excel "C:\Users\user\Documents\BLUETOOTH FILES\okonkwo fin datasetii.xlsx", sheet("DATA")

 2 . gen lnFMV = log(FMV)
(5 missing values generated)

 3 .
 4 . replace lnFMV = 0 in 64
(1 real change made)

 5 .
 6 . replace lnFMV = 0 in 356
(1 real change made)

 7 .
 8 . replace lnFMV = 0 in 357
(1 real change made)

 9 .
10 . replace lnFMV = 0 in 358
(1 real change made)

11 .
12 . xtset C_ID Years
        panel variable:  C_ID (strongly balanced)
         time variable:  Years, 2015 to 2020
                 delta:  1 unit

13 .
14 . describe

Contains data
  obs:           474
 vars:            10
 size:        54,036
-------------------------------------------------------------------------------
              storage   display    value
variable name   type    format     label      variable label
-------------------------------------------------------------------------------
C_ID            int     %10.0g                C_ID
CompanyName     str58   %58s                  Company Name
Years           int     %10.0g                Years
FMV             double  %10.0g                FMV
SIZE            double  %10.0g                SIZE
CS              double  %10.0g                CS
ROA             double  %10.0g                ROA
SALES           double  %10.0g                SALES
LR              double  %10.0g                LR
lnFMV           float   %9.0g
```

Sorted by: **C_ID Years**
     Note: Dataset has changed since last saved.

```
15 .
16 . summarize
```

Variable	Obs	Mean	Std. Dev.	Min	Max
C_ID	474	210	22.8276	171	249
CompanyName	0				
Years	474	2017.5	1.709629	2015	2020
FMV	474	34438.47	99862.2	-35539.94	1131481
SIZE	474	96834.32	244788.6	0	2022451
CS	474	.7807932	1.988022	0	35.489
ROA	474	.0343629	.0630231	-.205	.263
SALES	474	66635.41	162691.3	0	1346390
LR	474	1.491561	2.365416	0	33
lnFMV	473	9.022027	1.861488	0	13.93904

```
17 .
18 .
19 .
20 . **Line chart of dependent variable**

21 .
22 . xtline FMV

23 .
24 . **estimations**

25 .
26 . xtreg lnFMV SIZE CS ROA SALES LR, fe
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Fixed-effects (within) regression Number of obs = **473**
Group variable: **C_ID** Number of groups = **79**

R-sq: Obs per group:
     within = **0.0340** min = **5**
     between = **0.4064** avg = **6.0**
     overall = **0.3390** max = **6**

F(**5,389**) = **2.74**
corr(u_i, Xb) = **0.4293** Prob > F = **0.0190**

lnFMV	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
SIZE	2.09e-06	1.09e-06	1.91	0.057	-6.38e-08	4.23e-06
CS	-.0433249	.0233519	-1.86	0.064	-.0892367	.0025868
ROA	1.843199	1.126945	1.64	0.103	-.3724659	4.058864
SALES	-6.91e-07	1.72e-06	-0.40	0.688	-4.07e-06	2.69e-06
LR	.0225067	.0193886	1.16	0.246	-.0156129	.0606263
_cons	8.806581	.0891127	98.83	0.000	8.631379	8.981784
sigma_u	1.4889052					
sigma_e	.77829871					
rho	.78539235	(fraction of variance due to u_i)				

F test that all u_i=0: F(**78, 389**) = **17.27** Prob > F = **0.0000**

```
27 .
28 . xtreg lnFMV SIZE CS ROA SALES LR, re

Random-effects GLS regression                   Number of obs     =       473
Group variable: C_ID                            Number of groups  =        79

R-sq:                                           Obs per group:
     within  = 0.0323                                         min =         5
     between = 0.4065                                         avg =       6.0
     overall = 0.3447                                         max =         6

                                                Wald chi2(5)      =     56.25
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =    0.0000
```

lnFMV	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
SIZE	2.65e-06	9.22e-07	2.87	0.004	8.37e-07	4.45e-06
CS	-.0514508	.0230149	-2.24	0.025	-.0965592	-.0063424
ROA	2.853613	1.066131	2.68	0.007	.7640342	4.943192
SALES	4.78e-07	1.42e-06	0.34	0.736	-2.30e-06	3.26e-06
LR	.0243742	.0192312	1.27	0.205	-.0133182	.0620667
_cons	8.644643	.1648383	52.44	0.000	8.321566	8.96772
sigma_u	1.2961226					
sigma_e	.77829871					
rho	.73498119	(fraction of variance due to u_i)				

```
29 .
30 . xi: regress lnFMV SIZE CS ROA SALES LR
```

Source	SS	df	MS	Number of obs	=	473
				F(5, 467)	=	51.87
Model	583.992363	5	116.798473	Prob > F	=	0.0000
Residual	1051.55328	467	2.25172009	R-squared	=	0.3571
				Adj R-squared	=	0.3502
Total	1635.54565	472	3.46513908	Root MSE	=	1.5006

lnFMV	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
SIZE	3.08e-06	7.28e-07	4.23	0.000	1.65e-06	4.51e-06
CS	-.1020229	.0353361	-2.89	0.004	-.1714604	-.0325853
ROA	6.890144	1.18432	5.82	0.000	4.562889	9.2174
SALES	1.08e-06	1.13e-06	0.96	0.339	-1.14e-06	3.29e-06
LR	.0517299	.0294707	1.76	0.080	-.0061817	.1096416
_cons	8.427303	.0961844	87.62	0.000	8.238296	8.616311

```
31 .
32 . **Post estimation tests**

33 .
34 . **1. test for time fixed effects**
```

```
35 .
36 . xi: xtreg lnFMV SIZE CS ROA SALES LR i.Years, fe
i.Years           _IYears_2015-2020   (naturally coded; _IYears_2015 omitted)

Fixed-effects (within) regression               Number of obs     =       473
Group variable: C_ID                            Number of groups  =        79

R-sq:                                           Obs per group:
     within  = 0.0597                                         min =         5
     between = 0.4147                                         avg =       6.0
     overall = 0.3282                                         max =         6

                                                F(10,384)         =      2.44
corr(u_i, Xb)  = 0.4434                         Prob > F          =    0.0079

------------------------------------------------------------------------------
       lnFMV |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        SIZE |   1.86e-06   1.10e-06     1.69   0.092    -3.07e-07    4.03e-06
          CS |  -.0458669   .0233547    -1.96   0.050     -.091786    .0000523
         ROA |   2.187526   1.125589     1.94   0.053    -.0255624    4.400614
       SALES |  -9.51e-07   1.75e-06    -0.54   0.586    -4.38e-06    2.48e-06
          LR |   .0217739   .0193602     1.12   0.261    -.0162915    .0598393
_IYears_2016 |  -.0956709   .1239422    -0.77   0.441    -.3393612    .1480195
_IYears_2017 |  -.0143676    .124509    -0.12   0.908    -.2591725    .2304372
_IYears_2018 |  -.0976492   .1260652    -0.77   0.439    -.3455136    .1502153
_IYears_2019 |    .163435   .1262892     1.29   0.196    -.0848699    .4117399
_IYears_2020 |   .2040336   .1268754     1.61   0.109    -.0454239    .4534911
       _cons |   8.809563   .1141164    77.20   0.000     8.585192    9.033934
-------------+----------------------------------------------------------------
     sigma_u |  1.5221106
     sigma_e |  .77286221
         rho |  .79502815   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0: F(78, 384) = 17.50                     Prob > F = 0.0000

37 .
38 . testparm _IYears*

 ( 1)  _IYears_2016 = 0
 ( 2)  _IYears_2017 = 0
 ( 3)  _IYears_2018 = 0
 ( 4)  _IYears_2019 = 0
 ( 5)  _IYears_2020 = 0

       F(  5,   384) =    2.10
            Prob > F =    0.0649

39 .
40 .
41 .
42 . **test for RE: Breusch pagan Langrange Multiplier(LM). This helps you decide whether a random ef

43 .
44 . xtreg lnFMV SIZE CS ROA SALES LR, re

Random-effects GLS regression                   Number of obs     =       473
Group variable: C_ID                            Number of groups  =        79

R-sq:                                           Obs per group:
     within  = 0.0323                                         min =         5
     between = 0.4065                                         avg =       6.0
     overall = 0.3447                                         max =         6

                                                Wald chi2(5)      =     56.25
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =    0.0000
```

lnFMV	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
SIZE	2.65e-06	9.22e-07	2.87	0.004	8.37e-07	4.45e-06
CS	-.0514508	.0230149	-2.24	0.025	-.0965592	-.0063424
ROA	2.853613	1.066131	2.68	0.007	.7640342	4.943192
SALES	4.78e-07	1.42e-06	0.34	0.736	-2.30e-06	3.26e-06
LR	.0243742	.0192312	1.27	0.205	-.0133182	.0620667
_cons	8.644643	.1648383	52.44	0.000	8.321566	8.96772
sigma_u	1.2961226					
sigma_e	.77829871					
rho	.73498119	(fraction of variance due to u_i)				

```
45 .
46 . xttest0
```

Breusch and Pagan Lagrangian multiplier test for random effects

lnFMV[C_ID,t] = Xb + u[C_ID] + e[C_ID,t]

Estimated results:

	Var	sd = sqrt(Var)
lnFMV	3.465139	1.861488
e	.6057489	.7782987
u	1.679934	1.296123

Test: Var(u) = 0

chibar2(01) = 575.59

Prob > chibar2 = 0.0000

```
47 .
48 .
49 .
50 . **Test for cross sectional dependences**

51 .
52 . xtreg lnFMV SIZE CS ROA SALES LR, fe
```

Fixed-effects (within) regression — Number of obs = 473

Group variable: C_ID — Number of groups = 79

R-sq:

within = 0.0340

between = 0.4064

overall = 0.3390

Obs per group:

min = 5

avg = 6.0

max = 6

F(5,389) = 2.74

corr(u_i, Xb) = 0.4293 — Prob > F = 0.0190

lnFMV	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
SIZE	2.09e-06	1.09e-06	1.91	0.057	-6.38e-08	4.23e-06
CS	-.0433249	.0233519	-1.86	0.064	-.0892367	.0025868
ROA	1.843199	1.126945	1.64	0.103	-.3724659	4.058864
SALES	-6.91e-07	1.72e-06	-0.40	0.688	-4.07e-06	2.69e-06
LR	.0225067	.0193886	1.16	0.246	-.0156129	.0606263
_cons	8.806581	.0891127	98.83	0.000	8.631379	8.981784
sigma_u	1.4889052					
sigma_e	.77829871					
rho	.78539235	(fraction of variance due to u_i)				

F test that all u_i=0: F(78, 389) = 17.27 — Prob > F = 0.0000

```
53 .
54 . xtcsd, pesaran abs


   Pesaran's test of cross sectional independence =    13.944, Pr = 0.0000

   Average absolute value of the off-diagonal elements =     0.573

55 .
56 .
57 .
58 . **Test for Hetroscedasticity**

59 .
60 . xttest3

   Modified Wald test for groupwise heteroskedasticity
   in fixed effect regression model

   H0: sigma(i)^2 = sigma^2 for all i

   chi2 (79)  =    3.1e+06
   Prob>chi2 =      0.0000


61 .
62 .
63 .
64 . **Test for Serial Correlation**

65 .
66 . xtserial lnFMV SIZE CS ROA SALES LR

   Wooldridge test for autocorrelation in panel data
   H0: no first order autocorrelation
       F(  1,      78) =      2.475
             Prob > F =      0.1197

67 .
68 . **Our results shows the problem of heteroscedasticity, Now we will fix the problem using Panel C
   >  of this method is cased on the fact that out N > T.**

69 .
70 . xtpcse lnFMV SIZE CS ROA SALES LR

   Linear regression, correlated panels corrected standard errors (PCSEs)

   Group variable:   C_ID                          Number of obs     =        473
   Time variable:    Years                         Number of groups  =         79
   Panels:           correlated (unbalanced)       Obs per group:
   Autocorrelation:  no autocorrelation                          min =          5
   Sigma computed by casewise selection                          avg =  5.9873418
                                                                 max =          6
   Estimated covariances      =      3160          R-squared         =     0.3571
   Estimated autocorrelations =         0          Wald chi2(5)      =     341.00
   Estimated coefficients     =         6          Prob > chi2       =     0.0000
```

lnFMV	Panel-corrected Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
SIZE	3.08e-06	3.99e-07	7.73	0.000	2.30e-06	3.86e-06
CS	-.1020229	.0466918	-2.19	0.029	-.1935371	-.0105086
ROA	6.890144	1.398233	4.93	0.000	4.149657	9.630632
SALES	1.08e-06	7.34e-07	1.47	0.142	-3.60e-07	2.52e-06
LR	.0517299	.0156108	3.31	0.001	.0211333	.0823266
_cons	8.427303	.096542	87.29	0.000	8.238084	8.616522

```
71 .
72 .
73 . xtreg lnFMV SIZE CS ROA SALES LR, fe
```

Fixed-effects (within) regression Number of obs = 473
Group variable: C_ID Number of groups = 79

R-sq: Obs per group:
within = 0.0340 min = 5
between = 0.4064 avg = 6.0
overall = 0.3390 max = 6

F(5,389) = 2.74
corr(u_i, Xb) = 0.4293 Prob > F = 0.0190

lnFMV	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
SIZE	2.09e-06	1.09e-06	1.91	0.057	-6.38e-08	4.23e-06
CS	-.0433249	.0233519	-1.86	0.064	-.0892367	.0025868
ROA	1.843199	1.126945	1.64	0.103	-.3724659	4.058864
SALES	-6.91e-07	1.72e-06	-0.40	0.688	-4.07e-06	2.69e-06
LR	.0225067	.0193886	1.16	0.246	-.0156129	.0606263
_cons	8.806581	.0891127	98.83	0.000	8.631379	8.981784
sigma_u	1.4889052					
sigma_e	.77829871					
rho	.78539235	(fraction of variance due to u_i)				

F test that all u_i=0: F(78, 389) = 17.27 Prob > F = 0.0000

```
74 . estimates store fixed

75 . xtreg lnFMV SIZE CS ROA SALES LR, re
```

Random-effects GLS regression Number of obs = 473
Group variable: C_ID Number of groups = 79

R-sq: Obs per group:
within = 0.0323 min = 5
between = 0.4065 avg = 6.0
overall = 0.3447 max = 6

Wald chi2(5) = 56.25
corr(u_i, X) = 0 (assumed) Prob > chi2 = 0.0000

lnFMV	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
SIZE	**2.65e-06**	**9.22e-07**	**2.87**	**0.004**	**8.37e-07**	**4.45e-06**
CS	**-.0514508**	**.0230149**	**-2.24**	**0.025**	**-.0965592**	**-.0063424**
ROA	**2.853613**	**1.066131**	**2.68**	**0.007**	**.7640342**	**4.943192**
SALES	**4.78e-07**	**1.42e-06**	**0.34**	**0.736**	**-2.30e-06**	**3.26e-06**
LR	**.0243742**	**.0192312**	**1.27**	**0.205**	**-.0133182**	**.0620667**
_cons	**8.644643**	**.1648383**	**52.44**	**0.000**	**8.321566**	**8.96772**
sigma_u	**1.2961226**					
sigma_e	**.77829871**					
rho	**.73498119**	(fraction of variance due to u_i)				

76 . estimates store random

77 . hausman fixed random

Note: the rank of the differenced variance matrix (**3**) does not equal the number of coefficients be
expect, or there may be problems computing the test. Examine the output of your estimator
consider scaling your variables so that the coefficients are on a similar scale.

	Coefficients			
	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
SIZE	**2.09e-06**	**2.65e-06**	**-5.60e-07**	**5.86e-07**
CS	**-.0433249**	**-.0514508**	**.0081259**	**.003953**
ROA	**1.843199**	**2.853613**	**-1.010414**	**.365197**
SALES	**-6.91e-07**	**4.78e-07**	**-1.17e-06**	**9.69e-07**
LR	**.0225067**	**.0243742**	**-.0018675**	**.0024655**

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(**3**) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= **14.32**
Prob>chi2 = **0.0025**

78 .