US Corporate Responses to the "Great Recession" (2007-2009): Evidence from the Entrails

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The Great Recession of 2007-09 and US government response to prevent another great depression forced changes in businesses. We evaluate changes in the operations, investment and financing policies of the largest US firms- S&P500 companies, and identified differences in key operating and financing parameters after the crisis. LOGIT analysis of ratios classified pre and post crisis firms correctly confirming the firms differences in pre and post meltdown periods (gross margin, Tobin's Q, capital intensity, total returns, and capital turnover ratio were significantly different). This suggests firms behaved as anticipated from corporate finance prescriptions i.e. overall US corporate response was rational.

INTRODUCTION

In this paper, we examine how the 2007-2009 Global Financial Crisis - *financial meltdown* precipitated in the US which impacted worldwide markets and economies - has affected corporate decisions on key areas such as Financing Policy and the Capital Expenditure Investment. The record low interest rate environment engineered by the US Federal Reserve skewed the incentives to finance using debt v/s equity for example, while also impacting the willingness and ability of firms to undertake capital expenditure. As well, the pressure to reduce costs resulted in shutting down operations that were rendered uneconomic and unnecessary. For example the US Auto Industry shut 18 factories after 2008 and curtailed "job bank" programs they had run to keep workers on payroll even after their jobs were eliminated Castonguay (2013).

Managers tasked with both managing the fall-out of the crisis and positioning their firms for developments coming down the pike, are expected to have made decisions that would be different than under more normal operating conditions, to ensure that the systemic risk then manifested and the high level of government intervention to generate a 'new normal' would benefit their shareholders. Of course, the larger the firms the greater their strategic options, resources, and perhaps know-how in these matters. These large firms are arguably more likely to be actively traded in the capital markets, highly visible, able to attract and retain competent and responsive managers operating in the interest of their shareholders and have more effective agency problem controls. We examine the member firms of the Standard and Poor's 500 and compare their financial positions and changes from 2006 to 2010 to look for evidence of their responsiveness and how the changes fit standard financial theory prescriptions. We expect to find

evidence that the firms in this group overall reacted in a predictable manner- such as by increasing leverage to capitalize on record low interest rates, increase gross margins by cutting costs in line with reduced demand - to manage both the risk they faced and benefit from the opportunities being opened up. Being among the most widely traded firms, they have high visibility, impact the markets, and are the best positioned to implement financial and operational restructuring. We analyze data from the year 2006 (*Pre-financial crisis)* and 2010 (*Post financial crisis)*

HYPOTHESES DEVELOPMENT and VARIABLES USED

As a consequence of the broad based wealth erosion from the housing market collapse, widespread job-losses and impacts to their investment portfolios (*retirement and savings values declined dramatically*), consumers cut back on their expenses and demand for goods and services fell dramatically. In response firms also tightened their belts, and engaged in major cost cutting. Based on prior research in the literature, we selected ten financial variables that reflect the operating decisions as well as financial structure and investment policies of firms. We analyzed them 2006, pre-meltdown and 2010, post-meltdown to identify if our priors of significant changes were upheld. The variables studied are:

One year total return (1YTR) variable measures the bottom-line results for the firms during the year analyzed. The base year stock prices were lower in 2009 than in 2006 – the effect of the great recession. Debt costs were also at record low levels as the US Federal Reserve and Foreign Central Banks forced interest rates to levels not seen before in an attempt to stimulate the economy and try to inflate asset prices to engineer "soft landings" for the economy. We, therefore, anticipate that the cost reduction coupled with much lower financing costs would result in returns to shareholders being higher in 2010 *post meltdown* than in 2006 – *pre meltdown*. Both the *insurance needs* for firms dealing with unknown and risky operating environment, and the really low cost of debt capital incented management to hoard cash and to raise more debt capital that was used to shore up balance-sheets of firms. Adjei (2013) concluded that firms with low cash reserves had the largest declines in performance following the onset of the financial crisis. Fresard (2010), showed that large cash reserves lead to systematic future market share gains at the expense of industry rivals, and suggested that cash policy encompasses a substantial strategic dimension. Schilling (1996) highlights the importance of Cash Turnover in determining optimal liquidity position necessary to support a given level of business activity. With little incentive to engage in major capital expenditure projects in the face of low and uncertain demand, companies were holding on to as much cash as they could garner, thus conserving Net Working Capital. We therefore expect a lower cash turnover (CT) in 2010 than in 2006, when operations were more 'normal'

Total Asset Turnover (TAT) is another explanatory variable used in this study. Firms downsized by shedding surplus capacity, under-performing assets and drawing down inventories. To that extent we would expect this ratio to go up, though the downdraft in revenues in the face of slack demand might counter this effect to some extent. So we do not have any strong priors for this variable, and the net effect would depend on which of the effects was dominant. Firm earnings did improve due to cost containment and downsizing and we expect this to reduce Price-Earnings Ratios (P/E). However, this is also a prospective measure in that it captures market perceptions of growth prospects, and when the economy was expected to recover. That would serve to raise the ratio. Hence the net effect would depend on which impact would be higher – so we do not have strong priors about this ratio in 2010 over 2006.

We expect Return on Assets (ROA) ratio to benefit from two effects – the improving profit picture as a result of cost cutting and containment and the reduction in Assets values due to reduced capital investments and depreciation of existing capital stock. Hennessy (2004) models the impact of debt levels – overhang – on the capital investment by firms. Thus here we expect the returns in the *post meltdown* period 2010 to be higher than in the *pre-meltdown* period 2006. Debt Ratio (DR) is measured by total debt to total assets. Farhi (2009) studying the US financial crisis, establishes a relationship between monetary developments and trends in private leverage and its structure. For the reasons already discussed – *record low level of cost of debt* – we expect this ratio to have gone up *post meltdown*. While leverage increases risk to shareholders, the abnormally low interest rate environment created by central bankers

skews incentives for firms to ramp up debt and lock in these rates for as long as possible. Even if the leverage structure is beyond the optimal capital structure range, it makes sense for managers to borrow more and lock in lower financing costs. The negligible after tax cost of debt provides all the incentives needed to bring this *post crisis* ratio to be higher than the *pre-crisis* levels. Baum et.al (2012) found that US firms' demand for liquidity was sensitive to uncertainty facing the firm and the quality of corporate governance. ROA has been used by Erkens et al. (2012) as a measure of firm profitability while examining the impact of corporate governance during the financial crisis.

Capital Intensity (CAPINT) ratio expresses the capital expenditure as a percentage of Property, Plant and Equipment and is a measure of the propensity of firms to undertake capital expenditure during the year. Given the stagnant though slowly growing economy, we do not expect firms to have undertaken large capital expenditure during the *immediate post meltdown period.* In fact, we expect this to be lower for 2010 than in 2006, even though firms would have shed PPE during the financial meltdown and aftermath – thus ameliorating the impact of the underlying trend. Campello et al (2010) report that more than half of their survey respondents (more than 500 CFOs) indicated that their companies cancelled or postponed their planned capital investment because of the financial crisis.

Total Assets (LNTA) is a measure of the total firm size using a logarithmic scale. Logarithm of Total Assets has been used by Erkens et al. (2012) as a measure of firm size while examining the impact of corporate governance during the financial crisis. We expect that this variable would be lower *post meltdown* 2010 than *pre-meltdown* 2006 with firms having shed less productive assets. Even so, to some extent we have consolidation of firms – *especially financial firms* – that resulted in increase in total assets for some. Overall though, our priors remain that 2010 would be smaller than 2006. Gross Margin (GM) is a measure of profitability for firms and with very low levels of inflation, good cost containment, and lower financing costs we anticipate increase in this ratio *post meltdown* 2010 as compared to *pre-meltdown* 2006. Tobin's Q is a measure of market power computed as {Total Assets + (Market value of Equity – Book Value of Equity)} / Total Assets, and is a proxy for the value added by the firm's operations & management (see Hirschey and Connolly 2005 and Adams (2012)). The direction of the change in this is uncertain, as the book value of equity would have been eroded by cumulative losses during the financial crisis period, which to some degree would have also offset the decline in market value of equity during the financial crisis period. Hence we have no strong priors overall for this ratio. Bolton et. al.(2011) highlight the central importance of the endogenous marginal value of liquidity (cash and credit line) for **corporate** decisions.

DATA AND SAMPLE

Data for S&P 500 firms were obtained from Research Insight (Compustat) for the years 2006 and 2010. The great recession started in late 2007 and ended in the middle of 2009. The database used in this study consists of ten attributes for each firm. These attributes are: 1) one-year total return; 2) Cash turnover ratio; 3) Total assets turnover ratio; 4) Price earnings ratio; 5) Return on Assets; 6) Total Debt to Total Assets ratio; 7) Capital expense to Property, Plant & Equipment ratio; 8) Natural logarithm of the Total Assets; 9) Gross Margin; and 10) Tobin's Q ratio. Following Hirschey and Connolly (2005), Tobin's Q ratio is approximated by the following formula: [Total Assets + Market Value of Equity – Book Value of Equity] / Total Assets. Support for using these specific variables is found in earlier research described in the literature review section.

RESULTS

We provide a summary of descriptive statistics in Table 1. For pre-meltdown (2006) and post-meltdown (2010) years separately, this table reports the mean, the standard deviation, and T-statistics for variables used in this study. Mean values indicate that the post-meltdown period has higher one-year total returns, higher debt ratios, and most importantly, higher gross margins. However, the pre-meltdown period has higher cash turnover, higher total asset turnover, higher capital intensity and most importantly, higher

Tobin's Q ratios. T-tests for mean difference indicate that total assets and one-year total returns are significantly different between the two periods. T-test results also indicate that capital intensity and Tobin's Q ratios are significantly different between the two periods.

TABLE 1
DESCRIPTIVE STATISTICS

	Firm Year	N	Mean	Std. Dev.	T-statistic
1 Year Total Return	2006	467	18.927	26.164	
	2010	489	23.855	27.689	2.826[a]
Cash Turnover	2006	481	26.672	81.153	
	2010	494	17.912	42.428	-2.104[b]
Total Asset Turnover	2006	482	0.923	0.763	
	2010	495	0.838	0.728	-1.792[c]
Price Earnings	2006	476	26.745	97.817	
	2010	491	17.955	43.857	-1.812[c]
Return on Assets	2006	491	7.375	6.982	
	2010	500	6.696	6.035	-1.640
DebtRatio	2006	489	0.220	0.172	
	2010	496	0.236	0.171	1.459
CapInt	2006	447	0.248	0.159	
	2010	458	0.186	0.114	-6.651[a]
LnTA	2006	491	9.312	1.448	
	2010	500	9.607	1.347	3.314[a]
GM	2006	491	0.254	3.687	
	2010	500	0.430	0.218	1.061
Tobin's Q	2006	478	2.266	1.467	
	2010	491	1.910	1.104	-4.253[a]

[a] two-tailed significance at < 0.01 level
[b] two-tailed significance at < 0.05 level
[c] two-tailed significance at < 0.10 level

We provide a summary of Pearson correlation coefficients for the variables in Table 2. There are a number of strong correlations among the variables. Return on assets is positively correlated with Tobin's Q, gross margin, and total assets turnover and negatively correlated with debt ratio. Debt ratio is negatively correlated with capital intensity and total assets turnover. There is a positive relationship between gross margin and capital intensity. There is a strong negative association between gross margin and total assets turnover. Tobin's Q has strong positive correlation with capital intensity, gross margin, one year total return, and total asset turnover. Tobin's Q is negatively correlated with debt ratio and logarithm of total assets. Even though some of these relationships among independent variables are significant at conventional levels, none of the correlations are greater than 0.590. Only two correlations (out of 45) are greater than 0.4. According to Judge, Griffiths, Hill and Lee (1985), multicollinearity problems arise only when the correlations among explanatory variables are higher than 0.8. Hence, the

degree of collinearity present among independent variables appears to be too small to invalidate estimation results.

TABLE 2
PEARSON CORRELATION COEFFICIENTS

	Firm Type	1 Year Total Return	Cash Turnover	Total Asset Turnover	Price Earnings	Return on Assets	Debt Ratio	CapInt	LnTA	GM	Tobin's Q
Firm type	1.00										
1 Year Return	.103	1.00									
Cash Turnover	-.073	.004	1.00								
Total Asset Turnover	-.069	.081	.106	1.00							
Price Earnings	-.053	.163	-.009	-.010	1.00						
Return on Assets	-.056	.131	.011	.281	-.001	1.00					
DebtRatio	.086	.001	.151	-.202	-.059	-.297	1.00				
CapInt	-.214	.024	-.108	.098	.100	.229	-.285	1.00			
LnTA	.117	-.161	-.030	-.270	-.089	-.342	.145	-.290	1.00		
GM	.028	-.009	-.113	-.352	.029	.276	-.078	.262	-.211	1.00	
Tobin's Q	-.135	.313	-.054	.226	.162	.590	-.239	.421	-.492	.393	1.00

Multivariate Tests - Logit Model

Using the independent variables in a multivariate context, however, allows one to examine their relative explanatory power and can lead to better predictions since the information contained in the cross-correlations among variables is utilized. A primary objective of many multivariate statistical techniques is to classify entries correctly into mutually exclusive groups. Multiple discriminant analysis, PROBIT, and LOGIT represent such multivariate models.

In this study, the following logistic regression (LOGIT) model is proposed:

$$Pr\ (Y=1|X) = F\ (\beta_0 + \beta_1\ x_1 + \beta_2\ x_2 +.....+ \beta_K\ x_k) \qquad (1)$$

The dependent variable Y is a dichotomous (0, 1) variable representing the two groups, S&P firms in 2006 before the market meltdown (Y=0) and S&P firms in 2010 after the market meltdown (Y=1). The independent variables $X_1, X_2, ... X_K$ include the return on assets, Tobin's Q, size, one year total return, capital intensity, debt ratio, gross margin, PE ratio and asset turnover measures described in the previous section. Specifically these explanatory variables are given in table 3 below:

TABLE 3
VARIABLES USED

	VARIABLES
1YTR	1 year total return
CT	Cash turnover
TAT	Total assets turnover
PE	Price earnings ratio
ROA	Return on Assets
DR	Total Debt / Total Assets
CAPINT	Capital expense to Property, Plant & Equipment ratio
LNTA	Natural logarithm of the Total Assets
GM	Gross Margin
Tobin's Q	[TA + Market Value of EQ – Book Value of EQ] / TA

It is assumed that no exact linear dependencies exist among X's across k, and that the relationship between Y's and X's are non-linear or logistic (i.e., $P(Y = 1|X) = \exp(\Sigma\beta_K X_K) / [1 + \exp(\Sigma\beta_K X_K)]$.)

The null hypotheses would be:

$H_0 : \beta_k = 0$, where $k = 1,...10;$

LOGIT results appear in Table 4. Of the ten explanatory variables, only five were statistically significant and they are discussed here.

Null hypothesis 1 (H_1) suggests that there is no statistically significant difference in one-year total return between "pre-meltdown" and "post-meltdown" years. The coefficient estimate for this variable is 0.014 and is statistically significant at conventional levels. This suggests that one-year total return is different between the two periods. Post-meltdown period had larger one-year total returns than the pre-meltdown period.

H_2 (null) suggests that there is no statistically significant difference in cash turnover ratios between "pre-meltdown" and "post-meltdown" years. The coefficient estimate for the cash turnover ratio is -0.005 and is statistically significant at the 0.01 level. This suggests cash turnover ratios are different between the two periods. Firms in the pre-meltdown period had, on average, higher cash turnover ratios.

H_7 (null) suggests that there is no statistically significant difference in the capital intensity measure between pre-meltdown" and "post-meltdown" years. The coefficient estimate for the capital intensity variable is -3.210 and is statistically significant at the 0.01 level. This suggests that the capital intensity measure is different between the two periods. Firms in the pre-meltdown period had, on average, higher capital intensity ratios.

TABLE 4
**LOGIT ANALYSIS RESULTS TO TEST FOR DIFFERENCES IN FINANCIAL
ATTRIBUTES OF S&P 500 FIRMS: PRE-MELTDOWN VS POST-MELTDOWN**

$$P(Y=1|X) = \beta_0 + \beta_1 \, 1YTR_i + \beta_2 \, CT_i + \beta_3 \, TAT + \beta_4 \, PE + \beta_5 \, ROA + \beta_6 \, DR + \beta_7 \, CAPINT_i$$
$$+ \beta_8 \, LNTA_i + \beta_9 \, GM_i + \beta_{10} \, TOBIN'S \, Q \qquad (2)$$

VARIABLE	COEFFICIENT	CHI-SQUARE
INTER	-0.585	0.527
1YTR	0.014	21.660[a]
CT	-0.005	7.218 [a]
TAT	0.191	2.318
PE	-0.001	1.433
ROA	0.014	0.684
DR	0.466	0.896
CAPINT	-3.210	22.789 [a]
LNTA	0.084	1.545
GM	1.721	13.822 [a]
TOBIN'S Q	-0.341	11.652 [a]

[a] two-tailed significance at < 0.01 level
[b] two-tailed significance at < 0.05 level

NAGELKERKE R SQUARE = 0.137
MODEL LOG LIKELIHOOD = 1099.41
PERCENT CORRECTLY CLASSIFIED = 63.9

H_9 (null) suggests that there is no statistically significant difference in gross margin ratios between "pre-meltdown" and "post-meltdown" years. The coefficient estimate for the gross margin ratio variable is 1.721 and is statistically significant at the 0.01 level. Firms in the post-meltdown period had, on average, higher gross margin ratios. This is along the expected lines.

H_{10} (null) suggests there is no statistically significant difference in Tobin's Q ratios between "pre-meltdown" and "post-meltdown" periods. The coefficient estimate for Tobin's Q is -0.341 and it is statistically significant at the 0.01 level. Firms in the pre-meltdown period had, on average, higher Tobin's Q ratios. Tobin's Q has been used in prior research as a proxy for growth and firm value.

CONCLUSION

The once in a lifetime Great Recession caused as a result of the financial crisis has had significant impacts on the operations and prospects of the large US firms that comprise the S&P500 index. In response to the extreme stress exerted, we find evidence in the 'entrails' – financial ratios and variables that capture the effect of managerial decisions as well as the changes in the operating environments of the firms. To reiterate, we found statistically significant evidence that these large firms had cut costs and increased overall operating efficiency to provide larger returns to shareholders post-meltdown than in the pre-meltdown phase. We also find that cash turnover ratios had slowed down after the crisis, reflecting pre-cautionary buildup of liquidity by firms, incented to some degree by the prevailing very low interest rate environment engineered by the US Federal Reserve. The cutting back of capital expenditure is reflected in the reduced capital intensity of the firms' post-meltdown, evidence of the trend that politicians had been lamenting – *the unwillingness of corporate America to invest in the US and increase employment growth.* With unemployment still high and consumer confidence low, the reluctance to invest in the absence of demand from consumers is justified.

The reduction of Tobin's Q ratios post-meltdown could also be explained by the still serious decline in market values of equity from the pre-meltdown period, and the inadequacy of declining book value of equity to offset the market value erosion. We anticipate that this is however a short term phenomenon as the continued improvement in equity price levels from 2010 would doubtless improve the Tobin's Q ratios through 2013-2014.

We conclude that overall the US Corporate response has been rational and along anticipated lines for the most part. We also expect continued improvement in both the internal operating metrics as well as the market valuation of these firms as the low cost of capital enjoyed over the past 5 years continues to provide opportunities for improved profitability and wealth creation.

Finally, different industry firms in the data-set analyzed are expected to be impacted differently. The reasons for the differential impacts include, difference in risk, capital intensity and debt capacity – certain industries can support higher debt levels than others - exposure to domestic v/s international markets and possible business cycle synchronicity impacts across countries. Hence, while we capture the overall impacts for the S&P500 firms, some of the effects might be muted due to differential industry impacts.

REFERENCES

Adams, R.B. (2012). "Governance and the Financial Crisis. *International Review of Finance*. 12(1): 7-38.

Adjei, Frederick, (2013), "The Effects of Cash Holdings on Corporate Performance During a Credit Crunch: Evidence From the Sub-prime Mortgage Crisis", *Journal of Economics & Finance*. Apr2013, Vol. 37 Issue 2, p188-199.

Baum, Christopher F; Chakraborty, Atreya; Han, Liyan; Liu, Boyan.(2012). "The Effects of Uncertainty and Corporate Governance on Firms' Demand for Liquidity," *Applied Economics*. 2012, Vol. 44 Issue 4, p515-525.

Bolton, Patrick; Chen, Hui and Wang, Neng (2011). "A Unified Theory of Tobin's q, Corporate Investment, Financing, and Risk Management." *Journal of Finance*. Oct2011, Vol. 66 Issue 5, p1545-1578.

Campello, M., J.R. Graham and C. R. Harvey. (2010). "The Real Effects of Financial Crisis: Evidence from a financial crisis." *Journal of Financial Economics* 97(3): 470–487.

Castonguay, Guiles. (2013). "At Fiat, Getting Paid Not to Work," *The Wall Street Journal*, 35(2), 217-223.

Erkens, D.H., M. Hung and P. Matos. (2012). Corporate Governance in the 2007-2008 financial crisis: Evidence from financial institutions worldwide. *Journal of Corporate Finance*. 18(2): 389-411.

Farhi, , Emmanuel and Jean Tirole (2009). "Leverage and the Central Banker's Put," *American Economic Review*. May2009, Vol. 99 Issue 2, p589-593.

Fauzi, F. and S. Locke. (2012). Board structure, Ownership structure and Firm performance: A Study of New Zealand Listed Firms. *Asian Academy of Management Journal of Accounting and Finance.* 8(2): 43-67.

Fresard, Laurent (2010). "Financial Strength and Product Market Behavior: The Real Effects of Corporate Cash Holdings," *Journal of Finance*. Jun, Vol. 65 Issue 3, p1097-1122. 26p. 7.

Hennessy, Christopher A. (2004). "Tobin's *Q*, Debt Overhang, and Investment" *The Journal of Finance*, 59(4), 1717-1742.

Hirschey, M. and R. A. Connolly. (2005). "Firm Size and the Effect of R&D on Tobin's q," *R & D Management*, 35(2), 217-223.

Judge, G., W. E. Griffiths, R. C. Hill, H. Lütkepohl and T. Lee. (1985). The theory and practice of econometrics. (John Wiley and Sons, New York, NY).

Schilling, G. (1996). "Working Capital's Role in Maintaining Corporate Liquidity," *Treasury Management Association Journal*, September / October 1996.