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Multifactor Model for Estimation of Tobin's Q for Listed Firms

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ABSTRACT

This research examines the effect of firms efficiency in asset utilzation(ROA), leverage(debt/equity ratio), dividend decision and corporate governance on the firm value measured through Tobin's Q for listed Indian firms in FMCG, Auto and IT sector using quarterly accounting data collected for period from 2004 through 2017. The study has examined a multi-factor model by applying multiple linear regression to identify the model for estimation of Tobin's Q. The results reveal that the explanatory variables for predicting firm value for the auto sector are ROA, debt equity ratio and dividend payout ratio, for the FMCG sector, debt equity ratio, dividend payout ratio and governance score and for the IT sector are ROA, debt equity ratio, dividend payout ratio and governance score are the statistically significant explanatory variables for modelling Tobin's Q. As the statistically significant predictors for Tobin's Q are different for IT, auto and FMCG sectors, a key implication of this study is that it is not very useful to apply a common model for predicting Tobin's Q for all firms.

1. Introduction

Investors, analysts and regulators are always interested in evaluating the performance of firms and the value they create. As businesses are run on borrowed funds and public money, the interest in their performance and sustainability is very high amongst all stakeholders in the society. Failure of a firm to perform well can have contagion effect on many other firms and the society as a whole in any economy. In the recent years, with scams being reported in different firms across the world and bankruptcy filings by certain businesses like Vodafone Uganda, Aircel India, Toys R Us, Inc., USA to name a few, the interest in evaluating firms and identifying the factors that enhance their value has increased noticeable. Nirav Modi scam in India and high bankruptcy filing rates, for instance bankruptcies in Turkey increased to 780 companies in March from 682 companies in February of 2018 , bankruptcies in Australia increased to 645 companies in February from 461 companies in January of 2018 and bankruptcies in Japan increased to 789 companies in March from 617 companies in February of 2018 where in United States alone bankruptcies increased at an alarming rate to 23157 companies in the fourth quarter of 2017 from 23109 companies in the third quarter of 2017, have spotlighted the need to analyze firms in greater detail, as reported by *investor.fastenal.co.m*

Firm value or shareholder value has been measured by researchers in numerous ways by using indicators such as Return on Investment (ROI) or Return on Equity (ROE) as suggested by Abor and Biekpe (2006), Tobin's Q (Tobin and Brainard,1968; Tobin and Brainard, 1977; Tobin ,1969 and Tobin,1978), the market value added (MVA) and the Economic value added (EVA).

In this paper, the author has analysed the impact of four variables linked with firm's asset utilization (return on assets or ROA), capital structure decision or leverage (debt-equity ratio), dividend decision as measured by dividend payout ratio and corporate governance, measured through governance score generated by the author, on Tobin's Q (TQ), being taken as measure of firm value in line with Cho (1998) and Chaabouni and Ben Saud (2016), of firms listed across three sectors in India, namely, fast moving consumer goods (FMCG), automobiles and information technology (IT). Analysis has been performed using multiple regression on time series data, with TQ as the dependent and the rest four variables used in the study as its explanatory variable.

The sectors used for the study represent the key sectors in the Indian economy that are notable contributors to India's GDP. As per data available at ibef.org, FMCG is the 4th largest sector in the Indian economy and it has grown from US$ 31.6 billion in 2011 to US$ 52.75 billion in 2017-18. The sector is further expected to grow at a Compound Annual Growth Rate (CAGR) of 27.86 per cent to reach US$ 103.7 billion by

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2020. It has been focus of many studies in the recent past in India including those by Bagchi (2014) and Madhani (2014).

The Indian auto sector contributes about 7.1per cent to its GDP and is considered amongst the largest in the world. In addition to strong domestic performance, auto exports also have strong growth estimates for the near future, with automobile exports growing 15.81 per cent year-on-year between April-February 2017-18. India's IT sector is key driver of the economy. India had 55 per cent share of world's IT services in 2016-17. The IT industry of India has led its economic renaissance and repositioned India in the global economy.

The findings of the study reveal that for the auto sector, ROA, debt equity ratio and dividend payout ratio are the explanatory variables for predicting Tobin's Q. For the FMCG sector, debt equity ratio, dividend payout ratio and governance score are the explanatory variables for predicting Tobin's Q. For the IT sector, ROA, debt equity ratio, dividend payout ratio and governance score are the statistically significant explanatory variables for predicting Tobin's Q.

Rest of the paper is arranged as follows: section 2 deals with the theoretical framework and research hypotheses of the study, methodology is discussed in section 3, data description is given in section 4 followed by results of empirical analysis in section 5 and conclusions and implications of the study in section 6.

2. Theoretical framework and research hypotheses

Relationship between TQ and parameters like asset utilization efficiency, use of debt, payment of dividend and effective governance has been explored extensively in the existing literature. However, all these variables have not been taken together to evaluate their impact on Tobin's Q. Using Tobin's q to measure firm value Holderness and Sheehan (1988) find that family firms have TQ that is noticeably lower than non-family firms, while the opposite is revealed in their study by Anderson and Reeb (2003). In contrast, results from studies by Klein et al. (2005) and Gupta et al. (2009) show absence of relation between performance of a firm and its governance mechanism. Bozec et al. (2010 also investigated the relationship between the effectiveness of governance measures of a firm and TQ and found a statistically significant elationship between the two.

In his related study, Cho (1998) found TQ ratio was related to ownership structure of a firm. In their study, Marsha and Murtagi (2017) applied multiple regression and found that ROA as an independent variable had impact on TQ ratio of 14 Indonesia Firms in the Food and Beverages sector for period of 2010-2014. Uchida (2006) and Inoti et al. (2014) also found that ROA had statistically significant impact on value, that is, increase in ROA can be expected to lead to increase in firm value. Cheng et al. (2010) applied threshold regression panel to study the effect of leverage on value and confirmed the existence of a positive relationship between the two. On the other hand, Aivazian, et al. (2005) found that debt had negative effect on Tobin's Q. Many other studies have researched the relationship of debt and Tobin's Q including those by Nunes et al. (2009) and Sadeghian et al. (2012). Using OLS regression analysis on primary data and multiple regression analysis on secondary data, Nwamaka and Ezeabasili (2017) explored the effect of dividend decision on firm value for ten listed companies on Nigerian stock exchange. The study found that firm value was influenced significantly by dividend policy in case of public limited companies. Kallapur and Trombley (1999) and Labhane and Mahakud (2016) have also studied the relationship and found it to be positive.

Based on the existing knowledge, theoretical background and literature reviewed, the hypotheses for the present study are formulated as:

H1: Ceteris paribus, the relationship between TQ ratio and return on assets of firms listed on auto index in India's Bombay Stock Exchange (BSE) is positive, with TQ as the dependent variable.

H2: Ceteris paribus, the relationship between TQ ratio and corporate governance of firms listed on auto index in India's Bombay Stock Exchange (BSE) is positive, with TQ as the dependent variable.

H3: Ceteris paribus, the relationship between TQ ratio and dividend payout ratio of firms listed on auto index in India's Bombay Stock Exchange (BSE) is positive, with TQ as the dependent variable.

H4: Ceteris paribus, the relationship between TQ ratio and debt equity ratio of firms listed on auto index in India's Bombay Stock Exchange (BSE) is negative, with TQ as the dependent variable.

H5: Ceteris paribus, the relationship between TQ ratio and return on assets of firms listed on FMCG index in India's Bombay Stock Exchange (BSE) is positive, with TQ as the dependent variable.

H6: Ceteris paribus, the relationship between TQ ratio and corporate governance of firms listed on FMCG index in India's Bombay Stock Exchange (BSE) is positive, with TQ as the dependent variable.

H7: Ceteris paribus, the relationship between TQ ratio and dividend payout ratio of firms listed on FMCG index in India's Bombay Stock Exchange (BSE) is positive, with TQ as the dependent variable.

H8: Ceteris paribus, the relationship between TQ ratio and debt equity ratio of firms listed on FMCG index in India's Bombay Stock Exchange (BSE) is negative, with TQ as the dependent variable.

H9: Ceteris paribus, the relationship between TQ ratio and return on assets of firms listed on IT index in India's Bombay Stock Exchange (BSE) is positive, with TQ as the dependent variable.

H10: Ceteris paribus, the relationship between TQ ratio and corporate governance of firms listed on IT index in India's Bombay Stock Exchange (BSE) is positive, with TQ as the dependent variable.

H11: Ceteris paribus, the relationship between TQ ratio and dividend payout ratio of firms listed on IT index in India's Bombay Stock Exchange (BSE) is positive, with TQ as the dependent variable.
H12: Ceteris paribus, the relationship between TQ ratio and debt equity ratio of firms listed on IT index in India's Bombay Stock Exchange (BSE) is negative, with TQ as the dependent variable.
H13: The impact of the explanatory variables, namely, return on assets, corporate governance, dividend payout ratio and debt equity ratio on the dependent variable, namely, firm value, is same across listed firms in all three sectors under the study.

3. Methodology

This section describes the methodology used to test the hypothesis formulated in the previous section based on the review of the existing research. Multiple regression is used to test the linear relationship between TQ ratio, dependent variable and the four explanatory variables used in the study and the classical assumption tests are used to check normality, serial correlation and multicollinearity.

3.1 Ordinary least squares linear multiple regression

Regression analysis is a common way in statistics to discover association between variables having dependent and explanatory relationships. The relationship is not a causal one; rather it is indicative of some significant association in the data representing the variable under the study. Since in the current stay more than one explanatory or independent variables have been used, the regression applied is multiple linear regression. The purpose is to evaluate how much variance in the continuous dependent variable, firm value, is explained by a set of predictors or independent variables, namely, return on assets, debt/ equity, dividend payout ratio and governance score.

Following equation is formulated to test the hypothesis:

$$Y = \alpha + X_1 + X_2 + X_3 + X_4 + e \quad (1)$$

The variables used for regression are as follows:
α = Constant Coefficient
Y= Firms Value measured by Tobin's Q
X_1= Average Return on Assets (ROA)
X_2= Average Debt / Equity (D/E)
X_3= Average Dividend Payout ratio
X_4= Average Governance Score
e = Error term

First, the relationship of each independent variable, taken one at a time, with the dependent variable is assessed by calculating the correlation coefficient and obtaining a scatter plot to ascertain that the two variables are linearly related in each case. Thereafter, the relationship between all of the independent variables taken pairwise is assessed by generating a correlation coefficient matrix to examine if the independent variables too highly correlated with one another. If two variables are highly correlated, they are measuring the same phenomenon. When such highly correlated explanatory variables enter into the regression equation together, one of them may tend to explain most of the variance in the dependent variable. This leaves very little variance to be explained by the remaining correlated independent variable. At the same time, it is difficult to find to completely uncorrelated predictors, so researchers settle for as low correlations as realistically possible.

Further, since the set of predictors is not too large, the enter method of regression is used in SPSS, where all independent variables are entered into the equation at the same time. The coefficients and regression outputs are then examined using appropriate tests of statistical significance to assess the contribution of each explanatory variable in predicting the value of the dependent variable. R-squared, the coefficient of determination and F statistic are used to interpret the output. A high value of R^2, statistical insignificance of few variables with a statistically significant F value for the equation as a whole is taken to indicate the existence of 'spurious significance' (Phillips, 1998) and statistically significant. Durbin Watson test statistic (1950) is used to interpret the regression output for all three sectors. It is a commonly reported diagnostic test for the presence of serial correlation in the residuals of a time-series regression model. As a rule of thumb, if the DW is less than 2, it indicates the presence of positive serial correlation. The DW test statistic is represented as given below:

$$d = \frac{\sum_{i=2}^{n}(e_i - e_{i-2})^2}{\sum_{i=1}^{n} e_i^2} \quad (2)$$

Where

$e_i = y_i - \widehat{y_i}$ y_i $\widehat{y_i}$

are the observed and the predicted values of the dependent variable. The value of d becomes smaller as the serial correlations increase (Ivanova and Dospatliev, 2017).

According to Granger and Newbold (1974), a classic spurious regression may have very high R^2 accompanied by very low (less than 1.5) Durbin- Watson (DW) statistic. They suggested that the value of Durbin- Watson (DW) statistic was a good indicator of issues in regression equation. The argument put forth by Granger and Newbold contended that it was not essential for the DW statistic to fail for an equation to be spurious; however, a failed DW statistic can be taken as an ample proof of a failed regression model.
The regression residuals have been tested for normality, heteroscedasticity and multicollinearity.

3.2 Jarque-Bera Normality Test

Normality is a key assumption for the regression analysis and it is important to examine if the residuals of regression equation are normally distributed. The Jarque-Bera (Jarque and Bera, 1987) statistic is used for testing normality. If the residuals of the regression equation are normally distributed, the Jarque-Bera statistic will not be significant (Ivanova and Dospatliev, 2017). In general, a large value of JB statistic is indicative of non-normality of errors distribution. The Jarque-Bera test is goodness-of-fit test of whether the data have the skewness and kurtosis like that of a normal distribution. It has a chi-square distribution with two degrees of freedom under the null hypothesis of normally distributed residuals. The JB statistic is calculated as represented in equation 3 given below.

$$JB = n\left[\frac{(k_3)^2}{6} + \frac{(k_4 - 3)^2}{24}\right] \quad (3)$$

Where n is the sample size, k_3 is skewness of the sample, and k_4 is kurtosis of the sample.

3.3 Breusch-Pagan-Godfrey test for heteroscedasticity

In regression, an error measures the deviation from the regression line. OLS assumes that the variance of the error term is constant or homoskedastic. If the error terms do not have constant variance, they are heteroskedastic, violating the assumption. Heteroscedasticity can result in a variety of issues in regression and it needs to be examined and taken care of. Breusch-Pagan-Godfrey test (Breusch and Pagan, 1979; Godfrey, 1978) has been used in the current study to detect heteroscedasticity of errors in regression.

The Breusch-Pagan-Godfrey test is a Lagrange multiplier test testing the null of no heteroscedasticity against heteroscedasticity. The test statistic for the Breusch-Pagan-Godfrey test is $N*R^2$ (with k degrees of freedom) (Williams et al., 2017).

Where: n = sample size, R^2 is Coefficient of Determination of the regression of squared residuals from the original regression and k = number of independent variables. The statistic follows a chi-square distribution and a small chi-square value with a small p-value indicates the null hypothesis is rejected, that is, there is heteroscedasticity.

3.4 Multicollinearity

Multicollinearity indicates very high correlations among the independent or the explanatory variables in regression equation and its presence can adversely affect the regression results. Multicollinearity can increase standard error of estimates of the betas and result in 'spurious regression' (Kock and Lynn, 2012; William, 2000).Therefore, it is checked after running the regression model.

Multicollinearity can be detected using tolerance and its reciprocal, variance inflation factor (VIF). The VIF shows the extent of the increase in variance of a regression coefficient due to multicollinearity in the model. VIF is estimated as given in equation 4 below:

$$VIF = \frac{1}{1 - R_i^2} \quad (4)$$

Where i is the predictor or the independent variable being examined and R_i^2 is its coefficient of determination.

Variance inflation factors range from 1 upwards and a VIF of above 10 indicates severe multicollinearity. Some authors have suggested a more conservative value of 2.5 to 3. A general rule that is followed for interpreting the variance inflation factor is:

1 = no multicollinearity
Between 1 and 5 = moderate multicollinearity
Greater than 5 = high multicollinearity.

The value of tolerance should be greater than 0.2 or 0.1 as lower values indicate multicollinearity.

4 Data description

4.1 Data

Accounting data has been collected from published sources for companies constituting S & P BSE Sector Series (90/FF) for the three sectors for a period from 2003-2004 through 2016-2017 for each quarter has been averaged across the five variables.

4.2 Descriptive statistics

Mean, median standard deviation, minimum, maximum, skewness kurtosis and Jarque bera values of dependent and independent variables are calculated for all three sectors. Mean, median and standard deviation reveal the statistical nature of the time series under the study. Jarque-Bera statistic tests the distribution of a given series assuming the null hypothesis that the data is normally distributed.

Starting with dependent variable for the auto sector, TQ ratio is found more than the benchmark value of 1, with a mean with the score of 1.98. High value of TQ ratio confirms that the listed Indian auto firms have performed quite well during the period under the study. It also indicates that these firms are overvalued. ROA seems to be on a lower side indicating issues with efficiency in asset utilization. ROA of 11% indicates that before deducting interest and tax expenses from the earnings, on an average auto firms have recompensed around 11% of their assets in one year through their operations, which is quite low. Dividend payout and debt equity ratios are quite good and the average governance score of nearly 50% indicates good governance in the sector. Jarque-Bera statistics confirm that all series are normally distributed.

For FMCG firms, the TQ ratio is more than the benchmark value of 1, with a mean score of 1.99. Thus, the listed Indian FMCG firms have also performed quite well during the period under the study. It also indicates that these firms are overvalued. Again, ROA seems to be on a lower side indicating issues with efficiency in asset utilization. Debt equity ratio is very high, indicating highly leveraged sector. However, the average governance score of more than 50% indicates better than average governance in the sector. Probability values of Jarque-Bera statistics show some variables deviating from normality.

For IT firms, the TQ ratio is more than the benchmark value of 1, with a mean with the score of 1.62. Hence, the listed Indian IT firms have performed quite well during the period under the study. It also indicates that these firms are overvalued. For these firms also, ROA seems to be on a lower side indicating issues with efficiency in asset utilization. Debt equity ratio is very low, indicating low debt in the sector. Average governance score is more than 50%, indicating better than average governance in the sector. Probability values of Jarque-Bera statistics show some variables deviating from normality.

4.3 Variable description

The variables used for the purpose of the study have been calculated as given below.

$$Tobin's\ Q = (market\ capitalization + \ total\ debt)/total\ assets \tag{5}$$

Tobin's Q, the dependent variable representing firm value is calculated for the purpose of the study as given in equation 5. Here market capitalization is measured as the number of outstanding equity shares at the end of each quarter multiplied with the closing price on the last day of the quarter. Similarly, total debt and assets have also been extracted from the quarterly statements. Tobin's Q has been calculated for the purpose of the study by dividing market value with book value of the firm based on the studies of Tobin (1969) and Lindenberg and Ross (1981). Gamayuni (2015) considered Tobin's Q to be a good measure of firm value.

$$ROA = PAT/average\ total\ assets \tag{6}$$

Return on assets is calculated as given in equation 6. It is the ratio of profit after tax at the end of each quarter divided by total assets averaged across two quarters.

$$D/E = total\ liabilities\ /shareholders'\ equity \tag{7}$$

Debt equity ratio is calculated for the purpose of the study as given in equation 7. Both the values are extracted from the quarterly statements.

$$DIVIDEND\ PAYOUT\ RATIO = dividend\ per\ share\ /earning\ per\ share \tag{8}$$

Dividend payout ratio, as given in equation 8, is calculated by extracting the dividend data by the earnings information.

To measure corporate governance, the author has generated governance score using hand collected information related the board of directors, the ownership structure and audit committee in line with previous studies such as Ahmed and Hamdan (2015), Lee et al. (2011) and Marashdeh (2104).

5 Results of empirical analysis

The results of all empirical and diagnostic tests are reported in this section for each of the sector under the study separately.

5.1 Correlation coefficients

As mentioned in the preceding section, before developing the regression equation, a correlation matrix is generated for all the independent variables for each of the sectors under the study to verify the degree of correlation among them. Most pairwise correlations among the variables are low enough to be useful for generating meaningful regression coefficients. The author has used reasonably low correlations between each pair of regressors for each of the sector under the study as the basis for developing the regression equation as a review of literature has revealed that the use of correlation matrix is commonly acceptable for the studies like the one being undertaken.

5.2 Multiple regression analysis

Regression is run for all three sectors with firm value as the dependent and return on assets (ROA), debt/equity ratio, dividend payout ratio, and governance score as the independent variables. The results are discussed in this section.

Auto sector

The results for the conceptual model are displayed in table 1. Adjusted R-squared value of 0.893 implies that the model used in the study has accounted for 89.3% of the total variance in the dependent variable. The result of this regression needs to be evaluated in terms of Durbin- Watson (DW) statistic as well. The Durbin-Watson statistic for the model is 2.39. In this instance D-W has not failed. This implies that the regression may not be spurious. The t-statistics show that X_1 (i.e. ROA), X_2 (i.e. debt-equity ratio) and X_3 (i.e. dividend payout ratio), are significant at 5% level of significance. Thus, we can interpret that ROA, D/E ratio and dividend payout ratio affect firm value measured by Tobin's Q for the firms in the auto sector. The fourth variable, governance score, is found to be insignificant to firm value.

Table 1: Regression output for auto sector

Auto Sector		Variables	Coefficients	p-value	Collinearity Statistics (Tolerance)	Collinearity Statistics (VIF)	Jarque-Bera Normality Test	
Adjusted R square	0.893	**ROA_AUTO**	17.047	0.001	.756	1.322	JB Statistic	2.314
Durbin-Watson Statistic	2.39	**D/E _AUTO**	-5.985	0.000	.323	3.000	p-value	0.321
		Dividend Payout_AUTO	-2.381	0.050	.586	1.705	**Breusch-Pagan-Godfrey Heteroscedasticity Test**	
		GOVSCORE_ AUTO	-7.700	0.181	.375	2.667	Obs*R-squared	2.700
							Prob. Chi-Square(4)	0.178
							F-statistic	0.646
							Prob. F(4,51)	0.632

To further confirm goodness of fit, residual diagnostics is applied for testing normality, heteroscedasticity and multicollinearity of the residuals. The output is exhibited in table 4. JB statistics is low and statistically insignificant; implying the null of normal distribution cannot be rejected. Thus, the residuals are normally distributed. Breusch-Pagan-Godfrey heteroscedasticity test statistics (obs*R^2) is small and statistically insignificant, implying the null of no heteroscedasticity cannot be rejected. Thus, the residuals are homoscedastic.

Collinearity diagnostics show that tolerance is more than the threshold value of 0.1 and VIF is within the moderate threshold level of 3 for all variables. Thus, no issue with multicollinearity exist and the outcome of this regression can be applied for modelling TQ ratio of list firms in auto sector in India.

FMCG sector

The results for the conceptual model are displayed in table 2.The r-squared value of 0.781 implies that the model used in the study has accounted for 78.1 % of the variance in the variable under study. The t-statistics show that all predictor variables except ROA significantly explain the variation in TQ ratio in the FMCG sector. The Durbin-Watson statistic for the model being used is 2.352 and it has not failed, indicating that the regression may not be spurious.

Table 2: Regression output for FMCG sector

FMCG Sector		Variables	Coefficients	p-value	Collinearity Statistics (Tolerance)	Collinearity Statistics (VIF)	Jarque-Bera Normality Test	
Adjusted R square	0.781	**ROA_FMCG**	-2.722	0.453	.829	1.207	JB Statistic	1.895
Durbin-Watson Statistic	2.352	**D_E_RATIO_FMCG**	-1.648	0.003	.520	1.921	p-value	0.639
		DIVIDEND_PAYOUT_RATIO_FMCG	8.177	0.000	.548	1.824	**Breusch-Pagan-Godfrey Heteroscedasticity Test**	
		GOVSCORE_FMCG	24.814	0.000	.773	1.294	Obs*R-squared	3.485
							Prob. Chi-Square(4)	0.066
							F-statistic	0.563
							Prob. F(4,51)	0.073

The output of residual diagnostics is exhibited in table 2. The residuals are normally distributed and the collinearity coefficients are within limits. The heteroscedasticity test shows that the residuals are homoscedastic. Thus the model has not failed.

IT sector

The results for the conceptual model are displayed in table 3.The r-squared value of 0.802 implies that the model used in the study has accounted for 80.2 % of the variance in the variable under study. The t-statistics show that all four predictor variables significantly explain the variations in TQ ratio in the IT sector. The Durbin-Watson statistic for the model being used is 2.098 and it has not failed, indicating that the regression may not be spurious.

Table 3: Regression output for IT sector

IT Sector		Variables	Coefficients	p-value	Collinearity Statistics (Tolerance)	Collinearity Statistics (VIF)	Jarque-Bera Normality Test	
Adjusted R square	0.802	**ROA_IT**	15.397	0.006	.328	3.003	JB Statistic	1.374
Durbin-Watson Statistic	2.099	**D_E_RATIO_IT**	-2.680	0.000	.385	2.598	p-value	0.503
		DIVIDEND_PAYOUT_RATIO_IT	-0.683	0.003	.605	1.652	**Breusch-Pagan-Godfrey Heteroscedasticity Test**	
		GOVSCORE_IT	3.893	0.014	.932	1.073	Obs*R-squared	2.700
							Prob. Chi-Square(4)	0.178
							F-statistic	0.965
							Prob. F(4,51)	0.576

The output of residual diagnostics is exhibited in table 3. The residuals are normally distributed and the collinearity coefficients are within limits. The heteroscedasticity test shows that the residuals are homoscedastic. Thus the model has not failed.

6 Conclusion and implications of the study

The study is undertaken with a view to identify the explanatory variables for predicting Tobin's Q for listed firms in the auto, FMCG and IT sector in India, in line with many existing studies including those by Dybvig and Warachka (2012) and Ahmed and Hamadan(2015) Quarterly data of ROA, level of debt, dividend paid, governance measures and TQ ratio of firms listed on BSE and constituting their respective sectoral indices for a period from 2004 through 2017 is analysed to test the hypotheses proposed by the study.

The study addresses the research gap which exists in the extant literature where there are very few studies exploring the dynamics of firm value across different sectors of economy in India. Based on the above analyse, hypotheses H2, H3, H5, H11 and H13 are not supported as exhibited in table 4.

Table 4: Hypotheses of the study

Hypothesis Tested	Outcome
H1: Ceteris paribus, the relationship between TQ ratio and return on assets of firms listed on auto index in India's Bombay Stock Exchange (BSE) is positive, with TQ as the dependent variable.	Supported
H2: Ceteris paribus, the relationship between TQ ratio and corporate governance of firms listed on auto index in India's Bombay Stock Exchange (BSE) is positive, with TQ as the dependent variable.	Not supported
H3: Ceteris paribus, the relationship between TQ ratio and dividend payout ratio of firms listed on auto index in India's Bombay Stock Exchange (BSE) is positive, with TQ as the dependent variable.	Not supported
H4: Ceteris paribus, the relationship between TQ ratio and debt equity ratio of firms listed on auto index in India's Bombay Stock Exchange (BSE) is negative, with TQ as the dependent variable.	Supported
H5: Ceteris paribus, the relationship between TQ ratio and return on assets of firms listed on FMCG index in India's Bombay Stock Exchange (BSE) is positive, with TQ as the dependent variable.	Not supported
H6: Ceteris paribus, the relationship between TQ ratio and corporate governance of firms listed on FMCG index in India's Bombay Stock Exchange (BSE) is positive, with TQ as the dependent variable.	Supported
H7: Ceteris paribus, the relationship between TQ ratio and dividend payout ratio of firms listed on FMCG index in India's Bombay Stock Exchange (BSE) is positive, with TQ as the dependent variable.	Supported
H8: Ceteris paribus, the relationship between TQ ratio and debt equity ratio of firms listed on FMCG index in India's Bombay Stock Exchange (BSE) is negative, with TQ as the dependent variable.	Supported
H9: Ceteris paribus, the relationship between TQ ratio and return on assets of firms listed on IT index in India's Bombay Stock Exchange (BSE) is positive, with TQ as the dependent variable.	Supported
H10: Ceteris paribus, the relationship between TQ ratio and corporate governance of firms listed on IT index in India's Bombay Stock Exchange (BSE) is positive, with TQ as the dependent variable.	Supported
H11: Ceteris paribus, the relationship between TQ ratio and dividend payout ratio of firms listed on IT index in India's Bombay Stock Exchange (BSE) is positive, with TQ as the dependent variable.	Not supported
H12: Ceteris paribus, the relationship between TQ ratio and debt equity ratio of firms listed on IT index in India's Bombay Stock Exchange (BSE) is negative, with TQ as the dependent variable.	Supported
H13: The impact of the explanatory variables, namely, return on assets, corporate governance, dividend payout ratio and debt equity ratio on the dependent variable, namely, firm value, is same across listed firms in all three sectors under the study	Not supported

The findings of the study reveal that for the auto sector, ROA, debt equity ratio and dividend payout ratio are the explanatory variables for predicting Tobin's Q. The impact of debt equity ratio and dividend payout ratio is found to be negative where one-raw-unit increment on debt-equity ratio results in the decrease in firm value by 5.98 of its raw units and one-raw-unit increment on dividend payout ratio results in the decrease in firm value by 2.38 of its raw units. One raw unit increase in ROA results in the increase in firm value by 17.05 of its raw units, as it can be seen in equation 9.

$$FIRMS_{VALUE_{AUT\,O}} = 1.78 + 17.05 * ROA_{AUTO} - 5.98 * D\_E_{AUTO} - 2.38 * DIVIDEND_{PAYOUT_{AUTO}} \quad (9)$$

For the FMCG sector, debt equity ratio, dividend payout ratio and governance score are the explanatory variables for predicting Tobin's Q. The impact of debt equity ratio is found to be negative where one-raw-unit increment on debt-equity ratio results in the decrease in firm value by 1.65 of its raw units. The effect of governance score and dividend payout ratio is positive where one-raw-unit increment on dividend payout ratio results in the increase in firm value by 8.18 of its raw units and one raw unit increase in governance score results in the increase in firm value by 24.81 of its raw units, as can be seen in equation 10.

$$FIRMS_{VALUE_{FMCG}} = 15.79 - 1.65 * D_{E_{RATI\,O_{FMCG}}} + 8.18 * DIVIDEND_{PAYOUT_{RATI\,O_{FMCG}}} + 24.81 * GOVSCORE\_FMCG \quad (10)$$

For the IT sector, ROA, debt equity ratio, dividend payout ratio and governance score are the statistically significant explanatory variables for predicting Tobin's Q. The impact of debt equity ratio and dividend payout ratio is found to be negative where one-raw-unit increment in debt-equity ratio results in the decrease in Tobin's Q by 2.68 of its raw units and one-raw-unit increment dividend payout ratio results in the decrease in Tobin's Q by 0.68 of its raw units. The effect of ROA and governance is positive where one-raw-unit increment in ROA results in the increase in firm value by 15.39 of its raw units and one-raw-unit increment in governance results in the increase in firm value by 3.89 of its raw units as can be seen in equation 11.

$$FIRMS_{VALUE_{IT}} = 6.29 + 15.39 * ROA_{IT} - 2.68 * D_{E_{RATI\,O_{IT}}} - 0.68 * DIVIDEND_{PAYOUT_{RATI\,O_{IT}}} + 3.89 * GOVSCORE\_IT \quad (11)$$

Thus, it can be inferred that the dynamics of Tobin's Q determination varies across sectors, though the results need to be tested on more sectors across economies at different stages of development before drawing any universally applicable conclusions.

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