The Effect of Petrochemical Industry on Relationship between Information Asymmetry of Investment Risk and Financing Choices

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ABSTRACT

Although it is generally accepted that information asymmetry has an impact on capital structure policy, the nature of the information asymmetry is not well understood. Recent theoretical works and empirical evidences suggest that financing choice depends upon the information asymmetry of the investment risk of using funds (Halov & Heider, 2012) (Rao, Mohanty, & Baxamusa, 2015). Consistent with this view, we analyzed the data gathered among 199 companies listed in Tehran Stock Exchange during 2009-2016 by the multiple linear regressions in order to check that the research hypotheses have been applied. We examined the influence of petrochemical industry on that relationship. The findings show that equity is used to fund projects with a greater information asymmetry of their risk such as intangible assets, while debt is used to fund investments with a lower information asymmetry of their risk such as capital expenditure and liquidity enhancement. We found out that the membership of petrochemical industry has no effect on the intangible assets, but, concerning the capital expenditure and working capital, the impact is significantly negative; the impact is significantly positive about cash holding.

1. Introduction

Today, with the growth of the companies and the development of the technologies, the needs for capital funds and the enormous sources of capital have been intensified, and such an issue causes that the capital budgeting and the companies' financial decisions to be one of the major decision scopes of financial managers. The company's ability to determine the appropriate financial resources and making decision about such a matter is the main factors of company's success (Darabi, 2014). The base of participants' decision in the securities market is the information which has been published by exchanges, issuers of securities listed on the exchange, and the operating intermediaries of these markets (Ghadiri Moghadam, 2011)

One of the effective factors in decision-making is the relevant information of the decision's subject. If the required information is distributed asymmetrically between individuals, it can lead to different results toward a particular subject. Therefore, before information itself should be assumed important for decision-makers, the information distribution quality must be evaluated (Vatanparast, 2016). Hence, the role of information asymmetry in corporate financing has become one of the basic tenets of capital structure theory.

In finance literature, two important theories have been proposed on how to finance companies, i.e. pecking order and trade off theory. Based on the trade off theory, firms can achieve an optimal capital structure, while based on the pecking order theory (PO) all the imperfections of capital market are highlighted, and transaction costs and information asymmetry about new investments are linked with internal funds and resources (Booth, Aivazian, Demirguc, & Maksimovic, 2001)

According to this model, information asymmetry

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between managers and investors leads to adverse selection costs, creating a hierarchy of financing preference based on the information sensitivity of the security. In this scheme, retained earnings are the least information sensitive, followed by debt, and then by external equity. Thus, firms are inclined to fund their financing deficit first by retained earnings, then by debt issuance, and only as a last resort by external equity issuance. Although evidence in favor of PO is mixed, Leary and Roberts suggested that measures of information asymmetry may be systematically related to the financing behavior, albeit not necessarily in sync with the predictions of the PO model. Specifically, some of the observed patterns with respect to small firms, age, and asset tangibility suggest that information asymmetry may play an important role in future investments (Leary & Roberts, 2010). Therefore, PO theory cannot explain why young, small, and non-dividend paying firms, which face large asymmetric information problems, issue equity securities.

The intensity of research in this area is only matched by the lack of empirical consensus for the PO theory. For example, Ambarish et al. (1987), Fama and French (2002), and Wu and Wang (2005) showed in their research that young, small, and non-dividend paying firms, which face large asymmetric information problems, issue equity securities (Ambarish, John, & William, 1987) (Fama & French, 2002) (Fama & French, 2005) (Wu & Wang, 2005). According to the result of Booth et al. (2001), the explanatory capacity of the capital structure model of developing countries are different from those of developed countries (Booth, Aivazian, Demirguc, & Maksimovic, 2001).

On the other hand, energy is a strategic commodity internationally, and the activities of governments, organizations, and producers are vastly dependent upon this product and its related markets. Hence, making policies by governments and international organizations in the field of energy and financial policies will have direct and indirect effects on product price in the energy sector (Komijani & Naderi, 2013).

Also, Islamic Republic of Iran, having a completely strategic position in the Asia-Oceania region, is located in the neighborhood of oil-rich countries of the Persian Gulf; it holds a significant share of the world's oil and gas reservoirs and, with the second-largest oil and gas reserves among the countries of the world, it is known as the major center of the current and future energy consumption. Therefore, the petrochemical industry is dependent on oil price from two aspects: its imported chemical compounds and its exported products. Hence, petrochemical industry as a strategic, revenue-generating, and influential industry is worth being studied, and the reasons for doing so are sufficient.

2. Literature Review

Kim et al. (2010) links equity issuance proceeds to how they are subsequently utilized. However, their choice of methodology and the focus on equity issuance exclusively make it difficult to draw any causal inferences between the sources of financing and the particular use of funds. Specifically, it is difficult to infer that an equity issuance in the current period is used for a particular investment in the following period if other sources of financing are not controlled in the current and subsequent period. In other words, it is possible that the next period's capital expenditure may be more closely associated with the next period's debt financing and not necessarily with this period's equity issuance. Additionally, these studies have not focused specifically on linking the sources of financing to investments differentiated on the basis of their risk information asymmetry. Instead, the studies have more broadly focused on how equity issuances are deployed. Furthermore, in the case of DeAngelo et al. (2010), they did not consider R&D as a possible use of funds (Kim & Weisbach, 2008) (DeAngelo & Stulz, 2010). Similar to our study, Gatchev et al. (2010) used the accounting identity framework to relate financing decisions to changes in investments. Among other things, they found out that R&D and advertising expenses (classified together) and net working capital investments are primarily financed by equity, while fixed asset investments, e.g. capital expenditures, are largely financed by debt. Gatchev et al (2010) did not separate R&D from advertising expenses since they argued that as both are intangible in nature, their information asymmetry will be high (Pulvino & Tarhan, 2010).

Our study also adds to the evidence presented by Halov and Heider (2012) on their theoretical model that the information asymmetry of project risk drives security preference. They used recent firm asset volatility as a proxy for project risk asymmetry and found out that greater asset volatility was associated with the preference for equity issuance. By linking the capital raised to where it is deployed, we are able to provide additional evidence in support of Halov and Heider's theoretical argument and empirical evidence (Halov & Heider, 2012).

Ramesh et al. (2015) by using funds framework based on the accounting identity equation showed in their empirical research that 22 cents per dollar of equity issued are used for R&D, while only one cent per dollar of debt is allocated to R&D financing. With respect to capital expenditures, 11 cents of every dollar of debt financing are devoted to this expenditure in contrast to only five cents in the case of equity financing. A similar pattern is evident for working

capital expenditures where nine cents of every dollar of debt financing, compared to three cents in the case of equity, end up. In the case of cash, they found that 77 cents of every dollar of debt are allotted to building up cash, while the equivalent for equity is 68 cents (Rao, Mohanty, & Baxamusa, 2015).

All activities in the energy industry encompass four interrelated functions, which are described as the energy cycle as defined below; the term energy cycle is used interchangeably with the term commodity cycle.

- exploration and production;
- transportation and storage;
- refining and processing;
- distribution and sales.

The first two steps in the energy value chain, namely exploration and production and transportation and storage, are generally referred to as upstream, and the last two steps, i.e. refining and processing and distribution and sales, as downstream. All businesses face risks which are often grouped into the five broad categories of market risk, credit or default risk, operational risk, liquidity risk, political or regulatory risk (Abbott, Apostolik, & Goodman, 2009). The petrochemical industry, as a downstream industry, is not excluded for being the riskiest industry. This industry, due to its bilateral relationship with oil and gas industry (in terms of both feeds and products), entails the abovementioned risks more than other industries. Therefore, it is very significant to study the correct financing method in this industry.

In this study, according to the theories and empirical evidence, we decided to support the notion that the information asymmetry of the underlying project risk is what drives the financing choice; For testing purposes, we classify investments into a hierarchy based on their underlying risk information asymmetry: liquidity investments (the lowest risk), capital expenditures (moderate risk), and intangible investments (the highest risk).We argue that liquidity-enhancing investments (e.g. building up cash or working capital) are associated with fairly low information asymmetry of their risk, while, at the other extreme, investments in intangibles are expected to be associated with the greatest information asymmetry of their project risk. On the other hand, as capital expenditures tend to be focused on investments in fixed assets, they are assumed to hold an intermediate position between liquidity-enhancing investments and intangible investments. Thus, we expect debt financing to be associated with subsequent low risk information asymmetry of liquidity-enhancing investments, while equity financing should be more closely related with the information asymmetry of high underlying risk investments such as intangibles.

The gap in the previous studies is that there is no mention of the two-way relationship between information asymmetry of investment risk and financing choice, and the models of Gatchev et al. (2010) and Chang et al. (2014) have not been used; also, no internal researchers introduced variables such as intangible assets and cash holding investments into their models. The impact of petrochemical industry as the strategic industry in our country on the relationship between the information asymmetry of investment risk and financing choices is not illustrated in any of the previous studies in our country and abroad.

To this end, we will survey companies listed on the Tehran Securities Exchange. The sources of funds and the types of investment used in this study are derived from Ramosh P. Rao (2015), whose model contains equity, debt and internal cash invested in R&D expenditure, capital expenditure, working capital, discretionary cash, and dividend (Rao, Mohanty, & Baxamusa, 2015). Lack of organized information regarding the research and development expenditure (R&D) of the companies' financial statements leads us to the fact that investment in the intangible assets would be as the riskiest investing asset which can be substituted for R&D. Moreover, this subject particularly would be investigated in petrochemical industry via using a dummy variable because commodity section has formed more than 70 percent of Tehran Securities Exchange, and according to its data, the petrochemical industry plays a special role in this market.

The rest of the paper is organized as follows. The next section develops the hypotheses and introduces research variables. In section 4, we discuss our empirical model, data analysis, and interoperation. Section 4 presents the results, and the work concludes with section 5.

2.1. Hypothesis development

Recent works by Fulghieri and Lukin (2001) and Halov and Heider (2012) suggest that the nature of the investment may dictate financing preference (Fulghieri & Lukin, 2001) (Halov & Heider, 2012). Halov and Heider (2012) argue that the traditional PO model ignores investment risk specifically. Myers and Majluf (1984) PO model assumes that the adverse selection costs vary across securities, but the investment risk is constant (Myers & Majluf, 1984). Halov and Heider (2012) argue that debt dominates equity financing only if there is no asymmetric information about the risk of a firm's future investments. More importantly, they demonstrate that at the other extreme, equity dominates debt financing when there is only asymmetric information about the risk of the firms' future investments. Their model shows that firms prefer equity over debt when there is greater information asymmetry of future investment risk between the firm and outsiders, i.e. the adverse selection cost of debt increases by information asymmetry of investment risk (Halov & Heider, 2012).

Based on the above discussion, we try to test this proposition that debt (equity) will be associated with investments characterized by lower (greater) information asymmetry of their risk. To test this hypothesis, we consider three major financing needs by investment type, namely intangible assets, capital expenditures, and liquidity. We focus on these needs because they are the most frequently stated reasons for issuing debt and equity. These discrete investment types are assumed to have varying information asymmetries with regard to their risk, ranging from low to high in the following order: liquidity, capital expenditures, and intangible assets. In the next few paragraphs, we discuss each of these investment types and their relevance to financing choices.

Intangibles are unique and strategic in nature, so insiders have better awareness of their risk than outside investors. In such a setting, an asymmetric problem exists with regard to the project risk associated with intangible investments. Overall, intangibles represent investments that are informationally less transparent compared to capital expenditures (Rao, Mohanty, & Baxamusa, 2015). Based on our argument, the petrochemical industry is proved to be risky; it is expected that this industry will be in harmony with other market industries and have a positive impact on this relationship. These leads us to the first hypothesis:

1. The rate of financing in intangible investments is more closely associated with equity than debt financing, and the petrochemical industry has an effect on this relationship.

While both intangibles and capital expenditures are considered long-term investments needed for the growth of the firm, capital expenditures differ from investment in intangible in several ways. Thus, the extent of information asymmetry associated with investment in capital expenditures is significantly less than that associated with investments in intangibles. In such cases, firms prefer to issue fewer information-sensitive securities such as debt to finance capital expenditures (Rao, Mohanty, & Baxamusa, 2015). Based on the fact that the petrochemical industry is proved to be risky, it is expected that this industry will be in harmony with other market industries and have a positive impact on this relationship. Thus, we hypothesize that, all else being equal, firms should prefer debt to finance capital expenditures:

2. The rate of financing in capital expenditure investments is more closely associated with debt than equity financing, and the petrochemical industry has an effect on this relationship.

We define liquidity investment as a need for cash holding and working capital by a firm that is otherwise fundamentally sound (Neamtiu, Shroff, White, & Williams, 2014). From the investors' point of view, supplying capital to fulfill liquidity needs is associated with less information asymmetry of the

Table 1- The formulas and descriptions of the variables

Variable Name	Formulas and Description
ΔIA	$IA = \frac{\Delta IA}{AT}$ ΔIA: change in intangible asset AT: total assets
ΔCapex	$CAPEX = \frac{(IVCH + AQC - SPPE - SIV - IVSTCH - IVACO)}{AT}$ IVCH: increase in investment AQC: acquisitions SPPE: sale of property plant and equipment SIV: sale of investment IVSTCH: change in short term investment IVACO: other investing activities AT: total assets
ΔWorkcap	$\Delta WORKCAP = \frac{-(RECCH + INVCH + APALCH + AOLOCH)}{AT}$ RECCH: change in accounts receivable INVDH: change in inventory APALCH: change in accounts payable AOLOCH: change in assets and liabilities AT : total assets
ΔCash	$\Delta CASH = \frac{CHE}{AT}$ CHE: change in cash AT: total assets
ΔDebt	$Debt = \frac{(DLTIS - DLTR - DLCCH)}{AT}$ DLTIS : long-term debt issuance DLTR : long-term debt reduction DLCCH : change in current debt AT : book assets at the beginning of the year
ΔEquity	$Equity = \frac{(SSTK - PRSTKC)}{AT}$ SSTK: sale of stock PRSTKC: purchase of stock AT : total assets at the beginning of the year
Cashflow	$cashflow = \frac{(IBC + XIDOC + DPC + TXDC + SPPIV)}{AT}$ IBC: income before extra items WIDOC: extra items and discontinued operations DPC: depreciation and amortization TXDC: deferred taxes SPPIV: gains in sale of PPE and investment AT: total assets
Leverage	$Leverage = \frac{(DLTT + DLC)}{AT}$: total long-term debt : short-term debt : total assets
Sales Growth	Year over year percentage change in sales.
Size	$Size = \log(SALE)$
Tang (Tangibility)	$\text{Tan}\, g = \frac{PPENT}{AT}$ PPENT: net property, plant, and equipment AT: total assets
VB (Value to Book)	$VB = \frac{(V = f(AT, NI, Leverage))}{AT}$ V: market value AT: total assets NI : net income

investment risk. Investors can make reasonable judgments by looking at the firm's financial statements and public disclosures. In this situation, debt financing would be the cheaper alternative as there is very little information asymmetry surrounding the nature of the investment. Once again, consistent with the model of Halov and Heider (2012), we argue that firms tend to issue debt to fund liquidity needs (Halov & Heider, 2012). Based on the fact that the petrochemical industry is proved to be risky, it is expected that this industry will be in harmony with other market industries and have a positive impact on this relationship.

3. The rate of liquidity enhancing investments is more closely associated with debt than equity financing, and the petrochemical industry has an effect on this relationship.

3. Methodology

As it seems, the research results would help managers to make better business decisions in the area of financial policy and investment decisions, so, this research can be categorized as an applied research. Furthermore, since this study deals with the effects of petrochemical industry on the relationship between asymmetrical information on investment risk and financing choices, this study uses a descriptive-correlational methodology. All the companies listed on Tehran Stock Exchange and Iran Fara Bourse from 2008 to 2016 are assessed in this study. We collect data through the databases of Rahavard Novin3 software and the stored information from the following sources: the library of the Tehran Stock Exchange, Tehran Securities Exchange Technology Management Co site , the site of comprehensive system to inform publishers , and the center of financial data . We use Microsoft Excel® spreadsheet software to prepare variables which are used in this model to test the hypotheses, and, in order to conduct the final analysis, we use Eviews (Version 9).

3.1. Research variables

The above hypotheses are evaluated using the sources and uses of fund framework commonly adopted in the tests of the pecking order and, more broadly, in research which links investments to financing (e.g. Gatchev et al., 2010; Chang et al., 2014). Gatchev et al. (2010) and Chang et al. (2014) adopted the view that investment and financing decisions are made jointly subject to the constraint that the sources of cash must equal the uses of cash. Therefore, we focus on four primary uses of funds as dependent variables: changes in intangible asset (ΔIA), capital expenditure ($\Delta CAPEX$), changes in working capital ($\Delta WORKCAP$), and changes in cash ($\Delta CASH$). Following Chang et al. (2014), we estimate various uses of funds in a given period as follows:

Equation 1

$$Y_{i,t} = \alpha + \beta_1 debt_{i,t} + \beta_2 equity_{i,t} + \beta_3 cashflow_{i,t} + \beta_4 x_{i,t-1} + \varepsilon_{i,t}$$

In addition, we run the bellow model to find the effect of petrochemical industry on the on relationship between information asymmetry of investment risk and financing choices. Z represents a dummy variable, which is one if the firm consists of petrochemical industry, otherwise it is zero.

Equation 2

$$Y_{i,t} = \alpha + \beta_1 debt_{i,t} + \beta_2 equity_{i,t} + \beta_3 cashflow_{i,t} + \beta_6 debt_{i,t} z_{i,t} + \beta_7 equity_{i,t} z_{i,t} + \beta_8 cashflow_{i,t} z_{i,t} + \varepsilon_{i,t}$$

In Equation 1, debt, equity, and cash flow are the sources of funds. Y represents the particular use of funds (e.g., ΔIA , $\Delta CAPEX$, $\Delta WORKCAP$ and $\Delta CASH$). X stands for control variables primarily taken from Rajan et al. and Frank et al., and it includes growth opportunities, value to book, sales growth, leverage, tangibility, and size (Rajan & Zingales, 1995) (Frank & Goyal, 2008). All the variables are indexed on i and t, which represent the firm and time (year) respectively.

The formulas and descriptions of the variables are tabulated in Table 1.

To test the hypothesis, we examined the significance of all the coefficients in Equation 1 at a significance level of 95%. In accordance with Equation 1, in the first hypothesis about financing intangible assets, β_2 should be more than β_1, while in the second hypothesis about financing capital expenditure, β_1 should be more than β_2; in the third hypothesis about financing working capital and cash holding,

Table 2- Descriptive statistics for research variables (n= 1393)

Variables	ΔIA	ΔCapex	ΔWork-cap	ΔCash	Debt	Equity	Cash-flow	Lever-age	Sale growth	Size	Tang	Vb	Z
Mean	0.00	0.04	0.01	0.00	0.01	0.07	0.11	0.62	0.17	13.75	0.24	0.92	0.10
Median	0.00	0.01	0.02	0.00	0.00	0.04	0.10	0.61	0.14	13.59	0.19	0.68	0.00
Maximum	0.08	0.75	1.69	0.34	0.68	2.02	0.64	3.06	2.20	19.72	0.87	6.17	1.00
Minimum	(0.07)	(0.61)	(1.20)	(0.25)	(0.34)	(0.75)	(0.30)	0.06	(0.93)	7.61	0.00	0.03	0.00
Standard Deviation	0.01	0.10	0.15	0.04	0.07	0.19	0.13	0.28	0.40	1.59	0.19	0.78	0.30

β_1 should be more than β_2. Afterwards, we test Equation 2 to see what will be resulted if we use petrochemical industry effect; in fact, according to the literature review, we expected that in Equation 2 and in the first hypothesis, β_7 should be meaningful in terms of the statistical test and larger than β_6; in the second and third hypotheses, β_6 should be meaningful in terms of the statistical test and larger than β_7.

The population used in this study includes all the companies listed on Tehran Stock Exchange and Iran Fara Bourse Company, which has the following characteristics:

- Company fiscal year is ended in Iranian month of Esfand.
- During the period of 2009-2016, they have not changed their fiscal year.
- Their financial statements should be available fully and continuously.
- Because of the differences in the nature and classification of financial statements, items should not be a financial intermediary, insurance, bank, and investment institution.
- The data related to petrochemical industry containing branches and subsidiaries related to chemical products are available on a stock board.

Based on the aforementioned conditions, 199 companies have been chosen with no sampling.

4. Results

Descriptive statistics include a set of methods used to collect, summarize, classify, and describe numerical facts. In fact, these statistics describe research data and information and provide a general pattern of data for being applicable in a quick and better manner. The descriptive statistics of our research variables are presented in Table 2.

Variable size has the largest mean, and ΔIA is the smallest value. Median is another central indicator which shows the state of the population. The important point which can be deduced from comparing mean and median is the issue of data normalization. One of the most important parameters of data dispersion is standard deviation; an important point which can be deduced from the standard deviation of a variable is inserting the variable in the regression model. As it can be seen in Table , the standard deviation of the variables is not zero, so we can insert the variables into the model (Gujarati, 2008).

The data of this research is panel-type; in the panel-type data, in order to know that if they should be analyzed as a panel type or a pooled data model, we use F Limer test. The panel method itself may be applicable to two approaches based on the nature of data: fixed effects or random effects; Hausman test has been run to determine which approach should be selected. The performed test results of the studied models are tabulated in Table 3.

Before interpreting the regression results, the assumptions of the model should be checked for confirming the accuracy of the results and ensuring the reliability of the regression model results estimated before. These assumptions are as follows:

Regarding According to the results listed in Table , Durbin-Watson statistics of all the models are located in the region of non-autocorrelation between disturbances (between 1.5 and 2.5).

Table, since the values listed in the third column (i.e. Centered VIF) are less than 5, there is no significant multicollinearity between the research variables.

We use modified Wald test to recognize heteroscedasticity; the results of Regarding According to the results listed in

Table 3- The results of F Limer test and Hausman test (n= 1393)

Equations	Models	F-Limer test			Hausman test		
		Statistic	Probability	Result	Statistic	Probability	Result
Equation 1	Hypothesis 1	6.92	0.0000	panel	23.30	0.0030	Fix effect
	Hypothesis 2	8.23	0.0000	panel	31.97	0.0001	Fix effect
	Hypothesis 3/ Model 1	3.82	0.0000	panel	25.77	0.0011	Fix effect
	Hypothesis 3/ Model 2	3.03	0.0000	panel	32.11	0.0001	Fix effect
Equation 2	Hypothesis 1	0.55	0.1300	pool	-	-	-
	Hypothesis 2	1.46	0.0007	panel	82.11	0.0000	Fix effect
	Hypothesis 3/ Model 1	1.36	0.0059	panel	76.5	0.0000	Fix effect
	Hypothesis 3/ Model 2	0.55	0.1200	pool	-	-	-

Table , Durbin-Watson statistics of all the models are located in the region of non-autocorrelation between disturbances (between 1.5 and 2.5).

Table, since the values listed in the third column (i.e. Centered VIF) are less than 5, there is no significant multicollinearity between the research variables.

Table confirm that if the probability of test statistic is less than 0.05, the H0, in accordance with the similarity of variance, is rejected; on the other hand, the H1, based on the heteroscedasticity of variance, is accepted.

In this study, three hypotheses were made to answer the question whether information asymmetry related to the risk of each type of investment affects their financing. The summary of research hypotheses results is presented in

- Debt Usage

Equation 1 in Table 7 shows that the coefficients of the debt financing (Debt) variable in row one are positive and statistically significant in columns three and four at the 1% and 10% levels. These results indicate a positive sensitivity of working capital and cash holding to debt financing

Specifically, the results of Table 7 and Equation 1 show that a one-unit increase in debt raises working capital by 3.15 units, cash holdings by 1.05 units, Capex by 0.73 units, and intangible assets by 0.25 units. The evidence from Table 7 and Equation 1 supports the view that debt financing is used to fund investments having a low information asymmetry of their risk such as working capital and cash holding but not IA investments and capital expenditure relatively, which are at the opposite end and in the middle of the spectrum. The bottom rows of Table 7, Equations 1 and 2, present the difference in the sensitivity of equity and debt financing with respect to each use of funds and their significance levels. The rows of variables Debtz t and Equityz t show the impact of petrochemical industry on each type of investment financing method.

- Equity Usage

Equation 1 in Table 7 shows the contemporaneous relationship between equity financing and various uses of funds. The regression estimates reveal positive and statistically significant coefficients for the equity issuance variable across the various uses of funds. In terms of economic significance, a one-unit increase in equity financing raises investment in IA by 2.64 units, capital expenditures by 0.37 units, working capital by 0.37 units, and cash holdings by 0.95 units. When compared to the coefficients of debt financing, there is a clear preference by firms to use equity to finance IA investments. Overall, the results from

Table suggest that firms are most likely to use debt financing to fund current liquidity needs and capital expenditure. On the other hand, firms are likely to use equity over debt to finance intangible assets.

Table 4- Durbin-Watson statistics results (n= 1393)

Models	Durbin-Watson Statistics	Result
Hypothesis 1	1.79	no autocorrelation
Hypothesis 2	2.17	no autocorrelation
Hypothesis 3/Model 1	2.15	no autocorrelation
Hypothesis 3/Model 2	2.34	no autocorrelation

Table 5- VIF calculation between variables (n= 1393)

Variable	Coefficient Variance	Centered VIF
DEBT	0.000325	1.106297
EQUITY	0.000108	1.123458
CF	0.000162	1.113462
LLEV	5.92E-05	1.495731
LSG	1.23E-05	1.090939
LSIZE	5.95E-07	1.240129
LTANG	6.69E-05	1.143643
LVB	8.63E-06	1.536189
Z	6.42E-05	1.557195
DEBTZ	0.005652	1.078415
EQUITYZ	0.002413	1.197441
CFZ	0.003502	1.719839
C	0.000152	NA

5. Conclusions

We investigated the role of investment-specific information asymmetry in capital structure decisions. Recent theoretical works indicate that, for projects with less information asymmetry of their risk, e.g. increasing liquidity, the preferred choice is to issue debt as it has low contracting costs under these conditions. On the other hand, for projects with a greater information asymmetry of their risk, e.g. IA, the optimal choice is to issue equity as the returns from the project risk accrue to the stockholders, and the contracting costs of debt are very high. Our empirical methodology utilizes the sources and uses of funds framework based on the well-established accounting identity that the total funds used by the firm should equal internal cash flows plus debt and the equity raised by the firm. Our primary test methodology involves regressing various uses of funds on the sources of funds and other control variables by following the work of Chang et al. (Chang, Wong, & Yao, 2014).

The primary uses of funds that we consider are intangible assets, capital expenditure, working capital changes, and changes in cash holdings. The sources of funds include debt, equity financing, and internal cash flow although

our focus is on the former (external capital sources). If the information asymmetry of investment risk is the main driver of financing choice, we should find debt financing to be closely associated with the information asymmetry of low risk uses (e.g. liquidity enhancement investments), while equity financing should be more closely related with projects characterized by a high information asymmetry of their risk investments such as intangible assets.

According to Error! Reference source not found., the first hypothesis is accepted, and the petrochemical industry does not affect this relationship; in other words, the mentioned relationship is not approved in petrochemical industry. According to the study on research and development (R&D) investment conducted by Ramosh P. Rao (2015), equity funding is greater than debt due to the fact that the information asymmetry of risk is high (Rao, Mohanty, & Baxamusa, 2015). In the present study, due to the existing limits, our dependent variable with a high level of information asymmetry is considered as intangible assets; however, the obtained results of this study are consistent with previous researches. These findings are consistent with the recent theoretical and empirical findings by Fulghieri and Lukin, Wang and Wu, and Halov and Heider (Fulghieri & Lukin, 2001) (Wu & Wang, 2005) (Halov & Heider, 2012). Moreover, according to the research of Omid Pourohidari and Parvin Farhoudi, in which no meaningful relationship is made between the type of industry and capital structure, it is expected that the petrochemical industry does not affect the financing choice of the intangible asset. Therefore, the obtained results of this paper correspond with the previous works (Farhoudi.P, 2009) (Heydari.O, 1995)

In addition, regarding the second hypothesis, the results of Error! Reference source not found. state that the main hypothesis is accepted, and the impact of the petrochemical industry on this relationship is meaningful and negative. The mentioned relationship is approved in petrochemical industry, but, due to the fact that the petrochemical industry is a risky industry, the rate of equity financing of capital expenditure in the companies established in this industry becomes higher. According to the study of capital expenditure (CAPEX) investments carried out by Ramosh P. Rao (2015), debt funding is higher than equity due to its mid-level information asymmetry of risk (Rao, Mohanty, & Baxamusa, 2015). Therefore, the risk of asymmetrical information on investment is the factor which helps companies to select appropriate financing method and the capital structure via issuing equity securities and debts, and the capital expenditures possess an intermediate level of risk. With regard to the mentioned statistical output in section four, in the case of Tehran Stock Exchange companies, capital expenditure financing through equity issuance is greater than debt; our result is not in accordance with pervious researches. Additionally, the petrochemical industry, due to its bilateral relationship with oil and gas industry (in terms of both feeds and products), is the riskiest industry and entails the energy cycle risks more than other industries (Abbott, Apostolik, & Goodman, 2009). Hence, it is expected that the petrochemical industry impact on the capital expenditure financing choice is negative.

Based on the third hypothesis, it is expected that investments such as liquidity enhancing, in which the level of information asymmetry of risk is at the end of the spectrum and its risk is at a low level, can be financed more often by issuing debt bonds rather than equity, and the petrochemical industry has an impact on this relationship. As mentioned earlier, for estimating this hypothesis, two dependent variables and two models were used. According to the results of

Table , the third hypothesis is accepted, and the impact of the petrochemical industry on the working capital financing method is meaningful and negative; nevertheless, it is meaningful and positive about the financing method of cash holding. According to the study investigated by Ramosh P. Rao, liquidity enhancing (working capital and cash holding) investments, debt funding is higher than equity due to its low-level information asymmetry of risk (Rao, Mohanty, & Baxamusa, 2015). These findings are consistent with the recent theoretical and empirical findings by Fulghieri and Lukin, Wang and Wu, and Halov and Heider (Fulghieri & Lukin, 2001) (Wu & Wang, 2005) (Halov & Heider, 2012).

Based on the results of this research, some suggestions may be proposed as follows:

Table 6- Checking heteroscedasticity-consistent standard error (n= 1393)

H0 Hypothesis	Models	Test Statistic	Probability	Result	Estimating Method
Constant variance	Hypothesis 1	348.89	0.0000	Heteroscedastic	GLS
	Hypothesis 2	93142.20	0.0000		WGLS
	Hypothesis 3/Model 1	110000	0.0000		GLS
	Hypothesis 3/Model 2	111.78	0.0000		GLS

Table 7-Use of funds, debt, and equity financing

Equations	Variables	ΔIA (H1)			ΔCAPEX (H2)			ΔWORKCAP (H3/M1)			ΔCASH (H3/M2)		
		Coef-ficient	t-Statistic	Prob-ability	Coef-ficient	t-Sta-tistic	Prob-ability	Coef-ficient	t-Sta-tistic	Prob-ability	Coef-ficient	t-Sta-tistic	Prob-ability
Equation 1	Debt t	0.25	2.40	0.02	0.73	13.21	0.00	3.15	15.64	0.00	1.05	9.31	0.00
	Equity t	2.64	5.70	0.00	0.36	2.76	0.01	0.37	22.23	0.00	0.95	11.14	0.00
	Cashflow t	-0.04	-0.48	0.63	-0.26	-4.12	0.00	0.48	3.85	0.00	0.19	1.39	0.17
	Leverage t–1	-0.02	-0.34	0.73	-0.14	-1.78	0.08	0.48	2.87	0.00	-0.33	-2.59	0.01
	Sales Growth t–1	0.04	1.30	0.20	-0.05	-1.95	0.05	0.01	0.26	0.79	-0.02	-0.62	0.54
	Size t–1	-0.02	-0.87	0.39	0.03	1.98	0.05	0.04	1.31	0.19	-0.02	-0.72	0.47
	Tang t–1	0.22	2.10	0.04	-0.91	-7.64	0.00	1.60	8.66	0.00	0.30	1.97	0.05
	VB t–1	0.01	0.58	0.57	0.08	4.98	0.00	-0.05	-2.53	0.01	-0.02	-1.01	0.31
	C	0.43	1.40	0.16	-0.03	-0.12	0.91	-1.31	-3.35	0.00	0.65	1.87	0.06
	Adjusted R-squared	0.46			0.42			0.56			0.34		
	Probability(F-statistic) Probability(F-statistic)xdSC	0.00			0.00			0.00			0.00		
	Coefficients of:	t-statistic	Prob-ability	Value	t-sta-tistic	Prob-ability	Value	t-sta-tistic	Prob-ability	Value	t-statistic	Prob-ability	Value
	C(EQUITY)-C(DEBT)=0	-12.97	0.00	2.39	3.45	0.00	-0.36	2.28	0.02	-0.79	2.28	0.02	-0.10
Equation 2	Debt t	0.35	0.03	0.98	0.04	1.54	0.13	0.73	19.04	0.00	0.04	1.79	0.07
	Equity t	8.42	2.21	0.03	0.20	14.99	0.00	0.51	30.34	0.00	0.05	7.38	0.00
	Cashflow t	-0.62	-0.12	0.91	-0.03	-2.13	0.03	0.08	4.54	0.00	0.10	7.97	0.00
	Leverage t–1	1.59	81.61	0.00	-0.05	-2.65	0.01	0.08	3.36	0.00	0.01	1.57	0.12
	Sales Growth t–1	-0.93	-0.52	0.60	0.00	-0.55	0.59	0.00	-0.31	0.75	0.00	-0.79	0.43
	Size t–1	0.58	1.22	0.22	0.01	1.62	0.11	-0.01	-1.24	0.21	0.00	-0.71	0.48
	Tang t–1	9.50	2.02	0.04	-0.21	-8.82	0.00	0.23	7.45	0.00	0.01	0.70	0.48
	VB t–1	0.09	0.10	0.92	0.01	3.69	0.00	-0.01	-2.66	0.01	-0.01	-3.10	0.00
	Debtz t	49.03	0.73	0.47	0.00	0.02	0.98	-0.02	-0.18	0.86	0.05	1.01	0.31
	Equityz t	-17.66	-0.86	0.39	-0.13	-3.97	0.00	0.19	3.97	0.00	-0.02	-1.00	0.32
	CFz t	14.49	0.64	0.53	0.13	2.34	0.02	0.05	0.65	0.51	-0.06	-1.91	0.06
	C	-9.22	-1.35	0.18	0.01	0.24	0.81	-0.06	-1.05	0.29	0.00	-0.26	0.79
	Adjusted R-squared	0.88			0.53			0.74			0.12		
	Probability(F-statistic)	0.00			0.00			0.00			0.00		
	Coefficients of:												
	C(EQUITY)-C(DEBT)=0	t-statistic	Prob-ability	Value	t-sta-tistic	Prob-ability	Value	t-sta-tistic	Prob-ability	Value	t-statistic	Prob-ability	Value

1. According to pecking order theory, the information asymmetry of risk is one of the factors leading firms to choose their capital structure in terms of priority. This matter was violated in this study, that is, the existence of the order of choosing capital structure was not approved.
2. As the factors mentioned in the PO theory, we can name the agency costs, transactions costs, so on; As a result, it is suggested that future researches should examine these factors in an empirical and applied study.

However, the findings of this study should be employed with caution as there were the following limitations in conducting this research:

1. Lack of organized information on the research and development expenditure (R&D) of the companies' financial statements leads us to the fact that investments in the intangible assets would be considered as the riskiest investing asset that can be substituted for R&D; this matter may affect the overall result of the study.
2. There are different types of dependent variables with different definitions and interpretations, and each definition and interpretation depict one aspect of that variable. Nonetheless, a particular model in this study is used in which some aspects of the variables may be less illustrated.
3. The items stated in the financial statements have not been adjusted due to the effects of inflation, and, since business enterprises have been established and acquired their assets at different times, the different qualities and abilities of comparing financial items can affect the research results; thus, the result generalization will be limited.

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