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JEL Classifications: G32, L25, M10, P27

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Abstract:

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1. Introduction

In many aspects, Vietnam can represent a kind of emerging market economy, embedded with transitional characteristics, that could spark earnest academic interests. When the 2008-10 financial crisis started out, the fast-growing economy of Vietnam had already seen a 2-digit inflation raging, following years of overinvestment and sky-rocketing speculative and real estate asset prices. Domestic firms, both privately held and state-owned, tried all ways possible to acquire financial and land resources to expand, and also speculate. Very few made a serious question about why they did all these, and for what? In principle, firms are born to make profits, and the priority of performance - defined one way or another - should always be put high on agenda. However, this is not always the case. After five years in transition turmoil, many have still been puzzled with making the obvious priority although problems of firm performance have become even more acute.

This paper investigates the relationships between business scales (operation aspects), sources of funding (financial) and corporate financial performance in Vietnam. In our consideration, the Vietnamese socio-cultural and politico-economic context has made the first two groups of factors the predictor variables for firm performance. Thus, we follow the logic to implement subsequent econometric analysis, using a Vietnamese longitudinal dataset.

2. Review of related academic literature

2.2. A brief literature review

Modiglian & Miller (1958) theorem on capital structure has inspired a great number of researchers to make academic efforts in studying various issues related to capital structure – which is expected to be related to corporate performance. Jensen & Meckling's (1976) work on relationship between investment and financing decision started a new wave of research on the relationship between capital structure and corporate performance, and optimal capital structure, such as Beard & Dess (1981), Ofek (1993), Rajan & Zingales (1995), Jordan, Lowe & Taylor (1998), Zeitun & Tian (2007), Ahmad et al. (2012). Several excellent review and meta-analysis papers, e.g. Capon, Farley & Hoenig (1990) and Cekrezi (2013), show that that there is no consensus among economists. Empirical results have proved to be different, depending on periods, locations, type of economy, etc.

Researchers around the world rely on econometric techniques and data availability to learn about the relationship between capital structure and corporate performance - for instance, Harris & Raviv (1991), Krishnan & Moyer (1997), Gleason, Mathur & Mathur (2000), Abor (2005), Zeitun & Tian (2007), and Ahmad et al. (2012). These regression results, on the one hand, provide empirical evidence for one of the most controversial topics in the business academic literature. On the other hand, purely technical approaches, perhaps, may miss the point: corporate performance is also affected by elusive variables such as innovation strategy, and socio-economic and cultural settings. Barton & Gordon (1987) even point out that extensive theoretical and empirical studies have failed not just to determine which factors influence capital structure but also to confirm whether capital structure really affects the value of firms.

But recently, renewed research efforts have enhanced the literature with new evidence from both developed and developing countries. To study that relationship, Zeitun & Tian (2007) use panel data sample of 167 Jordanian companies during 1989-2003, using Tobin's Q, market value of equity to the book value of equity (MBVR), price per share to the earnings per share (P/E), and market value of equity and book value of liabilities divided by book value of equity (MBVE) to measure corporate market performance while return on equity (ROE), return on assets (ROA), and earnings before interest and tax plus depreciation to total assets (PROF) serve as accounting/financial performance. Their independent variables are various leverage measures: (i) total debt to total assets (TDTA), (ii) total debt to total equity (TDTE), (iii) long-term debt to total assets (LTDTA), (iv) short-term debt to total assets (STDTA), and (iv) total debt to total capital (TDTC), growth of sales, size of assets or sales, STDVCF standing for standard deviation of cash flow (net income plus depreciation) for the last three years, total tax to earnings before interest and tax, tangibility (fixed assets to total assets). Their empirical results suggest that "ROA and Tobin's Q are the most powerful measures of performance" and "higher level of leverage lead to lower ROA" (p.49). In addition, three proxies for capital structure – LTDTA, STDTA and TDTE – are found to be significantly and negatively related corporate profitability.

Harris & Raviv (1991) show that firms may have more debt in their capital structure than they should because of underestimation of bankruptcy costs of liquidation or reorganization, or the aligned interest of both managers and shareholders. Krishnan & Moyer (1997) confirm negative and significant impact of the financial gearing ratio on ROE. Gleason, Mathur & Mathur (2000) provide evidence that firm capital structure has a negative and significant impact on firm performance measures ROA, growth in sales, and pre-tax income, and more interestingly, that capital structures differ by the cultural settings.

Barclay & Smith (1995) find that large firms and firms with low growth rates prefer to issue long-term debt, while Stohs & Mauer (1996) suggest that larger and less risky firms usually make greater use of long-term debt. Schiantarelli & Sembenelli (1999) find a positive relationship between initial debt maturity and medium term performance in Italy and United Kingdom. Chakravarthy (1986) suggests that corporate financial performance is possibly measured by profit maximization, maximizing profit on assets, and maximizing shareholders' benefits. In addition, Hoffer & Sandberg (1987) consider growth in sales and growth in market share operational performance which later on defines financial results of corporations.

Return on assets (ROA), return on equity (ROE), and return on investment (ROI) are the most common proxies for corporate performance since the measures have been employed by Demsetz & Lehn (1985) , Gorton & Rosen (1995), Mehran (1995), and Ang, Colde & Line (2000). Related measures include earnings per share (EPS), Tobin's Q and market value of equity to book value of equity (MBVR).

Prahalathan & Ranjani (2011) examine the impact of capital structure choice on corporate performance of 65 listed firms for the period 2003-2007, in Sri Lanka. The author employed multiple regression analysis to estimate the relationship between financial performance – represented by gross profit margin, ROA, and ROE – and leverage ratios of short-term debt to total assets (STD), long-term debt to total debt (LTD), total debt to total assets, and firm size. They find that capital structure to have statistically significant negative impact on gross profit margin, but not returns on asset and investment.

San & Heng (2011) are interested in the impact of capital structure on corporate performance in a single industry. They investigate 49 listed construction Malaysian firms from 2005 to 2008. While dividing firms into big, medium and small based on paid-up capital, the authors propose six dependent variables representing corporate performance – including, return on capital (ROC), ROE, ROA, EPS, operating margin, and net margin – and six independent variables of long-term debt to capital, debt to capital (DC), debt to asset (DA), debt to equity market value (DEMV), debt to common equity (DCE), and long-term debt to common equity (LDCE). OLS estimations show that only ROC and EPS have significant relationship with capital structure in big firms, operating margin in medium firms, and EPS in small firms. In addition, significant independent variables are DEMV, LDC, and DC of big firms, LDCE of medium firms, and DC of small firms.

Ahmad, Abdullah & Roslan (2012) also investigate the capital structure-corporate performance relationship in Malaysian firms. 2005-2010 data of 58 firms are analyzed by multiple regressions to examine the impact of short-term debt, long-term debt and total debts on returns on assets (ROA) and equity (ROE), in addition to total assets, asset growth, sales growth, and sales over total assets. In difference to the findings of San & Heng (2011), Ahmad et al. (2012) reveal that significant relationship between ROA and debts, both short-term and long-term.

Salteh, Ghanavati, Khanqah & Khosroshahi (2012) study the relationship between capital structure and corporate performance in 28 Iranian listed companies in vehicles and parts manufacturing sector, from 2005 to 2009. Multi regression analysis is also employed to estimate the impact of leverage ratios – including short-term debt to total assets (SDTA), long-term debt to total assets (LDTA), total debt to total assets (TDTA), and total debt to total equity (TDTE) – on corporate financial performance represented by return on equity (ROE), return on assets (ROA), earnings per share (EPS), market value of equity to book value of equity (MBVR), and the Tobin's Q. Salteh et al. (2012) provide empirical results suggesting that (i) EPS and ROA are negatively related to capital structure; (ii) ROE and Tobin's Q are positively related to TDTE; and (iii) MBVR is statistically significant related to SDTA. While (i) is in line with Zeitun & Tian (2007), Rajan & Zingales (1995), and Abor (2007), it is contrary to the works of Champion (1999) , Ghosh, Nag & Sirmans (2000), Hadlock & James (2002), Frank & Goyal (2003), and Berger & di Patti (2006) which show a positive relationship.

While many study the impacts of capital structure on corporate performance – for instance, Salteh et al. (2012), Ahmad et al. (2012), San & Heng (2011), Prahalathan & Ranjani (2011), and Zeitun & Tian (2007). Jordan, Lowe & Taylor (1998), in a reverse approach, examine factors that explain corporate debt levels. While looking at capital structure through traditional proxies, i.e., leverage and gearing, the work of Jordan et al. (1998) also makes difference by its focus on SMEs, not large and public firms. Regression results suggest that financial and strategic factors, including turnover, profit, and innovation strategy, are necessary to explain corporate debt levels.

O'Brien (2003) investigates the relationship between innovation-based competitiveness strategy and capital structure, and corporate performance, employing a dataset of 16,358 firms that have filed reports to the U.S. Securities and Exchange Commission and been listed for more than one year in the period 1980-1999. While capital structure is represented by a leverage measure (book value of debt/total market value of firm) and M/B (market value of firm/book value of total assets), independent variables include innovation (proxy for relative R&D intensity of firm), R&D intensity (firm-level expenditures on R&D/sales), advertising intensity (expenditures on advertising/sales), size (book value of total assets), profitability (return on assets), capital intensity (book value of total assets/sales), and tangible assets/total assets ratio. This study performs OLS regressions with lagged dependent variables as predictor variables. The results suggest that there are intangible factors that determine both corporate capital structure and performance, such as innovation-based competitive strategy.

Empirical results provided by Ozkan A (2001) while surveying 390 firms in the 1984-96 period, suggest that in developed economies such as UK, firms have the so-called "target borrowing ratios," and tend to adjust to their targets quite fast. In other words, moving away from the desirable level of debt could be costly. Also, the author provides evidence on positive impact of size, and negative effects of growth opportunities, liquidity, profitability, and non-debt tax shields on the borrowing levels. Harvey, Lins & Roper (2004) investigate the effect of capital structure, especially the use of internationally syndicated loans, on firms value creation, with significant results. The authors show that equity holders value compliance with "monitored covenants" in presence of overinvestment, particularly in emerging markets.

Hovakimian, Hovakimian & Tehranian (2004) provide for interesting insights: a) high market-to-book firms have good growth opportunities and, therefore, have low target debt ratios; b) the importance of stock returns in studies of corporate financing choices is unrelated to target leverage and is likely to be due to market timing behavior; c) profitability has no effect on target leverage. So, their evidence supports the hypothesis that firms have target capital structures.

Opler & Titman (1994) provide evidence that heavily indebted firms tend to lose market share to those conservatively financed rivals when market conditions worsen. Highly leveraged firms also suffer from equity value decline. Financial distress costs adversely affect firms' financial performance, especially those with highly specialized products and using debts to finance R&D activities. In a more general situation, Campello (2006), when studying long-term industry relationships, with data incorporating 115 industries and spanning over 30 years, shows that debt can both boost and hurt performance, depending the on the market conditions and phase of industry development. Use of moderate debt can be productive, but high indebtedness potentially leads to market underperformance. Empirical results using international data from a research by Rajan & Zingales (1995) also show influence of some key factors to capital structure: tangibility (+), market-to-book ratio (-), firm size (+), and profitability (-), with varying degrees depending on level of concentration and country. The study focuses on developed market economies. Margaritis & Psillaki (2010) results are confirmatory of Rajan & Zingales 1995.

While Huang & Song (2006) show similar results to Rajan & Zingale 1995 for a data set containing 1000 Chinese firms, the results also indicate that "leverage in Chinese firms increases with volatility and firms tend to have much lower long-term debt."

Gallo & Vilaseca (1996) analyze issues of capital structure of family firms, behavior towards investments and risk, and dividend policy and reach conclusions that those with stronger market-share positions tend to have low debt/equity levels. Yet, having leading market-share positions does not automatically means superior financial performance over followers. While researching 986 African firms over the period 1999-2008, using GMM/SUR methods, Lemma & Negash (2013) report that probability of bankruptcy, agency and transaction costs, tax issues and information asymmetry, access to finance and market timing, but NOT firms profitability, are significant factors that influence African firms' capital structure choice.

Coleman & Robb's multivariate analysis (2011) shows that new technology enterprises, especially fast-growing ones, focus on size of capital more than others, preferring internal sources to maintain control. However, they do use both equity and debt to finance operations. Availability of finance does not appear to be a major issue if technology-based firms can make a case for high growth and competitive advantage, which help overcome some of the problems of information asymmetry.

2.2. Some relevant insights from emerging markets and Vietnam:

Bevan, Estrin & Schaffer (1999) study the determinants of enterprise performance in transition economies, where the need of restructuring makes substantial capital investment expenditure a relatively important condition. The author discuss that firms in these economies are likely to experience acute financial constraints, leading banks to play a more prominent role. But in general, leverage ratios appear to have been lower in European transition economies: 32% and 41% for Hungary and Poland respectively. The figure is ~66% for G7 non-financial firms according to Rajan & Zingales (1995).

In Vietnam, Phung & Le (2013) study a smaller data set of firms listed on Ho Chi Minh Stock Exchange during the period 2008-2011, providing some evidence of negative impact of foreign ownership on firm performance, and positive impact on capital structure. They offer an explanation of foreign investors' limited ability to monitor Vietnamese firms' corporate governance practices. As foreign investors may suffer from the problems of information asymmetry, they tend to advocate higher debt finance for mitigating agency problem.

Tran & Santarelli (2013) investigate the effect of capital constraints on the performance of entrepreneurial firms, using a panel of 1721 firms in 4-year time span. They report evidence that entrepreneurial firms that are faced with capital constraints tend to perform substantially better, roughly 4.9% above the norm.

Vuong (2014) discusses the deeply-rooted issues of the political economy that have lead to firms' choices of debt vs. equity. Although access to bank loans have for a long time been an overwhelming issue to the majority of smaller firms, larger companies especially state-run firms are still able to borrow, and in some cases, staggering amounts of money. At some points, abundance of resources available to well established firms has even led to the problem of "resource curse" and "destructive creation" whereby resource-rich firms create subsidiaries to take on speculative assets, and employs their advantage of size to borrow more (Vuong & Napier 2014).

3. Research questions and data

3.1. Research questions

Our review of related academic literature helps gain some understanding. First, there can be two ways to look at the relationships between factors constituting the so-called "capital structure" and firms' performance, in which the view of "target capital structure" appears to be more suitable to developed market, while the view of capital structure and related operational dimensions (sales, growth, size) affecting performance tends to be more appropriate for developing economies. Second, the plethora and rising complexity of independent variables (IV) used in econometric analyses do not solve the issue of disagreement among various empirical results reported: signs of coefficients, magnitudes of influence, relevant IVs, and so on. There is also no evidence that more complex techniques would better explain the relationship, especially in less developed markets. Third, the longitudinal data analysis becomes more insightful and popular, although it cannot be guaranteed that well known models and reported results in academic literature would automatically become applicable in a new dataset.

The above points lead to the following research questions, which this study will address:

1. Do operational scales have effects on firms' performance?
2. Does capital structure influence firms' performance?
3. How would operational scales and sources of finance likely impact financial results of firms?

3.2. The longitudinal dataset

The dataset contains information extracted from financial reports of 37 listed companies in Vietnam, for the period 2004-13. The factors enter into subsequent analysis include: STD (short-term debt to total asset); LTD (long-term debt to total assets); SIZE (natural logarithm of total assets); SALES (natural logarithm of sales); SIG (growth rate of SIZE); SAG (growth rate of SALES); ROE; and PM (net profit margins to sales). Graphs presented in Figure 1 and 2 provide a visual check on possible pairwise relationships between some of the variables in consideration.

Figure 1 – Observation of possible relationships between pairs of variables

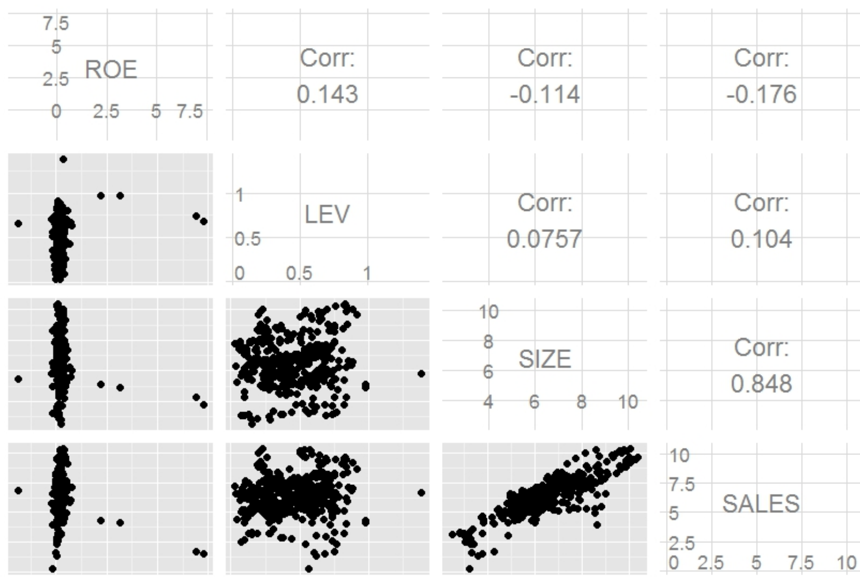
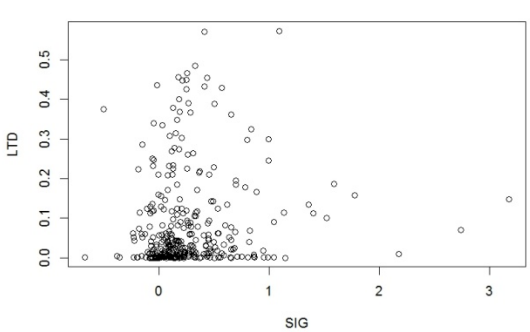
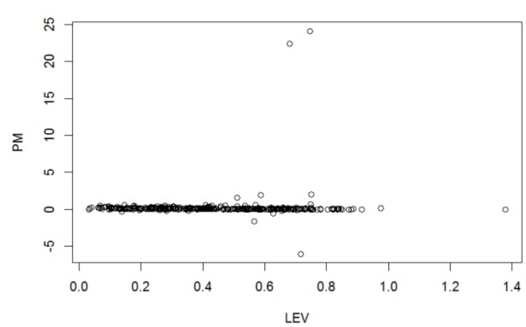


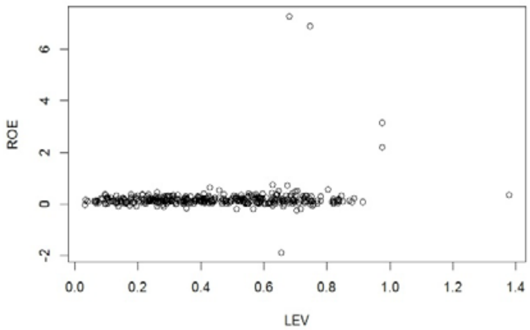
Figure 2 – Further visual checks on other pairs of variables



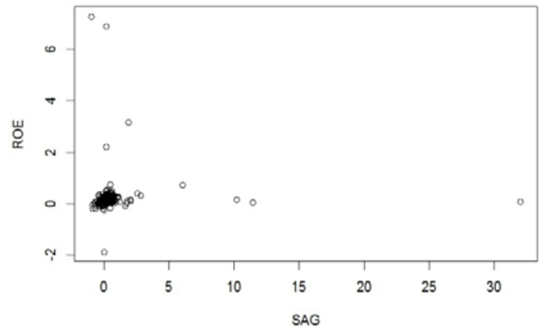
LTD and growth of size (a)



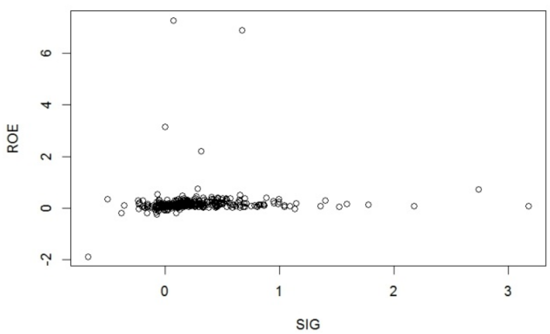
PM and leverage (LEV) (b)



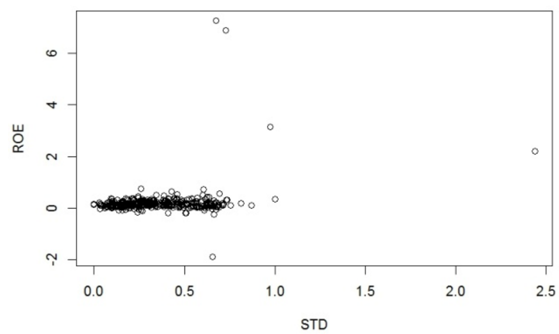
ROE and leverage (c)



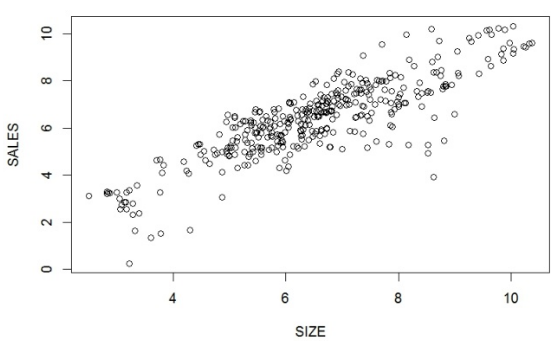
ROE and growth of sales (d)



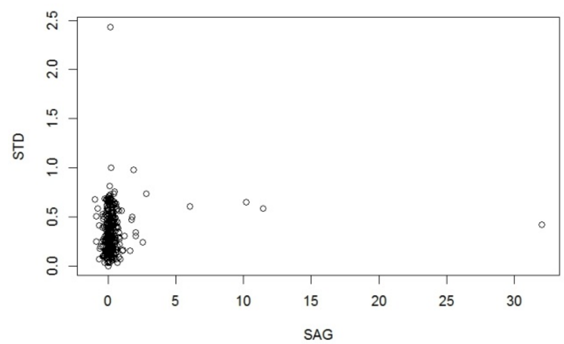
ROE and growth of size (e)



ROE and short-term debt (f)



Log of sales and log of size (g)



STD and growth of sales (h)

The dataset used for this study is also check for the Pearson correlation (pairwise). One example is the null hypothesis that the correlation between ROE and SALES is 0 (H_0). Performing this test using R, assuming that the population correlation is 0, the result suggests that to expect a correlation coefficient of -0.176, the chance is really slim, about 1/1500 (t = -3.4299, df = 368, p-value = 0.00067). As this is highly unlikely, H_0 is rejected; that means corr(ROE,SALES) is significant. Table 1 provides for basic statistics and Pearson correlation coefficients, rounded to 2-digit decimal (so corr(SOE,SALES) is reported as -0.18), each with a corresponding level of significance.

Table 1. Descriptive statistics and Pearson correlation coefficients

	Mean	S.D.	Min.	Max.	ROE	PM	STD	LTD	LEV	SIZE
ROE	0.21	0.57	-1.87	7.28						
PM	0.23	1.75	-6.01	24.16	0.89*					
STD	0.36	0.22	0.00	2.44	0.23*	0.08				
LTD	0.09	0.12	0.00	0.57	-0.05	-0.03	-0.07			
LEV					0.14**	0.06	0.76*	0.46*		
SIZE	6.52	1.61	2.51	7.86	-0.11**	-0.10***	-0.08	0.25*	0.08	
SALES	6.39	6.48	0.26	10.34	-0.18*	-0.19	0.05	0.04	0.10***	0.85*

(*): p <.01; (**): p <.05; (***): p<.10; n=370. Size: 30 listed firms. Data period: 2004-2013.

3.2. Method for data analysis

For this type of research question, it is plausible to employ longitudinal data analysis especially when the data set involves both time-series and cross-sectional variables, reflecting the evolution of the same group of entities/individuals over the recent years. Specifically, this data set will be examined using several specifications of pooled OLS, fixed-effects and random-effects models. During the estimating process, some variants of these three approaches are also explored such as models with lagged dependent variables or with time-specific effects.

A brief description of these methods for data analysis. For a full account of technical treatments for longitudinal analysis, see Hsiao (2003) and Frees (2004). Four models for consideration, with $i = 1,2, \ldots N$, $t = 1,2, \ldots, T$, are given below:

Constant slope coefficients, with intercept varying over individuals	$y_{it} = \alpha_i^* + \sum_{k=0}^{K} \beta_k x_{kit} + u_{it}$	Eq.1
Constant slope coefficients, with intercept varying over individuals and time	$y_{it} = \alpha_{it}^* + \sum_{k=0}^{K} \beta_k x_{kit} + u_{it}$	Eq.2
All coefficients vary over individuals	$y_{it} = \alpha_i^* + \sum_{k=0}^{K} \beta_{ki} x_{kit} + u_{it}$	Eq.3
All coefficients vary over individuals and time.	$y_{it} = \alpha_{it}^* + \sum_{k=0}^{K} \beta_{kit} x_{kit} + u_{it}$	Eq.4

Depending on our assumption of the coefficients to be fixed or random, each model is then estimated with a relevant specification. Models of Eq.1 and Eq.2 are widely used for panel data analysis.

To assess the effects of both quantitative and qualitative factors, the general linear model has the form:

$$y_{it} = \alpha_{it}^* + \boldsymbol{\beta}_{it}' \mathbf{x}_{it} + u_{it} \qquad \text{Eq.5}$$

where α_{it}^{*} and $\boldsymbol{\beta}_{it}^{'} = (\beta_{1it}, \beta_{2it}, \dots, \beta_{Kit})$ are 1×1 and $1 \times K$ vectors of constants that vary across i and t; $\mathbf{x}_{it}^{'} = (x_{1it}, x_{2it}, \dots, x_{Kit})$ is a $1 \times K$ vector of exogenous variables; u_{it} the error term.

The logic of the test procedure is to confirm/reject if: a) slopes and intercepts simultaneously are homogenous among different individuals at different times; b) regression slopes are the same; c) regression intercepts are the same.

<u>Fixed effects (FE) model</u>

The data used in this research exhibit varying impacts of independent variables over the years. Thus, FE models help to efficiently capture the relationship between predictor and outcome variables within an entity, by removing the effect of the time-invariant characteristics from predictor variables to gauge predictor variables' net effect. A simpler model that assumes no time-specific effects to focus on individual-specific effects has a general form as follows:

$$y_{it} = \alpha_i^{*} + \boldsymbol{\beta}^{'}\mathbf{x}_{it} + u_{it} \qquad \text{Eq.6}$$

We assume that u_{it} is uncorrelated with $(\mathbf{x}_{i1}, \dots, \mathbf{x}_{iT})$ and $u_{it} \sim \text{i. i. d.}(0, \sigma_u^2)$. With FE, linear regression model is estimated when effects of omitted individual-specific variables (α_i) are treated as fixed constants over time (in contrast to RE model, where individual-specific effects as u_{it} are treated as random variables.) If the error terms are correlated then FE is no suitable since inferences may not be correct and you need to model that relationship (probably using random-effects), this is the main rationale for the Hausman test.

Hsiao (2003) shows that as $E\mathbf{u}_i = 0$, $E\mathbf{u}_i\mathbf{u}_i^{'} = \sigma_u^2 I_T$, $E\mathbf{u}_i\mathbf{u}_j^{'} = 0$, if $i \neq j$, I_T is the $T \times T$ identity matrix, the OLS estimator for Eq.6 is the best linear unbiased estimator.

$$\hat{\alpha}_i^{*} = \bar{y}_i - \beta^{'}\bar{\mathbf{x}}_i$$

where $\bar{y}_i = \frac{1}{T}\sum_{i=1}^{T} y_{it}$, $\bar{\mathbf{x}}_i = \frac{1}{T}\sum_{i=1}^{T} \mathbf{x}_{it}$.

$$\hat{\beta}_{CV} = \left[\sum_{i=1}^{N}\sum_{t=1}^{T}(\mathbf{x}_{it} - \bar{\mathbf{x}}_i)(\mathbf{x}_{it} - \bar{\mathbf{x}}_i)^{'}\right]\left[\sum_{i=1}^{N}\sum_{t=1}^{T}(\mathbf{x}_{it} - \bar{\mathbf{x}}_i)(y_{it} - \bar{y}_i)^{'}\right]$$

Eq.6 can also take the form Eq.6(b) with both μ and α_i being fixed constants. Imposing the restriction $\sum_{i=1}^{N} \alpha_i = 0$ can help identify these two constants, in which case the individual effects α_i represents the deviation of the i^th individual from the common mean intercept, μ.

$$y_{it} = \mu + \boldsymbol{\beta}^{'}\mathbf{x}_{it} + \alpha_i + u_{it} \qquad \text{Eq.6(b).}$$

To turn the matrix form of Eq.6(b) into a more familiar specification for panel data, we can write:

$$y_{it} = \beta_0 + \beta_1 x_{1,it} + \cdots + \beta_K x_{K,it} + \gamma_2 E_2 + \cdots + \gamma_n E_n + u_{it} \qquad \text{Eq.6(c),}$$

where: y_{it} is the dependent variable where i=individual, and t= time; β_k the coefficient for the corresponding independent variable; $x_{k,it}$ the independent variable; γ_n coefficient for the binary regressor; and E_n the entity/individual n (as they are dummy variables the model has n-1 entities).

Also, when adding time to the above entity-specific e fixed effects model, the following time and entity fixed effects regression model is obtained:

$$y_{it} = \beta_0 + \beta_1 x_{1,it} + \cdots + \beta_K x_{K,it} + \gamma_2 E_2 + \cdots + \gamma_n E_n + \delta_2 T_2 + \cdots + \delta_t T_t + u_{it} \quad \text{Eq.6(d)},$$

where the binary (dummy) variable T_t is added with the corresponding coefficient for the time regressors δ_t.

Random-effect (RE) model

The rationale behind the use of a random-effects model is that the unobserved individual effect in RE models consists of elements that are random and uncorrelated with the regressors (predictor variables). So following the same vein as Eq.6 and 6(b), for the RE model, the individual-specific effects are treated as random variables, where the residual v_{it} can be assumed to consist of three components as in Eq.7:

$$v_{it} = \alpha_t + \lambda_t + u_{it} \qquad \text{Eq.7}$$

where: $E\alpha_i = E\lambda_t = Eu_{it} = 0, E\alpha_i\lambda_t = E\lambda_t u_{it} = E\alpha_i u_{it} = 0,$

$$E\alpha_i\alpha_j = \begin{cases} \sigma_\alpha^2 & \text{if} \quad i = j \\ 0 & \text{if} \quad i \neq j \end{cases}$$

$$E\lambda_t\lambda_s = \begin{cases} \sigma_\lambda^2 & \text{if} \quad t = s \\ 0 & \text{if} \quad t \neq s \end{cases}$$

$$Eu_{it}u_{js} = \begin{cases} \sigma_u^2 & \text{if} \quad i = j, t = s \\ 0 & \text{otherwise} \end{cases},$$

and $E\alpha_i\mathbf{x}_{it}^{'} = E\lambda_t\mathbf{x}_{it}^{'} = Eu_{it}\mathbf{x}_{it}^{'} = \mathbf{0}^{'}$. The variance of y_{it} conditional on $\mathbf{x}_{it}$ is: $\sigma_y^2 = \sigma_\alpha^2 + \sigma_\lambda^2 + \sigma_u^2$.

The modeling of the residual of estimation model following Eq.7 leads to the familiar form ready for estimation of 7(b):

$$y_{it} = \beta_0 + \beta_1 x_{1,it} + \cdots + \beta_K x_{K,it} + \gamma_2 E_2 + \cdots + \gamma_n E_n + u_{it} + \varepsilon_{it}, \qquad \text{Eq.7(b)}$$

where u_{it} represents "between-entity" error term; and, ε_{it} "within-entity" error.

For technical details on determining GLS estimator and further MLE computations, see Hsiao (2003: 35-41), Frees (2004: Chapter 3), and Baltagi (2005: 14-21).

4. Empirical results

Empirical results that are reported in Section 4 below are obtained from actual estimation using the statistical package R (release 3.0.2). The dataset has n=37, T=10, N=370.

First, the results of estimating three models Pooled OLS (M1); and, FE vs. RE models, using with dependent variable (DV) being ROE; independent variables (IV) being STD, LTD, SIZE, and SALES, are reported in Table 1.

Table 1 - FE, RE and Pooled OLS models estimations

	Fixed (M2)		Random (M3)		Pooled OLS (M1)	
	Coefficient (s.e.)	t-Stat. (p-Value)	Coefficient (s.e.)	t-Stat. (p-Value)	Coefficient (s.e.)	t-Stat. (p-Value)
Intercept	--	--	0.5153** (0.1727)	2.9837 (0.0030)	0.2576* (0.1290)	1.9967 (0.0466)
STD	0.5926*** (0.1617)	3.6661 (0.0003)	0.6789*** (0.1431)	4.7435 (3.02×10^{-06})	0.681778*** (0.1286)	5.3032 (1.98×10^{-07})
LTD	-0.8265* (0.3591)	-2.3017 (0.0220)	-0.5145 (0.2932)	-1.7544 (0.0802)	-0.462850c (0.2542)	-1.8208 (0.0694)
SIZE	0.1475*** (0.0555)	3.5611 (0.0004)	0.1475*** (0.0438)	3.3691 (0.0008)	0.1120** (0.0370)	3.0282 (0.0026)
SALES	-0.4489*** (0.0577)	-7.7755 (9.74×10^{-14})	-0.2299*** (0.0422)	-5.4497 (9.30×10^{-08})	-0.1542*** (0.0344)	-4.4807 (9.97×10^{-06})
R^2 /Adj. R^2	0.1285 / 0.1267		0.1285 / 0.1267		0.1111 / 0.1096	
F-stat / p-value:	13.45 (on 4 and 365 DF) / 3.09×10^{-10}		13.45 (on 4 and 365 DF) / 3.09×10^{-10}		11.41 on 4, 365 DF / 9.83×10^{-09}.	
Note: '--' : "not applicable" ; Significance level codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 'c'.						

The LM Breusch-Pagan test reports a large χ^2-statistic of 23.64 (df = 1), and p-Value of 1.16×10^{-06}. Since the null hypothesis of this B-P test stipulates that there is NOT evidence of significant differences across entities/individuals (that is variances across individuals are zeros), the test statistic rejects H_0 (Baltagi 2005: 59-61). Therefore, although most estimated coefficients are significant at conventional levels, the pooled OLS specification is not a better choice.

Performing a specification test with the LM Breusch-Godfrey/Wooldridge yields a χ^2-statistic of 95.6938, df = 10, p-value = 3.95×10^{-167}, in favor of fixed-effects model choice (see Baltagi 2005: 95). In addition, applying the Hausman test for this specification of predictor variables, between fixed- and random-effects models, yields a large χ^2 numerical value of 37.29 (df = 4, p-value = 1.57×10^{-07}), leading to the preference of fixed-effects model.

On the time-fixed effects estimation (only significant time-effects are reported), the result is provided in Table 2:

Table 2 - Estimation of time-fixed effects model

	Time-fixed effects model (M4) DV=ROE; IV=STD, LTD, SIZE, SALES; Dummy=T	
	Coefficient (s.e.)	t-Stat. (p-Value)
STD	0.6812*** (0.1682)	4.0507 (6.42×10^{-05})
LTD	-0.8485* (0.3665)	-2.3149 (0.0213)
SIZE	0.1886* (0.0851)	2.2160 (0.0274)
SALES	-0.4537*** (0.0580)	-7.8220 (7.62×10^{-14})
YEAR(2006)	0.3258**	2.7916

	(0.1167)	(0.0056)
YEAR(2007)	0.2865* (0.1334)	2.1475 (0.0325)
YEAR(2009)	0.2577c (0.1456)	1.7704 (0.0776)
YEAR(2010)	0.2676c (0.1559)	1.7169 (0.0870)
R^2 /Adj. R^2	0.24451 / 0.21147	
F-statistic / p-value:	7.9668 on 13 and 320 DF / 8.14×10^{-14}.	
Significance level codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 'c'		

Also the F-test for individual effects indicates that with F = 1.5669 (df1 = 9, df2 = 320). Although the corresponding p-Value (0.1241) shows insignificance of the overall specification (in which case we may say there is no need for use of the time-fixed effects to model the dataset), the insights gained from significant time-effects for the two 2-year periods (2006-07 and 2009-10) are interesting and noteworthy (see section 5).

Table 3 reports statistics obtained from estimations of FE and RE models M5-7, using SIZE/SIZE GROWTH (SIG), and ASSET GROWTH (SAG)

Table 3 - Estimated coefficients and test statistics M5-7

	Fixed (M5) DV=ROE; IV=STD, LTD, SIZE, SAG		Random (M6) DV=ROE; IV=STD, LTD, SIZE, SAG		Fixed (M7) DV=ROE; IV=STD, LTD, SIG, SAG	
	Coefficient (s.e.)	t-Stat. (p-Value)	Coefficient (s.e.)	t-Stat. (p-Value)	Coefficient (s.e.)	t-Stat. (p-Value)
Intercept	--	--	0.2697c (0.1507)	1.7890 (0.0745)	--	--
STD	0.7342*** (0.1894)	3.8767 (0.0001)	0.6281*** (0.1438)	4.3693 (1.67×10^{-05})	0.7483** (0.2541)	2.9446 (0.0035)
LTD	0.2422 (0.5136)	0.4717 (0.6375)	0.0278 (0.2909)	0.0957 (0.9238)	0.4199 (0.3766)	1.1149 (0.2658)
SIZE (SIG)	-0.2033*** (0.0501)	-4.0571 6.38×10^{-05}	-0.04243* (0.0212)	-1.9998 (0.0463)	0.1591* (0.0658)	2.4168 (0.0163)
SAG	-0.0549** (0.0172)	-3.2035 (0.0015)	-0.0099 (0.0165)	-0.6019 (0.5477)	-0.0611** (0.0199)	-3.0593 (0.0024)
R^2 /Adj. R^2	0.1238 / 0.1086		0.0698 / 0.0688		0.0866 / 0.0760	
F-statistic / p-value	10.3173 on 4 and 292 DF / 7.91×10^{-08}		6.1533 on 4 and 328 DF / 8.74×10^{-05}		6.9243 on 4 and 292 DF / 2.45×10^{-05}	
Note: '--' : "not applicable" ; Significance level codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 'c' ; When appropriate, estimation of coefficients' statistics employ heteroskedasticity-consistent varying covariance matrix.						

Both t-test of Breusch-Pagan for the first spec (BP = 13.7479, df = 4, p-value = 0.008145) and LM Breusch-Godfrey/Wooldridge test for serial correlation (χ^2-stat. = 77.6822, df = 9, p-value = 4.659×10^{-13}) suggest the use of fixed-effect model M5. In addition, Hausman test with chisq = 75.5587, df = 4, p-value = 1.518×10^{-15} advocates the use of FE in M5 is superior than the RE model of M6.

<u>Profit margin instead of ROE:</u>

In the last estimations that follow, the dependent variable is now Profit Margin (PM), instead of ROE as in preceding specifications. The balanced panel has n=37, T=10, N=370. The general specification is: DV=PM; IV= STD, LTD, SIZE, SALES.

Table 4 - Estimation results for FE and RE models, using dependent variable PM.

	Fixed (M8)		Random (M9)	
	Coefficient (s.e.)	t-Stat. (p-Value)	Coefficient (s.e.)	t-Stat. (p-Value)
Intercept	--	--	1.5339^{**} (0.5405)	2.8378 (0.0048)
STD	0.1244 (0.5087)	0.2445 (0.8070)	0.7136 (0.4494)	1.5880 (0.1132)
LTD	-3.9809^{***} (1.1301)	-3.5225 (0.0005)	-2.1913^{*} (0.9202)	-2.3812 (0.0178)
SIZE	0.7715^{***} (0.1747)	4.4167 1.361×10^{-5}	0.5498 (0.1373)	3.3691 (0.0008)
SALES	-1.4735^{***} (0.1817)	-8.1104 (1.01×10^{-14})	-0.77710^{***} (0.1322)	4.0039 (7.55×10^{-5})
R^2 /Adj. R^2	0.1871 / 0.1663		0.0988 / 0.0975	
F-statistic / p-value:	18.9252 on 4 and 329 DF / 5.10×10^{-14}		10.006 on 4 and 365 DF / 1.08×10^{-7}	
Note: '--' : "not applicable" ; Significance level. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 'c'.				

Result obtained from the Hausman test (with χ^2-stat = 37.9048, df = 4, p-value = 1.172×10^{-07}) suggests the use of FE Model (M8).

5. A discussion on the insights

This final section briefly discusses several important insights can be gained from the above empirical results.

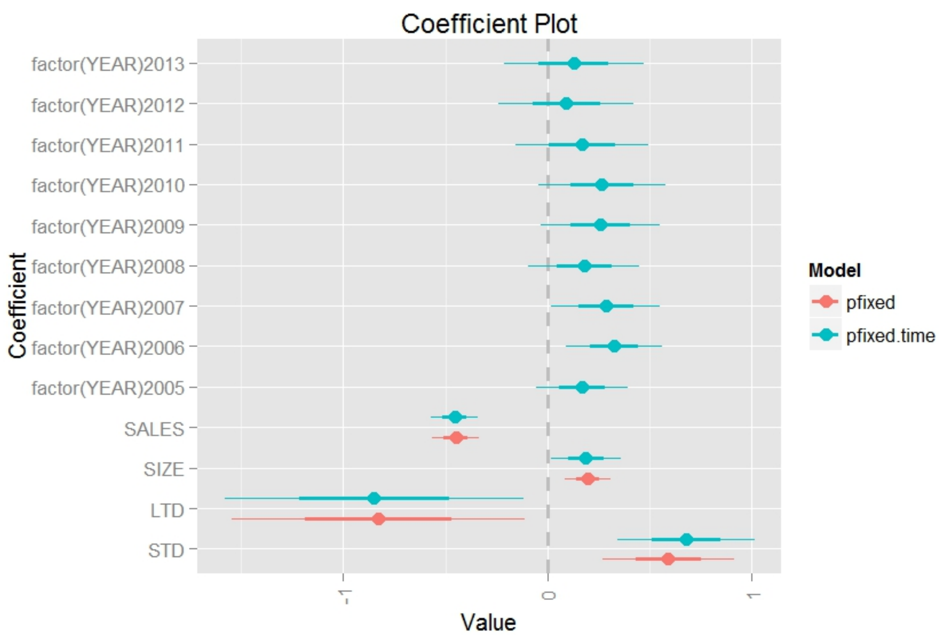
First, the obsession of capital resources is strong in the Vietnamese emerging market, following years of harsh economic realities and shortage of finance. This has a deeply-rooted cultural reason as for many years in the history, older people teach younger generations that: "Trade talent is no match with abundance of capital." From Table 1, we see that short-term debt has constantly been the single most important factor, reflecting the long-standing issue of shortage of term financing in the emerging market economy of Vietnam, although listed firms in the dataset belong to upper-stratum and better-performing ones, compared to the society at large. For all specifications that model the response variable of ROE, STD coefficients are found positively and strongly related to firms' performance; while LTD is mostly insignificant or weakly significant, bearing negative sign (M2,M4). With DV being profit margin (PM), LTD suddenly becomes very influential, with strong significance, negative sign and large magnitude of influence (M8-9).

Second, firm size shows mixed results in terms of contribution ROE, with significant and positive effect for M1-4, M8. However, with present of sales growth (SAG) in the equations as IV, size shows negative contribution and is statistically significant, except when growth of firm size (SIG) becomes IV then it shows positive and significant contribution to ROE.

Third, the negative and strongly significant coefficients of sales and growth rate of sales (SAG) found in all estimations suggest that increasing sales appears to dampen both ROE and profit margins.

Finally, from the longitudinal data with presence of time effects in an estimated model, we can also observe critical periods that have significant impacts on firms' performance, see Figure 3.

Figure 3 - Coefficient plot from M4 estimation



Two subperiods 2006-07 and 2009-10 show a substantial and positive influence to firms' ROE. And simultaneously, contribution of STD is found stronger (and significant) when the time effects are playing in the model. In the period 2006-07, Vietnam was entering a booming phase, with both foreign direct and portfolio investments surged in anticipation of its forthcoming prosperity following the accession to WTO. It is not surprising if short-term view induced short-term debt, and short-term performance. The next significant period 2009-10 was when the government of Vietnam followed a rather extreme expansionary monetary policy, injecting a staggering stimulus package of approximately US$9 billion into the small economy of Vietnam (then only US$90 billion GDP). With money flooding the economy, the stock market was seeing an upsurge, and investors (including listed firms as "institutional investors") with short-term investments in speculative assets, especially stocks, reaped huge short-term returns, not uncommonly in the range of 200-300% over just 2 years (see Vuong, Napier & Samson 2014).

To conclude this paper, we may say that empirical evidence from the longitudinal data analysis on Vietnam's listed firms' operational scales (size, sales, and their growth rates), sources of finance (short- versus longer-term debts), and firms' performance has been mixed and still insightful. The observed patterns of influence by these predictor variables capture the characteristics of the current period of "Vietnamese transition turmoil" fairly well, unveiling the deeper insights that otherwise observers could only "feel" rather intuitively.

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