Key Factors Impacting Large US Firms During the 2007-8 Financial Crisis

Submitted by
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Analysis of Key Factors that Impact Large Cap US Firms’ Financial and Market Performance at Different Phases during the 2007-8 Financial Crisis

**DBA Research Thesis**

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Abstract:

The financial crisis of 2007-8 provides an opportunity to investigate which factors have a significant impact on firms at different stages of the crisis. This paper considers this shock event along these lines: impact of leverage on a firm can vary depending on timing of the crisis; firm are challenged to invest as the crisis recedes; revenue growth can enhance and sometimes impede returns; choosing to hold cash or not when a firm make the trade-off with investment and both the timing and decision are important; investors, managers and shareholders perceive these actions and events differently. Large cap US firms (as defined in the S&P 500) provide a stable sample to study these questions; this paper uses ROA and Tobin’s Q (Q) as performance measures and analyzes how they are impacted by debt, asset utilization, revenues and cashflow at different stages of the 2007-8 crisis. Using a cross-sectional regression analysis, the results show that firm performance (ROA), consistent with previous studies, is inversely related to leverage. However, coming out of the crisis, this reverses and leverage has a positive impact on valuation (Q) and is consistent with the Pecking order theory of capital structure where profitable companies (with strong cashflows) tend to finance investments from internal sources and therefore such companies tend to be associated with lower levels of leverage (Myers, 1984; Myers & Majluf, 1984). This paper also shows that while cashflow has a positive but declining impact on ROA over these time periods and has a similar positive impact on valuation (Q), however, the estimate’s sign changes to negative during the post-crisis suggesting that holding cash in an economic expansion doesn’t support higher valuation. By contrasting the impact of these variables on financial returns (ROA) and market valuation (Q) for large cap US firms during each of the three phases of the crisis, we see anomalies that would otherwise not be apparent, and, in this way, this study adds to the literature on corporate performance during a financial crisis.

Introduction:

The 2007-8 financial crisis began to build momentum during 2007 with the Federal Reserve slashing interest rates, the collapse of Bear Stearns in early 2008 and subsequently Lehman Brothers and Merrill Lynch in the fall of that year. The US economy, quickly followed by other developed economies, went into recession. The US crisis deteriorated rapidly, with the economic malaise spreading around the world through financial markets and international banks and affected many economic sectors (IMF, 2001; Ahn, Cetorrelli and Goldberg, 2011; Amiti and Weinstein, 2011). While the financial services industry initially felt the force of this meltdown, the shrinking in available credit and loss of liquidity served to spread the effects of the crisis into 2009 and, in Europe, even longer.

Several papers analyze the economic effects of the 2007-8 financial crisis empirically. Campello et al. (2010) survey 1,050 CFOs in 39 countries in the USA, Europe, and Asia to directly assess whether their corporate investment plans differ conditional on the financial constraints of the firms. They show that a significant majority of financially constrained firms postponed or cancelled their planned investments and show that more firms sold assets during the financial crisis to fund their ongoing operations.
This paper is based on financial data of S&P 500 firms, using public quarterly financial data for the period 2004-2012, which encompasses the crisis period of 2007-9 as well as three years before and after. My motivation in doing this paper was the absence of published research focused on large cap US firms’ performance, as measured by financial and market returns, showing the impact on these measures at different stages of the financial crisis.

Key findings:

- Regarding the impact of leverage, consistent with current literature, performance (ROA) is negatively correlated to leverage in all periods, however, significantly, the estimate changes sign in the post-crisis recovery period for Q, implying that the market favors borrowing to invest over the possibility of financial distress in this period of economic recovery. This anomaly emerges only when comparing the same variable’s impact on the two performance measures and segregating the crisis time frame into three phases.

- Cashflows are positively related to ROA although the estimate values decline over time, possibly as returns on cash holding are marginal if not deployed. Cashflow estimates are high for Q prior to the crisis when there is a premium put on liquidity in a period of uncertainty (pre-crisis); the estimate coefficient drops rapidly in the crisis period and turns negative during the post-crisis recovery period, as investors reward drawing down cash and investing for growth.

- Revenues have a positive impact in all three periods on ROA, which is not unexpected (although statistically insignificant after the crisis). However, the estimate changes signs with Q and has a negative impact on valuation in the same three periods.

This study contributes to academic literature on corporate performance during a financial crisis in two ways, first, by analyzing the impact of the same four variables on financial returns (ROA) and market valuation (Q) for large cap US firms, the study highlights the contrast between the financial (internal) and investor (external) views. Second, in disaggregating the 2004-12 period into three specific phases around the crisis, this paper extracts unique anomalies, related to the impact of leverage and cash holdings on firm valuation, particularly in the post-crisis economic expansion period, which would otherwise not be apparent.

The rest of this paper will follow this outline: I will do a literature review in Section 2, and this will lead us to Section 3 where I discuss my motivation and hypothesis. Section 4 explains the details of Data Selection and shows Descriptive Statistics and Section 5. provides details of the Empirical Methodology, Section 6 discusses the Results and Findings, and Section 7 has the Conclusion. References and Bibliography and the Appendices are in Section 8.
Section 2:

Literature review:

In reviewing the literature for this study, I concentrated on papers focusing on financial crises or shocks as they relate to debt and leverage, cash flows and performance. Additional research provided guidance in confirming the selection of dependent and independent variables for my empirical work. The research papers below are categorized by these characteristics:

Leverage:

Opler and Titman, (1994). The authors studied highly leveraged firms in an economic downturn and found that they were affected by financial distress more than firms with lower debt and noted significant signs of economic distress. They also found that firms investing in R&D as well as those in concentrated industries were not protected and did not benefit during economic downturns. This paper was useful in guiding me to compare the impact of low and high debt levels on growth and performance.

Demirguc-Kunt et al, (2015). This study of 277,000 firms in 79 countries from 2004-7 found that even in countries that were not impacted by the crisis, firms experienced reduction in debt and reduced maturity although this impact was less apparent in public firms. Countries with weak legal and regulatory systems, as well as inefficient banks and monetary authorities had greater deleveraging. Larger firms with access to capital markets and public listings were less likely to face financial distress. Some parts of this paper, which focused on larger and listed firms, provided insight on the use and impact of debt and leverage.

Harrison, Widjaja, (2013). This study updated the 1995 paper by Rajan and Zingales and focused on US firms using leverage as the dependent variable in their models. In their findings, consistent with the original work by Rajan and Zingales, tangible assets and the market to book ratio had a stronger impact on capital structure during the crisis than prior. They showed that profitability was less impactful than before the crisis. Revenue had the opposite impact (negative) than before the crisis. This paper reinforced the use of Tobin’s Q as a performance measure and pointed to linkage to the Pecking Order theory.

Tan, (2015). This study showed how leverage impacted firm performance during the Asian financial crisis of 1997-8. The author used return on assets and Tobin’s q as proxies for firm performance. Here, consistent with Opler (1994) and Asgharian (2002), the author found that the coefficient for leverage was negatively related to performance and higher leverage firms were more likely to face financial distress. Additionally, the crisis magnifies the negative relationship between financial distress and firm performance. This paper pointed to the use of
multiple performance measures, particularly Q and ROA, although its focus was on the Asian countries.

Medina, (2013). The author focused on over 6500 firms in 48 countries to study factors that had positive and negative impacts on their performance during the financial crisis. These included factors at the firm level as well as at the country and sector levels. His findings show that higher levels of short-term debt and leverage negatively impact sales growth in the recovery, but higher levels of fixed assets were positively related. A depreciating currency during the crisis also helped during the recovery stage. The paper also shows that the macroeconomic framework critically matters for firm growth. Although this report was based on a global sample, it reinforced the importance of debt and leverage, which was useful in formulating my analysis.

Performance:
Hossain, Nguyen, (2016). This paper focuses on the oil and gas industry in Canada and looks at capital structure, stock, and operating performance before, during and after the recent financial crisis for a ten-year period (2004-2013). Comparing the ROE of high and low leverage firms, they found the gap in performance was 6.5% (pre-crisis), 3.3% (crisis), and 6.7% (post-crisis). They found that leverage has a strong and significant relationship with return on assets. Firms with high cash reserves also perform better over this period. This paper showed the usefulness of breaking out the crisis into three clear phases and while it was narrowly focused (O&G in Canada), it provides a working framework for my paper.

Alghifari et al, (2013). This study aimed to determine the effect of Return on Assets (ROA) on Tobin's Q, based on research in the food and beverage industry. This study concluded that, consistent with Dodd and Chen (1996), Uchida (2006) Ulupui (2007) Carlson and Bathala (1997), return on assets had a significant effect on Tobin's Q. This paper was useful in understanding the relationships between the two dependent variables selected for my regression analysis.

Cashflows:
Bierlen, Featherstone, (1995). This study based on panel data tested the impact of financial constraints. Their findings indicated that debt levels had the biggest impact on credit constraints; they studied the relationship between investments and cash flow for low-farms and found that with low leverage, investments increased with higher cashflows. This study provided insight into the impact of cashflows on investments and provided some analogy in its use in down-business cycles.

Myers and Majluf (1984) and Titman and Wessels (1988) find that profitable companies (with strong cashflows) tend to finance investments from internal sources and therefore such
companies tend to be associated with lower levels of leverage. I was able to apply the Pecking Order theory and its insights on internal cashflows when developing my empirical model.

Duchin et al 2010. This study of publicly traded firm comprises of 6,421 quarterly observations for 3,668 firms and splits the data into pre and post periods related to the 2008 financial crisis. They found that as the crisis got started, investments dropped significantly, with firms that have low cash reserves or high short-term debt obligation showing the greatest decline. This paper provided analytical insight on understanding the impact of cashflow in the crisis and the period immediately preceding it.

Investments:
Bolton, Chen, Wang, (2009). In this study the authors found that as firms increased leverage, the level of marginal investments inversely impacted incremental changes in their value (Q). Also find that financially constrained firms hold higher levels of cash as a precaution. This study helped reinforce the benefits of using Q as a performance measure when considering the impact of cashflows.

Abel, Eberly, (2011). The authors studied the relationship between investments and Tobin’s Q. In this study, investment and the investment-capital ratio are positively related to Tobin's Q and cash flow, even in the absence of adjustment costs or financing frictions. They showed that investment and Q were positively correlated and that increase in revenue made positive impacts on Q and investment. Although his study focused on family-owned firm, the use of ROA and Q as performance measures provided a guidance in selecting it for this paper.

Campello, Graham, and Harvey, 2010. This study found that as firm experienced restriction in their borrowing capacity they avoided investment opportunities. Their analysis showed that firm facing financial constraints, reduced spending in technology, staffing and investments. CFOs who were interviewed confirmed that the credit crisis of 2008 restricted their ability to grow investment. This was consistent in the US Europe and Asia. Insights provided by this study were invaluable in selecting the key independent variables in my paper.

Section 3

HYPOTHESIS DEVELOPMENT & MOTIVATION

Research on the impact of financial crises is quite substantial particularly in the areas of debt and leverage. Most of these studies usually cover a broad range of firms (in size and location). Others are more specific, covering a particular country, region, or industry. In these studies, the authors mostly do not break down their analysis by size of firm and when they do, it is in reference to how large and small firms in general differ in impact on a global basis. However, when combining large and small cap firms, it is likely that the impact of factors like leverage,
investments and cashflows can be different depending on the size of the firm. Based on the literature review three opportunities presented themselves, one was to focus on large cap US firms based on the S&P 500 as information pertaining to how they performed during the crises was less clear as the findings were merged with the broader group of firms. The other was to contrast two distinctive performance measures (ROA and Tobin’s Q) and hypothesize as to how they would be impacted by similar variables. And finally, there was the opportunity to break out the crisis into three distinct phases as the studies on large firms in the 2007-8 financial crisis either studied just the event itself or compared the results before and after the crisis without including any analysis on the period covered by the crisis itself.

My motivation in this paper was to fill in gaps presented by these opportunities and thus add to the existing literature and analysis of crisis events. My paper does this through the study of two distinctive performance measures: ROA and Tobin’s Q and how they are each impacted by the same set of independent variables. The other unique aspect of this study is to disaggregate the crisis period into three phases and particularly to include the actual crisis period.

My research questions focus on two issues:

- I would like to know if these key variables have the same effect on a firm as it operates before a crisis, during the crisis as well as after the crisis.

- My research question is directed to whether the impact of these factors is the same on ROA as on Q (both in size and direction).

Based on the above research questions, I am proposing two hypotheses for this paper:

Hypothesis 1: Leverage will have a different impact on the two performance measures, a negative impact on ROA which measures investment returns but will have a positive impact on Tobin’s Q which focuses on valuation. The basis for this hypothesis is the contrasting nature of these two performance measures. The null hypothesis will be negative estimates for all three periods for leverage impact on both performance measures.

Hypothesis 2: The impact of the estimates for ROA and Q will be consistent regarding asset turnover but will diverge on operating variables like cashflow and revenues. I expect to see opposite signs for the same variables for ROA compared to Q. By implication, I expect investors to be focusing on future cashflows and growth while operating management will be less risk averse.

Section 4
DATA SELECTION
The two performance measures I have selected, ROA and Tobin’s Q (Tan 2015; Bierlen, Featherstone, 1995) look at different aspects of performance: ROA is mostly internally focused and uses financial accounting generated information, while Q is mostly influenced by the market value of the firm which considers future cashflow from investments. Taking a lead from academic papers about factors influencing these performance measures, I have selected leverage, asset turnover, revenues and cashflows.

In studying firms during financial shocks, certain characteristics of corporate behavior tend to stand out: a) debt and leverage fund the business but there is the risk of financial distress (Harris and Raviv, 1991), b) Investment in assets and their productive usage, position the firms to emerge from the crisis successfully, Duchin et al. (2010) but need to be timed to take advantage of economic recovery and productively used, c) revenues or maintenance of market share and d) cashflows, which can be deployed to manage operations Myers and Majluf (1984) and Titman and Wessels (1988), service debt and invest for growth Duchin et al. (2010).

Accordingly, I used these variables to see how they impacted firm’s performance.

My analysis is based on financial data of S&P 500 firms using published quarterly financial data reported by these companies from Compustat as well as share price information from CRSP (Center for Research on Security Prices) through the Wharton Research Data Services (WRDS). In this paper we use a panel data sample and fixed effect regression model with firm (company) and period (year) fixed effects. My final sample includes 3,048 quarterly observations over each three-year period. With ROA and Tobin’s Q (following Chung and Pruitt (1994) calculation for approximate Q) as dependent variables, I used the same four independent variables which are recognized in published research, this included Leverage, Assets (normalized using Asset turnover), Revenues (using the normal Log) and cashflow (normalized using cashflows/debt).

In this section:
Table 1 provides definitions for all the variables as well as the corresponding predictions in the Hypothesis.
Table 2 has the descriptive statistics.
Table 3 shows the pairwise correlations for all the variables.

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Description of Variable</th>
<th>Hypothesized Prediction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent Variable</strong></td>
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<tr>
<td>ROA</td>
<td>The return on assets (ROA) shows profitable a company’s assets are in generating revenue. ROA is computed ROA = (Net Income)/(Average Total Assets)</td>
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<tr>
<td><strong>Independent Variables ROA</strong></td>
<td><strong>Hypothesized Prediction</strong></td>
<td></td>
</tr>
<tr>
<td>Leverage</td>
<td>This is the ratio of Long-Term liabilities to Total Assets.</td>
<td>Negative in all three phases</td>
</tr>
</tbody>
</table>
Asset Turnover | This is the ratio of Revenues to Total Assets. It measures the effective use of assets, the higher the multiple the more effective the usage. | Positive in all three phases
---|---|---
Revenues | This is the log of Total revenues. | Positive in all three phases
Cashflow to debt | This is the ratio of cash flow to total debt | Positive in all three phases

<table>
<thead>
<tr>
<th>Independent Variables Tobin’s Q</th>
<th>Hypothesized Prediction</th>
</tr>
</thead>
</table>
Leverage | This is the ratio of Long-Term liabilities to Total Assets. | Negative in pre-crisis, Positive in crisis and post crisis
Asset Turnover | This is the ratio of Revenues to Total Assets. It measures the effective use of assets, the higher the multiple the more effective the usage. | Positive in all three phases
Revenues | This is the log of Total Revenues. | Negative
Cashflow to debt | This is the ratio of cash flow to total debt | Negative in all three phases

* Based on Chung and Pruitt (1994)
The generally acceptable time frame for the financial crisis begins in 2007, reaches a peak in 2008 and extends to 2009 and I have included all 3 years for the crisis periods. For comparative purposes I have taken the three-prior year, 2004-6 as pre-crisis and the three subsequent years, 2010-12 as post crisis. Keeping the time periods and independent variables consistent allows for unbiased comparison across the three periods as well as between the two performance measures, ROA, and Q.

Data is based on quarterly financials reported by firms and collated by Compustat. Using the above criteria, the total number of firms which are included is: 254 firms with 3048 observations for each of the three phases.

Requirements for a company to be included as a sample are:

1. Not newly listed or delisted during the research period.
2. Availability of certain accounts in the financial statement during the period of research (total assets, total current assets, earnings and book value per share, total short and long-term debt, total liabilities, total current liabilities, total liabilities and stockholders’ equity, stockholders’ equity, sales, and total market value).
3. Any changes to the legal structure of firms during this period has been incorporated by WRDS into a single consolidated holding company.

Descriptive Statistics:

One feature that distinguishes this research with other empirical crisis period studies is the choice of the time frame. In most studies covering this crisis, the time frame is divided into two periods which are the period before financial crisis and the period after the financial crisis. This paper emphasizes that the 2007-9 period of the actual financial crisis should be segregated as a sub-period as it may specifically highlight the determinant impact of debt, cashflows and investments on the two performance measures. Separating the crisis period from the pre and post periods helps to highlight trends and anomalies which would otherwise be submerged.

The descriptive statistics in Table 2 provide additional detail for each phase of the crisis.

Table: 2

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<th>Pre Crisis</th>
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<td>ROA</td>
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<td>48,048</td>
<td>257,600</td>
<td></td>
</tr>
<tr>
<td>Long Term Debt</td>
<td>3027</td>
<td>13,343</td>
<td>3,596</td>
<td>1,446</td>
<td>8,815</td>
<td>44,965</td>
<td></td>
</tr>
</tbody>
</table>
Table 3

<table>
<thead>
<tr>
<th></th>
<th>Pearson Correlation Coefficients</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Leverage</td>
<td>Asset</td>
<td>Revenues</td>
<td>Cashflows</td>
</tr>
<tr>
<td>Leverage</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asset Turnover</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log Revenues</td>
<td>-6%</td>
<td>19%</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Cashflow</td>
<td>-38%</td>
<td>20%</td>
<td>-3%</td>
<td>1</td>
</tr>
</tbody>
</table>

|                  | Leverage | Asset | Revenues | Cashflows |
| Leverage         | 1        |      |          |           |
| Asset Turnover   |          | 3%   |          | 1        |
| Log Revenues     | -12%     | 19%  | 1        |           |
| Cashflow         | -32%     | 19%  | 1%       | 1        |

|                  | Leverage | Asset | Revenues | Cashflows |
| Leverage         | 1        |      |          |           |
| Asset Turnover   |          | 12%  |          | 1        |
| Log Revenues     | -11%     | 20%  | 1        |           |
| Cashflow         | -24%     | 18%  | 11%      | 1        |

As seen in the above table there are no coefficients of pairwise correlation larger than 0.8. Thus, it can be concluded that multicollinearity problem is not an issue in these variables. These correlation tables provide a view of the relationships among the variables. Leverage paired with both Revenues and Cashflows have negative correlation, we see positive correlation with all the other variables in all phases. The only exception to this consistency is the pairing of Revenue and Cashflow in the pre-crisis period a time when you might want to preserve cash at the risk of higher revenues/market share. Pecking order theory predicts the negative correlation between revenues and cash with leverage.

Section 5
Empirical Methodology

In this paper we use a panel data sample and fixed effect model effect regression model with firm (company) and period (year) fixed effects. In panel data used in this study where longitudinal observations exist for the same subject; fixed effects represent the subject-specific means. The fixed effects estimator is used to refer to an estimator for the coefficients in the regression model including those fixed effects.

We use the statistical software package of SAS to examine the presence of significant correlation between the independent variables and the dependent variable. The model regression equation consists of a dependent variable (ROA and Tobin’s Q) and independent variables (Leverage, Asset Turnover, Revenue, Cashflow/debt).
The equations being used are:

a) $Y(t) \text{ROA}^* = \beta_1 \text{Leverage}^{**(t-1)} + \beta_2 \text{Asset turnover}^{**(t-1)} + \beta_3 \text{Log Revenues}^#(t-1) + \beta_4 \text{Cashflow}^{**~(t-1)} + \epsilon$

b) $Y(t) \text{Tobin's Q}^* = \beta_1 \text{Leverage}(t-1) + \beta_2 \text{Asset turnover}(t-1) + \beta_3 \text{Log Revenues}(t-1) + \beta_4 \text{Cashflow}^{**~(t-1)} + \epsilon$


Section 6: Results

In this section, we will discuss the results based on the outputs of the above regressions. Table 4 has this summarized.

Table 4

<table>
<thead>
<tr>
<th></th>
<th>Pre</th>
<th>CRISIS</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ROA</strong> Estimate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leverage</td>
<td>-0.0185 *</td>
<td>-0.1566 ***</td>
<td>-0.0291 ***</td>
</tr>
<tr>
<td>Asset Turnover</td>
<td>0.1879 ***</td>
<td>0.1850 ***</td>
<td>0.1174 ***</td>
</tr>
<tr>
<td>Revenues</td>
<td>0.0189 ***</td>
<td>0.0423 ***</td>
<td>0.0000</td>
</tr>
<tr>
<td>Cashflow</td>
<td>0.1011 ***</td>
<td>0.0973 ***</td>
<td>0.0531 ***</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.9408</td>
<td>0.9094</td>
<td>0.9542</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Tobin's Q</strong></th>
<th>Pre</th>
<th>CRISIS</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leverage</td>
<td>-0.0836</td>
<td>-2.5786 ***</td>
<td>0.3706 ***</td>
</tr>
<tr>
<td>Asset Turnover</td>
<td>0.7643 ***</td>
<td>0.7502 ***</td>
<td>0.4717 ***</td>
</tr>
<tr>
<td>Revenues</td>
<td>-0.5488 ***</td>
<td>-0.7271 ***</td>
<td>-0.2409 ***</td>
</tr>
<tr>
<td>Cashflow</td>
<td>1.0633 ***</td>
<td>0.1833</td>
<td>-0.0907</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.9247</td>
<td>0.8392</td>
<td>0.9356</td>
</tr>
<tr>
<td>Observations</td>
<td>3048</td>
<td>3048</td>
<td>3048</td>
</tr>
<tr>
<td>Fixed Effects</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
The key finding of this study regarding leverage shows that in the post-crisis period, we get a sign change in Q, clearly favoring borrowing for investment growth in this period of economic recovery. While ROA is negatively correlated to leverage, with Q, the negative impact is consistent only for the first two periods (the negative coefficient during the crisis increases 31x, showing that the market is very sensitive to the risk of financial distress). This is a partial validation of my first hypothesis.

In keeping with academic literature on leverage, we see that all periods show negative estimates for ROA. This rises 8.5x during the crisis period when the default risk is at its peak and while it drops to pre-crisis levels after the crisis, the statistical significance is more robust.

Cashflows are positively related to ROA is implied by the negative impact of leverage, the higher the cashflow, the less the need for borrowing (consistent with the Pecking Order theory). but the estimate values decline, as returns on cash holding is marginal if it is not deployed. Cashflow has a very high estimate for Q prior to the crisis when there is a premium put on liquidity, this drops rapidly in the next two periods and is not statistically significant. During the post-crisis recovery period, we see the estimate changes signs as investors reward using cash for investments. This validates my second hypothesis.

Revenues has a positive impact in all 3 periods on ROA, which is not unexpected (although it is statistically insignificant after the crisis). However, it has a negative impact on Q in all three periods which seems counter-intuitive. Again, this is a validation of my second hypothesis.

Asset productivity has the same impact for both performance measures although we see that the coefficients are much higher for Q than for ROA. The possible reason for the drop in productivity post-crisis is increase in investments which will impact the denominator and lowers the ratio.

Section 7

Conclusion

This paper compares the performance of large-cap firms before, during and after the financial crisis of 2008. Literature suggested that the most predictive variables impacting performance would be leverage, asset productivity, revenues and cashflows. Of these, leverage, with its potential for financial distress gets the most coverage in research publications. A key finding of this study is in Q, where we see a change in sign for leverage from negative for the previous two periods, to positive in the post-crisis period. This is important because it strengthens the explanatory power of the Pecking Order theory of capital structure which emphasizes the importance of information asymmetry and predicts a negative correlation between profitability (ROA in this case) and leverage. Pecking order theory also suggests a positive correlation between market value (Q in this case) and leverage and we see this validated by the data in the post-crisis period.
The regression results for Q in post crisis period shows some significant differences compared to the Crisis and Pre-Crisis periods. The most notable difference, as stated earlier, is the change in sign of the coefficient of leverage during the post-crisis period. This points to the need for financial flexibility coming out of a crisis to invest for the coming upturn. The second difference in this post-crisis period is that the coefficient of cashflow which is positive during the two preceding periods, turns negative in the recovery phase, pointing to the advantage of financial flexibility (internal cashflow vs. external borrowings).

The results show that during the 2007-8 financial crisis, the Pecking Order theory has more explanatory power than the other two theories considered. As Bharath, Pasquariello, and Wu (2008) found in their research, firms which face higher information asymmetry have more tendency to follow the prediction of Pecking Order theory. During the 2008 financial crisis, the amount of information asymmetry was arguably larger than the other periods, resulting in the increase of explanatory power of Pecking Order theory.

One limitation of this research is regarding the chosen turning point of the financial crisis occurrence. There is no academic consensus on the exact timing of the onset of this financial crisis exposing the risk of overlapping period in the data set. This paper selected the years 2007-9 as the period for the crisis to be consistent with the published literature on the time-line. Although this research emphasizes the timing around the financial crisis, it does not provide an inarguable exact point on when the financial crisis did start. Further research could be done adopting a different timing period of the crisis.
Section 8  REFERENCES

- Alghifari et al. (2013), Effect of Return on Assets (ROA) Against Tobin's Q: Studies in Food and Beverage Company in Indonesia Stock Exchange Years 2007-2011
- Bierlen and Featherstone (1995), Fundamental q, Cash Flow, and Investment: Evidence from Farm Panel Data
- Bolton et al. (2013), A Unified Theory of Tobin’s q, Corporate Investment, Financing, and Risk Management
- Booth (2001); Capital structures in developing countries
- De Jong et al. (2008), Capital structure around the world: The roles of firm-and country-specific determinants
- Duchin et al. (2010), Costly External Finance, Corporate Investment, and the Subprime Mortgage Credit Crisis

• Harrison and Widjaja (2013), Did the financial crisis have an impact on the financial structure of firms

• Hossain and Nguyen (2016), Capital Structure, Firm Performance and the Recent Financial Crisis

• Hutchinson and Michaelas (2004), Determinants of the capital structures of European SMEs

• International Monetary Fund (2008), “Factsheet – The IMF’s Response to the Asian Crisis,”


• Kurshev, Strebulaev. 2015, Firm Size and Capital Structure, Quarterly Journal of Finance


• Lemmon and Zender (2010), Debt Capacity and Tests of Capital Structure Theories


• Medina (2013), Spring Forward or Fall Back? The Post-Crisis Recovery of Firms


APPENDICES

Below are the variance inflation factors (VIF) outputs using Proc Reg in SAS. These factors measure the inflation in the variances of the parameter estimates due to collinearities that exist among the regressor (independent) variables. This calculation is done independently for ROA and Tobin’s Q and for each time period (Pre Crisis, Crisis and Post Crisis). The outputs are shown below:

**Model: Pre-Crisis**
Dependent Variable: ROA Return on Assets

![Graphs showing residual distribution, predicted value vs. quantile, and other diagnostics related to the model.](image-url)
Model: Pre-Crisis
Dependent Variable: Tobin’s Q

Fit Diagnostics for Tobin_Qx

- Residual vs Predicted Value
- RStudent vs Predicted Value
- Residual vs Quantile
- Tobin_Qx vs Predicted Value
- Cook’s D vs Observation
- Fit–Mean vs Residual
- Proportion Less vs Residual

Observations 2505
Parameters 5
Error DF 2500
MSE 0.8904
R-Square 0.3298
Adj R-Square 0.3287
Model: Crisis Period
Dependent Variable: ROA Return on Assets

Fit Diagnostics for ROA

Observations 3018
Parameters 5
Error DF 3013
MSE 0.005
R-Square 0.4444
Adj R-Square 0.4437
Model: CRISIS PERIOD
Dependent Variable: Tobin's Q

Fit Diagnostics for Tobin_Qx

- Residual vs. Predicted Value
- Cook's Distance vs. Observation
- Percent vs. Residual
- Fit-Mean vs. Residual
- Proportion Less

Observations: 2543
Parameters: 5
Error DF: 2538
MSE: 0.5312
R-Square: 0.2495
Adj R-Square: 0.2483
Model: POST CRISIS
Dependent Variable: ROA Return on Assets

Fit Diagnostics for ROA

- Residual vs Predicted Value
- RStudent vs Predicted Value
- RStudent vs Leverage
- Residual vs Quantile
- Return on Assets vs Predicted Value
- Cook's D vs Observation

Fit-Mean vs Proportion Less: Residual

Observations: 3008
Parameters: 5
Error DF: 3003
MSE: 0.0029
R-Square: 0.5858
Adj R-Square: 0.5852
Model: POST CRISIS
Dependent Variable: Tobin's Q

Fit Diagnostics for Tobin_Qx

Observations 2543
Parameters 5
Error DF 2538
MSE 0.3102
R-Square 0.2504
Adj R-Square 0.2492