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Effect of Earnings Volatility on Cost of Debt:

The case of Swedish Limited Companies



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Abstract

The paper empirically tests the relationship between earnings volatility and cost of debt with a sample of more than 77,000 Swedish limited companies over the period 2006 to 2013 observing more than 677,000 firm years. As called upon by many researchers recently that there is very limited evidence of the association between earnings volatility and cost of debt this paper contributes greatly to the existing literature of earnings quality and debt contracts, especially on the consequence of earnings quality in the debt market. Earnings volatility is a proxy used for earnings quality while cost of debt is a component of debt contract.

After controlling for firms' profitability, liquidity, solvency, cashflow volatility, accruals volatility, sales volatility, business risk, financial risk and size this paper studies the effect of earnings volatility measured by standard deviation of Earnings Before Interest, Taxes, Depreciation and Amortization (EBITDA) on Cost of Debt.

Overall finding suggests that lenders in Sweden does take earnings volatility into consideration while determining cost of debt for borrowers. But a deeper analysis of various industries suggest earnings volatility is not consistently used by lenders across all the industries. Lenders in Sweden are rather more sensitive to borrowers' financial risk across all the industries. It may also be stated that larger borrowers tend to secure loans at a lower interest rate, the results are consistent with majority of the industries. Swedish debt market appears to be well prepared for financial crises as the debt crisis seems to have no or little adverse effect borrowers' cost of capital.

This study is the only empirical evidence to study the association between earnings volatility and cost of debt. Prior indirect research suggests earnings volatility has a negative effect on cost debt (i.e. an increase in earnings volatility will increase firm's cost of debt). Our direct evidence from the Swedish debt market is consistent for some industries including media, real estate activities, transportation & warehousing, and other consumer services.

Keywords

Earnings Quality; Earnings Volatility; Debt Contract; Cost of Debt; Swedish Debt Market; European Debt Crisis

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List of Abbreviations

CoD: Cost of Debt

DbyE: Debt by Equity

DbyEv: Volatility of Debt by Equity

DTI: Debt-to-Income ratio

EP: Earnings Persistence

EQ: Earnings Quality

EU: European Union

EV: Earnings Volatility

EBIT: Earnings before Interest and Taxes

EBITv: Volatility of Earnings before Interest and Taxes

EBITDA: Earnings before Interest, Taxes, Depreciation and Amortization

EBITDAv: Volatility of Earnings before Interest, Taxes, Depreciation and Amortization

GDP: Gross Domestic Product

IFRS: International Financial Reporting System

LR: Liquidity Ratio

LRv: Volatility of Liquidity Ratio

NCF: Net Cashflow

NCFv: Volatility of Net Cashflow

ROA: Return on Asset

ROAv: Volatility of Return on Asset

SME: Small and Medium size Enterprise

T: Turnover (Net Sales)

Tv: Volatility of Turnover

WC: Working Capital

WCv: Volatility of Working Capital

1. Introduction

The adoption of Basel III framework is expected to promote a more stable financial condition worldwide (Schwerter, 2011) but banks may still need to be sophisticated when it comes to evaluating the creditworthiness of the borrowers. The Riksbank (the Swedish central bank) in their second quarter Financial Stability Report of 2010 stated that banks in Sweden is already partially complying with these new regulations and are also expected to adopt rest of the regulation ahead of stipulated time. Thus it may indicate that banks in Sweden are quite sophisticated compared to many other European countries.

The Swedish financial market consists of primarily insurance companies, mortgage credit institutions, mutual funds companies, AP funds (a form of pension funds), and banks. Banks along with insurance companies and mortgage credit unions holds the majority of the market share. There are primarily four types of banks in Sweden, which are commercial banks, foreign banks, savings banks and co-operative banks. Like most other countries the interest rate in Sweden is driven by the money market, however, borrower's creditworthiness and associated risk, financing cost and market competition also plays a key role. The financial market is highly regulated and responsibility of overall monitoring is bestowed upon Finansinspektionen (the Swedish Financial Supervisory Authority) and The Riksbanken. In case of any financial distress the Swedish National Debt Office, also known as the Financial Stability Council also steps in (Swedish Bankers' Association, 2016). The banking system itself changed a great deal after the era of 1940-1970 when it was more highly regulated and stable and today it is more liberalized and unstable, which is evident from the various financial crises in USA, Scandinavia and Spain. Liberalization, however, lead to various developments and market growth around the globe (Vives, 2001). Banks in Sweden have demonstrated superior performance over the past two decades as the actions taken after the 90s financial crisis seems to pay off (Boström, Lindbergh, & Wilson, 2015) and has been stable according to the z-score (measures bank's risk) calculated by Laeven & Levine (2009) for the period 1996-2001. According to a report by Gibas, Juks, & Söderberg (2015), the profitability of Swedish banks have been fairly stable over the period 2011 through 2015 after the profits plunged in 2010. Even though there are several studies on the bank's stability and earnings volatility, to the best of our knowledge, currently there is no paper that provides empirical evidence how bank values borrowers' earnings volatility (EV).

In the financial world lenders often talk about the five C's of credit, where the five C's stands for character, capital, capacity, conditions and collateral. Each of the C's may have different measures. For example: credit rating and credit history are good measures for character while a good capital structure (i. e. a lower debt-equity ratio) can be the measure to understand healthy capital position. Capacity, on the other hand, indicates the ability to repay debts and can be measured by debt-to-income ratio (DTI), earnings amount and stability. Collateral is often used to complement the capacity of the borrower and acts as a lien in the case borrower fails to repay the debt. Conditions are an overall evaluation of the economic conditions and market segments in which the borrowers operate (Investopedia, 2015 and Wells Fargo, 2016). According to Ruth (2004) and Ammann (2001) accurate evaluation of these factors is extremely important for banks' overall financial performance (Bruns & Fletcher, 2008).

We aim to enhance knowledge in the field by investigating 'if banks take into consideration earnings volatility to check the capacity of a borrower and determine the interest rate of borrowers (i.e. limited companies in Sweden).' Do banks only consider profitability, liquidity and solvency of their clients to determine interest rate/cost of debt (CoD) or do they also consider *earnings volatility* (EV) and/or persistence to determine interest rate of the borrower? We will also check the effect of 2008 financial crisis on the debt market for limited companies in Sweden. Did the banks in Sweden become more conservative or did they do business as usual? And finally we will check how banks' conservatism or aggressiveness in determining interest rates varies across different industries in Sweden.

EV is a proxy to measure *earnings quality* (EQ) when it comes to the literature. The three broad characteristics used in the literature to measure EQ are *properties of earnings*, investor responsiveness to earnings, and external indicators of earnings misstatements. EV is an element of *properties of earnings* (Dechow, Ge, & Schrand, 2010). A review of past research shows that the most commonly used term to consider 'EV' is '*earnings persistence* (EP)', which is of course the opposite of EV. EP is the firm's ability to maintain operating earnings from one year to another while EV is the dispersion in operating earnings. One of the most significant contribution to the EQ literature is perhaps from Dechow, Ge, & Schrand (2010) as they reviewed more than 300 articles from the EQ literature. DeFond (2010) critically evaluated the review article by Dechow, Ge, & Schrand (2010) and also considers

the review to be inclusive and extensive in providing an overview of the literature. It is a broad literature and one of the best classification of the literature could be the division in studies between the *determinants* and *consequences* of EQ done by Dechow, Ge, & Schrand (2010) in their review. Determinants' literature includes studies related to the effect of firm's characteristics, financial reporting practices, governance and controls, auditors, capital market incentives, and external factors on proxies of EQ. When it comes to the consequences of EQ, the proxies are considered independent variables in the study and are used to test the impact on dependent variables. Dependent variables include litigation propensity, audit opinions, market valuations, real activities including disclosure, executive compensation, labor market outcomes, a firm's cost of equity capital, *a firm's cost of debt capital (CoD)*, and analyst forecast accuracy (Dechow, Ge, & Schrand, 2010). EV may effect the perception of risk (Khan & Bradbury, 2014). Low voalatility in earnings is seen as a positive thing and increases the reliability of the financial statements (Su, 2013). Rightly so because EQ is affected by firm's fundamental performance and also the measurement and implementation of the accounting system (Dechow, Ge, & Schrand, 2010).

DeFond (2010) stated that the research related to the quality of accounting information with debt contracts is nothing new but the literature is extremely limited and Dechow, Ge, & Schrand, (2010) underscores the fact that studies of the consequences of EQ other than executive compensation is limited. This was also representative in their sample of 300+ reviewed article as it included only four papers that examined the conquences of earning quality in debt market and only one of them studied the effect of interest expenses to interest-bearing outstanding debt and that too using accruals as the proxy of EQ. They further conclude that the literature related to earnings persistence is extremely limited to two areas. First, valuation of equity with the assumption that persistent earnings are useful for equity valuation decision. Secondly, whether or not earnings are useful and if it provides better equity valuation. It can be observed that studies related to EV and CoD is extremely limited. Thus more research to study the relationship between EV and CoD is extremely important not only to advance the knowledge in the field but also to better understand the relationship.

Our study is an extension to numerous past research but it is unique in few ways, first the proxy for EQ will be EV while most other research uses earnings persistence in this field of study and secondly because we will study the consequences of EV on debt markets, a field

that is largely unexplored. The research on the consequences in debt market is extremely limited as suggested by both DeFond (2010) and Dechow, Ge, & Schrand, (2010). Furthermore, most of the prior research in the field is conducted on ordinary-least-squares regression (OLS) method, especially using cross-sectional or pooled cross-sectional data. But our study takes the panel data estimation approach thus having multiple time variant observation of each variable hence it will increase the reliability of the results (Rodríguez-Pérez & Hemmen, 2010). Armstrong, Guay, & Weber (2010, s. 38) from a review of past literature on the role of information and financial reporting in corporate governance and debt contracting suggests much of the research for accounting information and debt market is associated with either ‘(1) the choice of lender, (2) the lending market entered, (3) the amount of the loan held by the lead lender, and (4) the size of the bid-ask spread in the syndicated loan market.’ The authors also suggested various avenues for future research including more theoretical and empirical studies to understand the causal effect and/or relationship between the various earnings quality measures and the attributes (or determinants) of a debt contract. These studies can shed light if indeed these various earnings quality measures affect firm’s credit worthiness. Hence this paper will make significant contribution to the literature to understand how relevant is EV for banks to determine risk and interest rate besides traditional measures. This paper will also make significant contribution to the literature with respect to Swedish debt market as there is currently no empirical studies of the relationship between EV and interest rate (CoD) for the Swedish market.

Study of Sweden is also of particular interest because of its distinctive ownership structure and corporate governance. It has a concentrated ownership and private blockholder control compared to dispersed ownership and management control which is more common in the Anglo-American world even though a large portion of the population has investments in the stock market (Henrekson & Jakobsson, 2012). Sweden is also interesting to study because it is often cited as a leading example in the service theory and have long maintained a superior economic performance. Sweden’s life expectancy and GDP per capita either equals or exceeds USA often (Boström & Wilson, 2009). Lastly, Sweden is different from many other countries due to its historically low interest rates. In spite of which Swedish banks have been profitable and innovative (Gibas, Juks, & Söderberg, 2015). This paper will also do a cross-industry analysis of the relationship between EV and interest rate, therefore banks’ conservatism or aggressiveness across different industries can also be measured. As

the time period of the study will be between 2004 and 2013, this paper will also shed light on if the banks in Sweden were more conservative to EV during the recent financial crisis.

For the purpose of study, in consistent with numerous past studies as stated by Gassen & Fulbier (2015), we also assume that the financial accounting information effects the transparency or in other words creditworthiness of the borrower. According to Leuz (1998); Leuz, Deller, & Stubenrath (1998); Demerjian (2011) and Cascino, o. a. (2014), the financial accounting information is also reliable, relevant and consistent (Gassen & Fulbier, 2015); and Bruns & Fletcher (2008) suggests banks do take accounting information very seriously in their credit process.

The paper is organized as follows: it starts off with a brief but comprehensive review of past literature of earnings quality and its consequences (effects on cost of debt) in section 2 followed by empirical analysis in section 3, results & analysis in section 4, and conclusion & discussion in section 5.

2. Prior Literature and Hypothesis

The demand for accounting research in the capital market according to Kothari (2001) comes from four sources: fundamental analysis and valuation, test of capital market efficiency, *role of accounting in contracts* and in political process and disclosure regulation. Contracts essentially includes debt contracts. Some of the primary components of debt contracts are debt covenants, time to maturity, security/collateral, amount of loan, various restrictions including restrictions on dividend, asset sale and/or investments, financial reporting standards and *interest rate* (Armstrong, Guay, & Weber, 2010). The study of earnings and returns dates back to 1968 and was started by Ball and Brown as they wrote ‘An Empirical Evaluation of Accounting Income Number’ and Beaver when he wrote his seminal paper ‘The Information Content of Annual Earnings Announcement’ in the same year (Lev, 1989). The initial studies, however, were primarily capital market or stock market focused and as Lev (1989) pointed out most of the initial studies were low in information content as they only investigated the causal relationship between stock returns and earnings. It was primarily because the data were subject to manipulation by management and also because of the weak correlation. Lev (1989) further suggested that future research should rather try to

understand the implications of financial information using both positive and normative approaches; the research should focus beyond merely the use of accounting ratios by stakeholders. The literature has grown quite significantly though over the years, especially after 80s and have taken various directions (DeFond, 2010). And as per the division of Dechow, Ge, & Schrand (2010), the initial two- studies by Ball and Brown (1968) and Beaver (1968) may be considered under '*Investor responsiveness to earnings*' stream.

Our research falls under the consequence category more specifically under *properties of earnings*. The literature for *properties of earnings* is a broad field too and includes several sub-fields such as earnings persistence and accruals; earnings smoothness; asymmetric timeliness and timely loss recognition; and target beating. The sub-fields also overlaps with earnings management. According to Goel & Thakor (2003) earnings management is deliberate manipulation of accounting data as it will not show the actual economic earnings. Income smoothing is however a special case of earnings management and it is temporary shift of earnings from one period to another to decrease the volatility of reported earnings. It is important to note again that we assume the financial accounting information is reliable, relevant and consistent hence there is no deliberate manipulation.

One of the most recent study by Gassen & Fulbier, (2015) of 708,990 firms from 24 European countries between 1998 and 2007 checked the impact of earnings smoothness on the CoD of private firms. The study was limited to 2007 to avoid effects of the adoption of the International Financial Reporting Standards (IFRS) for and small and medium-sized entities (SME) and the financial crisis. Their findings conclude that companies with high amount of creditor finance tend to report smoother earnings trends. And in congruence with past research they found the relationship to be stronger for bank credit compared to trade credit for the observed determinants. They also found that in countries with relatively weak debt contracts creditors have a stronger preference for smooth earnings. Hence, EV should be something that creditors won't prefer and would want to be complemented by higher returns, the interest rate or cost of debt. Garcia-Teruel, Martinez-Solano, & Sanchez-Ballesta (2014) conducted a similar study, but restricted to SMEs in Spain and their access to supplier financing or non-bank credit in relation to their earnings quality (measured by earnings variability). They found that suppliers also prefer low volatility and firms with more predictable earnings had more access to supplier credit. Trueman & Titman (1988) also

concluded in their study that smoother earnings lowers CoD therefore EV should increase CoD. This leads to establish our first hypothesis:

H1: Increase in EV will result in an increase in firm's CoD

The adoption of IFRS in Sweden is perhaps different from many other countries especially because of its early soft adoption of IFRS during 1991 and 2004. However, the legal enforcement of the soft adoption of IFRS was rather weak compared to mandatory adoption of IFRS in 2005 following the EU regulation 1606/2002. Due to the early adoption of IFRS in Sweden the mandatory adoption is not expected to have any significant impact (Hellman, 2011). Thus in our study we assume the effect of the adoption of IFRS in Sweden is insignificant and won't affect the results.

The financial crisis that initiated in the U. S. housing market in 2008 affected all the markets around the globe and Sweden was no exception (Österholm, 2010; Cosimano & Hakura, 2011 and Gavalas, 2015). The Swedish capital market lost more than 40% of the market capitalization in the December of 2008. Swedish banks however are protected from such shocks by the regulatory and legislative authorities. But the real economy is expected to suffer as the actual growth rate of GDP is expected to be lower in the coming years (Österholm, 2010). The European debt crisis had several effect on the debt market too. For instance, it had significant effect on the interest rate spread of several European countries including Greece, Portugal and Ireland. The crisis also led to supply shortages (both internal and external funding) for various banks in Europe, both national and international. Some banks, however, were also able to maintain smooth operation (Lane, 2012) while several studies (Ivashina, Scharfstein, & Stein, 2012; Correa, Sapriza, & Zlate, 2013; Bofondi, Carpinelli, & Sette, 2013 and Adelino & Ferreira, 2016) also show that many banks have decreased their credit to private sector (Popov & Horen, 2015). It is evident that banks became conservative after the debt crisis but we don't have any empirical study proving that, especially with respect to EV. Hence we are interested to see how bank's perspective of earnings volatility have changed, if at all it changed after the debt crisis. Which is the effect EV on CoD in isolation before and after the debt-crisis after controlling for debt crisis. Hence, in order to answer that question, we hypothesize:

H2: There is a significant change of the effect of EV on CoD before and after the debt crisis.

Finally, we are interested to learn if the effects of EV on CoD varies across industries and markets they operate. As Dechow, Ge, & Schrand (2010) points out that Graham and Dodd (1934) mentioned in their book 'Security Analysis', EQ largely depends on the segment that the firm is operating, hence we assume EV varies across various industries in Sweden. Thus we hypothesize

H3: There is a significant difference between association of EV with CoD for different industries

CoD is affected by various other factors besides EV. For example, Minton & Schrand (1999) show that high cashflow volatility results in lower average spending in capital investments, R&D expenditures and advertising expenses. They also find that in case of cash flow shortages firms usually do not raise additional funds from external capital markets as it increases the cost of capital. Thus high cash flow volatility increases the cost of capital in the capital market. Baxter (1967) stated that after a certain acceptable Debt/Equity ratio the Cost of Debt will start to increase as creditors fear of bankruptcy. Companies may go bankrupt if it becomes insolvent. Insolvency means the inability of the firm to meet its debt when it falls due. Hence a high Debt/Equity ratio increases the riskiness of a firm since it increases its probability to become insolvent. Therefore, Debt/Equity ratio, often known as financial leverage has a positive relationship with cost of capital (both equity capital and debt capital).

To sum up, we are interested to learn if banks also consider EV besides traditional measures such as Return on Assets (ROA), Working Capital Ratio (WCR), Liquidity Ratio (LR), and Debt-Equity ratio (DbyE) to determine CoD. And if banks are considering EV does its importance and significance vary across industries in Sweden. Also, if the financial crisis had any effect on the relationship between earnings volatility (EV) and cost of debt (CoD). Thus the dependent variable of the study is CoD (interest rate) and the primary independent variable is EV. Since past research suggests CoD is also affected by various other factors including the profitability, liquidity, and solvency of the firm; size of the firm; capital structure of the firm; the sales volatility and the cash flow volatility of the firm; financial and business risk and lenders' availability of capital. On the other hand, earnings quality has various indicators other than earnings volatility. For instance, Dechow & Dichev (2002) introduced accruals quality as a measure of earnings quality, the first and perhaps the only paper to discuss accruals estimation errors, especially both intentional and unintentional error. Their model includes variables such as operating cycle, firm size, sales volatility,

cashflow volatility, accruals volatility and earnings volatility as indicators of accruals quality and consequently earnings persistence. Hence, to take the effect of these factor into consideration we'll include proxies for such factors as control variables. Some of the factors that are hard to quantify and difficult to have access to will not be included as control variables. Such factors include lender's relationship with the client, lender's risk appetite, lender's availability of funds, lender's profitability, collateral, and competence within the business project.

The proxies for the control variables are listed in Table 1:

| Control Variable | Proxy |
|-----------------------------|---|
| Profitability of firm | Return on Assets (ROA) |
| Liquidity of firm | Liquidity Ratio (LR) |
| Solvency of firm | Debt by Equity (DbyE) |
| Accruals volatility of firm | Standard deviation of Working Capital (WCv) |
| Cashflow volatility of firm | Standard deviation of Net Cash flow (NCFv) |
| Turnover volatility of firm | Standard deviation of Turnover (Tv) |
| Business risk of firm | Standard deviation of Return on Assets (ROAv) |
| Financial risk of firm | Standard deviation of Debt by Equity (DbyEv) |
| Size of the firm | Turnover (T) |

Table 1: Control variables and proxies

3. Empirical Analyses

The main research question of the study was to examine if lenders consider earnings volatility of borrowers to determine the cost of debt. The dependent variable is thus cost of debt reported by the sample companies over the study period. The primary independent variable is earnings volatility and is calculated as the standard deviation of reported Earnings over the study period. A more detail definition of Earnings will follow in Section 3.3. Subsequent parts of the study explain research design in section 3.1, population and sample in Section 3.2, measures of independent variables, control variables and dependent variable in Section 3.3, 3.4 and 3.5 respectively, and descriptive statistics in Section 3.6.

3.1. Research design

To carry out the study a quantitative research approach is designed since it primarily follows a deductive approach to test hypothesis and study relationship between dependent variable and independent variables using various statistical measures. Also, the analysis is carried out on numerical data collected from secondary source using predetermined criteria (Saunders, Lewis, & Thornhill, 2012, ss. 161-162).

The proposed study may be considered as a longitudinal study, where the subjects are studied over an extended period of time compared to cross-sectional studies where subjects are studied at a specific point of time (Saunders, Lewis, & Thornhill, 2012 and Cameron & Trivedi, 2009). The sample can be regarded as a short panel data since a large number of companies is studied over a short-period of time as opposed to long panel data or time series data which studies a relatively smaller number of subjects over a very long period of time. One of the main advantages of using panel data is that it increases the precision in estimation thus increases the reliability of the results (Cameron & Trivedi, 2009). Other advantages include that panel data models allows to control for unobserved variables (variables that are not included in the model) and individual heterogeneity (Torres-Reyna, 2007). There are various models that are used to analyse panel data. The most commonly used are Fixed effects model and Random effects model (Williams, 2015).

Fixed effect model assumes that the unobserved individual heterogeneity is correlated with the independent variables. Random effects on the other hand assumes unobserved individual heterogeneity are distributed independently of the independent variables and may

be more appropriate for short panel data under strong assumptions (Cameron & Trivedi, 2009, ss. 697-698). Another advantage of random effect model is that it does not limit the effect of the unobserved variables within the sample rather refers to the population from which the sample is drawn (Hedges & Vevea, 1998). In our study, some of the dominant unobserved variable include lender's relationship with the client, lender's risk appetite, lender's availability of funds, lender's profitability, collateral, and competence within the business project. None of these unobserved variables are expected to have any significant relationship with the independent variables of this study. Thus random effect model is more appropriate in our case since it assumes any unobserved individual heterogeneity is not significantly correlated with the independent variables. And unlike fixed effect model it also allows to include non-time variant variables in the model. However, fixed effect models will also be run to check the robustness of the models. Hausman Test will then be conducted to check if there is a significant difference between the fixed effect and random effect models and if fixed effect model is more consistent (Cameron & Trivedi, 2009).

To improve the accuracy of the study and in line with past studies non-linearly transformed variables are also analyzed to investigate the relationship. Prior research show that earnings volatility follows a highly non-normal distribution (Dichev & Tang, 2009) and cashflow volatility increases non-linearly across deciles (Minton & Schrand, 1999). And accounting choices tend to be non-linearly influenced by the size of private firms (Hope, Langli, & Thomas, 2012). A basic starting point of non-linear model is a log-log model, in our study we take natural log, \ln for all the variables to improve the robustness and accuracy of the models. Robust Standard Errors will be applied to the models to curb heteroscedasticity (Cameron & Trivedi, 2009, s. 793). Robust Standard Errors are usually consistent, does not get biased and behaves well for finite samples (Gabor, 2003). Thus, Robust Standard Errors will improve the precision and reliability of the models. The models will be introduced in Section 3.5.

For the purpose of testing the second hypothesis and to ascertain the likely effect of debt crisis on the relationship between CoD and EV a Z-test will be done to compare the regression coefficients before and after the debt crisis. The test will determine if there is any significant difference between the regression coefficients of the independent and control variables before and after the debt crisis.

The Z statistic will be calculated using the formula defined by Clogg, Petkova, & Haritou (1995, s. 1276) for large samples:

$$Z = (\beta_1 - \beta_2) / \sqrt{[s^2(\beta_1) + s^2(\beta_2)]}$$

Where, ' β_1 ' and ' β_2 ' are the respective coefficients of the independent variable for the comparison, and 's' is the standard error of the respective coefficients, assuming the samples are independent. The null hypothesis is that the two coefficients are equal. The test will be conducted at the 5% significance level, and the critical values for Z are between -1.96 and 1.96 at the 5% significance level. The null hypothesis is rejected if the observed value of Z does not fall in the critical range.

Significance test of the difference between two regression coefficients is common in various other field including criminology. According to Paternoster, Brame, Mazerolle, & Piquero (1998, s. 862) the approach of Clogg et al. (1995) is unbiased and the most correct form to test the statistical significance of the difference between two regression co-efficients.

Another advantage of the model suggested by Clogg et al. (1995) is that it allows to include control variables in the analysis too, thus the term 'full model' is often associated with the test (Karlson, Holm, & Breen, 2012).

3.2. Population and Sample

The accounting data for limited companies in Sweden has been collected from the Retriever database. The database holds information of more than 200,000 limited companies (listed and non-listed) in Sweden. The sample of this study however, includes about 77,000 companies. In line with previous studies (Yazdanfar & Öhman, 2014) companies with annual reported sales equal to or more than 120,000 SEK and no missing observation were chosen. Thus it will ensure that the sample comprise of active companies only. Companies registered under the Banking, Finance & Insurance sector were also omitted from the list since they are the supplier of the loan and we are interested to study the relationship between CoD and EV for the borrowers. The sample selection method is thus non-probabilistic and purposive in nature (Saunders, Lewis, & Thornhill, 2012, ss. 281-291). Table 2 gives a summary of the sample according to the various industries in Sweden. The sample is made up of 77,833 companies analyzing over 622,500 firm years.

| Industry number (<i>for the purpose of this study</i>) | Industry name | Sample size: Panel data | Percent |
|--|--|-------------------------|---------|
| 1 | Advertising, PR & Market | 1385 | 1.78% |
| 2 | Agriculture, Forestry, Fishing & Hunting | 3119 | 4.01% |
| 3 | Banking, Finance & Insurance | 0 | 0.00% |
| 4 | Business Services | 802 | 1.03% |
| 5 | Business, employers and Occupation Sadness | 110 | 0.14% |
| 6 | Computer, IT & Telecommunications | 2106 | 2.71% |
| 7 | Construction, Interior Design & Operations | 11568 | 14.86% |
| 8 | Culture, Recreation & Leisure | 1465 | 1.88% |
| 9 | Drain, Waste, Electricity & Water | 701 | 0.90% |
| 10 | Education, Research & Development | 1411 | 1.81% |
| 11 | Food Production | 671 | 0.86% |
| 12 | Hair & Beauty | 422 | 0.54% |
| 13 | Health & Medical | 2403 | 3.09% |
| 14 | Hotel & Restaurant | 2245 | 2.88% |
| 15 | Labour & Employment | 193 | 0.25% |
| 16 | Legal, Finance & Consultancy | 5596 | 7.19% |
| 17 | Manufacturing & Industry | 8367 | 10.75% |
| 18 | Media | 1039 | 1.33% |
| 19 | Motor Trade | 890 | 1.14% |
| 20 | Other Consumer Services | 410 | 0.53% |
| 21 | Public Administration & Society | 19 | 0.02% |
| 22 | Real estate activities | 8256 | 10.61% |
| 23 | Rental & Leasing | 765 | 0.98% |
| 24 | Repair & Installation | 2240 | 2.88% |
| 25 | Retail | 6380 | 8.20% |
| 26 | Technical consultancy | 2051 | 2.64% |
| 27 | Transportation & Warehousing | 4793 | 6.16% |
| 28 | Travel Agency & Tourism | 333 | 0.43% |
| 29 | Wholesale | 8093 | 10.40% |
| Total | | 77833 | 100.00% |

Table 2: Sample Summary

The most dominant industries in the sample are Construction, Interior Design & Operations, Manufacturing & Industry, Real estate activities and Wholesale each comprising of more than 10% of the sample size followed by Retail, Legal, Finance & Consultancy, Transportation & Warehousing each comprising about 7% of the sample size. Thus out of the 28 industries in the sample these six industries make up about 55% of the sample size. As mentioned earlier, the Banking, Finance & Insurance is excluded from the sample since they are on the supply side (lenders) and the study is conducted based on the demand side (borrowers).

3.3. Measures of Earnings and Earnings Volatility

This study uses two measures of earnings, thus it may improve the robustness and reliability of the study. The two measures are Earnings before Interest and Taxes (EBIT) and Earnings before Interest, Taxes, Depreciation and Amortization (EBITDA) reported by the sample firms. Both depreciation and amortization have similar meaning and have the same accounting principal. They are used to account for the loss in the value of fixed asset due usage and passage of time. It is just that the two terms are used in conjunction with the type of asset it is referring to (i. e. tangible versus intangible). Generally, depreciation is associated with tangible assets while amortization is associated with intangible assets. The primary difference between EBIT and EBITDA, as it is also self-explanatory, is the treatment of depreciation but both are measure of financial performance of a company. They are calculated as follows:

$$\text{EBIT} = \text{Revenue} - \text{Expenses (excluding interest and tax)}$$

$$\text{EBITDA} = \text{Revenue} - \text{Expenses (excluding interest, tax, depreciation and amortization)}$$

EV is calculated as the standard deviation in a firm's annual reported EBIT and EBITDA over the period between 2004 and 2013, the method of calculating volatility using standard deviation has been used in various past research including Hortlund (2005) Dichev & Tang (2009), Khan & Bradbury (2014) and Su (2013). The standard deviation of EBIT and EBITDA are calculated over two years respectively (i. e. standard deviation for 2006 is calculated over 2005 and 2006).

A second measure of earnings, EBITDA, is also chosen since various previous research (Albrecht & Richardson, 1990; Herrmann & Inoue, 1996; DeFond & Park, 1997; Karmon & Lubwama, 1997; Atik, 2009) show that firms often use discretionary accounting choices (e. g. depreciation and amortization) to smooth income. Smoother earnings reduce EV and affects the components of debt contracts (Beattie, o. a. , 1994; Minton & Schrand, 1999; Khan & Bradbury, 2014; Gassen & Fulbier, 2015), but has both positive and negative implications. There are various accounting choices other than depreciation that firms employs to report smoother earnings (Albrecht & Richardson, 1990; Herrmann & Inoue, 1996; DeFond & Park, 1997; Karmon & Lubwama, 1997; Atik, 2009) but it is beyond the scope of this research to investigate all the options.

3.4. Measure of Control variables

The study includes nine control variables of which four (ROA, DbyE, LR and T) are directly reported by firms and are available on Retriever. The remaining five (ROAv, DbyEv, WCv, NCFv and Tv) control variables are calculated as standard deviation of ROA, DbyE, WC, NCF and T respectively over two years (i. e. standard deviation for 2006 is calculated over 2005 and 2006).

The generally accepted formula to calculate the variables are as follows:

$$\text{Return on Assets (ROA)} = \text{Net Income} / \text{Total Assets}$$

$$\text{Debt-Equity (DbyE)} = \text{Total Debt} / \text{Shareholders Equity}$$

$$\text{Working Capital} = \text{Total Current Assets} - \text{Total Current Liabilities}$$

$$\text{Liquidity Ratio (LR)} = \text{Currents Assets} / \text{Current Liabilities}$$

Net Cash Flow (NCF) is not reported and can be calculated using indirect method as follows:

$$\text{NCF}_t = \text{Cash and Cash Equivalents}_t - \text{Cash and Cash Equivalents}_{t-1}$$

Where, Cash and Cash Equivalents at the end of the period was reported by sample firms.

3.5. Measures of Cost of Debt

CoD is the debt interest rate reported by sample firms. This study uses two proxies to measure earnings volatility, volatility of EBIT and volatility of EBITDA, this should improve the robustness of the study and thereby validity and reliability of the study. The following Random Effects Panel models will be used to study the relationship between CoD and EV.

$$\text{Model 1: } \text{CoD}_{it+1} = \alpha_i + \beta_1 \text{EBITv}_{it} + \beta_2 \text{ROA}_{it} + \beta_3 \text{LR}_{it} + \beta_4 \text{DbyE}_{it} + \beta_5 \text{DbyEv}_{it} + \beta_6 \text{WCv}_{it} + \beta_7 \text{NCFv}_{it} + \beta_8 \text{Tv}_{it} + \beta_9 \text{ROAv}_{it} + \beta_{10} \text{T}_{it} + \varepsilon_{it}$$

$$\text{Model 2: } \text{CoD}_{it+1} = \alpha_i + \beta_1 \text{EBITDAv}_{it} + \beta_2 \text{ROA}_{it} + \beta_3 \text{LR}_{it} + \beta_4 \text{DbyE}_{it} + \beta_5 \text{DbyEv}_{it} + \beta_6 \text{WCv}_{it} + \beta_7 \text{NCFv}_{it} + \beta_8 \text{Tv}_{it} + \beta_9 \text{ROAv}_{it} + \beta_{10} \text{T}_{it} + \varepsilon_{it}$$

Each of the models has one time-variant independent variable and nine time-variant control variables. The dependent variable CoD will lead by one year since lenders are likely to use historical accounting information of the independent variable and control variables. Thus independent variables and control variables at time ‘t’ will be used to define CoD at time ‘t+1’, thus CoD leads by 1 for the analysis. Further in the model ‘i’ represents entity while ‘t’ represents time. ‘ α_i ’ is the constant, ‘ ε_{it} ’ is the error term and ‘ β ’ are the coefficient of the respective independent variables.

3.6. Descriptive statistics

For Panel Data models, ‘within standard deviation’ shows the dispersion of a variable within a specific company over the sample years; while between standard deviation shows the dispersion of a variable between the companies over the sample years (Cameron & Trivedi, 2009). The mean CoD for the sample is 6.95 and it varies more between companies with a standard deviation of 0.96 than within companies with a standard deviation of 0.79. Which suggests some companies are regarded less riskier throughout the sample year compared to other companies. It is likely since some companies have more volatile earnings than others. It is evident since the magnitude of the standard deviation of within company is

almost double than between companies for both the proxies of earnings volatility. Within standard deviation of EBIT is 1.37 compared to between standard deviation of 0.62 while within standard deviation of EBITDA is 1.06 compared to between standard deviation of 0.48. So is the volatility of NCF and WC. Within standard deviation for NCF is 1.71 compared to between standard deviation of 1.45, which suggests some companies have more volatile cashflow than others over the sample period thus have a more volatile working capital too. The fact that working capital volatility is greater for within companies than between companies can be observed from high within standard deviation (1.07) compared to low between standard deviation (0.48). As it was observed in the raw data some companies have an abnormally high liquidity ratio and it may be seen from the higher between standard deviation of 0.97 compared to within standard deviation of 0.59. On the other hand, individual companies tend to maintain the same debt to equity ratio from one year to another even though some companies have higher debt to equity ratio compared to others. It is evident since within standard deviation (0.38) of debt to equity is lower compared to between standard deviation (0.45). Turnover (T) used as a proxy for size re-affirms the sample contains both large and small size companies since the between standard deviation of 1.84 is more than double of within standard deviation of 0.52. On the other hand, a high within standard deviation of sales volatility (T_v) compared to between standard deviation suggests some companies have more volatile sales than others. The mean for ROA is 9.14 with an overall standard deviation of 1.2 and much of the variation in ROA of the sample is from individual effects of the companies since the within standard deviation (1.07) is almost double than between standard deviation (0.55). And it is also reflected in the standard deviation of ROA volatility since within standard deviation of 1.78 is greater than between standard deviation of 1.11. The descriptive statistic suggests that risk varies from one company to another and in most cases it also varies within companies from one year to another. And at the same time cost of debt varied from one company to another with some variation between the years too. Thus differences across companies is likely to influence our dependent variable CoD which further justifies for the use of random effects model (Torres-Reyna, 2007) for this study.

| Variable | | Mean | Std. Dev. | Min | Max | | Observation |
|------------|---------|-----------|------------|------------|-----------|-----|-------------|
| CoD_In | overall | 6. 94881 | 1. 238073 | 0 | 9. 033961 | N = | 622744 |
| | between | | 0. 956294 | 2. 735117 | 8. 977314 | n = | 77843 |
| | within | | 0. 7863446 | 0. 3139831 | 10. 96765 | T = | 8 |
| EBITv_In | overall | 8. 775445 | 1. 502374 | 0 | 9. 959537 | N = | 622744 |
| | between | | 0. 6199086 | 0 | 9. 834695 | n = | 77843 |
| | within | | 1. 368519 | 0. 2264897 | 17. 28807 | T = | 8 |
| EBITDAv_In | overall | 8. 903254 | 1. 15928 | 0 | 9. 991361 | N = | 622744 |
| | between | | 0. 4797341 | 0 | 9. 877016 | n = | 77843 |
| | within | | 1. 055361 | 0. 3232836 | 16. 59834 | T = | 8 |
| NCFv_In | overall | 8. 555471 | 2. 241596 | 0 | 10. 06075 | N = | 622744 |
| | between | | 1. 445958 | 0 | 9. 91555 | n = | 77843 |
| | within | | 1. 712887 | -0. 126100 | 17. 34594 | T = | 8 |
| DbyE_In | overall | 8. 503768 | 0. 5861317 | 0 | 9. 542948 | N = | 622744 |
| | between | | 0. 4491969 | 4. 123261 | 9. 504592 | n = | 77843 |
| | within | | 0. 3765299 | 1. 135089 | 12. 72648 | T = | 8 |
| DbyEv_In | overall | 3. 671978 | 2. 209078 | 0 | 9. 070733 | N = | 622744 |
| | between | | 1. 626067 | 0 | 8. 864585 | n = | 77843 |
| | within | | 1. 495312 | -3. 594855 | 11. 03095 | T = | 8 |
| WCv_In | overall | 9. 135526 | 1. 174506 | 0 | 10. 20378 | N = | 622744 |
| | between | | 0. 4762005 | 0 | 10. 08437 | n = | 77843 |
| | within | | 1. 073639 | 0. 3803293 | 17. 43544 | T = | 8 |
| LR_In | overall | 4. 986166 | 1. 122715 | 0 | 15. 5031 | N = | 619840 |
| | between | | 0. 9698415 | 0 | 10. 77355 | n = | 77821 |
| | within | | 0. 5823363 | -1. 984197 | 13. 46641 | T = | 7. 96495 |
| ROA_In | overall | 9. 149175 | 1. 204973 | 0 | 9. 982576 | N = | 622744 |
| | between | | 0. 5502366 | 2. 731665 | 9. 9496 | n = | 77843 |
| | within | | 1. 072009 | 0. 5763552 | 14. 44369 | T = | 8 |
| ROAv_In | overall | 7. 349585 | 2. 095728 | 0 | 9. 48052 | N = | 622744 |
| | between | | 1. 108715 | 0 | 9. 306048 | n = | 77843 |
| | within | | 1. 778437 | -0. 474293 | 14. 14492 | T = | 8 |
| Tv_In | overall | 9. 426198 | 1. 567885 | 0 | 10. 5716 | N = | 622744 |
| | between | | 0. 7961284 | 0 | 10. 46217 | n = | 77843 |
| | within | | 1. 350722 | 0. 3349667 | 18. 65072 | T = | 8 |
| T_In | overall | 8. 210947 | 1. 908968 | 0 | 19. 19248 | N = | 622728 |
| | between | | 1. 837171 | 2. 544939 | 18. 99329 | n = | 77843 |
| | within | | 0. 5188231 | -0. 095935 | 14. 32517 | T = | 8 |

Table 3: Descriptive Statistics

The Pearson Correlation in Table 4 is calculated for the panel data sample before the logarithmic transformation of the variables. It may be observed that both EBITv (0.0025) and EBITDAv (0.0035) has positive but very weak association with CoD. However, EBITDAv has a significant relationship with CoD while EBITv does not. It may be an indication that EBITDAv is a better predictor of CoD compared to EBITv. Or it may also be the case that banks perceive there are some sort of income smoothing activities thus EBITDA is a better measure of earnings. EBITv and EBITDAv are strongly correlated (0.6804) and as expected the correlation is positive. The correlation is also statistically significant. EBITv and EBITDAv is expected to have a strong positive correlation since the only difference between the two is that EBITDA is calculated before charging depreciation and amortization while EBIT is calculated after charging depreciation and amortization. Inconsistent with prior research NCFv (-0.0526) has a negative association with CoD and so does ROAv (-0.0366), T (-0.0053), Tv (-0.0027) and LR (-0.0012). All the correlation coefficients are statistically significant except for LR. ROAv has been used as a proxy for business risk and one would expect CoD to increase when a firm's business risk increase but the results suggests otherwise. Tv on the other hand measured sales volatility, which was also expected to have a positive relationship since high volatility in sales indicates greater risk. The negative significant correlation coefficient of T, which is used as a proxy for size could mean banks favor smaller firms over larger ones. The positive statistically significant association between ROA (0.0260) and CoD is also unexpected, since a profitable firm should be able to secure debts at a lower cost. DbyE (0.1557) and DbyEv (0.1250) on the other hand has a positive and statistically significant relationship with CoD as expected. DbyE has been used as proxy for solvency while DbyEv has been used as a proxy for financial risk. A higher DbyE ratio means a less solvent company, thus a riskier one hence the CoD is likely to increase. On the other hand, a high volatility of DbyE (DbyEv) signifies a company with high financial risk thus the CoD is again likely to increase. WCv 0.0010 has a very weak correlation with CoD and the results are not statistically significant. WCv has been used as a proxy for accruals volatility and as discussed earlier past research showed it significantly influences CoD.

| | ComNo | Y | I | CoD | EBITv | EBIDTA _v | NCF _v | DbyE | DbyEv | ROA | ROA _v | WC _v | LR | T | T _v |
|---------------------|----------------|----------------|----------------|----------------|---------------|---------------------|------------------|----------------|----------------|----------------|------------------|-----------------|----------------|---------------|----------------|
| ComNo | 1.0000 | | | | | | | | | | | | | | |
| Y | 0.0000 | 1.0000 | | | | | | | | | | | | | |
| I | -0.0001 | 0.0000 | 1.0000 | | | | | | | | | | | | |
| CoD | -0.0780 | -0.0599 | 0.0657 | 1.0000 | | | | | | | | | | | |
| EBIT _v | -0.0038 | -0.0012 | -0.0004 | 0.0025 | 1.0000 | | | | | | | | | | |
| EBIDTA _v | 0.0002 | -0.0004 | -0.0005 | 0.0035 | 0.6804 | 1.0000 | | | | | | | | | |
| NCF _v | 0.0094 | -0.0067 | -0.0014 | -0.0526 | 0.0128 | 0.0113 | 1.0000 | | | | | | | | |
| DbyE | -0.0427 | -0.0483 | 0.0502 | 0.1557 | 0.0024 | 0.0042 | -0.0296 | 1.0000 | | | | | | | |
| DbyEv | -0.0108 | -0.0264 | 0.0140 | 0.1250 | 0.0034 | 0.0030 | -0.0288 | 0.2407 | 1.0000 | | | | | | |
| ROA | -0.0195 | -0.0404 | 0.0251 | 0.0260 | -0.0008 | -0.0032 | 0.0069 | 0.0159 | -0.0584 | 1.0000 | | | | | |
| ROA _v | 0.0063 | -0.0071 | -0.0396 | -0.0366 | 0.0220 | 0.0208 | 0.0091 | -0.0686 | 0.0220 | -0.0619 | 1.0000 | | | | |
| WC _v | 0.0000 | -0.0021 | 0.0010 | 0.0010 | 0.0324 | 0.0336 | 0.0073 | 0.0023 | 0.0037 | 0.0099 | 0.0027 | 1.0000 | | | |
| LR | 0.0041 | 0.0094 | 0.0009 | -0.0012 | 0.0012 | 0.0011 | 0.0009 | -0.0143 | -0.0092 | -0.0020 | -0.0062 | 0.0004 | 1.0000 | | |
| T | 0.0174 | 0.0026 | 0.0018 | -0.0053 | 0.0002 | 0.0022 | 0.0050 | 0.0099 | -0.0020 | 0.0136 | -0.0152 | 0.0005 | -0.0012 | 1.0000 | |
| T _v | 0.0012 | -0.0026 | -0.0047 | -0.0027 | 0.0227 | 0.0272 | 0.0051 | 0.0049 | 0.0041 | -0.0005 | 0.0117 | 0.0009 | -0.0036 | 0.0045 | 1.0000 |

Table 4: Pearson correlation table of Panel Data. Statistical significant results are in bold and italics.

4. Results and Analysis

This Section is organized as to discuss direct association between earnings volatility and cost of debt in Section 4. 1, effect of the debt crisis on the relationship of earnings volatility and cost of debt in Section 4. 2 and the relationship of earnings volatility and cost of debt along with other variables across the various industries.

4.1. Earnings Volatility and Cost of Debt

First the direct association between CoD and EV is analyzed using both standard deviation of EBIT and EBITDA as proxies of earnings volatility. The untabulated results are statistically insignificant at 5% significance level for both the proxies for both random effects and fixed effects panel data models. The choice between robust errors and standard errors did not affect the practical significance nor the statistical significance of the variables either. It could be reason since EV follows a highly non-normal distribution (Dechow & Dichev, 2002). Thus in line with some previous research (Minton & Schrand, 1999; Dichev & Tang, 2009; Hope, Langli, & Thomas, 2012) the direct association is CoD and EV is analyzed after the logarithmic transformation of the variables using both random effects and fixed effects models using robust standard errors. The untabulated results shows that the p-values for EBITv is insignificant under both random effects and fixed effects model. But EBITDAv showed contrasting results, significant during random effects and insignificant during the fixed effects. Untabulated results of Hausman tests suggests fixed effect models are more consistent. However, we still proceed with the random effects models since omitted variables can have a strong influence on cost of debt and the correlation (see Table 4 and Appendix B) between most of the independent variables are quiet weak (Cameron & Trivedi, 2009), hence, random effects model is more relevant for the purpose of this study. According to the estimation of random effects model (see Appendix A) for every 1% change in EBITDAv on average CoD changes by 0. 25%, and as expected the results are positive. Even though the result is statistically significant the low R-sq of the regression analysis suggests EV alone is not a good predictor of CoD.

Next, the relationship between CoD and EV is analyzed in presence of the control variables. Both the proxies of EV are used to check the robustness of the study. The results are significant for both the proxies of earnings volatility which suggests the results are robust. Further analysis is based on EBITDAv as a proxy for EV, Table 5 shows the regression

results of the random effects model using standard deviation of EBITDA as a proxy for earnings volatility.

| | | | | | | | |
|---|-------------|-----------------------------------|--------|------------------|----------------------|-------------|-----------|
| Random-effects GLS regression | | | | Number of obs | | = | 542,536 |
| Group variable: ComNo | | | | Number of groups | | = | 77,815 |
| R-sq | | | | Obs per group | | | |
| within | = | 0. 0132 | | Min | | = | 1 |
| between | = | 0. 1468 | | Avg | | = | 7. 0 |
| overall | = | 0. 0882 | | Max | | = | 7 |
| corr (u_i, X) | = | 0 | | Wald chi2 (10) | | = | 10672. 28 |
| (Std. Err. adjusted for 77,815 clusters in ComNo) | | | | Prob > chi | | = | 0. 0000 |
| F. CoD_ln | Coef. | Robust Std. Err. | Z | P> z | [95% Conf. Interval] | | |
| EBITDAv_ln | 0. 0045595 | 0. 0010803 | 4. 22 | 0. 000 | 0. 0024422 | 0. 0066768 | |
| NCFv_ln | -0. 0142965 | 0. 0006802 | -21.02 | 0. 000 | -0.0156297 | -0. 0129633 | |
| DbyE_ln | 0. 1536703 | 0. 0040154 | 38. 27 | 0. 000 | 0. 1458003 | 0. 1615403 | |
| DbyEv_ln | 0. 035488 | 0. 0008093 | 43. 85 | 0. 000 | 0. 0339018 | 0. 0370743 | |
| WCv_ln | 0. 0038587 | 0. 0010631 | 3. 63 | 0. 000 | 0. 001775 | 0. 0059424 | |
| ROA_ln | -0. 0063192 | 0. 0010883 | -5. 81 | 0. 000 | -0. 0084522 | -0. 0041861 | |
| ROAv_ln | -0. 110144 | 0.0006349 | -17.35 | 0. 000 | -0.0122588 | -0. 00977 | |
| Tv_ln | -0. 00076 | 0.0008775 | -0. 87 | 0. 386 | -0.0024798 | 0. 0009598 | |
| T_ln | -0. 0327348 | 0.0017144 | -19.09 | 0. 000 | -0.0360949 | -0. 0293747 | |
| LR_ln | -0. 1500052 | 0.0023984 | -62.54 | 0. 000 | -0. 154706 | -0. 1453044 | |
| _cons | 6. 714042 | 0.0432218 | 155.34 | 0. 000 | 6. 629329 | 6. 798756 | |
| sigma_u | 0. 82799791 | (fraction of variance due to u_i) | | | | | |
| sigma_e | 0. 82675603 | | | | | | |
| Rho | 0. 50075049 | | | | | | |

Table 5: Multiple Regression Analysis of Model 2 using Random Effects and Robust Errors

After the inclusion of control variables in the model EBITDAv still has a statistically significant positive relationship with CoD and the practical significance is also higher. The results suggest for every 1% change in EBITDAv in presence of variability of the other control variables CoD changes by 0.46%. Interestingly NCFv has a negative co-efficient with significant p-value for both the models. The result suggests for every 1% increase in NCFv there is a 1.43% of decrease in CoD. It is unexpected and inconsistent with previous research as Minton & Schrand (1999, s. 451) suggested positive association between NCFv

and CoD from indirect evidence. Our results are more reliable since it comes from a direct evidence and empirically proven. Sales volatility, measured in terms of Tv in this study is an indicator of the operating environment of firms. Higher the magnitude of the sales volatility the more volatile is the operating environment of firms (Dechow & Dichev, 2002). Thus Tv is expected to be positively associated with CoD. Tv is also a measure of accruals quality and past research (Francis, LaFond, Olsson, & Schipper, 2005) show that high Tv indicates poor earnings quality and poor earnings quality tend to increase CoD. Thus Tv should have a positive association with CoD from that aspect too. Even though the regression analysis shows a negative association between Tv and CoD but the co-efficient is very insignificant at -0.00076 and the p-values are also insignificant at 5% confidence level. Therefore, there is not enough evidence for this negative association.

As expected, DbyE and DbyEv has a positive association with CoD and at 5% significance level the p-value of the association are significant. DbyE is used as a proxy for solvency of the sample firms while DbyEv is used a proxy for financial risk of the firm. Firms that are more solvent and has low financial risk are expected to secure a lower CoD. The results are consistent and also practically significant. The results are also consistent for firms' profitability and capacity to manage accruals with a significant p-value. The models used ROA as a proxy for profitability and WCv as a proxy for accruals volatility. Profitable firms are expected to secure lower cost of debt (Bruns & Fletcher, 2008) as they have a lower chance of getting bankrupt and will be in a more stable financial position to repay its debts. Accruals volatility is a measure of accruals quality, prior research (Dechow & Dichev, 2002) shows low volatility of accruals is an indicator of good quality earnings. Firms with good quality earnings tend to be stable and should secure loans at lower cost (Bharath, Sunder, & Sunder, 2008). Thus the results are consistent that an increase in accruals volatility tends to increase CoD (Francis, LaFond, Olsson, & Schipper, 2005).

Firm size measured by turnover (T) in this study tends to have a negative association and the results are significant with p-value of 0.000. This suggests larger firms are more likely to secure a lower cost of debt compared to SMEs. However, a large amount of loans from Swedish banks goes to SMEs and in Sweden business size is determined by the size of loan instead of the size of the firm (Bruns & Fletcher, 2008). It is likely because SMEs are profitable for banks compared to larger firms since they can charge higher interest rates to SMEs.

LR, which has been used as a proxy liquidity ratio tend to have a strong negative relationship with CoD and the p-value of 0.000 suggests the results are significant. It is slightly surprising since firms with superior liquidity position should be able to pay off debts more easily thus should be considered less risky and would likely have a lower cost of debt. One reason could be that firms with sound liquidity ratio have more internal funding available that they tend to demand less from the external funding (Garcia-Teruel, Martinez-Solano, & Sanchez-Ballesta, 2014). Other reasons could be the negative collinearity (see Appendix B) of LR with T (-0.2153) for the sample firms, the collinearity is also statistically significant at 5% confidence level. The negative collinearity between LR and T suggests smaller firms tend to have a better liquidity position and as it has been empirically shown in this study that smaller firms tend to pay higher CoD.

To sum up, the observed variables does influence lenders to determine CoD of the borrowers and they indeed take EV into consideration. Some of the results are inconsistent with previous research but our study has strong empirical evidence and studies a different sample and economic setting al-together.

4.2. The effect of debt crisis

To check the effect of the debt crisis on the relationship between EV and CoD we first plot a two-way scatter graph (Figure 1) for the sample firms over the period from 2006 to 2013. The initial graph suggests there has been no effect of the 2008 debt crisis on the Swedish debt market. As we can see the scatter plot for all of the eight years are very much identical.

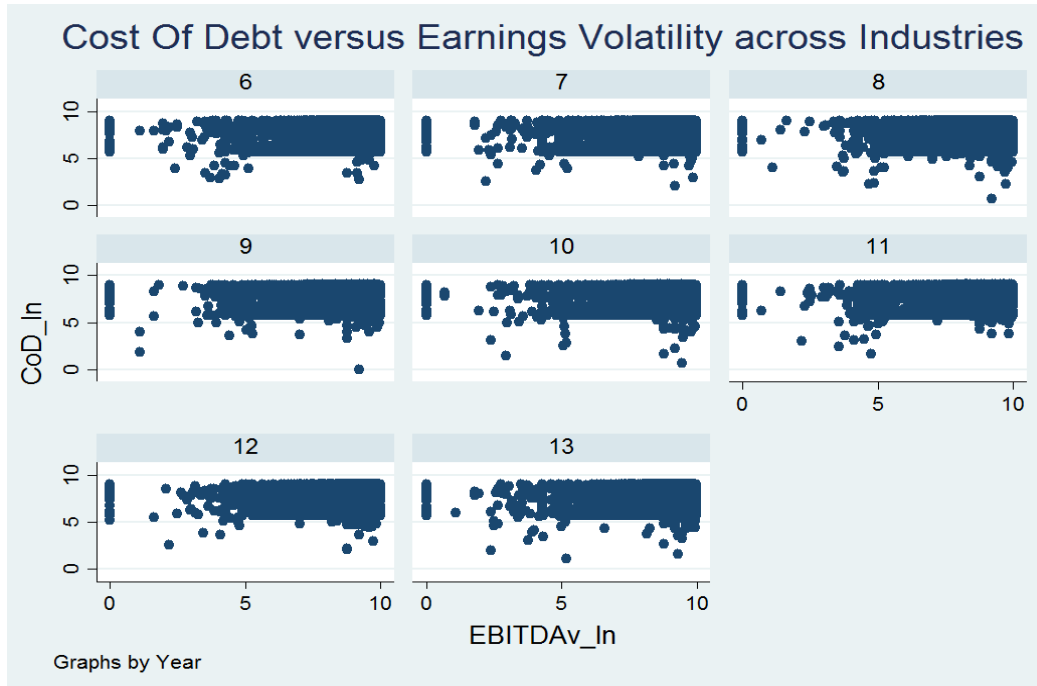


Figure 1: Two-way scatter plot CoD and EBITDAv by Year

For further analysis, we run two multiple regression analyses of the panel data over the time period 2006 to 2008 and 2011 to 2013. Since the debt crisis effected the Swedish market from the end of 2008 (Österholm, 2010; Cosimano & Hakura, 2011 and Gavalas, 2015), we considered years 2006, 2007 and 2008 as periods before the debt crisis and the years 2011, 2012 and 2013 as periods after the debt crisis. The difference of the coefficients of the independent and control variables are then tested to check the statistical significance. Table 6 below shows a comparison between the two regression analyses. That includes the regression coefficients and their respective p-values, the calculated or observed Z statistic according to Clogg, Petkova, & Haritou (1995) and states if the difference is significant or not.

The debt crisis seems to have some effect on the Swedish market. For instance, before the debt crisis for every 1% change in EBITDAv firm's CoD would likely to increase by 1% on average but after the debt crisis CoD would likely to increase by 0.75% on average. Which suggests the banks became a little liberal on borrower's risk assessment after the debt crisis. But the effect of debt crisis on relationship between EV and CoD is not statistically significant since the z-statistic calculated as per Clogg et al. (1995) falls in the range of critical value. Hence the null hypothesis, which was that the two coefficients are equal cannot be rejected. So is the case with the proxies for accruals volatility (measured by

standard deviation of WC), solvency (measured by DbyE), profitability (measured by ROA), business risk (measured by standard deviation of ROA), and turnover volatility (measured by standard deviation of turnover). It could be the scenario since the debt crisis of 2008 did not seem to effect Sweden significantly (Österholm, 2010) and also because the adoption of Basel III is expected to mitigate the drawbacks of Basel II and promote a more stable financial market (Schwerter, 2011). However, after the debt crisis, banks became more concerned with the financial risk of the borrowers. First, it is evident from the significant increase of the DbyEv coefficient, which was the proxy to measure firms' financial risk. And secondly, from the significant increase in the coefficient of NCFv after the crisis, which was a measure for cashflow volatility of firms. Therefore, it may be concluded that banks became more conservative in terms of financial risk of the lenders. Furthermore, after the crisis banks are relatively more comfortable to borrow money to larger companies compared to smaller companies. The significant decrease in the coefficient of T, which was a proxy for size is an indication of that.

| | Before Debt Crisis | | After Debt Crisis | | | |
|------------------|--------------------|-------|-------------------|-------|--|--|
| Number of groups | 77,772 | | 77,676 | | | |
| R-sq | | | | | | |
| Within | 0,0068 | | 0,0066 | | Z-statistic calculated as suggested by Clogg et al. (1995) | Is the Difference between the Coefficients Significant |
| between | 0,1251 | | 0,1214 | | | |
| Overall | 0,0883 | | 0,1002 | | | |
| F,CoD_In | Coef, | P> z | Coef, | P> z | | |
| EBITDAv_In | 0,0103303 | 0,000 | 0,0075434 | 0,000 | -1,061447942 | No |
| NCFv_In | -0,0165449 | 0,000 | -0,0257654 | 0,000 | -5,727811701 | Yes |
| DbyE_In | 0,1966958 | 0,000 | 0,1847149 | 0,000 | -1,396875232 | No |
| DbyEv_In | 0,038912 | 0,000 | 0,0447169 | 0,000 | 3,10593427 | Yes |
| WCv_In | 0,0078016 | 0,000 | 0,0050337 | 0,010 | -1,073838401 | No |
| ROA_In | 0,00444764 | 0,011 | 0,0038771 | 0,047 | 0,21624771 | No |
| ROAv_In | -0,0157382 | 0,000 | -0,015061 | 0,000 | 0,443333977 | No |
| Tv_In | -0,0018108 | 0,193 | -0,0010188 | 0,519 | 0,375928894 | No |
| T_In | -0,0531341 | 0,000 | -0,0429214 | 0,000 | 3,541229103 | Yes |
| LR_In | -0,1814365 | 0,000 | -0,1912261 | 0,000 | -2,063101814 | Yes |
| Rho | 0,55788698 | | 0,65904275 | | | |

Table 6: Comparison of Regression Analyses before and after the debt crisis

In short, even though the debt crisis did not have any significant effect on lender's perspective of borrowers' risk at least in terms of business risk, accruals volatility, turnover volatility and earnings volatility but they certainly became more conservative about borrowers' financial risk. On the other hand, after the crisis unobserved variables tend to influence banks more to lock down the cost of debt. It may be observed as the rho variable increased to 66% after the crisis from 56% before the crisis. It could be that banks are valuing business relationships more than traditional measures after the crisis.

4.3. How Earnings Volatility Influence Cost of Debt across various Industries

To check how EV influences CoD across various industries we first do a two-way scatter plot (Figure 2). The graphs do not reveal much and it's identical for most of the industries. The scatter plot is more clustered for industry 5 and 21 but primarily because of low number of observation. Next, multiple regression using both proxies of earnings volatility are run for all 28 industries of the sample.

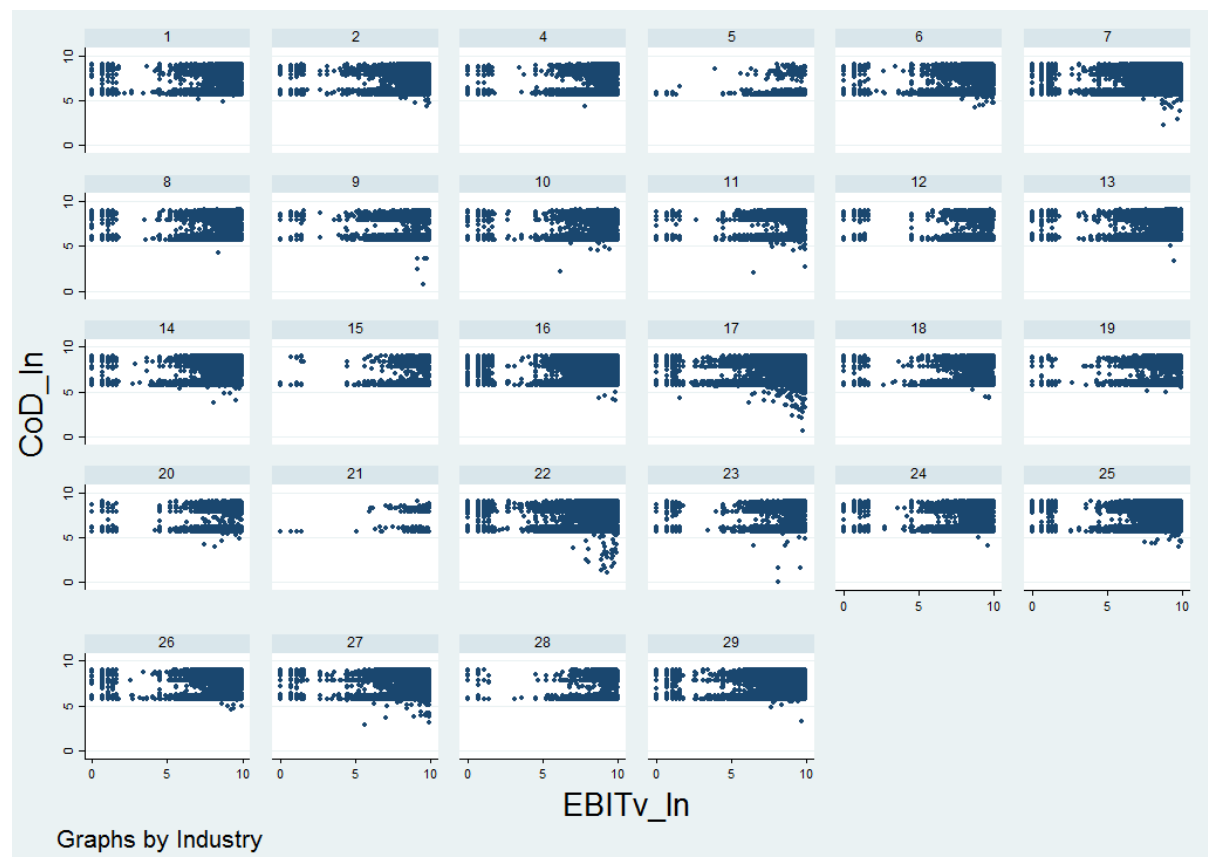


Figure 2: Two-way scatter plot CoD and EBITv by Industry

The regression analysis across the industries has a mixed result. For instance, 20 industries showed consistent result for both the measures of EV whereas 8 industries showed inconsistent result. Which suggests the results are somewhat robust since majority of the industries showed consistent result for both measures of EV. Appendix C shows the summary of p-values of the multiple regression analysis of the non-linear variables using random effects. The rho variable that explains the variation due to unobserved variables (Cameron & Trivedi, 2009) are consistent among the industries between 40% and 47%, except for industries Hotel & Restaurant, Public Administration & Society and 25 Retail. It suggests the unexplained variables are likely to have similar effects on CoD across all the industries. Public Administration & Society having a rho of 62% from the regression analysis reaffirms that determinants of interest rate differs greatly for public sector compared to private sector. One industry, 'Media' showed significant results for both the measures of EV. As discussed earlier that EBITDA_v is a better measure of earnings volatility therefore we investigate the relation of EV and CoD across various industries using EBITDA as a proxy for earnings volatility. Industries such as media, other consumer service, real estate activities and transport and warehousing showed significant association of earnings volatility with cost of debt. The reason behind it could be that banks views these industries to be riskier than other industries thus incorporates additional measures of risk. It may be also observed that influence of some of the other control variables also varies greatly between the industries. Which is a clear indication that bank's risk appetite varies across industries and results (see Appendix C) suggests banks take financial risk seriously for all the industries in Sweden. The proxy used for financial risk in this study was volatility of debt by equity (DbyEv). As it appears, banks in Sweden are very conservative with companies whose debt-equity ratio fluctuates a lot and are penalized by higher interest rates. It is understandable since higher level of debts makes creditors uncomfortable and associated with high cost of capital too (Baxter, 1967). Therefore, greater fluctuation in the debt-equity ratio beyond a tolerant level may make lenders conservative. The responsiveness to the fluctuation of DbyE however varies across industries. It can be observed that lenders in the Swedish Debt market perceives some industries riskiest since all the measures of risk returned significant results for such industries. They include construction, interior design & operations, food production, hotels and restaurant, real estate activities, repair and installation, retail, and wholesale. Interestingly, most of these industries also have stringent requirements set by the Swedish Migration Board (The Swedish Migration Agency, 2016). Therefore, these industries are deemed risky at both national level and bank level. Banks are also relatively liberal with few

other industries. For instance, in industries such as Drain, Waste, Electricity & Water, Other consumer service, and Rental & Leasing banks primarily only look at solvency besides financial risk.

5. Conclusion and Discussion

Earnings Quality research is not a new phenomenon but the literature on how some of the earnings quality measure influences cost of debt is extremely limited (DeFond, 2010 and Dechow, Ge, & Schrand, 2010). In fact, empirical evidence of the effect of earnings volatility (a proxy to measure earnings quality) on cost of debt is non-existent to the best of our knowledge and this would be the first paper to provide such direct evidence. Minton & Schrand (1999) indirectly suggested earnings volatility effects cost of debt and our direct study shows the evidence of such effects. Dichev & Tang (2009) stated earnings volatility to have a pretty strong predictive quality and tests show it can influence up to five years. However, our results suggest the effect is very weak for the Swedish debt market. Weak in terms of practical significance but there is no comparative result to determine the relativity.

The effect of the financial crisis of 2008 on the relationship between earnings volatility and cost of debt seemed to be insignificant; it could be because of the Swedish government's pro-activeness and expansionary monetary policy (Österholm, 2010). One other reason could be that bank's interest rates were already on the rise between the period 2006 and 2008 as credit declined (Cosimano & Hakura, 2011). Thus during and after the crisis it was difficult for the banks to increase the interest rates further since borrowers were already under pressure of high interest rate.

The industry analysis showed that banks' aggressiveness and conservatism varies greatly across different industries in Sweden. However, one thing was common that banks in Sweden takes financial risk more seriously than other measures of risk for most of the industries. The result suggests banks are most conservative with industries such as construction, interior design & operations, food production, hotels and restaurant, real estate activities, repair and installation, retail, and wholesale. It could be the case since restaurants does most of their business in cash and is considered a relative riskier business. Food production on the other hand deals with perishable goods, thus have high risk too. Some of these industries have stringent requirements from Swedish Migration Board on labor laws too. That may also influence bank's risk assessment for companies from such industries.

Even though EV showed a significant relationship with CoD for the total sample but an industry-level analysis revealed the relationship to be significant for four industries only. Which are media, other consumer service, real estate activities and transport and warehousing.

This study contributes to the literature at least in two ways, first, this is most likely to be the first paper to directly examine the association of firm's earnings volatility with firm's cost of debt hence. Secondly, studies on earnings quality and its consequences on debt market in Scandinavian debt market and Well-Fare State is almost non-existent. In addition to that empirical studies using panel data models are extremely limited in this field too. Furthermore, this study can be of interest for banks also; they may want to consider earnings volatility as a measure of risk for certain industries if they are not already doing so.

One of the limitation of the study is that interest cost is not the only cost borne by borrowers thus total cost of debt essentially includes other contract terms such as maturity and collateral. Lenders tend to optimize their risk-return relationship with a balance between these (Bharath, Sunder, & Sunder, 2008). This limitation is addressed up to some extent since panel data models measures the effect of the unobserved variables in the error term.

Future research may be done to examine the long-term relationship using long panel data (fewer companies and longer period of time), and it may facilitate a comparison between long-term and short-term relationship of earnings volatility and cost of debt. Since earnings volatility have strong predictive quality (Dichev & Tang, 2009) it is likely to have a stronger long-term relationship. More empirical evidence from other EU countries will also facilitate comparative results, especially because banks from developed EU countries are major exporter of banking services and risk varies greatly between developed and developing countries, and there is disparity between EU countries too (Sbarcea, 2015). One interesting aspect of future research could be from banks' perspective, whereby researchers may interview risk officers and credit analyst to find out up to what extent earnings volatility is used as a measure of risk; and then compare the results with the empirical findings from the market. Such research will be extremely useful to compare the perspective and value of risk. Future research will be also interesting since Basel III is likely to restrict credit limit and dampen economic activities; it may require both lenders and borrowers to adjust their business strategies (Allen, Chan, Milne, & Thomas, 2012).

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7. Appendices

| | | | | | | |
|---|------------|-----------------------------------|---------|------------------|----------------------|------------|
| Random-effects GLS regression | | | | Number of obs | = | 544,901 |
| Group variable: ComNo | | | | Number of groups | = | 77,843 |
| R-sq | | | | Obs per group | | |
| within | = | 0. 0000 | | Min | = | 7 |
| between | = | 0. 0008 | | Avg | = | 7. 0 |
| overall | = | 0. 0001 | | Max | = | 7 |
| corr (u_i, X) | = | 0 | | (assumed) | Wald chi2 (10) | = |
| (Std. Err. adjusted for 77,843 clusters in ComNo) | | | | Prob > chi | = | 0. 0213 |
| F. CoD_ln | Coef. | Robust Std. Err. | Z | P> z | [95% Conf. Interval] | |
| EBITDAv_ln | 0. 0024687 | 0. 0010723 | 2. 30 | 0. 021 | 0.0003671 | 0. 0045703 |
| _cons | 6. 924399 | 0. 01010778 | 680. 34 | 0. 000 | 6. 904451 | 6. 944348 |
| sigma_u | 0.91857653 | | | | | |
| sigma_e | 0.83332981 | | | | | |
| Rho | 0.54854446 | (fraction of variance due to u_i) | | | | |

Appendix A: Regression analysis Cost of Debt and EBITDA volatility, random effects and robust errors

| | ComNo | Y | I | CoD_ln | EBITv_ln | EBITDAv_ln | NCFv_ln | DbyE_ln | DbyEv_ln | ROA_ln | ROAv_ln | WCv_ln | LR_ln | T_ln | Tv_ln |
|------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|---------------|----------------|---------------|--------|
| ComNo | 1.0000 | | | | | | | | | | | | | | |
| Y | 0.0002 | 1.0000 | | | | | | | | | | | | | |
| I | -0.0002 | -0.0000 | 1.0000 | | | | | | | | | | | | |
| CoD_ln | -0.0909 | -0.0622 | 0.0733 | 1.0000 | | | | | | | | | | | |
| EBITv_ln | -0.0102 | -0.0007 | 0.0019 | 0.0093 | 1.0000 | | | | | | | | | | |
| EBITDAv_ln | -0.0024 | -0.0002 | 0.0004 | 0.0095 | 0.5544 | 1.0000 | | | | | | | | | |
| NCFv_ln | 0.0211 | -0.0177 | 0.0000 | -0.1162 | 0.0172 | 0.0163 | 1.0000 | | | | | | | | |
| DbyE_ln | -0.0341 | -0.0459 | 0.0446 | 0.1176 | 0.0097 | 0.0095 | -0.0039 | 1.0000 | | | | | | | |
| DbyEv_ln | -0.0241 | -0.0560 | 0.0168 | 0.2006 | 0.0235 | 0.0198 | -0.0851 | 0.2968 | 1.0000 | | | | | | |
| ROA_ln | -0.0113 | -0.0337 | 0.0099 | 0.0017 | 0.0002 | -0.0025 | 0.0145 | 0.0128 | -0.0279 | 1.0000 | | | | | |
| ROAv_ln | 0.0119 | -0.0110 | -0.0588 | -0.0638 | 0.1316 | 0.0974 | 0.0285 | -0.1023 | 0.0469 | -0.0429 | 1.0000 | | | | |
| WCv_ln | -0.0037 | -0.0042 | 0.0043 | 0.0082 | 0.0472 | 0.0531 | 0.0090 | 0.0095 | 0.0149 | 0.0177 | 0.0206 | 1.0000 | | | |
| LR_ln | 0.0738 | 0.0705 | -0.0865 | -0.2127 | -0.0204 | -0.0091 | 0.1374 | -0.1459 | -0.3804 | 0.0318 | 0.0337 | 0.0011 | 1.0000 | | |
| T_ln | -0.0399 | -0.0196 | 0.1168 | -0.0286 | 0.0854 | 0.0759 | 0.0356 | 0.2182 | 0.1225 | 0.1126 | -0.0601 | 0.0718 | -0.2153 | 1.0000 | |
| Tv_ln | -0.0004 | -0.0063 | -0.0145 | -0.0108 | 0.0576 | 0.0652 | 0.0191 | 0.0116 | 0.0300 | 0.0028 | 0.0617 | 0.0238 | -0.0206 | 0.1236 | 1.0000 |

Appendix B: Pearson Correlation of ln variables

| Industry | EBI TD Av | EB ITv | NCF v | Dby E | Db yE v | WC v | RO A | LR | RO Av | Tv | T |
|---|-----------------|-----------|----------|----------|---------------|---------|---------|----|----------|----|---|
| Advertising, PR & Market | n | n | y | y | y | n | N | y | n | n | y |
| Agriculture, Forestry, Fishing & Hunting | n | n | y | y | y | n | Y | y | n | n | y |
| Business Services | n | n | y | n | y | n | N | n | n | n | y |
| Business, employers and Occupation Sadness | n | n | y | y | n | n | N | n | n | n | n |
| Computer, IT & Telecommunic ations | n | n | y | y | y | n | N | y | n | y | y |
| Construction, Interior Design & Operations | n | n | y | y | y | n | Y | y | y | n | y |
| Culture, Recreation & Leisure | n | n | y | n | y | n | N | y | n | n | n |
| Drain, Waste, Electricity & Water | n | n | n | y | y | n | Y | y | n | n | n |
| Education, Research & Development | n | n | y | n | y | n | N | y | n | n | y |
| Food Production | n | n | y | n | y | n | N | y | y | n | n |
| Hair & Beauty | n | n | y | n | y | n | n | y | n | n | y |
| Health & Medical | n | n | y | n | y | n | y | y | n | n | y |
| Hotel & Restaurant | n | n | n | y | y | n | y | y | y | n | y |
| Labour & Employment | n | n | y | y | y | n | n | n | y | n | y |
| Legal, Finance & Consultancy | n | n | y | n | y | y | n | y | n | n | y |
| Manufacturing & Industry | n | n | y | y | y | n | n | y | y | n | y |
| Media | y | y | y | n | y | n | n | n | n | n | y |
| Motor Trade | n | n | n | y | y | n | n | y | n | n | n |
| Other Consumer Services | y | n | n | y | y | n | n | y | n | n | n |

| | | | | | | | | | | | |
|---------------------------------|---|---|---|---|---|---|---|---|---|---|---|
| Public Administration & Society | n | n | n | n | n | n | n | n | n | n | y |
| Real estate activities | y | n | y | y | y | n | y | y | y | n | n |
| Rental & Leasing | n | y | n | y | y | y | n | y | n | n | n |
| Repair & Installation | n | n | y | y | y | n | y | y | y | n | y |
| Retail | n | n | y | y | y | n | y | y | y | y | y |
| Technical consultancy | n | n | y | n | y | n | n | y | n | y | y |
| Transportation & Warehousing | y | n | y | y | y | n | y | y | n | n | y |
| Travel Agency & Tourism | n | n | n | y | y | n | y | n | n | y | y |
| Wholesale | n | n | y | y | y | n | n | y | y | n | y |

Appendix C: Significance of the regression coefficient across the industries at 5% significance level