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Do Country and Industry Patterns Contribute to an Optimal Capital Structure?

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Abstract

We investigate evidence the existence of optimal capital structure and carry out an examination across countries and industries to detect systematic capital structure differences. In particular, we examine whether firms aim for an optimal capital structure through changing their debt ratios over time. We find evidence for the presence of systematic patterns in debt ratios and in the ways firms adjust their capital structures. This is indirect evidence for the optimal capital structure model and suggests firms seek the correct capital structure based on firm, industry, and country factors.

Keywords:
Capital Structure, debt and equity issuance, capital structure adjustment, target debt ratio, financial deficit
JEL classification: G32,

1 Introduction

Capital structure theories based on asymmetric information, such as the pecking order, market timing, and inertia theories deny the existence of an optimal capital structure, while the trade-off and dynamic trade-off theories suggest that firms will seek the best mix of debt and equity to maximize firm value. At present, the argument remains unresolved. Prior studies, identify reasons why it has been difficult to find evidence that firms adjust their debt ratios. For example, Hovakimian and Li (2011) argue that there is no clear evidence that firms change their debt levels because moving towards their target capital structure may not be a policy priority. DeAngelo and Masulis (1980) argue that as firms have different tax rates and tax deductions, each firm has a unique target debt ratio. Consequently, firms that operate under different tax rates, bankruptcy risk, and securities issuing costs, will have different optimal debt ratios. Therefore, it has been difficult to observe clear patterns and adjustment in debt ratios that would imply firms are moving towards their optimal capital structure. When combined with differences in firms' target debt levels, related to their individual circumstances, it means clear evidence is lacking for the existence of target debt ratios and by implication optimal capital structure. A key problem in prior studies is that if firms are slow or patchy in adjusting their debt ratios and face different firm and country specific conditions this leads to less significant statistical results.

Although it is difficult to find statistically convincing evidence, using a large sample of firms across industries and countries, we seek systemic patterns in debt ratios in line with industries in which firms operate and the evidence for firms' debt ratio adjustments in line with the optimal capital structure theories. A key motivator for the present study is that since Stonehill and Stizel (1969) there has been little research that compares firms' debt ratios based on industry and country characteristics. We contend that if there are systematic patterns in leverage levels with respect to firms' characteristics, we can infer that firms are targeting an optimal capital structure. This is because, if there is no optimal capital structure, firms will not seek to change their debt ratios towards a target and, therefore, firms' debt ratios would be randomly distributed without regard to firms' characteristics.

There is much prior research that considers the relationship between a firm's debt ratio and its characteristics, particularly industry and country. For example, Mackay and Phillips (2005) argue, that firms' leverage levels are strongly related to their industries. In addition, the authors show that industry factors affect firms' leverage levels and bankruptcy costs. Qi et al. (2010) identify the importance of the country in which firms operate in influencing their debt ratios, which they attribute to differences in tax policies, the political environment, financial markets, and legal systems. To our knowledge, there have been no studies which compare firms' debt ratios between countries and industries, and across different time periods, since Stonehill and Stitzel (1969) and Scott and Martin (1975). Our study extends their analyses in a number of ways. First, we use a more extensive data set; second we take account of a wider set of capital structure theories; and third, we make use of new variables and instruments in order to identify statistically significant patterns in firms' capital structures.

In addition, as further evidence for the existence of optimal capital structures, we test for firms' behavior when adjusting their capital structure, including speed of capital structure adjustment, and the choice of debt or equity when new securities are issued. The speed at which firms adjust their capital structure confirms that over time firms change leverage levels. Net debt and equity issue patterns also provide evidence for firms' behavior in adjusting their debt ratios. For instance, in this paper, we consider the patterns for debt and equity issuance as evidence for the trade-off theory. This is because we find that for the period of our data firms mainly issue equity. Although we do not precisely know why firms mainly issue equity, we can presume that this situation is not related to the pecking order or market timing theories, as our data indicate low stock prices and weak profitability during our sample period.

We find some important phenomena in our results. First, there are systematic and statistically significant patterns in capital structures across industries, countries, and over time. Firms in high technology industries such as biotechnology, software, and semiconductors have low debt ratios; whereas, across countries, firms in the hotel, marine transportation, aluminum, and travel industries have high leverage levels. Second, firms generally reduce debt levels over time mainly by issuing equity. We consider that all these results support the trade-off theory rather than the pecking order and market timing theories.

The paper proceeds as follows. Section 2 reviews the literature and the motivation for the study. Section 3 presents the data and methodology. Section 4 shows the results of our analyses, including ANOVA tests, speed of capital structure adjustment, and the issuance of debt and equity. We conclude and summarize our findings in Section 5.

2 Literature review and motivation for the research

With the exception of the static trade-off theory, the pecking order (Myers, 1984), market timing (Baker and Wurgler, 2002), and the inertia theory (Welch, 2004) all deny the presence of an optimal capital structure. Evidence on the existence of optimal capital structure is still controversial, although many researchers, such as Megginson (1977) and Graham and Harvey (2001), find there is a pattern in leverage levels that matches industry classifications. After carefully reviewing earlier research, we find the last major empirical study that compared debt ratios across industries was by Stonehill and Stizel (1969), who examined the debt ratios of multinational firms based in different countries and industries. They showed that firms evidenced more similar in-industry debt ratios than across different industries.

The majority of recent studies, such as those by Frank and Goyal (2009), Welch (2004) and Qi et al. (2010), take account of important factors that influence the financial structure decision, such as the speed of capital structure adjustment, stock price and political rights, and how these determinants can be used to differentiate between the static trade-off, pecking order, and market timing theories. However, without knowing the optimal debt ratios, testing important determinants not may be the correct approach, as debt ratio determinants already imply the existence of optimal capital structures. Following Stonehill and Stizel (1969), and using a larger and more up-to-date sample of firms that operated under different economic circumstances, we investigate whether systematic patterns in debt ratios, with respect to industry and country, are indicative of the existence of optimal capital structures and hence lend support to the static or dynamic trade-off theories.

Purnanandam (2008) finds that firms in the same industry have similar leverage levels, maintain these over time and that this differs between industries. Furthermore, industries relate to debt ratio factors, such as bankruptcy costs, liquidation values, asymmetric information, collateral value, and micro-economic industrial business trends. All these factors, of course, also relate to capital structure theories. This is because firms in different industries have different assets and operating risks, while firms in the same industry face similar business risks and hold similar assets. Furthermore, industry factors are also important for firms' credit ratings and financial managers consider competitors' leverage levels (Graham and Harvey, 2001). Masulis (1983) also argues that firm values are high for those firms whose debt ratios are close to their industrial average. Consequently, this suggests firms in a particular industry choose to have ratios that approximate to their industry average as a way of maximising their value. This also suggests the likelihood of the existence of a pattern of industry-based debt ratios that are not randomly distributed.

Different countries have different tax rates, degrees of industrialization, financial, political, and legal systems (e.g. bankruptcy law and financial market regulations), and we presume that these factors affect firms' debt ratios. For example, both the trade-off theory and Graham's (2000) argument suggest that the corporate tax rate affects capital structures, together with bankruptcy costs. Both the tax rate and bankruptcy costs, through bankruptcy policy, are strongly related to a country's macroeconomic policies. Furthermore, each country has a different financial market system. For example, Japan and European countries (France and Germany) have more bank-oriented economies as compared to the United States and the United Kingdom. According to Antoniou et al. (2008), bank-oriented countries suffer less from asymmetric information because financial institutions, such as banks, are better able to collect information about firms than individual investors in capital markets. If this argument is correct, we can presume that firms in countries like Japan and France will have systematically different leverage ratios compared to those in the United States and Great Britain due to differences in asymmetric information. Qi et al. (2010) suggest a relationship between political systems and firms' debt levels in that firms with greater political rights have lower debt costs. They also suggest that political stability leads to a stable microeconomic environment. These studies directly or indirectly suggest that firms' debt ratios will be affected by country factors.

Both the market timing and pecking order theories can explain firms' debt ratio reducing behavior based on either overvalued stock prices or periods of rising income, or a combination of both. Under the timing theory, firms issue equity when they consider their stock price overvalued compared to its fundamentals. Leverage also decreases when firms operating income increases faster than dividend payouts. In the trade-off theory, firms will reduce debt levels when they confront financially difficult periods such as recession. The above implies that firms' debt ratios will shift over time, in line with the situation in financial markets and macroeconomic cycles. Indeed, previous research, such as Graham (2000) and Daskalakis and Psillaki (2008) find that debt ratios change over time. For instance, Graham (2000) finds that firms used more debt during 2000s than in the 1980s. On the other hand, Daskalakis and Psillaki (2008) show that, during their sample period (from 1997 to 2002), French firms reduced their leverage. These studies support the argument that firms adjust their debt ratios over time.

As indicated above, factors such as industry, country, and time affect firms' capital structure decisions. However, since the papers by Stonehill and Stitzel (1969) and Scott and Martin (1975), there has been no research that examines the differences in debt ratios from industry, country, and time effects. Although a number of papers investigate the trade-off theory by testing the capital structure determinants and the speed at which it is adjusted, we still do not have clear conclusions about the existence of an optimal capital structure. The present research contributes to the literature by extending Stonehill and Stitzel (1969) in a number of ways. It will be the first systematic examination of the interrelatedness of industry and country effects since that paper. In addition, we expand the number of countries and the time periods for the analysis. In particular, we look at emerging market countries in addition to developed market ones.

A further motivation is that, from prior research and our own data, we find that firms occasionally issue and retire both equity and debt at the same time. The pecking order theory cannot explain this behavior. Due to transaction costs, firms should either issue equity or debt to adjust their debt ratios, not issue both securities concurrently. The pecking order theory even suggests that firms should not issue any securities in order to save adverse selection costs. However, most prior research uses debt issue and changes in firms' debt ratios to observe firms' issuance choices in order to test the pecking order theory. Therefore, we believe we can improve on previous research by using a new variable, pure issuance, which allows us to segregate firms' intention to increase or decrease its leverage in situations where there are mixed transactions. We believe that this approach better indicates firms' real intention in altering their capital structure for those firms which simultaneously issue both equity and debt.

3 Data and methods

Our data consists of 2,823 listed firms from fourteen industries and nine countries for the period 1989 to 2008. Firms' financial and other data is collected from Thomson One Banker. Our sample consists of all companies from the aluminum, heavy construction, marine transportation, biotechnology, airline, hotel, travel and tourism, fixed line telecommunication, mobile telecommunication, computer services, internet, software, computer hardware, and semiconductor industries. The selected companies are domiciled in Australia, Canada, the United Kingdom, the United States, Germany, France, Japan, Korea, and Taiwan. To be included, the companies must have data for at least two or more years during our sample period. To ensure data integrity, we winsorize some values as outliers since they greatly distort results. For instance, we remove the data for firms which have debt ratios if the value is greater than 2.00, or is negative. For market-to-book ratio (M/B), we remove observations that are greater than 10 and smaller than zero. For other items, we also remove as outliers the data if their values are greater or smaller than 3 standard deviations from the average.

3.1 Descriptive statistics

Panel A in Table 1 provides descriptive statistics for our sample of 32,410 firm-year observations. Panel A, indicates some variables are not normally distributed. For example, the kurtosis of the debt ratio (DR), financial deficits (def), capital expenditure (capex), the stock return (SR), corporate tax (tax), market-to-book (M/B), and profits indicates that these variables are leptokurtic. The skewness statistic shows that corporate tax rate, profits, def and capex are asymmetric. The descriptive statistics for stock return (SR), market-to-book ratio (M/B) and profits also indicate that many firms are potentially financially distressed. One-half of the firms in the sample generate less than 3 percent in profit in relation to their total assets, 75 percent have low market values based on their M/B, and about half see a fall in their stock prices compared with the previous year. This may also indicate unfriendly macroeconomic conditions during our sample period.

Table 1 Panel B presents the correlation between the variables. Generally, there is no significant correlation, with the exception of the bankruptcy probability (BP) and the debt ratio (DR), which is not surprising; and although high, it is still acceptable for modeling purposes. Our unreported VIF tests indicate there is no serious multicolinearity in our models. We therefore use these two variables in the same model.

[Table 1 about here]

3.2 ANOVA test

In order to investigate the existence of capital structure patterns we apply an Analysis of Variance (ANOVA) test. As mentioned earlier, if there is no optimal capital structure, firms do not change their capital structure in systematic ways. Consequently, there should be no statistically significant differences in leverage levels between firms in particular countries and industries. On the other hand, if there is an optimal capital structure that maximizes a firm's value we can expect that firms will likely be close to their optimum and, if the optimal leverage relates to firms' characteristics, there will be a noticeable pattern to firms' debt ratio. The ANOVA test will indicate whether there are significant differences in firms' debt ratios based on their characteristics.

3.3 Partial adjustment process and System GMM

We also consider that firms only partially adjust their capital structures in any given period. The idea behind this is straightforward. If there is an optimal capital structure, firms will try to be close to, or at, it. However, because of transaction costs, firms will not always fully adjust their capital structure. To model this, we apply the following equation:

$$DR_t - DR_{t-1} = \alpha_t + \lambda(DR^*_t - DR_{t-1}) + \varepsilon_t \qquad (1)$$

where, DR is a firm's debt level; DR^* is the firm's optimal capital structure; λ is a coefficient for the speed of adjustment towards the firm's optimum capital structure, calculated using an auto regressive parameter.

In a world without transaction costs, from Equation (1) as DR^*_t is the optimal (or target) capital structure, DR_t should be DR^*_t in the next period and λ will be one. However, when there are costs to adjusting the debt ratio, λ will lie between 1 and 0 ($1 > \lambda > 0$). Hence we estimate the following equations:

$$DR_t=\alpha+(1-\lambda)DR_{t-1}+\lambda DR^*_t+\varepsilon_t \quad (2)$$

$$DR_{i,t}=\alpha+(1-\lambda)DR_{i,t-1}+\Sigma\lambda\beta\cdot X_{i,t-1}+\varepsilon_t \quad (3)$$

where, DR, DR^* and λ are as above and $\Sigma X_{i,t-1}$ is the sum of capital structure determinants for firm *i* at time *t*.

Equation (1) can be rewritten as Equations (2) and (3), if the target debt ratio (DR^*) is determined by the capital structure determinants ($\Sigma\beta\cdot X_{i,t-1}$). In Equation (3) we presume that the target debt ratio is defined by the previous year's capital structure determinants. This implies that firms decide their optimal capital structure based on their situation in the previous year. For example, if a firm has a high probability of bankruptcy then it is likely to issue equity in the future to reduce this risk.

Based on previous research, we selected the following proxies for the determinants of firms' capital structure: annual stock return (SR), asset tangibility (tang), capital expenditure (capex), market-to-book ratio (M/B), profits, firms' size (size), corporate tax rate (tax), and bankruptcy probability (BP). Therefore, the model for firms' optimal capital structure determinants is:

$$DR^*_{i,t}= \alpha_t+\beta_1\cdot SR_{i,t-1}+ \beta_2\cdot tang_{i,t-1}+ \beta_3\cdot capex_{i,t-1}+ \beta_4\cdot M/B_{i,t-1}+ \beta_5\cdot profits_{i,t-1} + \beta_6\cdot size_{i,t-1} + \beta_7\cdot tax_{i,t-1} + \beta_8\cdot BP_{i,t-1} + \varepsilon_t \quad (4)$$

$$DR_{i,t}=\alpha+(1-\lambda)DR_{i,t-1}+\beta_1\cdot SR_{i,t-1}+\beta_2\cdot tang_{i,t-1}+\beta_3\cdot capex_{i,t-1}+\beta_4\cdot M/B_{i,t-1}+\beta_5\cdot profits_{i,t-1}+\beta_6\cdot size_{i,t-1}+\beta_7\cdot tax_{i,t-1}+\beta_8\cdot BP_{i,t-1}+\varepsilon_t \quad (5)$$

As there are transaction costs, we expect that λ to fall between 1 and 0. Values $1 > \lambda > 0$ would provide support for the trade-off theory.

3.4 An endogeneity problem in panel data and System GMM

From Equations (2), (3) and (4), we can estimate λ in Equation (5), and we use 'system general method of moments' (System GMM) for Equation (5) because the panel data is in general endogenous and has idiosyncratic errors that are heteroskedastic and correlated within individual samples. System GMM has been developed by Arellano and Bover (1995) and Blundell and Bond (1998) for panel data which have a short time period (T) and a large number of individual cases in the sample (N). Furthermore, the dynamic form of an estimator, such as an autoregressive (AR) model, also has an endogeneity problem. As can be seen from Equations (2), (3) and (5), we use a dynamic model of capital structure adjustment. For our study, we use a simple form of the dynamic model as shown in Equation (6):

$$y_{i,t} = \alpha_i + y_{i,t-1} + X_{i,t} + \varepsilon_{i,t} \quad (6)$$

From Equation (6), we develop Equation (7):

$$(y_{i,t} - y_{i,t-1}) = \alpha_i + \lambda(y_{i,t-1} - y_{i,t-2}) + (X_{i,t} - X_{i,t-1}) + (\varepsilon_{i,t} - \varepsilon_{i,t-1}) \quad (7)$$

where λ is an auto regressive parameter for the speed at which firms move towards their optimal capital structure.

From Equation (6), we can see that $(\alpha_i + \varepsilon_{i,t})$ is correlated with $y_{i,t-1}$. In addition, Equation (7) indicates a correlation between $(y_{i,t-1} – y_{i,t-2})$ and the error term $(\varepsilon_{i,t} – \varepsilon_{i,t-1})$ (Cameron and Trivedi, 2009). In order to remove the correlation, we use instrumental variables instead of using ($y_{i,t-1} - y_{i,t-2}$). To be a good instrumental variable, it needs to fulfill two conditions. It should correlate with the regressor ($y_{i,t-1} - y_{i,t-2}$) and not correlate with ($\varepsilon_{i,t} - \varepsilon_{i,t-1}$). If it fulfills these two conditions, any variable can be an instrument. Most researchers generally use one, two, or *t* period lagged regressors as instruments. For example, from Equation (7) $y_{i,t-2}$ is correlated with the regressor ($y_{i,t-1} - y_{i,t-2}$) and not correlated with the error terms ($\varepsilon_{i,t} - \varepsilon_{i,t-1}$). Furthermore, lagged $X_{i,t}$ or $\Delta X_{i,t}$ can likewise be instruments. There is no criterion over how many instruments should be used; however, increasing the number of instruments increases the chance of multicolinearity between the variables.

GMM is generally used to solve an endogeneity problem in a dynamic model. Furthermore, if there is a heteroskedasticity problem, GMM is superior to instrumental variables (IV); and if it is not, then GMM gives the same asymptotical results when compared to IV (Baum et al. 2003). Based on the type of instrument, various configurations of GMM, Differences GMM, Levels GMM and System GMM have been introduced. System GMM addresses a weakness in Differences and Levels GMM. In System GMM differenced variables can still be predetermined and may not be strictly orthogonal with idiosyncratic errors. A weak instrument problem can also arise in the Levels GMM with persistent instruments. Furthermore, according to Hayakawa's (2007) finding, Differences GMM has a downward bias, and Levels GMM has an upward bias, but System GMM cancels out both biases. Therefore, we use a two-step System GMM estimator in order to obtain reliable results given the nature of our data. In addition, the two-step estimator is asymptotically more efficient.

3.5 Financial deficit and security issuance

Frank and Goyal (2003) use Equation (9), to test the pecking order theory. They expect that the coefficient sing for 'def' in equation will be positive if the pecking order theory is correct as firms issue only debt when they need cash due to transaction costs; on the other hand, in the market timing theory, firms issue equity with overvalued prices. However, from previous research, such as Hovakimian et al. (2004) and from our data set, we observe that many firms issue (or retire) debt and equity at the same time. For example, about half of the firms in our sample issue (or retire) debt and equity together in the same year. This implies that we cannot clearly distinguish whether firms issue debt or equity in a certain year when they need cash. We therefore develop a new variable that more clearly indicates firms' choices between debt and equity. We call this variable 'pure issuance' and define it by subtracting net debt issue from net equity issue. Hence, pure issuance more readily indicates firms' actual choices between debt and equity when they issue both. We define pure issuance as follows:

$$\text{Pure issuance} = \text{net equity issue} - \text{net debt issue} = (\text{total equity issue} - \text{equity repurchase}) - (\text{total debt issue} - \text{total debt retirement}) \quad (8)$$

$$\Delta DR_t = \alpha_t + \beta \cdot def_t + \varepsilon_t \quad (9)$$

$$\text{Pure issuance}_t = \alpha_t + \beta \cdot def_t + \varepsilon_t \quad (10)$$

where, def is the financial deficit as defined by Frank and Goyal (2003).

Applying Frank and Goyal's (2003) Equation (9), and using our new variable the 'pure issuance', we test the pecking order theory using Equation (10).

3.6 Descriptions of variables

We summarise all the variables, instrumental and control, and the other variables, including capital structure determinants that we use in our models in Table 2.

[Table 2 about here]

Some comments on our variables are called for. As regards calculating the debt ratio, there is no clear criterion for using book or market based debt ratios. According to Hillegeist et al. (2004), book-value-based debt ratios are over-leveraged due to the conservative accounting principle. Market-value-based debt ratios, on the other hand, change dramatically over time as the stock price changes. As we are interested in firms' capital structure decisions and want a stable measure of leverage, we use a book measure. To measure amount of cash that a firm needs for its operation, we use Frank & Goyal's (2003) definition of financial deficit. Under the pecking order theory firms issue debt when they do not have enough cash, and issue equity under the market timing theory if the stock price is overvalued. Financial deficit is therefore a key variable to test both the pecking order and market timing theories.

The stock return is one of the most important capital structure determinants in the pecking order and market timing theories. Myers (1984) asserts that firms issue only debt when they need cash as there are higher asymmetric information costs on stocks than on debt. On the other hand, the market timing theory (Baker and Wurgular, 2002) argues that firms opportunistically issue equity when stock prices are higher than warranted by the firm's fundamentals. These two arguments indicate that both theories are based on asymmetric information. Underpricing and overpricing both occur due to a lack of information in the market. However, the market timing argument suggests the opposite behavior to that proposed by the pecking order theory.

Tangibility relates to firms' bankruptcy and asymmetric information costs. The majority of prior research suggests that firms which predominantly have tangible assets have higher liquidation values. Tangibility also relates to asymmetric information as external investors can have a better idea of a firm's business or the purpose of tangible assets when firms hold tangible assets rather than holding cash. As the tangibility of firms' assets reduces asymmetric information increases and liquidation values decrease, consequently it should have a positive effect on debt issuance and the debt ratio.

Similar to asset tangibility, capital expenditure also relates to liquidation costs, industry classification, and asymmetric information. This implies that capital expenditure likewise relates to the trade-off and pecking order theories in the same way as high tangible assets have higher liquidation values and lower information asymmetry. This implies that capital expenditure has a positive association with debt issuance.

The market-to-book ratio (M/B) is market participations' expectation of a firm's growth in the future and a high M/B indicates high stock prices relative to fundamentals. The market-to-book ratio therefore is an indicator for both the pecking order and market timing theories, as firms' growth expectations relate to the information on firms and their stock prices. According to both theories, the market-to-book ratio has a negative association with the debt ratio. In the market timing theory, a high stock price leads a firm to issue equity. For the pecking order theory, a high stock price indicates low asymmetric information costs and this increases the likelihood firms will issue equity, as a low market-to-book leads firms to only issue debt.

Profit is also an important capital structure determinant as it affects firms' financial strength and debt capacity. In the pecking order theory, profits have a negative association with debt ratios because profits increase equity as well as total assets. However, in the trade-off theory, firms with high profits will issue debt because high profits make firms deviate below their optimal capital structure.

Total assets is indicative of the size of a firm and is important to both the pecking order and trade-off theories. Bigger firms generally imply a lower level of asymmetric information (Frank and Goyal, 2003) as they are more exposed in the public. Firm size also indicates bankruptcy probability, as larger firms are at less risky than smaller ones (Daskalakis and Psillaki, 2008). This implies that a firm's size is positively associated with the debt ratio in both the static trade-off and pecking order theories.

Since Modigliani and Miller (1963) tax is the most important and controversial determinant in capital structure theories. It is an important variable in developing optimal capital structure with variable bankruptcy costs. Contrary to Modigliani and Miller (1963), much research such as Shefrin (2007) suggests that the tax rate is not important for debt ratio decisions. However, Korteweg (2010) argues that the tax shield is about 5.5% of firms' values. The bankruptcy probability (BP) through bankruptcy costs is important for the trade-off theory. This argues firms balance bankruptcy costs against the advantages of the tax shield from debt to maximize firms' values by minimizing their after-tax weighted average cost of capital. Much prior research, for instance Shefrin (2007), makes the argument that bankruptcy costs are more important than the tax shield. We consequently include both the corporate tax rate and the probability of bankruptcy because these affect firms' decision whether to issue debt or equity.

We use a combined Z-score model to measure firms' bankruptcy probabilities in line with their countries of origin. Altman develop the original Z-score model for US manufacturing firms and the Z"-score model is for non-US firms in developed market, and the EMS model is for firms in the emerging markets[1]. We therefore use the Z-score model for US companies, the EMS model for Korean and Taiwanese firms, and the Z"-score model for firms which originate from all the other countries in our sample. For the all bankruptcy models using in this paper, we give a value of 1 if a firm is in non-bankruptcy area, 3 if it is in bankruptcy area, and 2 if it is in the between non-bankruptcy and bankruptcy area. In order words, if a firm is in non-bankruptcy area in Korea, in Japan or in Britain, its value is 1 although the non-bankruptcy area is determined by each different bankruptcy probability model according to the firm's nationality. We expect a negative association between debt issue and BP as firms with a high probability of bankruptcy would issue equity to reduce their debt ratio.

[1] Z-score, Z"-score and EMS models are developed by Altman in 1968, 2002, and 2005 respectively.

4 Analysis and results

4.1 Analysis of variance tests

For ANOVA tests, we classify our sample based on time periods, industries, and countries. We first separate our sample into two equal time periods, 1989 to 1998 and 1999 to 2008. As we mentioned in the previous section, we also classify our sample into the 9 different countries and 14 different industries used in our sample.

Table 3 Panel A reports the results for the ANOVA test for the two sub-periods and this shows that there are significant differences in the average debt ratios between the two periods. This indicates that firms have adjusted their capital structure between the two time periods. Panel B provides a country-by-country level breakdown of Panel A. Eight out of nine of the countries show a statistically significant difference between the two periods. Only the United Kingdom does not show any statistically significant differences. Overall, Table 3 supports the static trade-off theory, as only trade-off theory makes the case for firms to systematically adjust their debt ratios.

[Table 3 about here]

In Table 4, we also investigate whether there are systematic differences in debt ratio between countries. To do this, we initially use the whole sample period and Panel A shows that there are statistically significant the differences in debt ratios between countries. In Panel B, we do another test, separating the sample into the two sub-periods. One particularly interesting finding is that for the sample countries the debt ratios converge in the second period, a factor confirmed by the much higher F values for the earlier period compared to the later period (96.46 versus 41.34). This is shown graphically in Figure 1. We attribute this to a weakening of country effects due to factors such as globalization and the increasing standardization of financial and business norms.[2] Even though the difference in debt ratios between countries is smaller in the second sub-period, the table still indicates there is a big difference in capital structure. This result still supports the trade-off theory as only the trade-off theory suggests non-random contribution of debt ratio.

[Table 4 about here]

[Figure 1 about here]

Table 5 reports the results of our industry-based tests and indicates significant statistical differences exist. Panel A uses the whole time period and sample classified by industry while, as above, Panel B breaks the sample into the two sub-periods.

In Table 6, we finally present firms' debt ratios and leverage adjustment classified by industry. From Panel A, we note that, when we consider mean values, firms in 8 out of 14 industries have reduced their debt ratios, and when we use medians, it is 12 industries. This indicates that there is a pattern to the way firms adjust their leverage over our sample period. In Panel B, we arrange industries based on their mean and median debt ratios, and rank them in ascending order. We observe that there are two clear groups of industries. Firms in the biotechnology, software, semiconductor, computer hardware, computer service, heavy construction and the internet industries have low debt ratios. On the other hand, firms in the aluminum, mobile telecommunication, airline, fixed-line telecommunication, hotel, travel and marine transportation industries have high debt ratios. This industry-related pattern to firms' debt ratios accords with Scott and Martin (1975) and Harris and Raviv (1991), who find there are noticeable patterns across industries.

[2] One can note factors such as the widespread introduction of International Financial Reporting Standards, increasing popularity of cross-listings and the growth in international portfolio investment as potential influences that lead firms towards a "global" capital structure standard. It should be noted our sample is made up of relatively large firms and is more influenced by such factors than would be the case for purely local firms.

Our results in Tables 3 to 6, indicate significant differences in debt ratios based on firms' characteristics and support the trade-off theory as only this theory implies the existence of systematic patterns.

[Table 5 about here]

[Table 6 about here]

4.2 Firms' choice of debt or equity and the speed of adjustment of their capital structure

In this section, we investigate whether, when firms raise finance, there is a pattern in their choice of financing sources between equity and debt and whether they adjust their debt levels. To do this, in Panels A and B, we use financial deficit (def), as defined by Frank and Goyal (2003), for firms' cash needs to test the association between the change in a firm's debt ratio (ΔDR) and firms' financial deficit (def); and between pure issuance (pur) and firms' financial deficit. Our argument here is that firms which are financially constrained and have little or no financial slack, as measured by our financial deficit measure, will issue debt. This presupposes that financially constrained firms will issue debt, as debt has little adverse selection costs in the pecking order theory.

Panel A in Table 7, using Equation (9), presents negative associations between def and ΔDR. Only four countries out of the nine show a statistically significant relation between def and ΔDR, and the relationships are all negative. There are six countries with negative coefficients, including the non-significant ones, while three countries have positive coefficients but these are not statistically significant. This implies that firms generally use equity or operating profits for their financial needs. As observed from the descriptive statistics in Table 1, we know that for our sample it is not the case they are simply using operating profits for their financial needs. We therefore conclude that the negative coefficients in our results are caused by equity issuance.

In Panel B, using Equation (10), we test the relation between ‘def’ and ‘pure issuance’ across countries. Compared to ‘def’ and changes in leverage, our results indicate a strong positive correlation in that eight countries out of the nine have a positive and statistically significant coefficient. Only Taiwanese firms show a negative coefficient; and although this is significant, the coefficient level is close to zero. The results for def and pure issuance also indicate that firms mainly use equity to address financial deficits.

In our third test in Panel C, using Equation (5), we investigate the speed of capital structure adjustment for the sample countries using two-stage System GMM. The results indicate that firms for all the sample countries adjust their capital structure, although the speed varies between countries. As the coefficient is ‘1-capital structure adjustment speed (λ)’, firms in Australia, Canada, the US, Korean and Taiwan have a high rate of capital structure adjustment speed compared with Japan, UK, and France. We partly attribute these differences to differences in institutional and macro-economic environmental factors. For instance, Korean firms changed their capital structure rapidly after the Asian financial crisis in 1997.

From the above analyses, we can conclude that firms in our sample adjust their capital structures and, in doing so, principally issue equity. As discussed earlier, systematic debt ratio adjustment is evidence for the trade-off theory and as firms mainly use equity to adjust their capital structures, we can reject the pecking order theory. If we link our results with the financial condition of the sample and the underlying macroeconomic conditions over the time period, the evidence suggests firms issue equity to reduce their debt ratios in order to reduce their risk of financial distress. The reason is due to the adverse financial and economic conditions that prevailed. Such behavior accords with the trade-off model where firms rationally balance the advantages of the debt tax-shield against agency and financial distress costs.

[Table 7 about here]

5 Conclusions

We start this paper with one question: whether there is an optimal capital structure for firms. We mainly test our question in two ways that, we believe, can improve previous research with providing more clear and reliable conclusions. First, firms' debt ratios will not be randomly distributed if there are optimal capital structures for firms. As firms should adapt to their environment to survive; and if they do, characteristics such as industry and external factors such as recession would affect firms' debt ratios. As a consequence, firms in the same industry have a similar debt ratio compared to firms in other industries. Second, when they change their debt ratios to increase or decrease leverage, the majority of firms in an industry act the same way. It is because, when firms confront a shift in the economic environment, they show similar behaviors, such as decreasing debt ratios or issuing equity in a recessionary period.

As we expected, our results clearly indicate systematic patterns in capital structure across industries and over time. Firms in high-technology industries have low debt ratios compared to firms in traditional, high tangible asset, industries. We also notice a distinct secular trend in that firms reduce debt ratios over the sample period, regardless of industry and country and mainly use equity for their financial needs. We also observe that country factors greatly affect firms' debt ratios. We find that both debt ratios and capital structure adjustment speeds vary across countries. Our result in Table 6 presents that, in terms of mean value, firms in 8 industries and, in terms of median value, in 12 industries among 14 industries have reduced their debt ratios during our sample time period. This indicates that there is a clear trend in capital structure adjustment that firms try to follow. This likewise implies that macroeconomic environment prompts firms to change their capital structure. Finally, we observe that firms in our sample mainly issue equity during our sample time period, which is contrary to the pecking order theory. Consequently, our findings generally support the trade-off theory.

Finally, we would like to close this paper by emphasizing our contribution. In this paper, we use ANOVA test following Stonehill and Stizel's (1969) method when they compared firms' debt ratio from different industries. To our best knowledge, we have not seen any paper that directly compares debt ratio based on countries, industries and time period since Stonehill and Stizel's and hence we provide new evidence on this question. Our second contribution is that we show systematic patterns in debt ratios based on industries. For example, without exception firms in the software industry have lower debt ratios than firms in the hotel industry, across all countries and time periods in our sample. Although, this is an easy comparison to make, we have not seen this in research on this topic since the Stonehill and Stizel paper. Furthermore, our research methods give clear and intuitive results. Finally, there exists an endogeneity problem between the regressand and regressor when using panel data with a first order autoregressive model. We use a System-GMM model to solve this endogeneity problem and hence improve the reliability of our results compared to prior studies that do not address this modelling issue.

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Tables

Table 1: Descriptive statistics

This table presents summary statistics (Panel A) and correlation matrix (Panel B) for all firms in the sample for the whole period 1989 to 2008. The kurtosis and skewness indicate that some of the variables are not normally distributed. The descriptive statistics for stock returns (SR), the market-to-book ratio (M/B) and profits suggests that many firms were financially insecure and may also indicate firms experienced adverse macroeconomic conditions during our sample period. The correlation matrix in Panel B indicates no strong correlation between the variables, with the exception of the bankruptcy probability (BP) and the debt ratio (DR). Although high, the correlation between these two variables is acceptable as our unreported VIF tests indicate there is no significant multi-colinearity present. All variables are defined in Table 2.

	Panel A: Variables descriptive statistics									
Statistics	DR	def	Lnasset	Tang	Capex	SR	tax	BP	M/B	Profit
Mean	0.1956	0.1953	4.6007	0.2062	0.0546	-0.1823	0.3002	1.7495	2.0093	-0.0698
Min	0.0000	-3.5156	-4.6052	-0.0082	0.0000	-8.9480	0.0000	1.0000	0.0429	-3.0000
p25	0.0047	-0.0171	3.1232	0.0488	0.0094	-0.4993	0.0029	1.0000	1.0160	-0.0660
P50	0.1128	0.0630	4.5692	0.1286	0.0266	-0.0756	0.2485	1.0000	1.3958	0.0326
p75	0.3072	0.2736	6.1464	0.3004	0.0661	0.2586	0.4164	3.0000	2.3305	0.0903
p99	1.1013	2.0000	10.2730	0.8228	0.3956	1.1091	2.0804	3.0000	8.5978	0.3746
Max	1.9144	4.4286	12.5270	0.9125	0.6159	1.2672	13.2500	3.0000	9.9905	1.7714
Sd	0.2428	0.4290	2.4453	0.2066	0.0776	0.7178	0.5683	0.8820	1.6262	0.3848
Skew	2.1633	3.0493	-0.1431	1.2963	3.0258	-1.5475	10.7007	0.5099	2.2360	-3.5414
Kurto	10.4255	19.1971	3.5592	3.8724	14.7390	9.4910	169.456	1.4780	8.3467	19.6015
Obs	32410	24068	33029	32538	28212	29720	27446	26677	28333	32209
	Panel B: Correlation matrix									
	DR	def	Lnasset	Tang	Capex	SR	tax	BP	M/B	Profit
DR	1									
def	0.045	1								
Lnasset	0.0961	-0.3741	1							
Tang	0.3367	-0.0877	0.3237	1						
Capex	0.0878	0.0927	0.1539	0.4302	1					
SR	-0.0775	-0.1031	0.1411	0.0733	0.0441	1				
Tax	-0.0181	-0.0869	0.1686	0.0433	-0.0125	0.0503	1			
BP	0.5309	0.0546	-0.0433	0.2196	-0.0212	-0.1837	-0.0685	1		
M/B	-0.0176	0.2502	-0.2324	-0.1828	0.1117	0.143	-0.1241	-0.0882	1	
Profit	-0.1467	-0.4939	0.437	0.111	0.0914	0.2925	0.1808	-0.3401	-0.2349	1

Table 2: Description of variables used in the analysis

DIV is the firm's total dividend payments, I is investment (capital expenditure), WC is the net working capital (total current assets - total current liabilities = operating working capital + cash and cash equivalents + current debt), C is cash-flow after interest and taxes (internal cash-flow or net income + depreciation), D is the net issue of debt, E the net issue of equity issue. To remove size differences, all items are scaled by total assets. Z-, Z"-, EM models are the indices for bankruptcy probability measures; WC is working capital; TA is total assets, RE is retained earnings; ME is the market value of equity; EBIT is earnings before interest and taxes; BD is the book value of total debt; SALE is the firm's sales or turnover; BE is the book value of equity; BTL is the book value of total liabilities; OI is operating income. US firms are in the non-bankruptcy area if Z-score is greater than 2.99, in the intermediate area if between 1.81 and 2.99, and in the bankruptcy area if below 1.81. Korean and Taiwanese firms are in the non-bankruptcy area if EM score is greater than 5.85, the intermediate area if between 4.15 and 5.85, and bankruptcy area, if below 4.15. Finally, firms from all the rest of countries are in non-bankruptcy area if Z"-score is greater 2.60, in the intermediate area if between 2.60 and 1.1 and the bankruptcy area if below 1.1. We assign the number 1 to the variable of bankruptcy probability (BP) if they are in non-bankruptcy area, 2 if in gray area, and 3 if in the bankruptcy area.

Variable	**Description**	**Comment**	**Predicted sign**		
			Trade-Off	**Pecking Order**	**Market Timing**
Pure issuance (pur)	net equity issue – net debt issue = (total equity issue – equity repurchase) – (total debt issue – total debt retirement)	Indicator of firm's intent to issue debt or equity			
Debt ratio (DR)	total debt/ total assets	Book based debt ratio			
Financial deficit (def) *	$def_t = DIV_t + I_t + \Delta WC_t - Cf_t = D_t + E_t$	Frank and Goyal's (2003) definition		+	
Stock return (SR)	$SR_t = \log(\text{stock price}_t / \text{stock price}_{t-1})$			–	–
Asset tangibility (tang)	Tangibility = tangible assets / total assets		+	+/–	
Capital expenditure (capex)	= capital expenditure / total assets		+	+/–	
Market-to-book ratio (M/B)	= (total asset – book equity + market equity) / total asset			–	–

Profits	= operating profits / total assets		+	–	
Total assets(Lnasset)	= log(total assets)		+	+	
Corporate tax rate (tax)	= (income tax / pre-tax income)		+		
			+		
Bankruptcy probability (BP) [**]	Z-score for US firms is = $1.2\frac{WC}{TA}+1.4\frac{RE}{TA}+3.3\frac{EBIT}{TA}+0.6\frac{ME}{BD}+0.99\frac{SALE}{TA}$		–		
	Z"-score for other developed countries = $6.56\frac{WC}{TA}+3.26\frac{RE}{TA}+6.72\frac{EBIT}{TA}+1.05\frac{BE}{BTL}$	Score is 1, if firm is predicted as going concern; 2 if intermediate; 3 if predicted to go bankrupt	–		
	EM model for emerging markets = $6.56\frac{WC}{TA}+2.36\frac{RE}{TA}+6.72\frac{OI}{TA}+1.05\frac{BE}{BTL}+3.25$		–		

Table 3: Analysis of variance test between the two time periods

Panel A compares the differences in the means of firms' debt levels between the period 1989-1998 and the period 1999-2008 for the whole sample. This shows that there are significant differences in debt ratio between the two periods.
Panel B compares the differences for the means between the two periods using country level data. Both Panels present a significant difference in debt ratios between two periods, with the exception of the United Kingdom. For brevity, in Panel B, we do not report the full details of ANOVA test results such as, the sum of squares (SS), the degrees of freedom (DF) and mean square (MS) and provide only the F values and their significant levels. SS: sum of squares, DF: degree of freedom, MS: mean square, F: F statistic, Prob: p-value. *,**,*** statistical significances at the 0.10, 0.05 and 0.01 level, respectively.

Panel A: Comparison of debt ratios between 1989-99 and 1999-2008

	SS	DF	MS	F	Prob> F
Model	5.4837	1	5.4837	93.31***	0.0000
Residual	1904.608	32408	.0587		
Total	1910.092	32409	.0589		

Panel B: Comparison of debt ratios between 1989-99 and 1999-2008, based on country classification

	F statistic	Prob> F
Australia	10.69***	.0011
Canada	7.50***	.0063
Germany	18.79***	.0000
France	31.56***	.0000
United Kingdom	0.02	.8758
Japan	237.78***	.0000
Korea	352.26***	.0000
Taiwan	30.30***	.0000
USA	49.29***	.0000

Table 4 Analysis of variance tests on debt ratios by country

This table presents a non-random distribution in debt ratios across the countries in the sample. In Panel A, F statistics and p-values indicate that there are significant differences in debt ratios between countries. Panel B shows the average difference in debt ratio amongst countries for the two sub-periods. The F statistics indicate that there are significant differences in debt ratios between countries and over time. SS: sum of squares, DF: degree of freedom, MS: mean square, F: F statistics, Prob.: p-value. *,**,*** statistical significances at the 0.10, 0.05 and 0.01 level, respectively.

Panel A: ANOVA test based on 9 different countries						
		SS	DF	MS	F	Prob
Whole years	Model	28.5092	8	3.5636	61.37***	.0000
	Residual	1881.5826	32401	.0580		
	Total	1910.0919	32409	.0589		
Panel B: ANOVA test based on 9 different countries and the two periods						
		SS	DF	MS	F	Prob
Period one (1989-98)	Model	33.9225	8	4.2403	96.46***	.0000
	Residual	309.4408	7039	.0439		
	Total	343.3633	7047	.0487		
Period two (1999-08)	Model	20.1053	8	2.5131	41.34***	.0000
	Residual	1541.1395	25353	.0607		
	Total	1561.2448	25361	.0615		

Table 5 ANOVA tests for debt ratios, categorized by industries

Panel A gives evidence for a non-random distribution of debt ratios by industry. The results imply that each industry has a unique debt ratio. Panel B likewise presents the same analysis but split between 1989-99 and 1999-2008. SS: sum of squares, DF: degree of freedom, MS: mean square, F: F statistics, Prob: p-value. *,**,*** statistical significances at the 0.10, 0.05 and 0.01 level, respectively.

Panel A: ANOVA test based on 14 different industries						
		SS	DF	MS	F	Prob
Whole Period	Model	179.4630	13	13.8048	258.4***	.0000
	Residual	1730.6288	32396	.0534		
	Total	1910.0919	32409	.0589		
Panel B: ANOVA test based on 14 different industries and different time periods						
		SS	DF	MS	F	Prob
Period one (1989-98)	Model	66.9039	13	5.1464	130.94***	.0000
	Residual	276.4594	7034	.0393		
	Total	343.3633	7047	.0487		
Period two (1999-08)	Model	113.6087	13	8.7391	153.02***	.0000
	Residual	1447.6361	25348	.0571		
	Total	1561.2448	25361	.0615		

Table 6: Debt ratio adjustment patterns and ranked orders

This table presents firms leverage adjusting behavior by industry. Panel A indicates that, based on the average and median values, firms in most industries have reduced their debt ratios over the sample period. Panel B shows that there are two clear groups: Firms in biotechnology (Biotechn), software, semiconductors (Semicon), computer hardware (Com-hard), computer services (Com-serv), heavy construction (Heavy-con), and internet industries have low debt ratios. Firms in aluminum, mobile telecommunication (Mobile tel), airline, fixed-line telecommunication (Fixed tel), hotel, travel, and marine transportation (M-transport) industries have high debt ratios. The results indicate there is a pattern in the way firms adjust their leverage levels.

	Panel A					Panel B				
							Mean		Median	
ICB-sub	Periods	Mean	Mean change	Median	Median change	Rank	89-98	99-08	89-98	99-08
Aluminium	89-98	.3343	.0216	.3241	.0419	1	Biotechn	Software	Biotechn	Software
	99-08	.3559		.366						
Heavy-con	89-98	.2169	-.017	.1796	-.022	2	Software	Com-serv	Software	Biotechn
	99-08	.1999		.1576						
M-transport	89-98	.4450	-.0657	.4830	-.1073	3	Semicon	Semicon	Internet	Internet
	99-08	.3793		.3757						
Biotechn	89-98	.1355	.0336	.0393	-.0147	4	Com-hard	Internet	Semicon	Com-serv
	99-08	.1691		.0246						
Airlines	89-98	.3504	.0517	.3306	.0677	5	Com-serv	Biotechn	Com-serv	Semicon
	99-08	.4021		.3983						
Hotels	89-98	.4162	-.0651	.4097	-.0695	6	Heavy-con	Com-hard	Com-hard	Com-hard
	99-08	.3511		.3402						
Travel	89-98	.4319	-.0954	.4868	-.1566	7	Internet	Heavy-con	Heavy-con	Heavy-con
	99-08	.3365		.3302						
Fixed tel	89-98	.3507	-.0142	.3364	-.0367	8	Aluminium	Mobile tel	Aluminium	Mobile tel
	99-08	.3637		.2997						
Mobile tel	89-98	.3448	-.1069	.3305	-.1569	9	Mobile tel	Travel	Mobile tel	Fixed tel
	99-08	.2379		.1736						
Com-serv	89-98	.1719	-.022	.1145	-.0421	10	Airlines	Fixed tel	Airlines	Travel
	99-08	.1499		.0724						
Internet	89-98	.2280	-.0655	.0924	-.0607	11	Fixed tel	Hotels	Fixed tel	Hotels
	99-08	.1625		.0317						
Software	89-98	.1375	.0095	.044	-.0201	12	Hotels	Aluminium	Hotels	Aluminium
	99-08	.1470		.0239						
Com-hard	89-98	.1717	.0018	.1347	-.0069	13	Travel	M-transport	M-transport	M-transport
	99-08	.1735		.1278						
Semicon	89-98	.1568	.00	.1045	-.0128	14	M-transport	Airlines	Travel	Airlines
	99-08	.1568		.0917						
Total	89-98	.2202	-.0315	.1615	-.0647					
	99-08	.1887		.0968						

Table 7: Capital structure adjustment by country

This table summarizes the capital structure adjustment behavior of firms across the sample countries. Panel A shows that the change in debt ratio (ΔDR_t) indicates firms mainly use equity to adjust their debt ratios. Panel B shows that firms mainly use equity for increasing the amount of cash in their balance sheets. Panel C indicates that firms adjust their capital structure toward their optimal levels. In Panel C, to measure the speed at which firms adjust their capital structure, we use a two-stage System GMM estimator with one and two period lagged debt ratios as instruments. We presume that only debt ratios are endogenous as can be seen in Equations (6) and (7). US: Australia, CAN: Canada, UK: Britain, USA: the United States, DEU: Germany, FRA: France, JPN: Japan, KOR: Korea and TWN: Taiwan. *,**,*** statistical significances at the 0.10, 0.05 and 0.01 level, respectively.

Panel A: ΔDR_t										
	Whole	AUS	CAN	UK	US	DEU	FRA	JPN	KOR	TWN
Cons	-.0007 (-.72)	.0021 (.34)	.0045 (.78)	.0028 (.67)	.0051 (2.56)**	.0024 (.052)	-.0052 (-1.73)*	-.0118 (-8.7)***	-.0007 (-0.2)	-.0031 (-1.42)
Def_t	-.0098 (-4.32)***	.0064 (.69)	.0026 (.27)	-.0484 (-5.47)***	-.0094 (-2.55)**	-.0362 (-2.98)***	.0018 (.18)	-.0131 (-2.72)***	-.007 (-.6)	-.0074 (-1.00)
R^2	.0008	.0005	.0001	.0175	.0007	.0073	.00	.0016	.0003	.0004
Obs	23883	923	914	1681	9347	1209	1325	4611	1340	2533
Panel B: Pure $issue_t$										
	Whole	AUS	CAN	UK	US	DEU	FRA	JPN	KOR	TWN
Cons	.0168 (7.52)***	.0596 (4.05)***	.0400 (2.94)***	.0362 (4.28)***	.0247 (6.72)***	.0113 (1.60)	.0177 (3.47)***	.0089 (4.20)***	-.0062 (-1.07)***	.0039 (1.43)
Def_t	.3506 (76.44)***	.4147 (18.61)***	.4958 (19.76)***	.3883 (22.95)***	.3409 (53.38)***	.2690 (11.1)***	.0631 (2.97)***	.0691 (6.15)***	.2637 (12.81)***	-.0584 (-4.68)***
R^2	.2414	.2898	.3716	.2400	.2358	.1912	.0118	.0165	.1307	.0148
Obs	18367	851	662	1670	9236	523	679	2258	1094	1394
Panel C: DR_t										
	Whole	AUS	CAN	UK	US	DEU	FRA	JPN	KOR	TWN
Cons	.0002 (.04)	.0114 (.379)	-.0405 (-5.79)***	-.0056 (-.85)	.0186 (1.43)	.0223 (3.46)***	.0084 (1.26)	-.0196 (-3.7)***	-.0278 (-2.33)**	.001 (.08)
DR_{t-1}	.7283 (28.78)***	.5366 (45.91)**	.5538 (64.92)**	.7294 (29.14)***	.6434 (17.92)***	.7887 (114.85)***	.8271 (140.71)***	.8892 (37.84)***	.6513 (50.68)***	.6832 (19.26)***
BP_{t-1}	.0073 (2.27)**	.0207 (7.39)***	.0197 (16.35)***	-.0000 (-.02)	.0221 (2.89)***	-.0011 (-.54)	-.0058 (-2.36)**	.0073 (1.91)*	-.0004 (-.12)	.0077 (1.17)
$Ln(asset)_{t-1}$	.0037 (4.36)***	.0058 (3.74)***	.0067 (5.81)***	.0035 (4.39)***	.0009 (.53)	-.0012 (-1.97)**	.0029 (5.97)***	.0018 (2.37)**	.0166 (8.98)***	.0061 (3.16)***
Tang	.0549 (5.04)***	.0265 (1.54)	.0969 (5.97)***	.0580 (4.39)***	.0583 (2.89)***	.0837 (9.34)***	.0672 (7.90)***	.0215 (1.97)**	-.0028 (-.18)	.0281 (1.55)
Tax	.0029 (2.56)**	-.0070 (-3.36)***	.0068 (9.28)***	.0135 (2.21)**	.001 (.30)	-.0014 (-.62)	-.0151 (-3.35)***	.0035 (2.73)***	.0221 (8.41)***	.0033 (.7)
Capex	.0565 (2.51)**	.1394 (3.21)***	.1977 (7.44)***	.0671 (2.66)***	.0316 (.78)	.0516 (5.20)***	.0632 (2.42)**	.0305 (.74)	.1385 (6.08)***	.1037 (2.73)***
M/B	.0021 (1.80)*	-.0059 (-2.43)**	.0022 (1.68)*	-.000 (-.04)	.0030 (1.47)	-.0010 (-1.20)	.0087 (4.59)***	-.0001 (-.09)	-.0101 (-4.14)***	-.0064 (-1.53)
Profit	-.0147 (-1.44)*	.0412 (5.11)***	-.0193 (-2.18)**	-.0003 (-.02)	-.0221 (-1.34)	.0104 (1.59)	.0272 (1.80)*	.0746 (1.96)*	.0389 (1.04)	.0521 (1.19)
SR	-.0111 (-5.13)***	-.0141 (-3.64)***	.0006 (.29)	-.0100 (-4.56)***	-.0117 (-2.69)***	.0077 (5.05)***	-.0195 (-7.25)***	-.0094 (-4.03)***	-.0036 (-1.70)*	-.0005 (-.1)***
AR(1)	-8.36***	-2.59**	-2.89***	-3.45***	-5.23***	-2.81***	-3.64***	-5.34***	-1.96**	-6.57***
AR(2)	.72	.42	.97	-.30	.37	.83	-1.6	1.58	.74	-.90
Hansen [p-value]	60.87 [.162]	30.63 [.976]	45.23 [.701]	50.53 [.492]	44.16 [.740]	46.88 [.406]	53.83 [.367]	96.29 [.000]	55.01 [.326]	37.17 [.642]
Inst	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2	L1, L2
Obs	14302	676	489	1180	4437	679	748	4045	532	1516

Figure

Figure 1: Debt ratios over time

Figure 1 shows the changes in debt ratio by country during the sample period 1989-2008. Of particular note is the way debt ratios converge in the latter part of our sample period across all countries. The figure strongly indicates that on average for each country in the sample there is a pattern to how firms are adjusting their debt ratios. AUS: Australia, CAN: Canada, UK: Britain, USA: the United States, DEU: Germany, FRA: France, JPN: Japan, KOR: Korea and TWN: Taiwan.