The Determinants of Capital Structure: Comparison between Before and After Financial Crisis

Barry Harrison and Theodorus Wisnu Widjaja[1]

ABSTRACT

The financial crisis of 2008 provides an interesting opportunity to investigate the effect of the crisis on the capital structure decisions of firms. Over the years, capital structure choice has attracted considerable attention in the literature and is important to firms, investors and policy makers. We find that during the 2008 financial crisis, the coefficients of tangibility and market to book (MTB) ratio exert a stronger influence on capital structure choices than prior to 2008. We also find that the coefficient of profitability exerts less influence on capital structure choice than before the crisis. In addition, the sign of the coefficient of firm size is negative, which is exactly the opposite of the situation that existed before the crisis. Further analysis indicates that during the 2008 financial crisis, pecking order theory has more explanatory power than trade-off and market timing theory.

1. INTRODUCTION

In pursuit of maximising firm value, financial managers are charged with two main responsibilities: investment decisions and capital structure choices (Watson and Head 2010). The capital structure of a company is particularly important, because it impacts on the ability of the firm to take up investment opportunities. For example, debt gives firms more financial agility in taking up investment opportunities because, in general, debt can be raised more quickly than either equity finance or the accumulation of earnings. Debt might also enable firms to increase their after-tax earnings by exploiting available tax shields.

Myers (2001) has argued that there is no universal theory of the debt/equity choice and no reason to expect one. Despite this, scholars formulate the determinants of capital structure in the framework of trade-off theory, pecking order theory, or market timing theory. However, earlier tests of these theories produced ambiguous results. For example, the trade-off theory

argues that the correlation between profitability and leverage ratio is positive and the higher the profit, the higher the leverage ratio. On the other hand, Rajan and Zingales (1995) find a negative correlation between profitability and leverage ratio implying that the higher the profitability, the lower the leverage ratio. Akdal (2010) finds that the market to book ratio is negatively correlated with leverage ratio, while Lemmon and Zender (2010) find a positive correlation between market to book ratio and leverage ratio. These opposing results suggest that capital structure theories might not be consistent as financial and/or economic conditions change.

Bharath *et al* (2009) investigate the core of pecking order theory: asymmetric information. The proxies for information asymmetry are market liquidity and transactions costs. Transaction costs (for example the bid-ask spread) have three main components: order processing, inventory, and adverse selection. Bharath *et al* (2009) argue that adverse selection is positively correlated with the level of information asymmetry. Furthermore, they find that if the basic assumption of pecking order theory, severe adverse selection (and information asymmetry), is dominant in the data, then the theory performs better in predicting capital structure choices.

The recent financial crisis provides an opportunity to investigate the effect of a financial shock on capital structure and to assess the performance of the various theories of capital structure. Bhamra *et al* (2010) find that firms are more conservative in their financial policy knowing that there is a possibility of rare and random economic crises. Ariff *et a*l (2008) find that the speed of capital structure adjustment is significantly slower for financially distressed firms. A survey of the real effects of financial constraints during financial crises reveals that constrained firms tend to use internal funding and put more effort into obtaining credit from banks, anticipating restricted access to credit in the future (Campello *et al* 2010).

The purpose of this paper is to investigate whether the recent financial crisis has had any impact on the financial structure of firms. Table 1 presents some introductory data which, at the very least, suggests that the financial crisis might have led to a change in firms' preferences for raising capital through leverage.

Table 1: Securities issuance of US firms ($mn)

Year	*Bonds*	*Stocks*	*Total*
2004	1,923,094	147,585	2,070,679
2005	2,323,735	115,255	2,438,990
2006	2,590,863	119,165	2,710,028
2007	2,500,770	118,642	2,619,412
2008	2,220,530	168,571	2,389,101
2009	970,694	233,967	1,204,661
2010	893,717	131,135	1,024,852
2011	909,109	233,967	1,143,076

Source: www.federalreserve.gov

2. Literature Review

Capital structure theory stems from Modigliani and Miller (1958), who argue that firm value is uninfluenced by capital structure choices and that capital structure is irrelevant to both firm value and the cost of capital, as long as firms focus on value maximisation. Given certain assumptions,[2] Modigliani and Miller (1958) argue that any attempt to reduce the proportion of equity in the firm's overall capital structure by substituting debt for equity would equivalently reduce the price of debt and raise the price of equity, thus keeping the overall cost of capital constant (the reverse holds as well). However, it is now generally recognised that the assumptions made by Modigliani and Miller (1958) are too restrictive and as a result other theories have emerged in the capital structure debate.

Pecking order theory, trade-off theory and market timing theory have thrown up several variables as possible determinants of capital structure, including tangibility, profitability, size, market to book ratio, and liquidity. In brief, pecking order theory implies that firms prefer to employ internal finance and, when external finance is necessary, debt is preferred to equity. The rationale for this is based on information asymmetry: managers are better informed than outsiders about the firm's prospects and are thus less likely to issue equity when they feel the firm is undervalued. Market timing theory takes a different view and implies that managers are indifferent between sources of finance from one period to the next: they simply use the least cost method available at the time the firm is seeking finance. Trade off theory implies that firms exploit tax shields up to the point at which additional debt would increase the likelihood of financial distress.

Investigations into capital structure have produced ambiguous results. Marsh (1982) for example, finds that tangible assets and leverage are positively correlated. Shah and Khan (2007) find that a company which has a relatively large proportion of fixed assets usually pays lower rates of interest on its borrowing costs. Myers and Majluf (1984) and Titman and Wessels (1988) find that profitable companies tend to finance investments from internal sources and therefore such companies tend to be associated with lower levels of leverage.

Using international samples of the G7 countries, Rajan and Zingales (1995) focus on four determinants of capital structure: tangible assets, market to book ratio, size, and profitability. They find that in most countries, size and tangible assets are positively correlated with the level of debt, providing support for the trade-off theory of capital structure. However, they also find that market to book ratio and profitability are negatively correlated with the level of debt, which provides support for the pecking order theory. This ambiguity is explained by Myers (2001) who suggests that any capital structure theory might work better in some circumstances than others, since the theories could not be applied generally to various sets of capital structure determinants used in the studies.

Focussing on US companies in the period 1973-1994, Graham (2000) finds that the benefit of capitalised interest tax shields is about 10 per cent of firm value, but that the level of debt could be increased up to the point where, although incremental benefit decreases, the overall benefit of the tax shield rises to up to 15 per cent of firm value. The existence of unused tax shields, and therefore by implication conservatism towards increasing debt levels, reflects only weak support for trade-off theory, since this theory suggests firms should exploit the tax shield benefit effectively.

Using survey data from 16 European countries (Austria, Belgium, Greece, Denmark, Finland, Ireland, Italy, France, Germany, Netherlands, Norway, Portugal, Spain, Switzerland, Sweden, and United Kingdom), Bancel and Mittoo (2004) examine the relationship between theory and practice in capital structure decisions across countries with different legal systems. Their results show that financial flexibility is a significant factor in financial decisions. Financial flexibility is gained by having the ability to properly time debt or equity issuance according to the level of interest rates and the market value of equity. Furthermore, their findings show that firms do not rank agency costs or asymmetric information as important considerations in capital structure decisions. Overall they conclude that support for trade-off theory in capital structure choice is more apparent than support for pecking order theory.

Akdal (2010) examines different types of firm characteristics in the UK which may be related to the capital structure of firms, and finds that profitability, non-debt tax shields, volatility, and liquidity are significantly negatively correlated with the level of debt, giving some support to pecking order theory. However, tangibility and size are significantly positively correlated with the level of debt, providing support for the static trade-off theory. Lemmon and Zender (2010) control for debt capacity when investigating the capital structure of public companies in the United States between 1971 and 2001. Having allowed for debt capacity, they find that pecking order theory explains the observed financing behaviour of a broad cross section of firms because, on average, firms use internal funding to finance their investments.

In a different study, Antoniou *et al* (2008) argue that despite extensive investigation of capital structure, two fields remain unexplored by researchers. One is the impact of dissimilarities in the legal and governance environment. In the UK and USA we have common law and a market based governance structure, whilst in France and Germany the law is codified and bank based governance structures are the norm. Japan is a hybrid of both. The second factor is the impact of macroeconomic conditions which might influence the capital structure choice of firms. These authors find similarities between the determinants of capital structure among the five countries investigated, but the importance of these factors varies between the countries. This suggests that firm-specific factors cannot altogether explain capital structure and that country specific factors are also important. They also find evidence that the macroeconomic environment is important in explaining capital struc-

ture choice, but again the importance of this varies between the countries needs to be investigated.

Similarly, De Jong *et al* (2008) investigate the influence of firm-specific and country-specific factors in the capital structure choice of firms in a sample of 42 countries between 1997 and 2001. They find that firm specific factors (asset tangibility, firm size, and profitability and growth opportunities) have a significant impact on the capital structure choice in most countries. However, they also find that, for each country investigated, at least one of these factors is not significant and in a few countries, capital structure is inconsistent with the predictions of any theory of capital structure. They further find that creditor right protection, bond market development and GDP growth have a significant impact on corporate capital structure. The implication is that firms in countries with stronger legal protection and healthier economic conditions are more likely to take on debt. In other words, country specific factors matter in capital structure decisions.

Most studies show a positive correlation between leverage and tangibility (and size), which implies a role for trade-off theory in capital structure decisions. However, this role for trade-off theory is contradicted, since the correlation between leverage and profitability is negative. This contradictory finding can be found in several studies, such as Titman and Wessels (1988); Rajan and Zingales (1995); Antoniou *et al* (2008); De Jong *et al* (2008); and Akdal (2010). Fama and French (2002) argue that each capital structure theory possesses one defect in predicting the financing choices of firms. Thus pecking order theory fails to explain why small, low-leverage, growth firms have large equity issues whilst trade-off theory is unable to explain the negative correlation of leverage and profitability.

Shyam-Sunder and Myers (1999) investigate a sample of 157 US firms and find that these firms largely finance their deficits with debt. They conclude that the pecking order theory provides a good first-order approximation of the financing behaviour of the firms investigated. Consistent with this view, Fama and French (2002) report that short term variation in earnings and investment is mostly absorbed by debt. In contrast, Frank and Goyal (2003) show that Shyam-Sunder and Myers' empirical findings supporting pecking order theory do not survive when a broader sample of firms, or a longer time series, is used. Chirinko and Singha (2000) argue that the empirical test used by Shyam-Sunder and Myers has little power to distinguish the order of the financing schemes. They argue that the model used by Shyam-Sunder and Myers neglected the possibility of hidden costs of debt or hidden benefits of equity, which might change the preference of the financing order.

A recent study Bartiloro and Iasio (2012) provides an insight into how recent events in the financial system have impacted on firms' capital structure. Economic theory suggests that developed financial systems stimulate economic growth by improving efficiency in the allocation of resources to productive units. This process of channelling funds from savers to productive

users is developing continuously (Allen and Santomero, 1998). However, they argue that in the US, financial innovations in recent years have particularly benefited financial intermediaries, as evidenced by the significant increase in transactions between financial intermediaries relative to transactions between financial intermediaries and non-financial intermediaries. As a result of this, financial firms' balance sheets reflect interconnectedness among financial intermediaries, which might make the domino effect of a financial shock hard to contain within one small group of financial intermediaries. Bartiloro and Iasio (2012) find that, especially in the US, the balance sheet of financial intermediaries has been financed by short-term market instruments, for instance repurchase agreements. They conclude that this makes it difficult for financial intermediaries to adjust their debt offerings when adverse shocks occur.

In the wake of the financial crisis, the amount of credit channelled to non-financial intermediaries has declined in those countries heavily affected by the financial crisis. However, there has not been a pronounced confirmation that the financial crisis has triggered substantial changes in firms' capital structure choices. Kayo and Kimura (2011) find that in 40 countries (of which 18 per cent of their observations were derived from the US), firm-level characteristics and effort in timing the market are still factors that influence heavily the determinants of firms' capital structure choices. Furthermore, they find that in the US, UK, Germany, France, Italy, and Spain, non-financial firms have experienced difficulties in taking advantage of better financing schemes. There may have been significant changes in the financial system that led to the financial crisis, yet the impact of those changes and the crisis itself need to be investigated further before definitive judgements can be passed.

Severe financial crises may leave firms financially constrained. Consequently, most financially constrained firms would experience credit rationing (quantity constraint) in the capital market, higher costs of borrowing (price constraint), and difficulties in opening or renewing a credit line. Furthermore, these financially constrained firms would forego investment opportunities because of difficulties in raising internal or external capital, even if the investments have a positive net present value. These financially-constrained firms may also sell their assets to obtain cash in order to support their operations (Campello *et al* 2010). Since asset reductions might impair the ability of firms to raise debt, firms might be compelled to adjust their capital structure to overcome these adverse circumstances during a financial crisis.

Meanwhile, capital market conditions prior to a financial crisis are generally more favourable than after the financial crisis. Doukas *et al* (2011) investigate the effect of favourable debt market conditions on capital structure choice. They find that the adverse selection costs of equity at the firm level have a significant impact on capital structure choice. Firms tend to engage in debt-financing when equity is out of favour. Engagement in debt-financing

intensifies when debt market conditions are more favourable, regardless of the high adverse selection costs which firms may have. Furthermore, they find the effect of this debt-financing activity on capital structure of the debt issuers persists for more than five years after the issue year. They argue that the trade-off theory of capital structure is contradictory with the financing behaviour of these firms. The implication is that prior to a financial crisis, when the capital market is favourable, trade-off theory cannot explain the capital structure choice of firms.

Choe *et al* (1993) find that the managers of firms are expected to minimise the adverse selection costs of equity finance. They find that during a period of economic expansion, the adverse selection costs of equity tend to decline causing the amount of equity issuance to increase relative to debt issuance. Dittmar and Dittmar (2008) support this finding. They find that during economic expansion, the cost of equity falls relative to the cost of debt. Consequently the financing activities related to equity (equity issuance and equity repurchase) increase significantly during a period of economic expansion, impacting on the capital structure of the firms.

3. Data and Methodology

This research uses data from annual financial statements of non-financial listed companies and is compiled from Compustat North America - Fundamental Annuals, which is accessed from the Wharton Research Database System (WRDS). This database contains information on Income Statement, Balance Sheet, Statement of Cash Flows, and supplemental data items of US companies listed in the stock market from 1950 to today. This research uses the fundamentals annual section of COMPUSTAT North America. The data we extract consists of ACT (Current Assets - Total), AT (Assets - Total), BKVLPS (Book Value Per Share), DLTT (Long Term Debt - Total), INTAN (Intangible Assets - Total), LCT (Current Liabilities - Total), LSE (Liabilities and Stockholders' Equity - Total), LT (Liabilities - Total), SEQ (Stockholders' Equity - Total), EBITDA (Earnings Before Interest), SALE (Net Sales/Turnover), and MKVALT (Market Value - Total - Fiscal).

We omit financial firms from this research because of the incomparable nature of capital structure characteristics and a different balance sheet structure from non-financial firms. This research uses 2004-2007 as the period before the financial crisis; and 2008-2011 as the period after the financial crisis. It is impossible to give a definitive statement that identifies the onset of the financial crisis, so these dates are chosen as representative. Companies from the US S&P 500 Index are used. The US is the epicentre of the 2008 financial crisis and firms in the US have a comprehensive menu of financing options and relatively low cost of capital structure adjustment (Myers, 2001). The choice of using just the US is deliberate and follows Bancel and Mittoo (2004), who find that financial flexibility is affected by different legal systems in different countries. It is therefore important in any investigation into the

effects of the financial crisis on capital structure that managers have access to external financing in the changing financial environment. Furthermore, De Jong *et al* (2008) also find that firms in countries with stronger legal protection and healthier economic conditions are more likely to take on debt. Therefore, to eliminate country specific factor effects in this research, we confine ourselves to firms in the US in our sample.

We specify the following requirements for a company to be included in our sample:

1. Not in the industry of finance such as banks, insurance, leasing, investment, private equity and the like, since they are heavily regulated and have a different type of financial statement. In our data set, there are 82 out of 500 firms which belong in the financial industry.
2. Not newly listed or delisted during the period of research.
3. Availability of certain accounts in the financial statement during the period of research (leverage, tangibility, profitability, size, market to book ratio, liquidity, outstanding shares and shares price).
4. The leverage value is not larger than the total asset value.

Based on the above criteria, 87 firms are excluded from S&P 500, leaving a total sample of 331 firms. Furthermore, our sample is divided into two sub-sample periods representing the pre-crisis and post crisis period. With each sub-sample period covering 4 years, there are 1324 observations for each period.

Following Antoniou *et al* (2008), we use panel data methods and a random effect (RE) model. The RE model applies a different intercept for each data unit in both cross-section and time series, thus maintaining the level of degrees of freedom. We use the software package SAS to examine the presence of significant correlation between the independent variables (tangibility, profitability, size, market to book ratio, and liquidity) and the dependent variable (leverage). Our model is specified as:

$$Y_{it}\ (LEV) = \beta_0 + \beta_1\ TANG_{it} + \beta_2\ PROF_{it} + \beta_3\ SIZE_{it} + \beta_4\ MTB_{it} + \beta_5\ LIQ_{it} + \varepsilon_{it} + u_{it}$$

Where:

LEV = Leverage, proxied by long term debt (Titman and Wessels, 1998; Demirguc-Kunt and Maksimovic, 1999; Booth *et al* 2001; and Hall *et al* 2004).

TANG = Tangibility, the ratio of fixed assets over total assets (book value) (as used in Rajan and Zingales, 1995; De Jong *et al* 2008; Akdal, 2010).

PROF = Profitability, the value of earnings before interest and tax over the book value of total assets (as used in Lemmon and Zender, 2010; Akdal, 2010).

SIZE = Size, the value of log of total sales (as used in Rajan and Zingales, 1995; Akdal, 2010).

MTB = Market to book value, the ratio of total market value of firms' shares

over the book value of total assets (as used in Rajan and Zingales, 1995; Lemmon and Zender, 2010; Akdal, 2010).
(LIQ = Liquidity, the ratio of total current assets to total current liabilities (as used in Graham, 2000; De Jong *et al* 2008; Akdal, 2010).
i is 1, 2, 3,..., N= firms in the same cross-section
t = time period
ε_{it} : Within-entity error
u_{it} : Between-entity error

4. Preliminary Analysis

Table 2 summarises the descriptive statistics for the sample. Total assets of the sample firms range from USD 182.74 million and USD 331,052.00 million. Total liabilities of the sample firms vary between USD 39.30 million and USD 170,308.00 million. EBIT of the sample firms vary between USD -7,236.00 million and USD 78,669.00 million, whilst total market value of the firms in our sample range from USD 438.12 million to USD 504,239.58 million. We feel therefore that the firms in our sample are fairly representative of all listed firms in the US.

The descriptive statistics above show that the effect of the financial crisis is pronounced. The impact of the crisis on companies can be seen from the fluctuation of the EBIT and the total market value of the firm. The EBIT reflects the profitability of a company based on its core operational activities. For instance, although the average EBIT only dropped in 2009 (from USD 3,264.36 million to USD 2,978.78 million), the lowest EBIT in 2007, 2008, and 2009 are USD -95.52 million, USD -4,467.00 million, and USD -7,236.00 million, respectively. The average market value of the firm also dropped significantly in 2008 and 2009 (from USD 27,134.39 million in 2007 to USD 22,079.14 million in 2008 and USD 20,928.44 million in 2009). These two negative fluctuations of EBIT and market value of the firm, particularly in 2009, roughly describe the magnitude of the financial crisis which the firms endured.

We use pairwise correlations to test for autocorrelation and report our results in tables 3-5. The maximum coefficient of the pairwise correlation which can be tolerated is 0.8 (Lewis-Beck 1993, cited in Akdal, 2010 p.22). Since there are no coefficients of pairwise correlation which are larger than 0.8, there is no evidence of autocorrelation in our data. Our correlation tables further provide preliminary description of the relationships among the variables. Tangibility and size have positive correlations with leverage, whilst profitability, liquidity, and MTB ratio have negative correlations. The positive correlation of tangibility and size with leverage is in accordance with trade-off theory. Pecking order theory predicts a negative correlation between profitability and liquidity with leverage. However, pecking order theory fails to explain the negative correlation between MTB and leverage. Market timing theory has the edge in clarifying the negative correlation between MTB and leverage.

Table 2 Descriptive statistics for the samples (USD millions)

	2004	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*
Total Assets								
Mean	16,577.98	15,090.23	16,615.70	18,954.52	19,231.58	19,651.44	21,484.18	23,368.70
Standard Deviation	30,646.20	24,999.03	27,113.83	32,292.45	32,224.04	32,490.82	36,280.05	38,569.20
Min	182.74	248.12	333.54	334.36	477.55	679.73	982.07	1,311.84
Max	270,344.00	208,335.00	219,015.00	270,634.00	275,644.00	265,245.00	302,510.00	331,052.00
Total Liabilities								
Mean	9,364.30	8,269.64	9,203.72	10,481.12	11,211.72	11,343.26	12,174.81	13,332.70
Standard Deviation	17,741.15	13,691.91	15,120.06	17,826.24	18,580.04	19,145.15	20,828.36	21,955.54
Min	39.30	59.00	82.09	151.32	161.89	98.05	152.30	189.25
Max	164,547.00	101,696.00	111,932.00	155,094.00	160,277.00	168,898.00	166,427.00	170,308.00
EBIT								
Mean	2,537.81	2,436.52	2,751.49	3,050.66	3,264.36	2,978.78	3,290.76	3,802.17
Standard Deviation	5,160.42	4,846.88	5,501.04	5,895.74	6,785.93	5,555.42	6,017.26	7,096.62
Min	-82.18	-106.28	-126.43	- 95.52	-4,467.00	- 7,236.00	- 344.00	5.00
Max	45,639.00	59,255.00	68,355.00	69,905.00	78,669.00	42,946.00	54,882.00	69,687.00
Total Market Value of the Firm								
Mean	21,212.95	22,057.22	23,857.74	27,134.39	22,079.14	20,928.44	23,890.32	25,690.42
Standard Deviation	35,665.95	38,571.92	40,272.39	46,844.68	41,007.57	36,693.72	39,402.39	44,760.78
Min	438.12	734.07	1,269.90	1,523.27	1,110.58	548.75	1,093.69	2,057.96
Max	328,115.26	344,490.61	439,013.27	504,239.58	397,234.08	322,334.13	364,064.48	401,253.84

Table 3 Pairwise Correlations of all data (2004-2011)

	LEV	*TANG*	*LNSIZE*	*PROF*	*LIQ*	*MTB*
LEV	1					
TANG	0.142834	1				
LNSIZE	0.005862	0.143092	1			
PROF	-0.29682	0.087263	-0.01521	1		
LIQ	-0.14478	-0.23291	-0.30966	0.132136	1	
MTB	-0.43146	-0.19795	-0.2219	0.616582	0.268549	1

Table 4 Pairwise Correlations of all data (2004-2007)

	LEV	*TANG*	*LNSIZE*	*PROF*	*LIQ*	*MTB*
LEV	1					
TANG	0.201435	1				
LNSIZE	0.104169	0.103902	1			
PROF	-0.30735	0.081281	0.07372	1		
LIQ	-0.21441	-0.30943	-0.46258	-0.01034	1	
MTB	-0.46338	-0.24807	-0.33879	0.456217	0.465755	1

Table 5 Pairwise Correlations of all data (2008-2011)

	LEV	*TANG*	*LNSIZE*	*PROF*	*LIQ*	*MTB*
LEV	1					
TANG	0.187605	1				
LNSIZE	0.080512	0.115555	1			
PROF	-0.25925	-0.00165	-0.07055	1		
LIQ	-0.20984	-0.25481	-0.39346	0.198357	1	
MTB	-0.40588	-0.20678	-0.32093	0.563537	0.414797	1

Because our pairwise correlation test fails to detect higher orders of correlation, we apply the Breusch-Godfrey test as our next preliminary test. The Breusch- Godfrey test is based on the Lagrange multiplier test, with the inclusion of additional lagged residuals. The Breusch-Godfrey test therefore detects the presence of serial dependence which could not be detected by a simple correlation test. The Breusch-Godfrey test uses the regression of residuals from the models as the approximation to accept or reject the null hypothesis. The null hypothesis of this test is no correlation of any order up to certain lagged time series. We test all three groups in our sample (2004-2011,

2004-2007, and 2008-2011). We apply 7 lagged time series for the 2004-2011 group and 3 lagged time series for the 2004-2007 and the 2008-2011 groups. Hence, the presence of serial dependence would be optimally detected. The results of the test show that the null hypotheses (no correlation) are accepted for all three groups in the sample (see Table 6 below).

Table 6: Breusch-Godfrey Test Matlab v7.14
Sample Groups of 2004-2011, 2004-2007, and 2008-2011

Sample Groups	*nR2*	*Degree of Freedom*	*Critical Value*	*Chi-Squared Distribution (χ^2)*	*Accepted Hypothesis*
2004-2011	249.90	330	99%	273.19	H0
2004-2007	223.27	330	99%	273.19	H0
2008-2011	238.19	330	99%	273.19	H0

Multicollinearity is tested using a Variance Inflation Factor (VIF) test. This provides a reliable indication of the multicollinearity effects on the variance of the regression coefficient. Our VIF test measures the effect of multicollinearity on the variance increase of an estimated regression coefficient. A larger VIF implies that the presence of multicollinearity is stronger. The maximum VIF which is still being tolerated is 5. The results of our VIF tests from all three of our groups imply that multicollinearity among the variables in the models is relatively weak (see Table 7).

Table 7: Variance Inflation Factor Test

2004-2011	*R2i*	*VIF*
TANG	0.1138	1.1284
LNSIZE	0.2418	1.3189
PROF	0.2985	1.4256
LIQ	0.3127	1.4551
MTB	0.4517	1.8237
2004-2007	*R2i*	*VIF*
TANG	0.1454	1.1702
LNSIZE	0.2688	1.3677
PROF	0.3229	1.4769
LIQ	0.3755	1.6013
MTB	0.4850	1.9418
2008-2011	*R2i*	*VIF*
TANG	0.0948	1.1047
LNSIZE	0.1997	1.2496
PROF	0.3438	1.5240
LIQ	0.2730	1.3756
MTB	0.4602	1.8524

Our next preliminary test is the Hausman Specification test. The purpose of this test is to identify whether the individual-specific effects (unobserved individual abilities, say α) are correlated or uncorrelated with certain variables across individual (i) and over time (t) (say X_{it}). If α and X_{it} are uncorrelated, then the estimations which our RE model produces will be consistent and efficient compared to our FE model (Hsiao 2007). The Hausman Specification test is conducted with SAS and the results are shown in Table 8 below. The results show that all the Pr > m values are below the significance level of 0.05, indicating that our RE model would generate more consistent and efficient results than our FE model.

Table 8: Hausman tests

Using all data (2004-11)

DF	*m Value*	*Pr > m*
5	23.5	0.0003

Pre-crisis period (2004-2007)

DF	*m Value*	*Pr > m*
5	14.43	0.0131

Post-crisis period (2008-2011)

DF	*m Value*	*Pr > m*
5	27.35	< 0.0001

5. Results and Discussion

This section displays the results of our panel data regressions using data for the period 2004-2011 broken into two sub-periods 2004-2007 (to represent the period before the financial crisis), and 2008-2011 (to represent the period after the financial crisis). Each table contains the detailed results gathered from running PROC PANEL procedures in SAS. The columns which have to be observed are the estimates of the coefficient and the Pr > |t| values. The estimate column specifies the coefficient of each variable tested in the regression. The coefficient expresses the magnitude of influence on leverage and the relationship with leverage. A higher number of coefficients implies that a particular variable has greater influence on leverage. The positive or negative sign of the coefficient indicates whether the variable has a direct or inverse relationship with leverage.

The next column to be examined is Pr > |t|. This represents the significance of a particular variable on firm leverage. If the value is below 0.01, 0.05, and 0.1 (meeting the requirements of confidence the levels 99 per cent, 95 per

cent, and 90 per cent, respectively) then the variable is significant and has some impact on firm leverage. If the variable is insignificant, it clearly has no impact on firm leverage.

5.1 2004-2011 Period (the overall period)

Table 9: Result (truncated, full result is available in the appendix) of panel data procedure in SAS using all years in the time horizon (2004-2011)

The SAS System
The PANEL Procedure
Fuller and Battese Variance Components (RanTwo)

Dependent Variable: LEV

Model Description

Estimation Method	RanTwo
Number of Cross Sections	331
Time Series Length	8
R-Square	0.0910

Parameter Estimates

Variable	*DF*	*Estimate*	*Std. Err.*	*t Value*	Pr > |t|
Intercept	1	0.0324257	0.0832	3.90	<0.0001*
TANG	1	0.244431	0.0445	5.49	<0.0001*
LNSIZE	1	0.003469	0.00812	0.43	0.6693
PROF	1	-0.62955	0.0998	-6.31	<0.0001*
LIQ	1	-0.01151	0.00697	-1.65	0.0989**
MTB	1	-0.05746	0.00694	-8.28	<0.0001*

* and ** mark the significant at the 1 and 10 percent level, respectively.

The results above show that, with a confidence level of 99 per cent, the significant independent variables are TANG, PROF, and MTB (tangibility, profitability, and market to book ratio). The LIQ (liquidity of firms) variable is significant at the confidence level of 90 per cent. The LNSIZE (size of firm) variable is not significant. However, the insignificance of LIQ and LNSIZE does not make them irrelevant to our analysis. Indeed their insignificance is interesting since, in different ways, they each provide support for trade-off theory and pecking order theory. In trade-off theory, firm size and tangibility would be significantly and positively correlated with leverage (see for example, De Jong *et al* 2008; Akdal 2010; and Lemmon and Zender 2010). Pecking order theory, on the other hand, implies that liquidity should be significantly and negatively correlated with leverage (see for example, Graham 2000; De Jong *et al* 2008; and Akdal 2010). The strongest variables among our five determinants of

leverage are profitability and tangibility with coefficient values of -0.62955 and 0.244431 respectively. It can be roughly interpreted that in the period of 2004-2011, leverage is determined largely by the level of profitability and tangibility. Despite being significant, the MTB ratio coefficient is relatively low at only -0.05746.

The results above also show the coefficient of each independent variable. Tangibility and size have positive coefficients, of 0.244431 and 0.003469. The significant and positive coefficient of tangibility is predicted in trade-off theory, since tangible assets serve as collateral for debt. Furthermore, tangible assets are one of the instruments that mitigate the risk which occurs in shareholder and bondholder conflict (Jensen and Meckling, 1976). Thus, firms with a relatively large proportion of tangible assets could utilise this to their advantage and obtain more leverage than firms with a smaller proportion of tangible assets.

The coefficient of size indicates a positive relationship between firm size and leverage, although it is not significant. Similar results are also found in empirical studies by Antoniou *et al* (2008) and Akdal (2010). Titman and Wessels (1988) argue that large firms have more diversification in their revenue streams which makes them able to tolerate higher levels of leverage in their capital structure.

The coefficient of profitability is -0.62955 and is significant. This implies that the more profitable a firm, the lower its leverage. This behaviour means that trade-off theory fails to explain the relationship between profitability and leverage. Trade-off theory argues that firms with high profitability would have higher leverage because they have more taxable income to shield. Our result gives more support to pecking order theory which implies that firms prefer to finance projects with internal funding. In other words, firms with higher levels of profitability tend to have lower levels of leverage in their capital structure. This result is supported by Titman and Wessels (1988); Rajan and Zingales (1995); Graham (2000); Antoniou *et al* (2008); De Jong, Kabir, and Nguyen (2008); and Akdal (2010), among others.

The coefficient of liquidity is negative and significant. One reason for this, suggested by Lipson and Mortal (2009), is that more highly-liquid firms are less highly levered because the internal cost of capital for liquid firms is lower than the cost of both debt and equity. Furthermore, pecking order theory also suggests that internal funding is the first order of firms' capital structure. Higher levels of liquidity may indicate that firms have sufficient liquid assets to finance their operations. This finding is supported by Graham (2000); Antoniou *et al* (2008); De Jong *et al* (2008); and Akdal (2010) among others.

The MTB ratio is derived by comparing the market capitalisation and the book value of assets of the firm. The MTB ratio categorises a firm as either undervalued (the MTB ratio is below 1) or overvalued (the MTB ratio is greater than 1). Overvalued firms are often recognised as having relatively high growth potential. The growth potential of a firm is one reason investors might be will-

ing to pay more than the book value of the firm. However, this method of firm valuation can only be performed when investors have sufficient information about the firm. When investors have insufficient information to value a firm, investors tend to exhibit herding behaviour. The accumulated demand from informed and less well informed investors will tend to drive up the share price of the firm. Baker and Wurgler (2002) suggest that when the share price of a firm is overvalued, managers prefer to issue new shares since the firm would gain a higher price for a new issue of shares relative to book value. In contrast, when the share price of the firm is undervalued, managers prefer to buy back the outstanding shares since the firm could obtain a lower price for each share repurchased. Firms would also prefer to raise capital by issuing debt rather than issuing equity in an undervalued condition. Our regression result for the whole period (2004-2011) supports the findings of Baker and Wurgler (2002). The coefficient of the MTB ratio is -0.05746. The negative sign implies that when the MTB ratio is relatively high, that is, the firm is overvalued, leverage is relatively low. The findings of Rajan and Zingales (1995); Graham (2000); De Jong *et al* (2008); and Akdal (2010) support our findings on the MTB ratio variable.

In conclusion, for the whole sample period, no theory of capital structure fully explains the pattern observed. Regarding the relationship with leverage, trade-off theory could predict the positive relationship between tangibility and firm size but it fails to explain the negative relationship between profitability and liquidity. Pecking order theory could explain the negative relationship with profitability and liquidity. However, this theory states that the relationship between the MTB ratio and leverage will be positive whereas, in fact, the relationship is negative. Market timing theory explains the negative relationship between the MTB ratio and leverage. However, our results show that the explanatory power of market timing theory is restricted only to the MTB ratio variable. This theory therefore also has limited explanatory power.

5.2 The period 2004-2007

Table 10 summarises our findings for the sub-period 2004-2007. It is immediately apparent that the coefficient sign of each variable is the same as the results for 2004-2011. The values of other coefficients are also similar to the results for the full sample. However, there is an evident drop in the value of the tangibility coefficient. The significant independent variables are tangibility, profitability, and market to book ratio. Conversely, the insignificant independent variables are firm size and liquidity.

There is one pronounced difference in the regression results for the years 2004-2007, which is the lower coefficient value of tangibility from 0.244431 to 0.175105 (a decrease of 28.36 per cent). This implies that during economic expansion, tangibility has less dominance in determining the degree of firm leverage. This could be caused by increases in the coefficient values of other determinants which compensate for the lower coefficient value of tangi-

bility. Nevertheless, the coefficient of other determinants shows little change for the sub-sample period. The reduction in the coefficient of tangible assets, which are involved in a debt contract, has certain roles in determining the characteristics (interest rate) of debt raised.

Table 10: Result (truncated, full result is available in the appendix) of panel data procedure in SAS using 2004-2007 period

The SAS System
The PANEL Procedure
Fuller and Battese Variance Components (RanTwo)

Dependent Variable: LEV

Model Description

Estimation Method	RanTwo
Number of Cross Sections	331
Time Series Length	4
R-Square	0.1846

Parameter Estimates

Variable	*DF*	*Estimate*	*Std. Err.*	*t Value*	Pr > |t|
Intercept	1	0.265287	0.0642	4.13	<0.0001*
TANG	1	0.175105	0.0369	4.75	<0.0001*
LNSIZE	1	0.006671	0.00614	1.09	0.2777
PROF	1	-0.58715	0.0990	-5.93	<0.0001*
LIQ	1	-0.00615	0.00616	-1.00	0.3183
MTB	1	-0.05507	0.00606	-9.09	<0.0001*

* and ** mark the significant at the 1 and 10 percent level, respectively.

Tangible assets generally serve as proxies for collateral which a firm could use to increase debt. Collateral mitigates adverse selection which comes from asymmetric information between lenders and borrowers (Jimenez and Saurina 2004). The lower value of the coefficient of tangibility in the earlier sub-sample period might indicate that during economic expansion, lenders face lower adverse selection issues. Collateral also mitigates moral hazard problems, such as asset substitution and half-hearted managers in driving investments to a successful outcome. Asset substitution problems arise from the shift of risk from shareholders to bondholders because the revenue of bondholders remains the same, whereas the revenue of shareholders potentially increases. During an economic expansion, one may argue that the marginal increase in revenue is higher than the marginal increase in risk. Allen and Gale (2000) argue that by exploiting asset price bubbles during economic expansion, a firm may gain relatively large increases in revenue by undertaking slightly riskier investments. This implies that the role of tangible assets

as an instrument to mitigate the risk of adverse selection is less evident during an economic expansion period leading to a lower coefficient of tangibility below that experienced in other periods.

5.3 The period 2008-2011

Table 11 summarises our results for the period after the financial crisis erupted, and covers the period 2008-2011. There are more distinct changes which occur in this period. First, the coefficient of profitability in the later period is 25.23 per cent lower than the coefficient of profitability in the overall period (2004-2011). The second distinct change is the increased size of the MTB ratio coefficient in the later period compared with the full sample period. This implies that the impact of a firm's market valuation is much stronger in this sub sample period. The last unique property we identify is the negative sign on the coefficient of firm size. Even though it is not significant, this negative sign might indicate important shifts in capital structure determinants during the financial crisis.

Table 11: Result (truncated, full result is available in the appendix) of panel data procedure in SAS using 2008-2011 period

The SAS System
The PANEL Procedure
Fuller and Battese Variance Components (RanTwo)

Dependent Variable: LEV

Model Description

Estimation Method	RanTwo
Number of Cross Sections	331
Time Series Length	4
R-Square	0.0981

Parameter Estimates

Variable	*DF*	*Estimate*	*Std. Err.*	*t Value*	Pr > |t|
Intercept	1	0.456222	0.1489	3.06	0.0022*
TANG	1	0.280098	0.0748	3.75	0.0002*
LNSIZE	1	-0.00481	0.0147	-0.33	0.7427
PROF	1	-0.47069	0.1724	-2.73	0.0064*
LIQ	1	-0.00615	0.0130	-0.47	0.6368
MTB	1	-0.10823	0.0141	-7.70	<0.0001*

* and ** mark the significant at the 1 and 10 percent level, respectively.

The lesser influence of profitability on leverage is consistent with pecking order theory, where profitability is the dominant factor in firms' financing decisions. During a financial crisis, the profitability of firms would be considerably lower than in normal times leaving the internal financing capacity also much lower. Consequently, it would be more difficult to rely on internal

financing to cover the cost of operations and investment. In these circumstances, firms may favour external financing instead of relying on depleted internal financing. For instance, Campello *et al* (2010) find that financially-constrained firms would withdraw funds from their facilities of outstanding lines of credit in advance of, and during, a financial crisis. The tendency towards external financing may cause the coefficient of profitability to fall.

Market timing theory suggests that the negative sign of the MTB ratio coefficient implies an inverse relationship between market to book ratio and leverage. Furthermore, the relatively low value of the coefficient of the MTB ratio during the financial crisis (-0.10823) is 88.36 per cent lower than during the overall period (-0.05746), implying that MTB ratio has a stronger influence on leverage during the crisis. During the financial crisis, the market valuation of firms was relatively low. It is therefore possible that the capital structure of firms was more leveraged than in the period preceding the financial crisis. Higher level leverage can be achieved through either stock repurchase and/or debt issuance. Stock repurchase is a common strategy when market valuation of the firm is relatively low and economic conditions are normal. However, during a financial crisis firms are likely to spend cash more cautiously and build up cash reserves as a buffer against potential credit supply shocks (Almeida *et al* 2004, cited in Campello *et al*, 2010, p. 472).

Table 12: Total value of bond and stock issuance of non-financial industry

Items / Years	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*
Bond Issuance (USD million)	259,968	216,072	338,777	404,819	318,201	478,508	573,626	617,024
Stock Issuance (USD million)	64,345	54,713	56,029	65,440	44,545	63,043	60,831	57,822
Bond to Stock issuance ratio	4.04	3.95	6.05	6.19	7.14	7.59	9.43	10.67

Source: www.federalreserve.gov

Table 12 indicates that between 2008 and 2011, there were uneven increases in the bond to stock issuance ratio. The increase in this ratio indicates that when firms raise external capital, they prefer to issue corporate bonds rather than new stock, which would be issued on less favourable terms.

The last unique property in the regression result of 2008-2011 is the negative sign of the firm size coefficient. Previous results from the overall period (2004-2011) yield a positive sign of firm size coefficient. Likewise, previous empirical studies suggest that size has a positive coefficient (Titman and

Wessels, 1988; Rajan and Zingales, 1995; Graham, 2000; Antoniou *et al* 2008; De Jong *et al* 2008; Akdal, 2010; Lemmon and Zender, 2010). The different result compared to previous empirical studies could be cautiously attributed to the disparities in data samples and statistical procedures. However, the different result with the overall period regression should be interpreted carefully.

The overall period shows that the positive relationship between firm size and leverage is in accordance with trade-off theory. The theory predicts that a larger firm could borrow at a lower cost than a smaller firm and hence a larger firm would have more leverage in its capital structure. On the contrary, our results show the opposite during the financial crisis period. The result suggests that a larger firm would have less leverage, and a smaller firm would have more leverage, in its capital structure. Peterson and Shulman (1987), argue that a larger firm would indeed have less leverage since it has more funding options besides debt financing. However, they also argue that smaller firms would have less leverage because a smaller firm does not have a stable income and credible track record.

5.4 Comparison of the periods before and after the financial crisis

This section compares the differences which occur between our two sub-sample periods. The tangible assets coefficient from the period 2008-2011 is almost 40 per cent higher than in the 2004-2007 period. This significant increase implies that tangible assets had a greater influence on leverage during the financial crisis than during the preceding period of economic expansion. One prominent function of tangible assets is to mitigate the adverse selection problem faced by lenders (Jimenez and Saurina, 2004). This problem was more severe during the 2008 financial crisis (Barrell and Davis, 2008). Thus, it seems logical that during a financial crisis, lenders seek better quality and quantity of tangible assets, to compensate for the increasingly severe adverse selection problem. To the extent that this is the case, the increased desire for security would give this variable greater impact on firm leverage.

Table 13: Coefficient of independent variables of each period

Independent Variables	*Coefficient of Estimation (2004-07)*	*(2008-11)*
TANG	+ 0.175105*	+ 0.280098*
LNSIZE	+ 0.006671	- 0.00481
PROF	- 0.58715*	- 0.47069*
LIQ	- 0.00615	- 0.00615
MTB	- 0.05507*	- 0.10823*

* and ** mark the significant at the 1 and 10 percent level, respectively.

The negative coefficient on the firm size variable is also important. As discussed above, this coefficient may shift toward a negative sign, reflecting an inverse relationship between firm size and leverage (Peterson and Shulman (1987). Conversely, the existence of asymmetric information and relatively poor internal financing capacity may explain the inverse relationship between firm size and leverage. The negative coefficient of firm size could therefore simply reflect the tendency of larger firms toward lower leverage and smaller firms toward higher leverage.

The third difference to notice is the coefficient of the MTB ratio which fell almost 200 per cent during the financial crisis. Since the coefficient of the MTB ratio is negative, the lower value implies greater influence of the MTB ratio on the leverage of the firm. As noted earlier, the greater influence of the MTB ratio during the financial crisis might make debt issuance preferable to equity issuance. To the extent that this is true, the MTB ratio becomes more influential as a determinant of capital structure.

The last difference is in the R-Squared value between the period 2004-2007 (0.1846) and the period 2008-2011 (0.0981). Thus, the regression for the period 2004-2007 has more explanatory power than for the period 2008-2011. This could indicate that theories of capital structure only provide a reliable explanation over a relatively short time period, while the explanatory power of these theories over the longer term become less powerful.

6. Conclusions

This paper compares the determinants of capital structure before and after the financial crisis of 2008. We analyse capital structure in terms of the three main theories of capital structure: trade-off theory, pecking order theory, and market timing theory. The different theories stress different determinants of capital structure and in this paper we test five determinants widely used in capital structure studies: tangibility, firm size, profitability, liquidity, and MTB ratio. Leverage serves as a proxy for capital structure. In our empirical analysis, capital structure determinants are set as independent variables and leverage is set as the dependent variable. Our investigation uses data from non-financial and non-utility firms listed in the S&P 500 index. The US is chosen intentionally because the country was the epicentre of the crisis and its capital market is well developed. Our data are analysed using a panel data model and our period chosen (2004-2011) includes observations for both pre and post crisis periods. As well as analysing the entire sample period, our data is divided into two sub-periods: 2004-2007 (to represent the period before financial crisis), and 2008-2011 (to represent the period after financial crisis occurred).

The full-period regression yields similar results to previous empirical investigations in this area (Rajan and Zingales, 1995; De Jong et al, 2008; Akdal, 2010). Tangibility and firm size are positively correlated with leverage, whilst profitability, liquidity and MTB ratio are negatively correlated. The sig-

nificant variables are tangibility, profitability, and MTB ratio. One implication of this is that in the longer term there might be no prevailing theory of capital structure that has reliable predictive properties. This implication is also supported statistically by the noticeable difference in R-Squared for the regressions for the earlier sub-period and the later sub-period. These ambiguous results do not necessarily imply conflicts among the capital structure theories. Fama and French (2002) argue that capital structure theories could share many predictions on leverage, even though the predictions are motivated by different reasons.

The regression results for the pre-crisis period 2004-2007 reveal an interesting difference compared with the post crisis period, in that the coefficient of tangibility falls significantly. This indicates that lenders might seek lower adverse selection during a financial crisis.

Our results for the post crisis period show some clear differences compared to both the overall period and to the pre-crisis period. One difference is a notably lower value for the coefficient of profitability. One possible explanation of this is that weaker internal financing capacity during the financial crisis caused profitability to become less influential. Another difference between the pre and post crisis periods is that the coefficient of the MTB ratio is nearly twice as high in the post crisis period. This stronger influence of the MTB ratio could be attributed to the preference of firms toward debt financing during the financial crisis. A final difference is the negative sign for the firm size coefficient. Whilst it is common for larger firms to have relatively lower leverage in their capital structure, it is uncommon for smaller firms to have higher leverage in their capital structure. This peculiarity may be attributed to the abundant information asymmetry during the 2008 financial crisis which would disproportionately hinder smaller firms in raising external capital through equity, thus resulting in higher leverage in the capital structure of smaller firms. See Campello et al (2010) for example, who find that 82 per cent of firms adversely affected by financial crisis are small firms. This is in keeping with the predictions of pecking order theory.

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APPENDIX A

List of companies which are used in the data set

1 ABBOTT LABORATORIES
2 ADVANCED MICRO DEVICES
3 AETNA INC
4 AIR PRODUCTS & CHEMICALS INC
5 HONEYWELL INTERNATIONAL INC
6 ALCOA INC
7 HESS CORP
8 BEAM INC
9 AMGEN INC
10 ANALOG DEVICES
11 NABORS INDUSTRIES LTD
12 APACHE CORP
13 APPLE INC
14 APPLIED MATERIALS INC
15 ARCHER-DANIELS-MIDLAND CO
16 AUTODESK INC
17 AUTOMATIC DATA PROCESSING
18 AVERY DENNISON CORP
19 AVON PRODUCTS
20 BAKER HUGHES INC
21 BALL CORP
22 BARD (C.R.) INC
23 BAXTER INTERNATIONAL INC
24 BECTON DICKINSON & CO
25 VERIZON COMMUNICATIONS INC
26 BEMIS CO INC
27 BEST BUY CO INC
28 BLOCK H & R INC
29 BOEING CO
30 ROBERT HALF INTL INC
31 BRISTOL-MYERS SQUIBB CO
32 CSX CORP
33 CAMPBELL SOUP CO
34 CONSTELLATION BRANDS
35 CARDINAL HEALTH INC
36 CATERPILLAR INC
37 CENTURYLINK INC
38 CHEVRON CORP
39 CINTAS CORP
40 CLIFFS NATURAL RESOURCES INC
41 CLOROX CO/DE
42 COCA-COLA CO
43 COLGATE-PALMOLIVE CO
44 COMCAST CORP
45 CA INC
46 COMPUTER SCIENCES CORP
47 CONAGRA FOODS INC
48 COOPER INDUSTRIES PLC
49 MOLSON COORS BREWING CO
50 CORNING INC
51 CUMMINS INC
52 DANAHER CORP
53 TARGET CORP
54 DEVRY INC
55 DISNEY (WALT) CO
56 DONNELLEY (R R) & SONS CO
57 DOVER CORP
58 DOW CHEMICAL
59 OMNICOM GROUP
60 DU PONT (E I) DE NEMOURS
61 DUN & BRADSTREET CORP
62 FLOWSERVE CORP
63 PERKINELMER INC
64 EATON CORP
65 ECOLAB INC
66 EMERSON ELECTRIC CO
67 EXPEDITORS INTL WASH INC
68 EXXON MOBIL CORP
69 FMC CORP
70 FAMILY DOLLAR STORES
71 FEDEX CORP
72 MACY'S INC
73 FLUOR CORP
74 FOREST LABORATORIES -CL A
75 GANNETT CO
76 GAP INC
77 GENERAL DYNAMICS CORP
78 GENERAL MILLS INC
79 GENUINE PARTS CO
80 GOODRICH CORP
81 GOODYEAR TIRE & RUBBER CO
82 GRAINGER (W W) INC
83 HALLIBURTON CO
84 JACOBS ENGINEERING GROUP INC
85 JOHNSON & JOHNSON
86 JOHNSON CONTROLS INC
87 KLA-TENCOR CORP
88 SEARS HOLDINGS CORP
89 KELLOGG CO
90 KIMBERLY-CLARK CORP
91 KROGER CO
92 LSI CORP
93 LAM RESEARCH CORP
94 LEGGETT & PLATT INC
95 LILLY (ELI) & CO
96 LIMITED BRANDS INC
97 LOCKHEED MARTIN CORP
98 RANGE RESOURCES CORP

116 TENET HEALTHCARE CORP
117 NEWELL RUBBERMAID INC
118 NEWMONT MINING CORP
119 NIKE INC
120 NOBLE ENERGY INC
121 NORDSTROM INC
122 NORFOLK SOUTHERN CORP
123 NORTHROP GRUMMAN CORP
124 NUCOR CORP
125 OCCIDENTAL PETROLEUM CORP
126 OWENS-ILLINOIS INC
127 PPG INDUSTRIES INC
128 PALL CORP
129 PARKER-HANNIFIN CORP
130 PAYCHEX INC
131 PENNEY (J C) CO
132 PEPSICO INC
133 PFIZER INC
134 ALTRIA GROUP INC
135 CONOCOPHILLIPS
136 PITNEY BOWES INC
137 PRECISION CASTPARTS CORP
138 PROCTER & GAMBLE CO
139 RAYTHEON CO
140 AUTONATION INC
141 ROCKWELL AUTOMATION
142 ROSS STORES INC
143 ROWAN COMPANIES PLC
144 RYDER SYSTEM INC
145 SAFEWAY INC
146 ST JUDE MEDICAL INC
147 SCHLUMBERGER LTD
148 SEALED AIR CORP
149 SHERWIN-WILLIAMS CO
150 SIGMA-ALDRICH CORP
151 SMUCKER (JM) CO
152 SNAP-ON INC
153 SOUTHWEST AIRLINES
154 AT&T INC
155 SOUTHWESTERN ENERGY CO
156 STANLEY BLACK & DECKER INC
157 STRYKER CORP
158 SUNOCO INC
159 SYSCO CORP
160 ALLEGHENY TECHNOLOGIES INC
161 TERADYNE INC
162 TESORO CORP
163 TEXAS INSTRUMENTS INC
164 THERMO FISHER SCIENTIFIC INC
165 TOTAL SYSTEM SERVICES INC
166 TYCO INTERNATIONAL LTD
167 ANADARKO PETROLEUM CORP
168 NOBLE CORP
169 EMC CORP/MA
170 BIG LOTS INC
171 MICROSOFT CORP
172 ORACLE CORP
173 DIRECTV
174 LINEAR TECHNOLOGY CORP
175 HARLEY-DAVIDSON INC
176 CABLEVISION SYS CORP -CL A
177 ADOBE SYSTEMS INC
178 COCA-COLA ENTERPRISES INC
179 HARMAN INTERNATIONAL INDS
180 CERNER CORP
181 NEWS CORP
182 AIRGAS INC
183 JOY GLOBAL INC
184 CARNIVAL CORP/PLC (USA)
185 CELGENE CORP
186 TIFFANY & CO
187 DENTSPLY INTERNATL INC
188 CBS CORP
189 FASTENAL CO
190 AMPHENOL CORP
191 ALTERA CORP
192 PIONEER NATURAL RESOURCES CO
193 WASTE MANAGEMENT INC
194 DELL INC
195 FREEPORT-MCMORAN COP&GOLD
196 BMC SOFTWARE INC
197 DEVON ENERGY CORP
198 LABORATORY CP OF AMER HLDGS
199 VALERO ENERGY CORP
200 STAPLES INC
201 ALLERGAN INC
202 SYMANTEC CORP
203 EOG RESOURCES INC
204 ELECTRONIC ARTS INC
205 CABOT OIL & GAS CORP
206 DENBURY RESOURCES INC
207 CISCO SYSTEMS INC
208 XILINX INC
209 AUTOZONE INC
210 COVENTRY HEALTH CARE INC
211 UNITED STATES STEEL CORP
212 BIOGEN IDEC INC
213 PERRIGO CO

214 QUALCOMM INC
215 GILEAD SCIENCES INC
216 WHOLE FOODS MARKET INC
217 ROPER INDUSTRIES INC/DE
218 TIME WARNER INC
219 PRAXAIR INC
220 BOSTON SCIENTIFIC CORP
221 KOHL'S CORP
222 BED BATH & BEYOND INC
223 EXPRESS SCRIPTS HOLDING CO
224 STARBUCKS CORP
225 PATTERSON COMPANIES INC
226 CHESAPEAKE ENERGY CORP
227 WATSON PHARMACEUTICALS INC
228 INTUIT INC
229 MICROCHIP TECHNOLOGY INC
230 FOSSIL INC
231 O'REILLY AUTOMOTIVE INC
232 JABIL CIRCUIT INC
233 FLIR SYSTEMS INC
234 BORGWARNER INC
235 MARRIOTT INTL INC
236 COSTCO WHOLESALE CORP
237 URBAN OUTFITTERS INC
238 NEWFIELD EXPLORATION CO
239 JDS UNIPHASE CORP
240 EASTMAN CHEMICAL CO
241 DOLLAR TREE INC
242 AMERISOURCEBERGEN CORP
243 DARDEN RESTAURANTS INC
244 CAMERON INTERNATIONAL CORP
245 DIAMOND OFFSHRE DRILLING INC
246 DAVITA INC
247 SANDISK CORP
248 LEXMARK INTL INC -CL A
249 LAUDER (ESTEE) COS INC -CL A
250 BROADCOM CORP
251 L-3 COMMUNICATIONS HLDGS INC
252 COGNIZANT TECH SOLUTIONS
253 REPUBLIC SERVICES INC
254 CROWN CASTLE INTL CORP
255 EBAY INC
256 NVIDIA CORP
257 LIFE TECHNOLOGIES CORP
258 PRICELINE.COM INC
259 CONSOL ENERGY INC
260 REYNOLDS AMERICAN INC
261 F5 NETWORKS INC
262 JUNIPER NETWORKS INC
263 RED HAT INC
264 AKAMAI TECHNOLOGIES INC
265 AGILENT TECHNOLOGIES INC
266 EDWARDS LIFESCIENCES CORP
267 FRONTIER COMMUNICATIONS CORP
268 INTUITIVE SURGICAL INC
269 COACH INC
270 MONSANTO CO
271 PEABODY ENERGY CORP
272 FMC TECHNOLOGIES INC
273 KRAFT FOODS INC
274 ACCENTURE PLC
275 ROCKWELL COLLINS INC
276 ZIMMER HOLDINGS INC
277 GAMESTOP CORP
278 NETFLIX INC
279 WYNN RESORTS LTD
280 HOSPIRA INC
281 INTEL CORP
282 INTL BUSINESS MACHINES CORP
283 INTL FLAVORS & FRAGRANCES
284 INTL GAME TECHNOLOGY
285 INTL PAPER CO
286 INTERPUBLIC GROUP OF COS
287 WESTERN DIGITAL CORP
288 MEADWESTVACO CORP
289 WHIRLPOOL CORP
290 WILLIAMS COS INC
291 XEROX CORP
292 TJX COMPANIES INC
293 AMAZON.COM INC
294 RALPH LAUREN CORP
295 YUM BRANDS INC
296 C H ROBINSON WORLDWIDE INC
297 VERISIGN INC
298 QUANTA SERVICES INC
299 STERICYCLE INC
300 ABERCROMBIE & FITCH -CL A
301 NATIONAL OILWELL VARCO INC
302 QUEST DIAGNOSTICS INC
303 CARMAX INC
304 VARIAN MEDICAL SYSTEMS INC
305 VULCAN MATERIALS CO
306 WAL-MART STORES INC
307 WALGREEN CO
308 WASHINGTON POST -CL B
309 HOME DEPOT INC
310 HORMEL FOODS CORP
311 STARWOODHOTELS&RESORTS WRLD

312 ILLINOIS TOOL WORKS
313 INGERSOLL-RAND PLC
314 NETAPP INC
315 CITRIX SYSTEMS INC
316 ALEXION PHARMACEUTICALS INC
317 IRON MOUNTAIN INC
318 DEAN FOODS CO
319 UNION PACIFIC CORP
320 UNITED PARCEL SERVICE INC
321 UNITED TECHNOLOGIES CORP
322 SPRINT NEXTEL CORP
323 GOOGLE INC
324 HASBRO INC
325 HEINZ (H J) CO
326 HELMERICH & PAYNE
327 HERSHEY CO
328 HEWLETT-PACKARD CO
329 HARRIS CORP
330 TYSON FOODS INC -CL A
331 WATERS CORP

ENDNOTES

1. Correspondence Address: Barry Harrison, Department of Economics, Nottingham Business School, Burton Street, Nottingham, NG1 4BU, UK. Email: barry.harrison@ntu.ac.uk. Theodorus Wisnu Widjaja, TiasNimbas Business School, Campus Utrecht, Kromme Nieuwegracht 39, 3512 HD, Utrecht, The Netherlands. We gratefully acknowledge the helpful comments received from two anonymous referees. We thank Piers Thompson and Rob Ackrill for their careful editing skills and helpful comments which saved us from many errors and improved the paper. The usual disclaimer applies

2. Mainly perfect and frictionless capital markets, no transactions costs and tax deductible interest payments on debt.

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