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Co-determination of Capital Structure and Stock Return through Simultaneous Structural Equations Model

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ABSTRACT

Capital structure and stock return are the topics that have received much attention in the financial management arena. There are increasing researches surrounding the issues related to the determinants of capital structure and the factors of expected stock return separately. But, only few empirical studies combined these two major topics together and tested whether debt/equity ratio influences stock return or if stock return is a factor of capital structure choices. This research investigates common determinants of capital structure and stock returns from the simultaneous structural equations approach by LISREL software in the companies listed in Tehran Stock Exchange. For this purpose, 127 companies were selected from 2006-2010. The results show that except for the profitability, two exogenous factors—expected growth and size- are the common determinants of capital structure and stock return, where they both have positive and significant relationship with capital structure and negative and significant relationship with stock return. Besides, asset structure and return volatility are two significant determinants only for capital structure, where the former has positive and significant relationship while the later has negative and significant relationship with capital structure. But stock return is not a determinant of capital structure. Firm value and capital structure are significant determinants only for the stock return, where the first has positive and significant relationship and the second has negative and significant relationship with stock return. But liquidity and future return momentum are not determinants of stock return.
KEYWORDS: capital structure, stock returns, simultaneous structural equations, Latent variables, Lisrel

1. INTRODUCTION

Nowadays ranking the companies is based on their capital structure. In fact, the basis of producing and providing services depends on the ways of providing and consuming their financial assets (Meyers 2003).Capital structure and stock return are the issues attracting much attention in financial management discussions. Many studies have regarded them separately but few have combined them comprehensively to test if capital structure affects stock return and whether stock return is a determinant of capital structure (Yang et al 2010).One of the most important goals that financial managers should regard for maximizing the wealth of stockholders is identifying the best combination for company resources or capital structure. In providing financial decisions, companies face internal and external financial provision resources; the former includes cash currencies resulting from operational activities, asset sale, accumulated return and the latter consists of resulting cash from financial markets by distributing bonds, new stocks, and receiving financial facilities from the banks. Managers should decide about the ways of providing accessible financial resources and spending them for paying return to the stockholders, performing profitable investment projects, paying debits, and increasing current assets (Frank and Goyal 2003). Since one of the main tasks of managers is maximizing stockholders' return, the effects of financial provision methods and their consumption on future stock return is of great importance for the managers. Also, financial provision methods may affect the return of every share, financial risk, and the percent of stockholders ownership Bhandari (1988) found that expected stock return has a positive relation with debt rate and it is a determinant factor in stock return risk Hovakimian, Opler, & Titman (2001) used multiple regression models to explain financial leverage degree of the companies and concluded that expected debit rate may change parallel with stock price and companies' profitability capital structure is highly correlated with historical values of the market and the correlation of debit rate with unusual stock return is positive. Although many studies have regarded the correlation of capital structure and stock return separately but only few have studied them simultaneously. In other words, they have considered the just the effects of capital structure on the stock return or vice versa. But, this study aims to examine their bilateral relation coincidently. Profitability, growth opportunities, company size, stock return, asset structure,

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and return volatility are regarded as the variables of capital structure and profitability, growth opportunities, company size, company value, cashability, and return momentum are the variables of stock return (Yang et al 2010).

2. Background

Metan et al (2010) studied the effects of company features on the capital structure of accepted companies in Tehran Stock Exchange from 2002-2006 and concluded a negative and significant correlation among capital structure, asset structure, profitability, expected growth, momentum, and asset return. But, a positive and significant correlation was also observed among capital structure, company size, and interest covering ratio (Metan et al 2010). Studying the effects of company features on the capital structure of accepted companies in Tehran Stock Exchange from 1999-2003, Mohammadi (2005) concluded a positive and significant correlation between capital structure, cash ratios, and asset structures, but a negative and significant correlation between capital structure and profitability, profitability growth, competition and sale growth.

Studying the effects of independent variables of company size, profitability, tangibles, and growth opportunities on the financial leverages in the industries of Tehran Security Exchange, Sinai (2008) concluded that there is a relation between profitability of the companies and financial leverages based on information asymmetry in paper, automobile, chemicals, and minerals' industries. But, no significant correlation was found between intangibles and financial leverage. Also, the correlation between growth opportunities and financial leverage was evaluated as positive for all industries except for chemicals, food, paper, rubber, and minerals.

Ghaemi and Toosi (2006) studied effective factors in the stock return of accepted companies in Tehran Stock Exchange from 1998-2002 and examined the relation between stock return and risk by CAPM test. The results showed a significant and positive correlation of systematic risk index, company size, and P/E ratio. But, no significant relation was found between book value /market share ratio and stock transaction rate with the stock return. Amadpoor and Rahmani (2008) studied the roles of market factor, company size, and book value/ market share ratio factors in the stock return of accepted companies in Tehran Security Exchange from 2000-2004 and concluded that they are all effective in the stock return and using a multifactor model can show their distribution better than a one-factor model .

Yang et al(2010) introduced a factor analysis methodology for identifying determinant factors in capital structure and stock return and calculating the effects of these ratios on selection alternatives of debit rate and stock return. They studied 662 non- financial Taiwanese companies from 2003-2005 using leverage/ book value ratio and stock return or leverage ratio to market value and stock return as 2 endogenous variables. The results showed the positive effect of debit rate on the stock return. But, stock return had a negative effect on financial leverage degree. They found that 2 profitability and expected growth factors have negative effects on financial leverage degree and a positive effect on stock return. Besides, exclusiveness, industrial classifications, and asset structure were 3 determinant factors in capital structure in a way that 2 first had negative impacts and the third had positive effects on the capital structure. For stock return, value and liquidity were 2 significant factors in identifying stock return and the former had positive and the latter had negative effect on it.

Ramjee and Gwatidzo (2012)) studied "Dynamics in capital structure determinants in South Africa". The results show that South African firms adjust relatively fast towards a target leverage level. It is also found that asset tangibility, growth, size and risk are positively related to leverage, while profitability and tax are negatively related to leverage. The results also suggest that capital structure decisions of South African listed firms follow both the pecking order and trade-off theories of capital structure.

Nikolas (2007) examined the ways company features impress capital structure of Greek market using panel data in a sample of 9 companies in Athena in 1997-2001. The results showed a negative correlation between capital structure and interest rate coverage as well as company growth and momentum, but a positive correlation of company size and capital structure.

Obrien et al (2010) studied simultaneous effect of size, book value/ market value ratio and momentum on the stock return and concluded a correlation between size and momentum, and size and book value/market value ratio. This study showed that size is important in loser stock portfolio but book value/market value ratio affects smaller portfolios. Also, momentum impacts intermediate portfolios. Welsh (2004) examined the relation between stock return and capital structure, concluding that the effects of stock price are more important in identifying the ratio of debits to stock holders' equity than other factors. He introduces stock return as a premium estimator for debit ratios and probably the only effect inferred from debit changes.

Michaildis et al (2006) examined the effects of sale growth and company size and book value/market value ratio from 1998-2003 in Athena Stock Market and concluded that sale growth and these 2 variables explain stock return mean of Athena Stock Market.

Antao and Bonfim (2012) explored the process of convergence to firms' target leverage ratios. Using a unique dataset of micro, small, medium and large firms, they found that this process is very fast, most notably for the smaller firms. They further explored these results by analyzing different convergence trajectories. They found that

firms that are currently below their target leverage ratio take more time to reach this target than firms with a symmetrical departure point. Furthermore, smaller firms were able to converge faster to their optimal capital structure, regardless of whether they have to increase or decrease their current leverage ratios. Using a duration analysis framework, they also found that firms that have to increase debt to reach their target leverage ratio take more time to do so if they have freer cash-flow.

Fama and French (2011) studied the effects size, value, and momentum in International Stock Returns. In the four regions (North America, Europe, Japan, and Asia Pacific) they examined, there were value premiums in average stock returns that, except for Japan, decreased with size. Except for Japan, there was return momentum everywhere, and spreads in average momentum returns also decreased from smaller to bigger stocks. They tested whether empirical asset pricing models capture the value and momentum patterns in international average returns and whether asset pricing seems to be integrated across the four regions. Integrated pricing across regions didn't get strong support in our tests. For three regions (North America, Europe, and Japan) local models that use local explanatory returns provide passable descriptions of local average returns for portfolios formed on size and value versus growth. Even local models were less successful in tests on portfolios formed on size and momentum. Fama and French (1992) examined cross-sectional differences of stock return mean on market risk (β), company size, financial leverage, book value/market value ratio and earning/price ratios by regression method. They concluded that market risk and company size have no correlation with stock return mean. But stock return mean has a negative relation with financial leverage book value and a positive relation with market value of financial leverage. This relation is called riddle by Fama and French.

3. Hypothes

H1. Profitability of the companies impacts their capital structure and stock return simultaneously.
H2.Company size impacts their capital structure and stock return simultaneously
H3. Growth opportunities impact their capital structure and stock return simultaneously.
H4. Stock return of the companies impacts their capital structure.
H5. Asset structure impacts their capital structure.
H6. Return volatility impacts their capital structure.
H7. Capital structure impacts their stock return.
H8. Company value impacts their stock return.
H9. Liquidity of the companies impacts their stock return.
H10. Return momentum of the companies impacts their stock return.

4. **METHODOLOGY**

Selecting estimation methods of a model depends on the conditions of the equations. Since this study examines effective factors in the stock return and capital structure, it is of descriptive and correlation type with applied goals based on structural equations model.

Statistical population of this study included all accepted companies in Tehran Stock Exchange from 2005-2009.

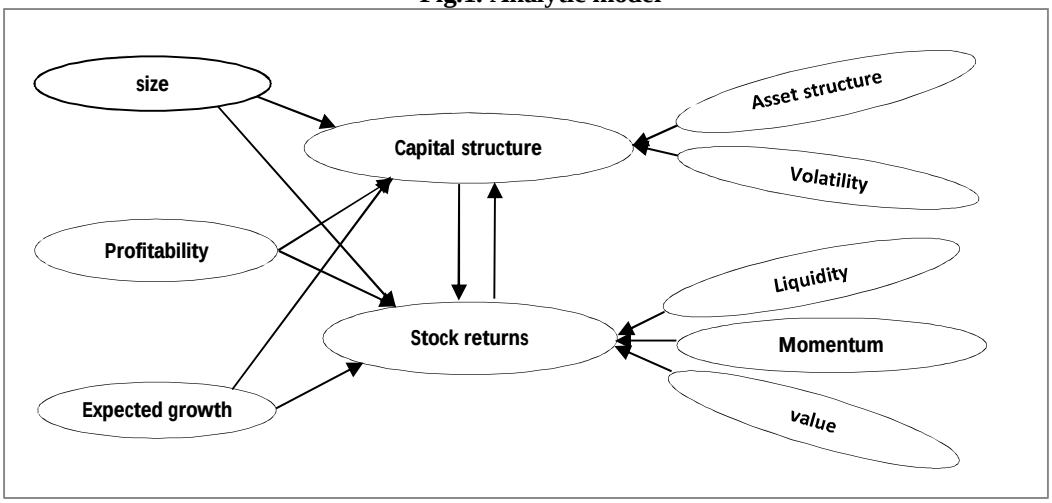
The firms with the following conditions were selected as the study sample.

1. They had no activity or financial year change during study period. 2. Their financial year ended in March. 3. Transaction breakage at least once in a year should be observed in the stocks of sample firms. 4. Investment, holding, banks, insurances, and retirement firms excluded from the sample. Based on the mentioned criteria, 127 firms were selected.

5. Analytic model

Analytic model of this study is adopted from Yang et al (2010), shown in fig1.

Fig.1. Analytic model



6. The way of evaluating research variables

Table 1: The way of evaluating research variables

Endogenous latent variables		Exogenous latent variables							
Capital structure	Stock returns	Expected growth	Asset structure	Size	Profitability	Volatility	Liquidity	Value	Momentum
(t)	(t)	(t+1)	(t)	(t-1)	(t-1)	avreage	(t-1)	(t-1)	(t-1)
LT/BVA	R_{it}	CE/TA	IGP/TA	LnS	NI /NS	σ(Δ(OI/TA))	Turnover	BE/ME	R_{it-1}
		GTA	FA /TA	LnTA	OI /NA	σ(Δ(EBIT/TA))		E/P	
		MTB		LnME	EBIT /NA				
					CFO/NA				

LT/BVA : long-term debt over book value of asset, R_{it} : Stock returns**,** CE/TA : capital expenditure over total assets, GTA : growth of total asset measured by percentage change of total assets, MTB: market-to-book ratio of assets; IGP/TA: inventory plus gross plant and equipment to total assets; FA/TA: depreciated fixed assets to total assets; LnS: logarithm of sales; LnTA: logarithm of total assets; LnME: logarithm of market value of equity; NI/NS: Net profit over sales; OI/NA: operating income over net assets; EBIT/NA: earnings before interest and tax to the net assets; CFO/NA: cash flow from operating activities over net assets; σ(Δ(OI/TA)): standard deviation of the first differences in the ratio of operating income divided by total assets; σ(Δ(EBIT/TA)): standard deviation of the first differences in the ratio of EBIT divided by total assets; Turnover: trading volume over outstanding shares; BE/ME: book-to-mark equity; E/P: earnings per share to price; Rit-1 : Stock return previous year

7. RESULTS

7.1. Descriptive statistic

This section includes standard deviation, skewness, kutosis, maximum, and minimum of exogenous and endogenous variables shown in Table 2.

Table 2. Descriptive statistics of the study

variable	N Statistic	Mean	Maximum	Minimum	Std. Deviation	skewness	kutosis
LT/BVA	635	0/31	0/87	0/01	0/163	0/425	0/24
R_{it-1}	635	0/96	27/60	-13/74	4/3	1/3	4/67
IGP/TA	635	0/038	1/25	0/003	0/198	0/245	0/301
(FA-G)/TA	635	0/148	0/995	-0/1	0/19	1/17	1/44
σ(Δ(EBIT/TA))	635	1/72	1/53	0/003	0/11	5/05	48/539
σ(Δ(OI/TA))	635	0/2	0/44	0/002	0/051	2/56	10/89
CE/TA	635	0/63	1/46	-3/12	0/173	-9/2	184/1
GTA	635	0/57	2/17	-0/98	0/22	1/46	13/9
MTB	635	0/41	5/15	0/03	0/66	2/35	7/75
NI/NS	635	5/56	3/36	-1/17	0/24	3/31	46/1
OI/NA	635	5/7	5/66	-1/53	0/64	1/98	8/29
EBIT/NA	635	5/52	3/63	-1/88	0/59	1/5	4/1
CFO/NA	635	0/503	2/78	-2/47	0/55	0/27	4/23
LNS	635	0/26	7/81	3/98	0/59	0/78	1/29
LNTA	635	0/094	7/87	4/25	0/6	0/76	0/93
LNME	635	0/06	8/41	4/02	0/68	0/802	0/77
SVol/NS	635	0/52	3/9	0/0002	0/66	1/88	3/8
BE/ME	635	0/7	4/38	-0/61	0/58	1/99	6/53
E/P	635	0/18	1/67	-1/29	0/167	-0/01	23/86
Rit-1	635	0/91	49/55	-13/74	4/98	3/24	23/93

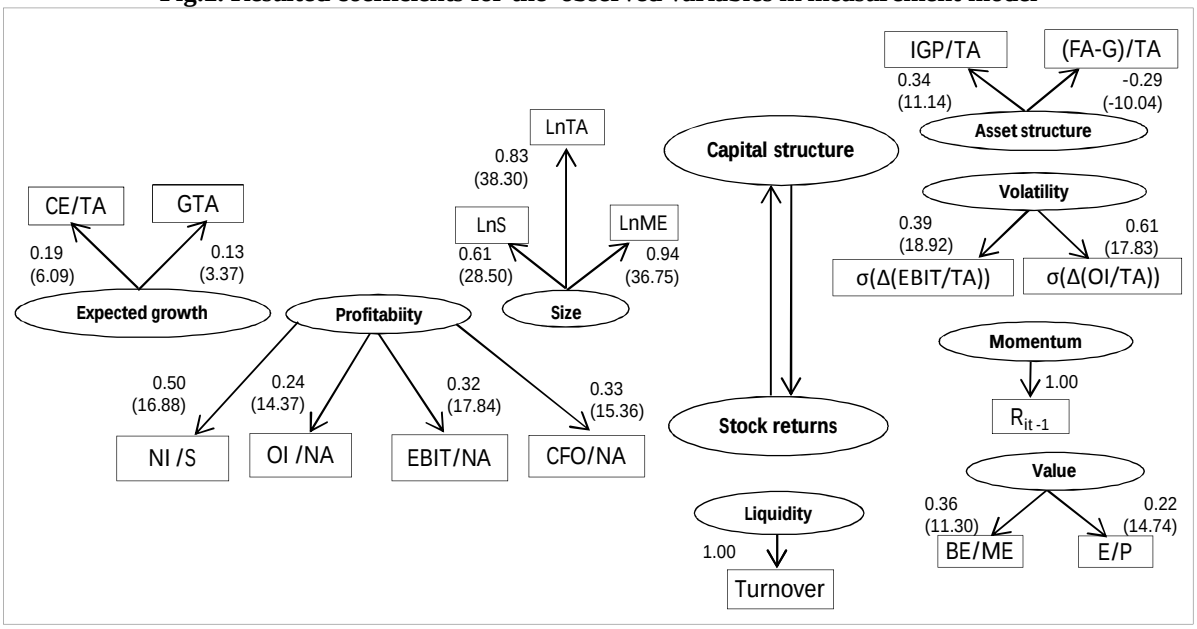
7.2. Structural equations model

In structural equations models, the first step is creating a theoretical model described by latent variables which are the theoretical foundations of the study and include immeasurable latent variables. After identifying structural model measured variables as latent variables indices are added to latent variables. This section of the model which measures the relation between latent and measurable variables is called measurement model. If two structural section and model measurement are shown in one diagram, the final model of the study will result which facilitates the evaluation of theoretical relations among latent variables by entering measurable variables.

7. 3. The results of measurement model

In the measurement model, the goal is identifying the suitability of the observed variables for introducing latent constructions. In LISERL software each equation can be estimated through maximum likelihood. As seen in measurement model table, all indices have t values over 2; so, they are capable of introducing their own latent variables.

Fig.2. Resulted coefficients for the observed variables in measurement model



7.4. Structural model results

In the second model of LISREL, in 2 separate equations, the effects of independent exogenous variables on dependent endogenous variables of capital structure and stock return were measured. Here, for every parameter a T

statistics was calculated in the parenthesis. Based on the results in regression model of capital structure estimated by maximum likelihood (ML), it is observed that except for stock return, other variables are statistically significant. Among 6 independent variables in regression model, only profitability and volatility have negative correlation with capital structure but the others have a positive correlation with capital structure.

$$CS = \alpha_0 + \beta_0 R_{it} + \beta_1 Grow + \beta_2 Prof + \beta_3 Size + \beta_4 Asset + \beta_5 Vol + \varepsilon_1$$

In the model of stock return, for lower t values of profitability, liquidity, and return momentum, these variables are not statistically significant and don't impress stock return significantly. In this model, growth and size variables have negative correlation with stock return. But, company value has appositive effect on stock return.

$$R_{it} = \alpha_0 + \beta_0 cs_{it} + \beta_1 Grow + \beta_2 Prof + \beta_3 Size + \beta_4 Liq + \beta_5 Val + \beta_6 Mom + \varepsilon_2$$

Fig.3. Coefficients of latent exogenous and endogenous variables in structural model

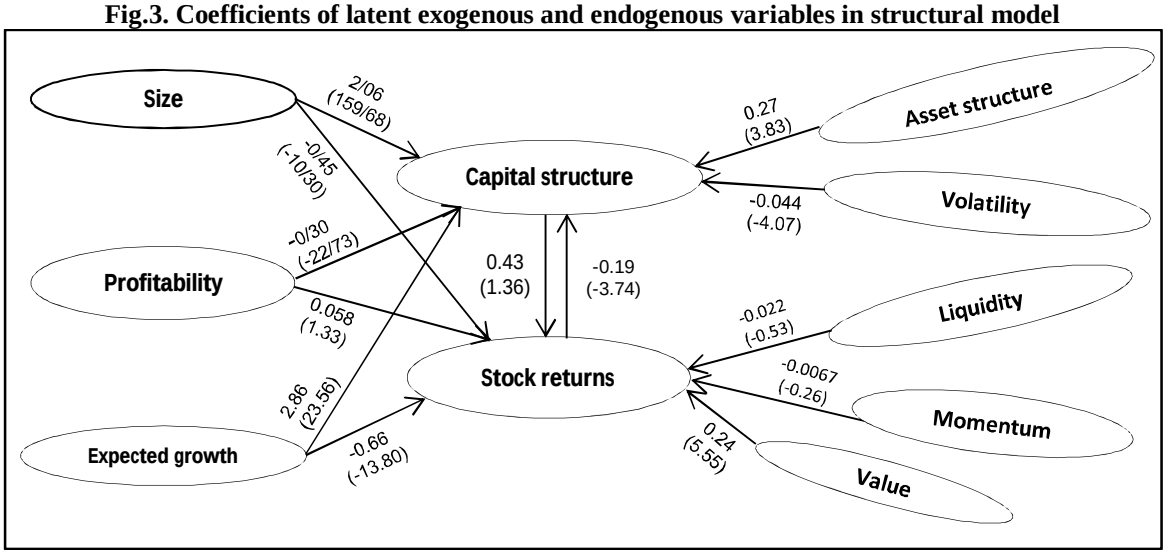


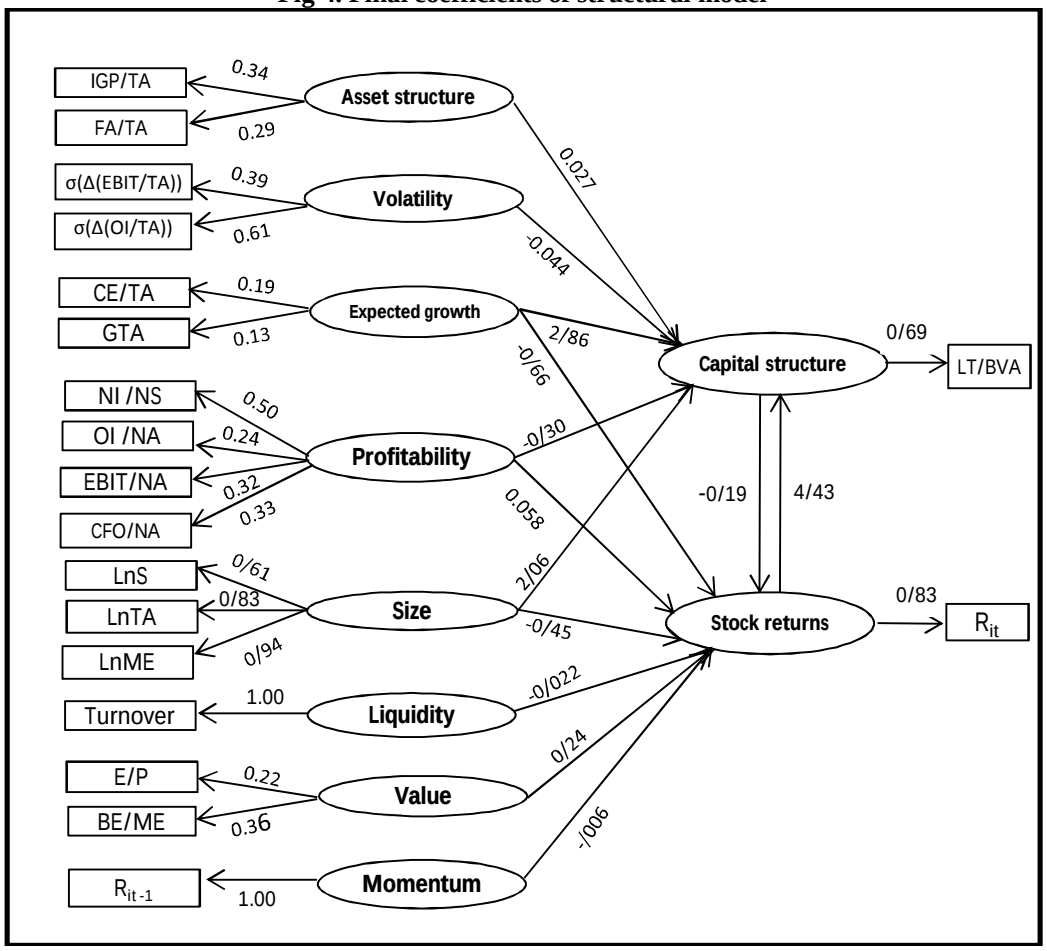
Table 3. Structural model results

Equation	Dependent variables	Independent variables									
		CS	SR	Growth	Prof	Size	Asset	Vol	Liq	Value	Mom
1	CS	-	0/43 (1/36)	2/86 (23/56)	-0/30 (-22/73)	2/06 (159/68)	0/027 (3/83)	-0/044 (-4/07)	–	–	–
2	SR	-0/19 (-3/74)	–	-0/66 (-13/80)	0/058 (1/33)	-0/45 (-10/30)	–	–	-0/022 (-0/53)	0/24 (5/55)	-0/0067 (-0/16)

Based on Fig. 4, opportunity growth variable impacts capital structure and stock return due to its larger coefficient. The minimum effective coefficient of 0.027 for capital structure relates to asset structure variable and the least effective coefficient of -0.006 on stock return belongs to momentum.

Based on Table 4, the relations and coefficients of every latent and endogenous variable can be observed. For example, in identifying capital structure, 2 variables of FA/TA and IGP/TA are involved which the former has a negative effect and the latter has a positive effect on asset structure. Among observed variables for volatility, σ (Δ (OI/TA) variable has a positive relation and the maximum effect on volatility.

Fig 4. Final coefficients of structural model



In profitability, NI/NS is the most important and the most effective variable. T values of all variables are above 2, enabling them to reveal and explain their related exogenous latent variables. Among growth variables, only MTB variable has low T value and determinant coefficient. Beside measurement model, structural equation model was measured by 2 endogenous latent variables. Based on resulted equations and coefficients,

1) $CS_{it} = 0/43R_{it} + 2/86Grow - 0/30Prof + 2/06Size_{it} + 0/027Ast_{it} - 0/044Vol_{it}$
2) $R_{it} = -0/19Cs_{it} - 0/66Growth + 0/058Prof - 0/45Size - 0/022Liq + o/24Val - 0/006Mom$

LISREL offers a reduced equation in which unnecessary latent variables are put aside. Here, in modified capital structure equations, stock return variable and in second equation, capital structure variable was eliminated. These equations are as follows:

3) $CS_{it} = 0/25Grow - 0/14Prof + 0/24Size_{it} + 0/075Ast_{it} - 0/16Vol_{it}$
4) $R_{it} = -0/70Growth + 0/035Prof - 0/41Size - 0/082Liq + o/86Val - 0/024Mom$

For every equation, R^2 determination coefficient was calculated. Here, determination coefficient is the strength index of the relation of latent variables which is 0.62, 0.71, 0.57, and 0.64 for equations 1-4. So, in capital structure's Equation 1, its determination coefficient is 0.62%, showing that existing variables in model explain 62% of the changes in dependent variable and the rest i.e. 38% are described by other factors which didn't enter the model. After exiting stock return (R) from the model and re-estimating it, determination coefficient didn't decrease significantly and reached 57%. It seems that for exiting R and CS variables from structural equation because of contradictory relations among variables, in 2 estimated models, normality of the remaining of regression model was tested and confirmed by SPSS software. So, the reliability of the results was proved.

Table 4. Final estimations of measurement model parameters

	variables	Indicators	estimations parameters	t-value	R^2
Endogenous latent variables (Dependent)	CS	LT/BVA	0/69	16/66	0/57
	R_i	R_{it-1}	0/87	51/30	0/90
Exogenous latent variables (Independent)	Asset	IGP/TA	0/34	11/14	0/31
		FA/TA	0/29	-10/04	0/34
	Vol	σ(Δ(EBIT/TA))	0/39	18/92	0/96
		σ(Δ(OI/TA))	0/61	17/83	0/96
	Growth	CE/TA	0/19	6/09	0/64
		GTA	0/13	3/37	0/55
		MTB	-71/85	-1/60	0/06
	Prof	NI/NS	0/50	16/88	0/92
		OI/NA	0/24	14/37	0/77
		EBIT/NA	0/32	17/84	0/85
		CFO/NA	0/33	15/36	0/78
	Size	LNS	0/61	28/05	0/94
		LNTA	0/83	38/75	0/99
		LNME	0/94	36/75	0/89
	Liq	Turnover	1/79	40/64	0/89
	Value	BE/ME	0/22	14/74	0/80
		E/P	0/36	11/30	0/73
	Mom	R_{it-1}	3/43	77/57	0/90

7-5. The results of good fitness indices

Generally, good fitness indices show model fitness with observed data. The results of good fitness indices for this study are shown in Table 5. Based on Table 5, good fitness indices show the acceptability of the results.

Table 5. The results of good fitness indices

row	Fitness index	Suggested criterion	results
1	X2/ df	≤ 3	1/93
2	P-value	≥0/05	0/09
3	NFI	≥0/90	0/97
4	NNFI	≥0/90	0/92
5	CFI	≥0/90	0/91
6	GFI	≥0/90	0/94
8	RMR	≤ 0/50	0/037
9	RMSEA	≤ 0/10	0/08

8. Conclusion

The results of testing H1 showed that company profitability doesn't affect capital structure and stock return simultaneously. Due to resulting coefficients, profitability variable is only significant in regression model of capital structure and has a negative relation with capital structure and positive relation with stock return. In other words, the companies of security market first use Meyers' preference theory (financial provision from internal sources like cumulative earnings), then external resources, debts, and stocks.

Testing H2: The effects of company size on the capital structure will be in a way that the larger the company size, the more credibility the company will have; as a result, it will have better reputation among lenders, investors, and capital markets. The results showed a positive and significant correlation between company size and capital structure. But their correlation is in this way that smaller companies gain more stock return than larger ones. The results also showed a significant and negative correlation between company size and stock return.

Testing H3: Also, the results showed a positive and significant effect of growth opportunities on capital structure. Thus, financial managers care about expected growth in determining capital structure. Based on Haugen and Baker (1996), the companies with more growth opportunities can gain higher stock return. This result disagrees with the findings of this study in which the effects of growth opportunities on stock return was negative and significant.

Testing H4 showed that stock return doesn't impact capital structure significantly. This consists with Baker and Wurgler (2002) who proved that the companies with lower financial leverages tend to take loans when the company value is high.

Testing H5 showed that asset structure affects capital structure. Based on static equilibrium theory, companies with low bankruptcy costs will have higher debit rate. Companies with more tangible assets may change their asset into cash easier than the companies with tangibles during bankruptcy. The results showed positive effect of asset structure on capital structure. So, it can be concluded that managers should consider this factor in capital structure

Testing H6 showed that return volatility affects capital structure of the companies. Based on static equilibrium theories, when return volatility is high companies try to have lower debit to avoid chaos; thus, there is a negative relation between profitability risk and debit ratio. The results of this study also showed a negative correlation between return volatility and capital structure. So, the more return volatility, the more expected bankruptcy costs and managers use lower debt.

Testing H7 showed that capital structure affects stock return. The effect of capital structure on stock return is in this way that financial leverage is a determinant factor in the expected return of the stocks Bhandari (1998) showed that stocks expected return is positively correlated with debt rate and debt rate is a factor of stock return risk. Increasing financial leverage of the company raises the risk of its common stocks (for the probability of financial recession) that in return it leads to more profit.

Testing H8 showed that company value has a positive and significant correlation with their stock return Rosenberg et al (1985) mentioned that the companies with higher book value/market value ration and more bonds have higher average stock return than other companies. So, company value and stock return have a negative correlation.

Testing H9 showed that cashability doesn't impact stock return of the companies. Some researchers have shown that the stocks with less cashability gain more profit which may be for compensating cashability risk. Although a negative correlation between cashability and stock return may be expected, but the rationale behind it is ambiguous and may be explained by other factors of stock return.

Testing H10 showed no significant effect of momentum on the stock return of the companies. Titman et al (1993) introduced momentum strategy including buying the stocks with a good performance in near past and stock sale with weak performance. They found that this strategy creates high return in first 3-12 months.

For confirming the correctness of the results, an adoptive comparison was done with previous studies especially with the study of Yang et al (2010). As seen in the following table 6, the results of this study from the aspect of the coefficients and the relation among variables looks like the Taiwanese study of Yang et al (2010). So, the conceptual model of this study and theirs consist statistically.

Table 6: Adoptive comparision of present study results with yang & et al (2010)

Equation	Dependent variables	Independent variables									
		CS	SR	Growth	Prof	Size	Asset	Vol	Liq	Value	Mom
This study	CS	-	0/43 (1/36)	2/86 (23/56)	-0/ 30 (-22/73)	2/06 (159/68)	0/027 (3/83)	-0/044 (-4/07)	–	–	–
	SR	-0/19 (-3/74)	–	-0/66 (-13/80)	0 /058 (1/33)	-0/45 (-10/30)	–	–	-0/022 (-0/53)	0/24 (5/55)	-0/0067 (-0/16)
Yang & etal (2010)	CS	-	0/06 (0/46)	0/35 (4/56)	-0/17 (-5/13)	-0/03 (-1/17)	0/11 (5/23)	0/14 (1/49)	–	–	–
	SR	-0/16 (-1/25)	-	0/55 (8/16)	0 /09 1/62	0/08 1/10	-	-	-0/07 (-2/88)	0/030 (8/77)	-0/06 (-0/12)

Suggestions for future researches

- Since this study was done in the period of the stock exchange market recession, it should be replicated in blooming period (2002-2006) and the results should be compared.
- It is suggested that the results should be sorted based on different industries.
- It is suggested that data mining method and neural network should be used in future studies.

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