# The Impacts of the CPS, Free Cash Flow, Tobin's Q, and Price-Earnings Ratio on Investment Decisions

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# Contents

# Abstract

This paper investigated the influences of Free Cash Flow, Tobin's q, and Price-earnings ratio on the investment decisions by using North American monthly data from January 2000 to March 2017. Correlation Analysis and three Generalized Linear Models (GLM) are employed in this empirical research. The company size effect and within industry effect are controlled, and the reverse causality issue in the regression is considered. The reasons and implications of the strong cash flow/investment relationship are explored and discussed. Tobin's q and cash flow/investment relationship are combined to identify the liquidity constraint and the overinvestment of the free cash flow. Moreover, the CEO Pay Slice, which contains the CEO compensation information, are included in the regression model to investigate the impact of the CEO on the capital spending decision of the company.



**Keywords**: Free Cash Flow, Tobin's q, Price-earnings Ratio, CPS, Investment

# Introduction

Investment is important to a company. Investment opportunity exists when the additional cost of the capital spending on the investment project exceeds project's expected net present value of future profits (Hubbard, 1998). Decision makers make investment decisions and attempt to archive the optimal level of capital spending which will maximize shareholders' value. Among the countless works analyzing the investment behavior in corporate finance, the discussion of the measurements of the investment opportunity, the explanations of the information asymmetries in corporate investment decisions, and the implication for cash flow/investment relationship have received significant attention and provoked numerous empirical studies for many years.

In this field of study, several pieces of literatures support the well-constructed Tobin's q theory, which suggests that Tobin's q is a sufficient statistic for the investment decision. In other words, in a regression of investment on Tobin's q, the coefficients on all the other repressors should be zero. Although the theoretical literature has provided evidence to support this argument of the Tobin's q theory, a large proportion of empirical studies found that the Free Cash Flow (FCF) was also a significant coefficient. In these empirical paper, researchers included FCF to the Tobin's q model, and their empirical results indicated that FCF has a strong influence on the investment rate. However, the reason to explain why FCF has such significant impact on investment decisions and the relationship between Tobin's q and FCF is quite controversial. For example, the Pecking Order (PO) hypothesis and the Free Cash Flow theory provide different predictions and interpretations on this relationship

regarding the information asymmetries. Furthermore, other empirical studies recommend that Price Earnings (PE) ratio is a meaningful measurement of the investment opportunities. For example, the study of Chen, Goldstein, and Jiang (2007) argued that since stock price reflected expected present value of future investment return on equity, the PE ratio contained some future information which may affect the investment decision of the decision makers.

With these in mind, the objective of this empirical research is to reconcile these three measures by adding both FCF and PE ratio to the q model. This paper will investigate the correlation between these measurements, and then examine the investment/cash flow relation in the q model. Moreover, this article will calculate the CEO Pay Slice (CPS) and comprise it into the q model. The CPS is defined as the proportion of the total compensation to the top five executives received by the CEO (Bebchuk, Cremers, & Peyer, 2011). Holding high level of CPS suggests that the CEO of the company has a dominant position on the board, and thus might have the decisive power to the usage of FCF and the investment rate of the company. Therefore, investigating the influence of CPS on the investment sensitivity to the FCF will provide some implications to the analysis of the relationship between Tobin's q, FCF, PE ratio and investment decision.

# Literature Review

The importance of the implications of the investment opportunities for investment decision has led to numerous empirical studies on this topic. The analytical frameworks of most studies are built on the famous Tobin's q model. Tobin's q is a ratio between the market value of additional investments and the replacement cost of the investments. James Tobin

(1969) connected the marginal q with the investment rate. Since marginal q is typical unobservable in financial data, Hayashi (1982) found the conditions under which marginal q and average q (Tobin's q) were the same. In the Tobin's q theory, if Tobin's q >1, the market value of additional investments is higher than the replacement cost of the investment, indicating the company should invest in this valuable project. If Tobin's q <1, the market value of additional investments is less than the replacement cost of the investment. Therefore, the company should not invest in the project.

Regarding the impact on the investment spending, another well-founded factor that has significant impact on the investment decision is the cash flow. Substantial empirical results have shown that the significant impact of the cash flow on the investment. The predictions and interpretations of such strong effect are concentrated on two theories. One is the Pecking Order (PO) hypothesis of Myers and Majluf (1984), which emphasis on the issue of imperfect information. This theory recognized that the sensitivity of the investment decision to the cash flow was associated with the fact that the investment decision was sensitive to the way by which corporation chose to finance the project (Vogt, 1994). Decision makers could select between external and internal channel to fund an investment project. External financing refers to issuing bonds or equities, while internal financing uses FCF to fund the profitable investment project. External financing is more expensive due to the asymmetric information, and the excess cost of external finance might indicate the liquidity constraint of the company (Myers & Majluf, 1984). The PO hypothesis will be held if the decision makers are considering the liquidity constraints, since it is highly possible for them

to choose internal financing by using FCF to finance a profitable investment project (Tobin's q >1). Consequently, the PO hypothesis predicts that companies with high Tobin's q will more rely on the FCF (Vogt, 1994).

The prediction of PO hypothesis supported by several literatures. Fazzari, Hubbard, and Petersen (1988) investigated the asymmetric information issue and examined the cash flow and investment relationship. Their empirical results support the prediction of PO hypothesis. Vogt (1994) studied the cash flow and investment relationship using a sample of 359 manufacturing companies from 1993 to 1990. The empirical result of Vogt indicated that the PO hypothesis held for the smaller, low-dividend companies. Also, his finding suggested that the prediction of the PO hypothesis also arise for the company with less tangible investments. Kaplan and Zingales (2000) reexamined the sample used by Fazzari, Hubbard and Petersen, rejected the PO hypothesis and questioned the effectiveness of using free cash flow to detect the financial constraint of the company. But Fazzari, Bubbard and Petersen (2000) pointed out the defect of the theoretical model and the classification method used by Kaplan and Zingales and rejected their questions on the implications of the cash flow/investment sensitivity.

Another reason to explain this cash flow/investment relationship is supported by the free cash flow hypothesis (Jensen, 1986), which predicts that companies with low Tobin's q will be more rely on the FCF. This line of literatures argued that the relationship between Tobin's q, FCF and investment rate can reflect agency problems of the companies. The free cash flow hypothesis suggests that paying dividend to the shareholders will reduce the level

of free cash flow (Lang & LItzenberger, 1989). The empirical study of Vogt (1994) indicated that companies paying less dividend to shareholders and using the free cash flow would have a low Tobin's q. The reason is that when the actual level of capital spending is above the optimal level, the company encounters an over-investment problem (Jensen, 1986). The over-investment problem will arise if decision makers invest the free cash flow of the company in unprofitable investment projects to avoid paying out dividend to the shareholders (Vogt, 1994). This explanation predicts that the decision makers of the company are seeking for their own interests rather than seeking for shareholder's interest. Therefore, in this case, the cash flow/investment relation can be regarded as an indicator of the agency problem. Carpenter (1993) examined both PO hypothesis and free cash flow hypothesis and found that both financial constraints and agency problem have some impacts on investment decisions.

In the empirical studies that try to find alternative measures of investment opportunities, Chen, Goldstein, and Jiang (2007) proposed that adding price-earnings ratio to the q model could generate a significant impact on the investment sensitivity to the price-earnings ratio. Pietorvito (2016) examined the investment sensitivity to the price-earnings ratio using an unbalanced panel of 500 public companies in German over the period between 1987 and 2007. This empirical study found that price-earnings ratio has a robust and positive influence on the investment. Also, adding new variables into the q model does not reduce the explanatory power of Tobin's q.

# Data Description

## 4.1 Data and Variables

### 4.2.1 Data Source:

The sample used in this paper consists of North American Corporations, and the sample extends from 2000 to 2017. The total number of observations used in the study is 48282. The financial statement data are obtained from Compustat and the executive compensation data are collected from Execucomp.

### 4.2.2 Variables：

Variables are defined as follows: the dependent variable is Investment Rate (IK), Independent variables are Free Cash Flow Rate (FCF), Tobin's q (TOBINSQ), Logarithm value of Market Value of Equity (SIZE), Price-Earning Ratio (PE), and Dividend Payout Ratio (DP). The variables employed in the analysis are described below:

**a. Investment Rate (IK)**

Following Broussard, Buchenroth and Pilotte (2004), the Investment Rate is defined as I/K, where I is the investment (capital expenditure), K is the total asset.

**b. Free Cash Flow Rate (FCF)**

Following Lang (1991), Howton (1998), and other literatures, Free Cash Flow is defined as the operating income before depreciations minus the interest and related expense total minus the income taxes total minus the preferred dividends and common dividends. Free Cash Flow Rate (FCF) is denoted as Free Cash Flow/K.

**c. Tobin's q (TOBINSQ)**

Following Chang, Chen, Hsing and Huang (2007), Tobins'q is denoted as the ratio of the total market value of the firm to the book value of the firm's assets. The market value of the firm is the sum of the total asset, the market value of equity total minus the liquidation value of common equity.

**d. Logarithm value of Market Value of Equity (SIZE)**

Following Broussard, Buchenroth and Pilotte (2004), the market value of equity is denoted as the ratio of the market value of equity total to the liquidation value of common equity. Size is defined as the logarithm value of the market value of equity. Size*FCF measures the impact of the company size.

**e. Price Earnings Ratio (PE)**

The Price Earnings ratio is defined as the ratio of close stock price to the earning per share (EPS), where EPS is denoted as the ratio of the net income to the common share outstanding.

**f. Dividend Payout Ratio (DP)**

The Dividend Payout Ratio is defined as the ratio of the sum of perferred dividends, common dividends and purchase of common and preferred stock to the income before extraordinary items.

**4.2.3 Summary Statistics**

A summary of the statistics of variables is displayed in Table 1. The mean indicates the average value; median depicts the middle number of the sorted data, and the Standard

Deviation measures the dispersion of the data. The maximum and minimum statistics are the largest and smallest value within the chosen time span. The average IK is 5.84%, the average of FCF is 8.39%, the average TOBINSQ is 1.44. The median values of IK, FCF and TOBINSQ are closed to the mean values. The average FCF is higher than the average IK, indicating the average sample firm has sufficient free cash flow to finance its investment capital expenditure. The average TOBINSQ is larger than 1, suggesting the average sample market value of the additional investment is higher than the average sample replacement cost of investment.

**Table 1.** Summary Statistics

| Variable | N | Mean | Median | Std Dev | Max | Min |
|---|---|---|---|---|---|---|
| IK | 48282 | 0.058361 | 0.035235 | 0.074218 | 0.984675 | 0.0000 |
| FCF | 48282 | 0.083902 | 0.073668 | 0.060918 | 0.810623 | 0.0000 |
| TOBINSQ | 48282 | 1.445616 | 1.317503 | 0.543111 | 2.999296 | 0.0281 |
| SIZE | 48282 | 0.620654 | 0.529408 | 0.616694 | 10.710935 | 0.0000 |
| PE | 48282 | 40.681762 | 13.960730 | 693.289622 | 102842.4 | 0.0000 |
| DP | 48282 | 0.933499 | 0.080007 | 23.075118 | 3610.0 | 0.0000 |
| CPS | 29500 | 0.397807 | 0.395647 | 0.259621 | 37.13078 | 0.0000 |

# Findings and Discussion of the Findings

## 5. 1 Correlation Analysis

This paper examines the statistical correlations among dependent variables and independent variables. The correlations among IK, FCF, TOBINSQ, SIZE, PE, and DP are reported in Table 2. It can be observed from the correlation analysis result, FCF, TOBINSQ, SIZE and PE are positive correlated to IK The correlation coefficients for the first three

explanatory variables are statistically significant at 99% confidence level, and the correlation coefficient for PE is statistically significant at 95% confidence level. The correlation coefficients for FCF, TOBINSQ and SIZE are 0.22336, 0.0382, and 0.01971, respectively. The correlation coefficient between IK and PE is 0.01018, the correlation coefficient between FCF and IK is -0.01553, and the correlation between PE and TOBINSQ is 0.01372. Such correlation relationships suggest that PE might capture aspects of investment opportunities that are not captured by the FCF. Similar to the correlation results of Pietrovito (2016), this result indicates that it is highly possible for FCF, TOBINSQ and PE to contain information on investment opportunities and exert positive influences on investment decision.

**Table 2.** Correlation Analysis

| **Pearson Correlation Coefficients, N = 48282**<br>**Prob > \|r\| under H0: Rho=0** | | | | | | |
|---|---|---|---|---|---|---|
| | **IK** | **FCF** | **TOBINSQ** | **SIZE** | **PE** | **DP** |
| **IK** | 1.00000 | 0.22336<br><.0001 | 0.03821<br><.0001 | 0.01971<br><.0001 | 0.01018<br>0.0253 | -0.00687<br>0.1309 |
| **FCF** | 0.22336<br><.0001 | 1.00000 | 0.28867<br><.0001 | 0.17133<br><.0001 | -0.01553<br>0.0006 | -0.01528<br>0.0008 |
| **TOBINSQ** | 0.03821<br><.0001 | 0.28867<br><.0001 | 1.00000 | 0.70839<br><.0001 | 0.01372<br>0.0026 | -0.00118<br>0.7947 |
| **SIZE** | 0.01971<br><.0001 | 0.17133<br><.0001 | 0.70839<br><.0001 | 1.00000 | 0.01021<br>0.0249 | 0.01123<br>0.0136 |
| **PE** | 0.01018<br>0.0253 | -0.01553<br>0.0006 | 0.01372<br>0.0026 | 0.01021<br>0.0249 | 1.00000 | 0.30163<br><.0001 |
| **DP** | -0.00687<br>0.1309 | -0.01528<br>0.0008 | -0.00118<br>0.7947 | 0.01123<br>0.0136 | 0.30163<br><.0001 | 1.00000 |

In addition, the correlation coefficient for FCF is larger than other variables including TOBINSQ, indicating that the investment opportunity might be more sensitive to FCF than other measurements due to the liquidity constraint. This finding suggests that the sample firms with higher Tobins'q might be more heavily rely on the free cash flow to finance the investment project rather than external financing, which is consistent with the prediction of the PO hypothesis. Moreover, the correlation between IK and DP is -0.0067; however, this coefficient is not significant at levels. Adding the CPS into the correlation matrix, the correlation coefficient for CPS is -0.04826, which is statistically significant at 99% confidence level. This correlation suggests that the CPS may exert a negative impact on the investment decision.

## 5. 2 Findings and Discussion of GLM Regression

### 5.2.1 GLM Regression Model 1

Firstly, to investigate the sensitivity of these measurements to investment within fixed industry effect, this empirical study estimates four GLM models within the sample period. Following the empirical framework of Broussard, Buchenroth and Pilotte (2004), and Pietrovito (2016), the first GLM regression model is specified as follows:

$$\left(\frac{I}{K}\right) = \alpha_1 \left(\frac{CF}{K}\right) + \alpha_2 TOBINSQ + \alpha_3 SIZE * \left(\frac{CF}{K}\right) + \alpha_4 * PE + \alpha_5 * DP + \lambda + \varepsilon$$

where the interaction term a3 captures the impact of the company size, and the $\lambda$ captures within industry effect. The regression results are reported in Table 3, and the detail regression results are reported in Appendix. The p-value for this model is smaller than 0.0001, indicating the null hypothesis that the model does not explain the variance of the response

variable is rejected at 99% confidence level. The R-square for this model is 70.1965%, suggesting that this model explains a significant proportion of variance since 70% of the total variance is explained the model.

**Table 3.** GLM Regression Result for Model 1

| Parameter | Estimate | Standard Error | t Value | Pr > \|t\| |
|---|---|---|---|---|
| **FCF** | 0.0800548869 | 0.00603199 | 13.27 | <.0001*** |
| **TOBINSQ** | 0.0116563625 | 0.00070588 | 16.51 | <.0001*** |
| **FCF*SIZE** | -.0115796975 | 0.00472367 | -2.45 | 0.0142** |
| **PE** | 0.0000004468 | 0.00000033 | 1.35 | 0.1756 |
| **DP** | 0.0000030583 | 0.00001018 | 0.30 | 0.7638 |

It can be observed from Table 3, the p-value for FCF and TOBINSQ is less than 0.0001, indicating FCF and TOBINSQ do explain a significant proportion of the variance. The estimate coefficients are 0.08 and 0.011, respectively. They suggest that FCF and TOBINSQ are significant and positively related to the capital spending. These positive coefficients are consistent with the prediction of the interpretations of the PO hypothesis that the investments for companies with high Tobin's q value are more heavily depend on the free cash flow.

The coefficient sign for the size/cash flow interaction term is negative and significant at 95% confidence level, which is consistent with the result of Broussard, Buchenroth and Pilotte (2004). In their paper, they provide an explanation for this term, and this explanation is associated with information asymmetries. Since smaller companies might have greater information asymmetry problems, negative coefficient supports the assumption that

asymmetries increase the investment-cashflow sensitivities of small companies (Broussard, Buchenroth & Pilotte, 2004).

However, the result shows PE and DP are not related to the capital spending: their coefficients are extremely small and the p-value is not significant at levels. Therefore, this result provides empirical support to prove that PE and DP are not significant measures of the investment opportunity.

### 5.2.2 GLM Regression Model 2

Secondly, since capital spending can also have an impact on the current free cash flow and the current adjustment cost, Model 1 might have reverse casuality issue that companies spend more on capital expenditure because they successfully raise external capital. To avoid this concern, a possible method is to use an ex-ante method of free cash flow, which suggests adding lagged term of FCF into our regression model. Therefore, following the empirical framework of Pietrovito (2016), the second model is constructed as follows:

$$\left(\frac{I}{K}\right)_t = \alpha_1 \left(\frac{CF}{K}\right)_t + \alpha_2 \left(\frac{CF}{K}\right)_{t-1} + \alpha_3 TOBINSQ_t + \alpha_4 TOBINSQ_{t-1} + \alpha_5 SIZE * \left(\frac{CF}{K}\right)_t + \lambda_t + \varepsilon_t$$

The estimated coefficient a2 and a4 capture the lagged effects of free cash flow. The regression result for model 2 is presented in Table 4. A more detailed result is reported in the Appendix. After adding the lagged terms into our model, the R-square of the model increases slightly to 70.4434%. The industry fixed effect and firm size effect still exists and statistically significant at 99% confidence level.

**Table 4.** GLM Regression Result for Model 2

| Parameter | Estimate | Standard Error | t Value | Pr > \|t\| |
|---|---|---|---|---|
| **FCF** | 0.0731401881 | 0.00602542 | 12.14 | <.0001*** |
| **LFCF** | 0.0222314799 | 0.00461648 | 4.82 | <.0001*** |
| **TOBINSQ** | 0.0091431584 | 0.00071658 | 12.76 | <.0001*** |
| **LTOBINSQ** | 0.0086756112 | 0.00054405 | 15.95 | <.0001*** |
| **FCF*SIZE** | -.0107315814 | 0.00470534 | -2.28 | 0.0226 |
| **FCF*LPE** | -.0000075738 | 0.00000406 | -1.86 | 0.0623 |

The p-values for all explanatory variables are statistically significant at 99% confidence level. The result indicates lagged terms of free cash flow and Tobin's q do capture additional information on capital spending. In addition, the lagged PE and FCF interaction term are significant at 95% confidence level, even though the estimated coefficient is small. Since the investment opportunity is not quite sensitive to the price-earnings ratio, it seems that the PE have little impact on the investment decision.

### 5.2.3 GLM Regression Model 3

Thirdly, to examine the CEO's impact on the investment decision, the CPS is involved in the third model. CPS is an indicator CEO power over the board. A higher level of the CPS is likely to suggest CEO dominates the board and might exert more influence on the investment decision. The regression model 3 is constructed as follows:

$$\left(\frac{I}{K}\right) = \alpha_1 \left(\frac{CF}{K}\right) + \alpha_2 TOBINSQ + \alpha_3 SIZE * \left(\frac{CF}{K}\right) + \alpha_4 * CPS + \lambda + \varepsilon$$

where a4 in this model capture the influence of the CPS. The regression result is shown in Table 5, and a more detailed result exhibits in the appendix. After adding CPS into the

regression model, the R-square of the model increases to 74.2426%. Although we remove the insignificant PE and DP, the fitness of this model has improved since we include CPS.

**Table 5.** GLM Regression Result for Model 3

| Parameter | Estimate | Standard Error | t Value | Pr > \|t\| |
|---|---|---|---|---|
| **FCF** | 0.1206758929 | 0.00800400 | 15.08 | <.0001*** |
| **TOBINSQ** | 0.0067171032 | 0.00084491 | 7.95 | <.0001*** |
| **FCF*SIZE** | -.0084539771 | 0.00623054 | -1.36 | 0.1748 |
| **CPS** | -.0060064181 | 0.00227289 | -2.64 | 0.0082*** |

The regression coefficient for CPS is approximate -0.006, and the p-value for this coefficient is less than 0.01, which indicates it is statistically significant at 99% confidence level. All the other explanatory variables except the size are statistically significant and the sign of these variables does not change. This finding suggests that the CEO is negative related to the capital spending in the company with higher Tobin's q and more dependent on free cash flow. Liquidity constraint of the company might be the reason to explain this finding. Facing the liquidity constraint, investing more capital implies exposure to more uncertainty and risk. Investment failure will hurt the advantage status of the CEO in the board. Consequently, it is likely for the CEO to prefer remaining the financial safety of the company to ensure his dominate situation on the board and reducing the potential profitable (risky) investment opportunity.

# Conclusions

This article investigate the impacts of free cash flow, Tobin's q, firm size, price-earnings ratio, dividend payout ratio and the CEO pay slice on the investment decisions of the company. The empirical findings from the correlation analysis and the GLS regression analysis confirm the prediction of the Pecking Order Hypothesis that firms with higher Tobins'q more severely rely on the free cash flow to finance the investment project rather than external financing. The finding also indicates that price-earnings ratio has little impact on the capital spending. Follow the Pecking Order Hypothesis this is an indicator of financial constraint for the sample firms. In addition, our empirical result shows that the investment opportunity is more sensitive to free cash free than to Tobin's q. To avoid the endogeneity issue, the ex-ante method of free cash flow and Tobin's q are employed and generate positive and significant results. In addition, our results provide empirical support to the argument that investment is not sensitive to the price earnings ratio. Moreover, the results of the third model lead us to conclude that the influence of CEO on the investment decision is significant since the CPS has a negative impact on the capital spending.

# Attachments

## 1. Exhibits

**Exhibit 1** Detailed GLM Regression Result for Model 1

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| **Model** | 7985 | 186.6870847 | 0.0233797 | 11.89 | <.0001 |
| **Error** | 40296 | 79.2622891 | 0.0019670 | | |
| **Corrected Total** | 48281 | 265.9493738 | | | |

| R-Square | Coeff Var | Root MSE | IK Mean |
|---|---|---|---|
| 0.701965 | 75.99374 | 0.044351 | 0.058361 |

| Source | DF | Type I SS | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| **SIC** | 7980 | 185.3364548 | 0.0232251 | 11.81 | <.0001 |
| **FCF** | 1 | 0.7077961 | 0.7077961 | 359.84 | <.0001 |
| **TOBINSQ** | 1 | 0.6263640 | 0.6263640 | 318.44 | <.0001 |
| **FCF*SIZE** | 1 | 0.0117683 | 0.0117683 | 5.98 | 0.0144 |
| **PE** | 1 | 0.0045238 | 0.0045238 | 2.30 | 0.1294 |
| **DP** | 1 | 0.0001776 | 0.0001776 | 0.09 | 0.7638 |

| Source | DF | Type III SS | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| **FCF** | 1 | 0.34646523 | 0.34646523 | 176.14 | <.0001 |
| **TOBINSQ** | 1 | 0.53637376 | 0.53637376 | 272.69 | <.0001 |
| **FCF*SIZE** | 1 | 0.01182063 | 0.01182063 | 6.01 | 0.0142 |
| **PE** | 1 | 0.00360848 | 0.00360848 | 1.83 | 0.1756 |
| **DP** | 1 | 0.00017763 | 0.00017763 | 0.09 | 0.7638 |

**Exhibit 2** Detailed GLM Regression Result for Model 2

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| **Model** | 7986 | 187.3432746 | 0.0234590 | 12.03 | <.0001 |
| **Error** | 40294 | 78.6053035 | 0.0019508 | | |
| **Corrected Total** | 48280 | 265.9485781 | | | |

| R-Square | Coeff Var | Root MSE | IK Mean |
|---|---|---|---|
| 0.704434 | 75.67926 | 0.044168 | 0.058362 |

| Source | DF | Type I SS | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| **SIC** | 7980 | 185.3356713 | 0.0232250 | 11.91 | <.0001 |
| **FCF** | 1 | 0.7077999 | 0.7077999 | 362.83 | <.0001 |
| **LFCF** | 1 | 0.2056569 | 0.2056569 | 105.42 | <.0001 |
| **TOBINSQ** | 1 | 0.5834594 | 0.5834594 | 299.09 | <.0001 |
| **LTOBINSQ** | 1 | 0.4937669 | 0.4937669 | 253.11 | <.0001 |
| **FCF*SIZE** | 1 | 0.0101429 | 0.0101429 | 5.20 | 0.0226 |
| **FCF*LPE** | 1 | 0.0067774 | 0.0067774 | 3.47 | 0.0623 |

| Source | DF | Type III SS | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| **FCF** | 1 | 0.28744157 | 0.28744157 | 147.35 | <.0001 |
| **LFCF** | 1 | 0.04524041 | 0.04524041 | 23.19 | <.0001 |
| **TOBINSQ** | 1 | 0.31759678 | 0.31759678 | 162.80 | <.0001 |
| **LTOBINSQ** | 1 | 0.49606502 | 0.49606502 | 254.29 | <.0001 |
| **FCF*SIZE** | 1 | 0.01014746 | 0.01014746 | 5.20 | 0.0226 |
| **FCF*LPE** | 1 | 0.00677744 | 0.00677744 | 3.47 | 0.0623 |

**Exhibit 3** Detailed GLM Regression Result for Model 3

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| **Model** | 2227 | 35.98802860 | 0.01615987 | 20.10 | <.0001 |
| **Error** | 15519 | 12.47902611 | 0.00080411 | | |
| **Corrected Total** | 17746 | 48.46705471 | | | |

| R-Square | Coeff Var | Root MSE | IK Mean |
|---|---|---|---|
| 0.742526 | 55.97484 | 0.028357 | 0.050660 |

| Source | DF | Type I SS | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| **SIC** | 2223 | 35.59570405 | 0.01601246 | 19.91 | <.0001 |
| **FCF** | 1 | 0.32280992 | 0.32280992 | 401.45 | <.0001 |
| **TOBINSQ** | 1 | 0.06243012 | 0.06243012 | 77.64 | <.0001 |
| **FCF*SIZE** | 1 | 0.00146899 | 0.00146899 | 1.83 | 0.1765 |
| **CPS** | 1 | 0.00561552 | 0.00561552 | 6.98 | 0.0082 |

| Source | DF | Type III SS | Mean Square | F Value | Pr > F |
|---|---|---|---|---|---|
| **FCF** | 1 | 0.18278646 | 0.18278646 | 227.31 | <.0001 |
| **TOBINSQ** | 1 | 0.05082289 | 0.05082289 | 63.20 | <.0001 |
| **FCF*SIZE** | 1 | 0.00148043 | 0.00148043 | 1.84 | 0.1748 |
| **CPS** | 1 | 0.00561552 | 0.00561552 | 6.98 | 0.0082 |

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