PONTIFICIA UNIVERSIDAD CATOLICA DE CHILE

ESCUELA DE INGENIERIA

THE RELEVANCE OF COMPANY FINANCIAL STATEMENTS FOR PRICING CORPORATE BONDS IN AN EMERGING MARKET

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Thesis submitted to the Office of Research and Graduate Studies in partial fulfillment of the requirements for the Degree of Master of Science in Engineering

Advisor:

GONZALO CORTAZAR SANZ

Santiago de Chile, (August, 2013)

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RESUMEN

Esta tesis investiga cuales son los ratios contables disponibles en los estados financieros de las compañías que ayudan a actualizar el precio de sus bonos en mercados de baja liquidez como también características de bonos que hagan más relevante esta información. El modelo fue implementado usando bonos corporativos del mercado Chileno y sus estados financieros trimestrales desde el año 2002 hasta el año 2012. Los resultados muestran que el ROA y el Valor de Mercado sobre EBITDA son los ratios de mayor importancia entre los más comunes de Liquidez, Apalancamiento, Operacionales, Rentabilidad y Valor de Mercado que se entregan en los estados financieros de la compañía. Otro resultado importante que se encuentra es que mientras más antigua sea la transacción y menor sea su cobertura por analistas, mayor es la relevancia que tienen estas variables para actualizar los precios de spreads de bonos corporativos.

Palabras Clave: Spreads de Bonos Corporativos, Mercados Ilíquidos, Estados Financieros, Ratios Financieros

ABSTRACT

This paper explores which are the accounting ratios that may help updating the price of a corporate bond in a low-liquidity market, and also the bond characteristics that make this information more relevant. The model is implemented using Chilean corporate bonds and quarterly financial statements from bond issuing companies, from 2002 to 2012. Results show that ROA and Market Value to EBITDA are the most important among the most common Liquidity, Leverage, Operating, Profitability and Market Value ratios released in company financial statements. Also it is found that the oldest the last bond transaction is and the less coverage by analysts the issuing company has, the more relevant these variables are for updating past bond spreads.

Keywords: Corporate Bond Spreads, Non-Liquid Markets, Financial Statements, Financial Ratios

1. ARTICLE BACKGROUND

1.1 Introduction

The work presented in this thesis is based on corporate bonds. It is widely accepted to use the spread of the last transaction as an approximation of the actual price of the bond. Many times this approximation is accurate, especially when this transaction is relatively new. The problem is that some bonds are not frequently traded, so this price does not incorporate events that have occurred to the bond issuer.

On the other hand, emerging markets are increasing their importance in world economy. This is explained by globalization, where markets are dependent on each other and occurring events in small markets can affect large developed countries. Emerging markets have the characteristics that their financial instruments, such as bonds, are not traded as frequently as in developed markets.

With this in mind, it is reasonable to search for a way in which these spread prices could be updated to incorporate current information in a more precise way.

Financial Statements are documents published quarterly that inform the official results of the firm. Within this document one typically finds an income statement that show the results of the firm, a balance sheet that show the assets and liabilities, a cash flow statement that report the companies inflows and outflows of cash and other information of the company.

In line with these observations, the hypothesis of this thesis is that corporate bond spreads can be updated when a financial statement is published after the last transaction. This means that these releases bring new information that was not incorporated in the last transaction price.

The rest of the work is structured as follows. Section 1.2 presents the main objectives; Section 1.3 presents a short literature review; Section 1.4 presents the main results; Section 1.5 states further research. Section 2 presents the main article of this

thesis. Section 2.1 presents the model to determine the accounting ratios relevant for pricing updates and the bond characteristics that makes the model more relevant. Section 2.2 presents the data used in the model implementations and Section 2.3 the model results. Finally, Section 2.4 concludes.

1.2 Main Objective

The goal of this thesis is to propose a model that can update corporate bond spreads by using information available in financial statements, obtaining more accurate prices compared to the actual ones (reflected in the next transaction).

The basic idea is to make a regression model with the spread of the last transaction and financial ratios available in these statements. Financial ratios will be separated in five different groups: Liquidity, Leverage, Operating, Profitability and Market Value (Groppelli and Nikbakht (2000)). There will be a maximum of one ratio representing each of these groups.

A second stage of this study is to make a back-test with the results obtained in this model, to test the effective predictive power of it, testing the correct direction of the prediction i.e. The direction in which the spread will move predicted by the model coincides with the actual direction in which the spread moves.

To analyze the effectiveness of the model, results are separated by proxies that represent two main dimensions:

i. Transaction age: Represent how old is the last transaction spread available in the market for a certain bond. It is believed the older the transaction the more information financial statements will contribute so the better the model will work. To represent transaction age the proxy used is number of days the last transaction was made before the publication of the financial statement.

ii. Degree of Analyst coverage: Represents the amount of analysts following a company. It is believed that when a company is followed more intensively, new information is incorporated into the price of their bonds. This means that the more analyst coverage a company has, the less unknown information can be added with financial statements. This means our model will work better with less analyst coverage. To represent degree of analyst coverage we used four proxies:
    a. Stock classification: If the company stocks are in the IPSA (Selective Stock Price Index) or not
    b. Market Capitalization: Value of the total emitted stocks of a company
    c. Days Traded in the last 90 calendar days: Represent the frequency of the transactions
    d. Amount traded in the last 90 calendar days: Represent the volume (money) of the transactions

An important feature of this methodology is that it is very simple to apply. The inputs can be easily observed in financial statements and in the Chilean stock exchange webpage. The model is very simple as well. Another important feature is that the selected ratios are universal, this means that they can be obtained for any company as long as the company has publicly traded stocks.

1.3 Literature review

1.3.1 Financial Statements

These documents present the picture of the financial health of the company. They consist in three main sections:

i. Income statement: Exhibit revenues, expenses, margins and other variables related to the performance of the company. It is designed to

show the financial resources the company generated and spent over a period of time

ii. Balance sheet: Exhibits a picture of what a company owns and owes. It consist in three main parts:
    a. Assets: An economic resource that has an economic positive value
    b. Liability: Amount of economic resources that a company owes to others
    c. Shareholders' Equity: Remaining economic resources after the company sells all assets and pays its liabilities

iii. Cash Flow Statements: Reports company's inflows and outflows of cash. While the income statement show the profit made on each period, cash flow statements show the cash made each period

Footnotes are also very important. They show detail about the significant accounting policies and practices (for example: Income taxes, SG&A[1], Stock Options, etc.)

It is important to mention that on January 1st of 2008 the Chilean SVS[2] established the transition from PCGA (GAAP)[3] to IFRS[4] and stated that issuers should present their financial statements with these rules on December 31st, 2009. The reason why this transition was mandatory is because it facilitates the access to international capital markets. Another advantage of the international nature of IFRS is that it makes it easier to compare companies with their international competitors. One of the major differences between these two ways of presenting financial statements is that IFRS uses *fair value* (market values) rather than *accounting values.* Other differences in these methods are related to leasing, inventory, and price level restatement, among others. These changes were not statistically significant when testing our results.

[1] Selling General and Administrative Expenses
[2] Superintendencia de Valores y Seguros
[3] PCGA: *Principios Contables Generalmente Aceptados;* GAAP: Generally Accepted Accounting Principles
[4] International Financial Reporting Standarts

Financial statements are published quarterly (March 31st, June 30th, September 30th and December 31st). While the balance sheet shows a picture of the company in a moment of time, the income and cash flow statements show the accumulated results of the period. Quarterly financial statements show the accumulated results of the year until the date of the financial statement. For example third quarter results of 2012 show the accumulated results from January 1st, 2012 to September 30th, 2012.

The main importance of financial statements is due to two main reasons:

i. Internal Reasons: These statements help companies to watch their performance in a more global way, detecting the strengths and weaknesses and their evolution during each quarter
ii. External reasons: Between the external reasons we can find:
    a. Investors: Before investing they need to know what the company is worth
    b. Lenders: Before lending to a company, a lender would need to project the results of the company to see if it will be able to repay
    c. Government institutions: They need financial statements to see how much money a company has to pay because of taxes

Financial statements can be audited. This means that an independent accountant or accounting firm verifies and expresses an opinion on them. The importance of this procedure is that because this audition is made by a third party, financial statements should be more trustworthy.

1.3.2 Linear Regression Model

This model assumes that the variable *y* has a linear dependency on the variables *x*.

$$y_i = \beta_1 * x_{1i} + \beta_2 * x_{2i} + \cdots + \beta_p * x_{pi} + \varepsilon_i \quad (1)$$

where y_i (i =1 to n) are the predicted variables and β_k (k = 1 to p) are the parameters of the independent variables. The latter represent how much the variable y_i increases when the variable x_{ik} increases in one unit. x_{ik} are the predictor variables. ε_i is the part of the dependent variable not explained by the independent variables, also called the error term.

The parameters or Betas are estimated by the method of Ordinary Least Squares or OLS. This method minimizes the sum of squares of the differences between the observed responses and the predicted ones:

$$\beta_{OLS} \rightarrow min \sum_{i=1}^{n} (y_i - \hat{y}_i)^2 \quad (2)$$

where y_i is the observed outcome in the dataset and $\hat{y}_i$ is the outcome predicted by the regression model composed by Betas. This means that the Betas that minimize this sum of squares are the Ordinary Least Squares Betas.

The coefficient of determination or R squared represents how much of the original data is explained by the regression model. This number varies between *zero* and *one*, where *zero* means that the model is not representative of the data and *one* means the data is explained in a hundred per cent by the model.

1.4 Results

The results of this thesis show that given certain conditions, financial statements add information that can update spreads of corporate bonds.

The two most significant ratios found in financial statements are:

i. ROA: Is the Return on Assets. This ratio is calculated as the net income of the company (last twelve months), divided in the total amount of assets it has. This represents how profitable company's assets are

ii. Market Value / EBITDA: Market Value is the total value of the issued shares on a publicly traded company at the current market price plus the total amount of debt. EBITDA is Earning Before Interests, Taxes, Depreciation and Amortization which is a proxy for the operational cash flow generated by the company. The ratio between these two values is a valuation multiple very popular in financial industry. It represents how much a stockholder is paying for a given operational cash flow.

A model is made with these two ratios and the spread of the last transaction. It is tested in an out-of-sample base.

When testing if our model predicted the correct direction in which the spread will move, we found that when testing transaction age, the older the spread of the bond, the better the model works. In the case of the degree of analyst coverage, for the four different proxies (Stock classification, Market capitalization, Amount traded in the last 90 days and Days traded in the last 90 days) , results show that the smaller the degree of analyst coverage, the better the model works. These coincide with the expected results.

1.5 Future research

Results presented in this thesis correspond to a study in a specific country during a specific time window. Other lines of research are presented below:

i. Different Country: To make this study with a different data base (different country), will confirm if financial statements provide information to update the spreads available in markets. It will also provide which financial ratios add more information to the spread, and if these coincide or are similar with the ones found in this thesis.

ii. Financial institutions: Testing to analyze if financial statements affect more or less the spreads of financial institution than in the case of corporate bonds. Also, analysis should be executed to see which information is most relevant.

iii. Government bonds: An analysis could be more challenging because instead of financial statements other factors could be used such as GDP per capita, unemployment rate, etc.

Given that the methodology in this thesis is general, researchers can follow it to test other lines of research showed above.

2. THE RELEVANCE OF COMPANY FINANCIAL STATEMENTS FOR PRICING CORPORATE BONDS IN AN EMERGING MARKET

Emerging markets have been growing in the last decades, increasing their relevance in the world economy. Even though these markets have many similarities with those from developed countries, they differ in many features such as size, volume, liquidity and available information.

In a very liquid market it may be reasonable to price a corporate bond using the current risk free term structure plus the spread of its last transaction. In emerging markets, which are typically less liquid, the last transaction may be too old and not capture updated company information. The problem then consists on how and when to include new company accounting/financial information that cannot be extracted from financial markets because bonds are not traded due to low liquidity.

In order to relate financial statement information to bond spreads in what follows a review of previous research is summarized. The literature states that a significant percentage of corporate bond spreads is explained by credit risk. For example, Longstaff et al. (2005) and Dionne et al. (2012) study the fraction of the spread in corporate bonds that can be attributed to credit risk. Both studies conclude that when bonds are speculative grade and for maturities of 10 years around 75% of the spread is explained by credit risk. Huang and Huang (2003) divide credit risk into default loss and risk premium. Elton (2001) makes the same division and report that the sum of these two components represents more than a 55% of the spread.

One way to estimate credit risk is to use Credit Default Swaps (CDS). Blanco et al. (2005) studies the parity between CDS and corporate bonds spreads. Their thesis is that a risky bond together with its associated CDS should be equivalent to a risk-free bond. Results show only a small difference between these two, explained mainly because the CDS markets lead corporate bond markets. Similar results are found in Zhu (2006).

Even though many emerging markets do not have a market for CDS thus credit risk cannot be obtained from these instruments, there is a literature that finds the determinants of CDS spreads. These determinants could be used later to directly estimate bond spreads. For example, Das et al. (2009) compares a model that explains CDS spreads by market variables with another by accounting variables. The results are that both models could explain statistically the same, but a mixed model with both sets of variables explains a bigger portion. Callen et al. (2009) studies how earnings affect CDS, concluding that a 1% increase in ROA diminishes the CDS spreads in approximately 5%. Aunon-Nerin et al. (2002) conclude that leverage and risk classification are the fundamental variables that mostly affect CDS. Elkamhi and Jacobs (2012) show that accounting information releases cause jumps in CDS spreads.

In addition, some studies using accounting data have shown to predict variations in credit risk. Altman (1968) states that when financial ratios rise above certain levels, probabilities of default by companies rise as well. This study was a pioneer on this field using ratio analysis as an analytic technique. Bijenen (1994) uses insolvency models to compare bankrupt and non-bankrupt companies using financial ratios. Campbell and Taskler (2003) investigate the importance of equity volatility in the spread of corporate bonds using accounting variables. Shumway (2001), with a time series model, and Carling et al. (2007), with a duration model, also show the importance of accounting variables.

Finally, Easton (2008) studies the volume of transactions near earning announcements. His results show that the amount of transactions rises the day when announcements are made, and up to two days later. This is even more pronounced when earnings are worse than expected and for speculative grade bonds. This supports the importance of quarterly financial statements showing that this information has an impact on financial transactions.

In conclusion, the literature supports that financial statements may be relevant for explaining credit risk. Thus it may be reasonable to assume that in the absence of

transactions data, which is typical of illiquid emerging markets, company financial statements could be a source of valuable information for updating spread estimates.

The goal of this paper is to find if accounting information appearing in public financial statements is or not helpful for updating prices of corporate bonds not traded recently and under which circumstances. We are interested both in identifying the financial ratios that are relevant among the many reported, and also finding which are the characteristics of the bonds for which using this accounting information for price updating is the most profitable.

We propose a model that first determines which variables among all Liquidity, Leverage, Operating, Profitability and Market Value ratios available in the public financial statements of corporate bond issuers are the best explanatory variables of bond spreads. We then analyze how to determine which bonds benefit the most from pricing using this model. In particular we propose looking at the transaction age, and the degree of analyst coverage. *Transaction age* is a proxy of how old is the company information already included in available bond prices, thus the larger this proxy is, the highest the relevance of financial statement information for updating past prices should be. Similarly, several proxies for the *degree of analyst coverage* are proposed. It is expected that using public financial statements should be more relevant when analyst coverage is lower.

The model is implemented using the low liquidity Chilean corporate bonds using transaction data and quarterly company financial statements. We analyze in which cases financial statement information is relevant for predicting the sign of the bond spread change. Our main results show that ROA and the Market Value to EBITDA ratios, among all available information, are the most relevant for updating spreads. Also, that the older the previous market transaction is and the less analyst coverage of the bond issuer there is, the most relevant company quarterly financial statements are, as expected. Thus, our results are increasingly relevant for emerging markets with low liquidity.

2.1 The Model

As stated earlier, we are interested in setting up a model with two goals: first to determine which accounting ratios help update bond prices that have not been traded recently, and second, to find the bond characteristics that make using the abovementioned accounting ratios more relevant.

We start by classifying publicly available financial ratios into five groups: Liquidity, Leverage, Operating, Profitability and Market Value ratios, according to Groppelli and Nikbakht (2000).

Liquidity (solvency) ratios focus on the capacity that a firm has to pay their short term debt. Leverage (debt) ratios show the capital structure of the firm and the ability to pay long term debt. Operating (asset efficiency) ratios reflect the effectiveness with which a firm uses its capital to generate sales. Profitability ratios show the ability to generate earnings and the efficiency in the use of assets and equity. Finally market value ratios relate the stock price to book values.

Once the group of financial ratios is chosen, we propose using a regression model to explain the first bond spread after a financial statement is made public. We use as explanatory variables the last observed spread before the accounting information is released plus the set of financial ratios reported in the financial statement.

$$\begin{aligned} Spread = \beta_0 + \beta_1 * Liquidity_{Ratio} + \beta_2 * Leverage_{Ratio} + \beta_3 \\ * Operating_{Ratio} + \beta_4 * Profitability_{Ratio} + \beta_5 \\ * MarketValue_{Ratio} + \beta_6 * \text{Spread}_{\text{Before}} + \varepsilon \end{aligned} \quad (3)$$

where *Spread* is the spread of the next transaction after the financial statement is published, $Spread_{Before}$ is the spread of the last transaction previous to the release of the financial statement and ε is the regression error i.e. the difference between the observed spread and the spread predicted by the regression model. $Liquidity_{Ratio}$ represents one

or several financial ratios among those reported in the financial statements that focus on the capacity that a firm has to pay their short term debt. A similar interpretation should be given to the other ratios in the model. To determine which specific ratios finally end up in the model, traditional Forward, Backward or Stepwise procedures should be used.

For liquidity ratios we expect that the more liquid a bond is, the lower the spread should be. For leverage ratios we expect that the higher the leverage, the larger the spread due to an increased probability of default. For operating ratios we expect that the more efficient the company is in managing their inventories and cash, the smaller the spread should be. For profitability ratios we expect that more profitable companies should have lower spreads. Finally for market-value ratios we expect the higher the ratio the smaller the spread due to increased future growth.

To search for the bond characteristics that would make using the above model more relevant we propose looking for in two dimensions: First *Transaction age*, defined as the time span between the last transaction and the release of the financial statement. It is conjectured that the smaller this variable, the less relevant is the financial statement for updating bond spreads.

A second dimension that should be analyzed is the *degree of analyst coverage*. Following Lu et al. (2010) we conjecture that the higher the number of analysts who study a company, the less relevant public financial statements should be. Given that in many emerging markets this information is not readily available, adequate proxies should be used, for example: If a company is included or not an important index (i.e. S&P 500); if the company has a large Market Capitalization; if the bond has a high number of transactions; if the bond has a high volume traded. All of these are proxies of a high degree of analyst coverage and should help explain the relevance of financial statements for updating bond prices.

2.2 Implementation Data

We now present an implementation of the above model for pricing corporate bonds in Chile. The Chilean bond market is extremely illiquid so it's a challenging emerging market to test our model (Cortazar et al., 2007, 2012). We use daily bond transactions from the Santiago Stock Exchange, bond descriptions from RiskAmerica and quarterly financial statements of the issuing firms from Bloomberg. Data is from the third quarter of 2002 to the fourth quarter of 2008, as the in-sample period, and from the first quarter of 2009 to the second quarter of 2012 for the out-of-sample.

The model will be calibrated to predict bond spread transactions occurring up to 30 days after a financial statement has been released using his accounting data and previous transactions. Whenever two transactions occur within these 30 days, they will be averaged. Also, bonds from financial companies are not considered because of the differences in accounting rules (Covits and Downing, 2007, Hovakimian et al., 2011, Shumway, 2001, and Lu et al., 2010) and the existing evidence on the difference in behavior of institutions in this sector (Elton et al., 2001, Longstaff et al., 2005 and Hovakimian et al., 2011).

Tables 1 and 2 present a summary of the in-sample and out-of-sample bond data

Table 1: Bond In-Sample Data Summary

	Average	Std. Deviation	Min.	Max.
Spread	1.49	0.85	0.15	6.59
Time to Maturity	8.79	7.02	0.01	24.94
Days Traded	10.84	8.50	1.00	41.15
Amount Traded	6,502	12,210	4	219,393

Table 1 shows the average value, standard deviation, minimum and maximum value of the 725 bond observations in the period between third quarter of 2002 to the fourth quarter 2008 (26 periods). Spread is the difference between the bond rate and the risk free rate given by RiskAmerica. Time to maturity is the time in years until the bond expires. Days Traded is the number of days the bond has registered a transaction in the last 90 calendar days. Amount traded is millions of Chilean pesos traded in the bond in the last 90 calendar days. Source: RiskAmerica.

In addition to gathering bond transaction data we collect all quarterly financial statements form bond issuers during the same period. For each statement a set of financial ratios must be selected among the many that could be used to predict the future spreads. Table 3 shows our initial selection with 18 ratios frequently proposed in the literature (Altman, 1968, Zmijewski, 1984, Carling et al., 2007, Cambell and Taskler, 2003, Chen et al., 2007, Bhat et al., 2011 and Das et al., 2009).

Table 2: Bond Out-if-Sample Data Summary

	Average	Std. Deviation	Min.	Max.
Spread	1.37	0.76	0.21	4.39
Time to Maturity	9.02	7.01	0.08	23.9
Days Traded	10.26	8.52	1.00	42.00
Amount Traded	6,449	11,316	11	117,586

Table 2 shows the average value, standard deviation, minimum and maximum value of the 803 bond observations in the out-of-sample period between third first quarter of 2009 to the second quarter of 2012 (14 periods). Spread is the difference between the bond rate and the risk free rate given by RiskAmerica. Time to maturity is the time in years until the bond expires. Days Traded is the number of days the bond has registered a transaction in the last 90 calendar days. Amount traded is millions of Chilean pesos traded in the bond in the last 90 calendar days. Source: RiskAmerica.

Table 3: Financial Ratios

Financial Ratios	Ratio Classification	Ticker Bloomberg
Current Assets / Current Liabilities	Liquidity	QUICK_RATIO
Interest Coverage	Liquidity	INTEREST_COVERAGE_RATIO
Working Capital / Total Assets	Liquidity	WORKING_CAPITAL / BS_TOT_ASSET
Accounts Payable / Sales	Liquidity	ACCOUNTS_PAYABLE_TO_SALES
Cash Flow / Interest	Liquidity	CASH_FLOW_TO_INT_EXPENSE
Leverage	Leverage	TOT_DEBT_TO_TOT_ASSET
LT Debt / Total Assets	Leverage	LT_DEBT_TO_TOT_ASSET
Cash / Assets	Operating	CASH_TO_TOT_ASSET
Inventories / Total Sales	Operating	INVENT_TO_SALES
Inventories / Total Assets	Operating	INVENT_TO_TOT_ASSET
ROA	Profitability	RETURN_ON_ASSET
EBITDA / Total Assets	Profitability	EBITDA / BS_TOT_ASSET
Retained Earnings / Total Assets	Profitability	RETAIN_EARN_TO_TOT_ASSET
Operating Income / Sales	Profitability	OPER_INC_TO_NET_SALES
Sales / Total Assets	Profitability	SALES_TO_TOT_ASSET
Net Income / Total Assets	Profitability	NET_INCOME / BS_TOT_ASSET
Total Debt / Market Value	Market Value	DEBT_TO_MKT_CAP
Market Value / EBITDA	Market Value	TOT_MKT_VAL_TO_EBITDA

The first column shows the name of the financial ratio. Leverage is Total Debt / Total Assets, ROA is the Return on Assets, LT Debt / Total Assets is Long Term Debt / Total Assets The other names are self explanatory. The second column shows the ratio classification. The third column shows the Bloomberg Ticker, (more information can be obtained from Bloomberg using this Ticker).

In terms of ratio classifications we selected five different liquidity ratios, two leverage ratios, three operating ratios, six profitability ratios and two market value ratios that may be tested to find if they may explain bond spreads.

Tables 4 and 5 present a summary of the quarterly financial statement of bond issuing companies in the in-sample and the out-of-sample periods. It can be noted that the standard deviation of some ratios is larger than their averages. Also there are some

ratios with negative minimum values which mean companies who have had losses instead of profits in the period (i.e. ROA and Operating Income / Sales).

Table 4: Financial Statement In-Sample Data Summary

	Average	Std. Deviation	Min.	Max.
Leverage	0,50	0,10	0,19	0,80
ROA	5,28	4,25	-4,15	22,02
Total Debt / Market Value	0,67	1,18	0,07	11,97
Current Assets / Current Liabilities	0,84	0,56	0,10	3,33
EBITDA / Total Assets	0,03	0,02	-0,03	0,11
Retained Earnings / Total Assets	18,45	12,41	0,09	68,78
Interest Coverage	4,36	4,13	-6,30	59,33
Operating Income / Sales	15,93	13,95	-24,72	70,40
Cash / Total Assets	3,35	3,33	0,00	18,63
Inventories / Total Sales	11,80	10,51	0,05	62,52
Sales / Total Assets	0,18	0,13	0,03	0,67
Working Capital / Total Assets	0,07	0,12	-0,19	0,45
LT Debt / Total Assets	26,20	9,28	0,19	45,65
Accounts Payables / Sales	0,08	0,03	0,02	0,19
Cash Flow / Interest	4,19	6,09	-18,20	42,37
Market Value / EBITDA	15,70	24,41	3,45	215,70
Net Income / Total Assets	0,01	0,01	-0,04	0,09
Inventories / Total Assets	8,15	8,37	0,01	41,15
Pretax 05	3,29	1,95	-6,30	5,00
Pretax 510	0,80	1,53	0,00	5,00
Pretax 1020	0,19	1,08	0,00	10,00
Pretax20	0,08	1,49	0,00	39,33

This table shows the average value, standard deviation, minimum and maximum value of the 725 observations of financial statement ratios of the bond issuers in different quarters (The 26 periods from the third quarter of 2002 to the fourth quarter of 2008). Pretax05 is the value of interest coverage when this value is smaller than 5, and is 5 when is bigger. Pretax510 is 0 when the value of interest coverage is smaller than 5, 5 when is bigger than 10 and the value of interest coverage minus 5 when is between 5 and 10. Analogously Pretax1020 is 0 when Interest Coverage is smaller than 10, 10 when is bigger than 20 and the value of interest coverage minus 10 when is between 10 and 20. Pretax20 is 0 when interest coverage is less than 20 and the value of interest coverage minus 20 when is bigger than 20. All the data is taken from Bloomberg.

Table 5: Financial Statement Out-of-Sample Data Summary

	Average	Std. Deviation	Min.	Max.
Leverage	0.54	0.11	0.28	0.93
ROA	5.22	4.14	-12.71	20.53
Total Debt / Market Value	0.62	0.98	0.07	9.25
Current Assets / Current Liabilities	3.37	12.17	0.10	94.52
EBITDA / Total Assets	0.03	0.02	-0.10	0.14
Retained Earnings / Total Assets	22.26	12.32	-11.14	61.56
Interest Coverage	6.36	7.48	-32.66	86.07
Operating Income / Sales	15.82	18.19	-72.92	122.82
Cash / Total Assets	5.36	4.79	0.34	35.00
Inventories / Total Sales	11.81	10.95	0.02	59.50
Sales / Total Assets	0.17	0.11	0.00	0.58
Working Capital / Total Assets	0.15	0.19	-0.13	0.85
LT Debt / Total Assets	27.78	8.50	1.39	69.36
Accounts Payables / Sales	0.12	0.04	0.02	0.27
Cash Flow / Interest	8.04	26.80	-60.04	420.99
Market Value / EBITDA	18.10	28.72	2.80	431.21
Net Income / Total Assets	0.01	0.01	-0.10	0.08
Inventories / Total Assets	8.08	7.69	0.03	33.64
Pretax 05	3.47	2.69	-32.66	5.00
Pretax 510	1.52	2.04	0.00	5.00
Pretax 1020	0.96	2.43	0.00	10.00
Pretax20	0.42	3.54	0.00	66.07

This table shows the average value, standard deviation, minimum and maximum value of the 803 financial statement ratios of the bond issuers in different quarters (The 14 periods from the first quarter of 2009 to the second quarter of 2012). Pretax05 is the value of interest coverage when this value is smaller than 5, and is 5 when is bigger. Pretax510 is 0 when the value of interest coverage is smaller than 5, 5 when is bigger than 10 and the value of interest coverage minus 5 when is between 5 and 10. Analogously Pretax1020 is 0 when Interest Coverage is smaller than 10, 10 when is bigger than 20 and the value of interest coverage minus 10 when is between 10 and 20. Pretax20 is 0 when interest coverage is less than 20 and the value of interest coverage minus 20 when is bigger than 20. All the data is taken from Bloomberg.

2.3 Model Results

2.3.1 Choosing the Accounting Ratios: In-Sample Results

The proposed linear regression using the spread of the bond last transaction ($Spread_{Before}$) and all the financial ratios described in the previous section. After applying standard econometric procedures only one profitability ratio (ROA) and one market value ratio (MarketValue/EBITDA) are chosen for the model. Thus the model is:

$$Spread_{Mod} = \beta_0 + \beta_1 * ROA + \beta_2 * MarketValue\ to\ EBITDA + \beta_3 * Spread_{Before} \quad (4)$$

where $Spread_{Mod}$ is the spread predicted by the model. ROA is return on assets, Market Value to EBITDA is the self explanatory financial ratio and $Spread_{Before}$ is the spread of the bond last transaction before the release of the financial statement. The first two variables are obtained from financial statements and the last one from the market.

Table 6 presents the coefficients, Standard Errors and t statistics. Table 7 shows the model results, including number of observations, and the F, R/squared and RMSE statistics.

Table 6: Accounting Information Model

	Coef.	S.E.	t
Spread Before	0.84510	0.045	18.81
ROA	-0.01030	0.005	-1.89
Market Value / EBITDA	-0.00120	0.001	-2.40
Constant	0.30660	0.093	3.31

Robust standard errors are calculated using the Huber-White Sandwich estimator which deals with heteroscedasticity. The regression is made with Stata.

Table 7: Accounting Information Model Statistics

Number of Obs	725
F (3,721)	259.17
Prob> F	0.00
R - Squared	0.76
Root MSE	0.48

Results show that, as expected, $Spread_{Before}$ is by far the most significant variable in the regression. However it is interesting to note that Market Value / EBITDA is significant at 95% and has the expected sign because the larger the ratio means a smaller spread because investors expect the company to grow more in the future. On the other hand ROA is significant at 90% and also has the expected sign, because the larger this ratio also means a smaller because investors find the company is more profitable and thus less likely to default. This is consistent with the literature (Callen et al., 2009, Das et al., 2009, Batta, 2011).

2.3.2 Out-of-Sample Results

In this section we apply the above model for the out-of-sample period and analyze the results to determine the bond characteristics which make the model more relevant for predicting corporate bond spreads. If the accounting information reported in the financial statements is relevant, then the model should be able to predict the spread change sign with statistical significance.

For our out-of-sample exercise we only use past data to predict future spreads. Starting with the in-sample data, we add every day the new transactions, run the above regression model, and predict next-day spreads. We only use one transaction for each bond in each quarter, so when there is another transaction of the same bond-quarter it is averaged with previous bond-quarter transactions. We compare model predictions with actual transactions up to 30 days after the financial statement publication**.**

As described earlier we are in classifying model results according to two bond characteristics that could make using our model more relevant: *Transaction age*, and *Degree of analyst coverage*.

In terms of *Transaction age* we will classify model results according to how many days before publication of the financial statement was the last transaction. We will name this variable *Days Before*. We expect that the larger the *Days Before*, the more outdated is the information included in the last transaction, thus making financial statements more relevant for updating spreads.

In terms of *Degree of analyst coverage* we use four proxies: If a company is included or not in the most important local index, IPSA; the size of the issuing company Market Capitalization; the bond volume traded; the number of days the bond traded in the last 90 day period. We expect that more analysts will cover a company if it is in IPSA, if it has a high Market Capitalization, and if the bond is more liquid, measured by a high volume or number of transactions. We assume that the fewer analysts cover a company, the more important is the information released in a public statement.

We now present model results according to *Transaction Age* and to the four proxies for *Degree of Analyst Coverage.* If the sign of the spread change is the same as the actual transaction spread change, then we report the sign to be correct.

Table 8 shows the percentage of correct spread changes predicted by the model for corporate bond transactions before and after the release of the financial statement. It can be seen that the older the last spread the more relevant financial statements are for predicting spread change sign, as expected. Also that if the last bond transaction is older than 12 days, then using financial statement information for determining if spreads will increase or decrease is beneficial, on average.

Table 8: Spread Change Sign Analysis vs *Transaction Age.*

Days Before	Observations	% Correct Sign	Std Deviation	Z
0 - 3	227	48.02%	0.501	-0.60
4 - 12	235	51.49%	0.501	0.46
13 - 59 **	254	57.09%	0.496	2.26
60 -> ***	87	63.22%	0.485	2.47
Total **	803	53.55%	0.499	2.01

**: Significant at 95%

***: Significant at 99%

The second column is the number of observations in each group. The third column indicates the percentage of times the prediction of the spread coincides in the change in direction of the real one. The fourth column is the standard deviation. The fifth column shows the Z statistic of the group.

Table 9 shows similar results, but now partitioned into two groups: the company is or is not important enough to be included in the main stock index IPSA. We expect that if the company is included in the index, then more analysts would be closely following it, making the release of financial statements uninformative for the market. Our results confirm this hypothesis, showing that the sign of the spread change after the release of the financial statement may be predicted better if the company is no included in the index.

Table 9: Spread Change Sign Analysis vs. Analyst Coverage-1: Stock Belongs to Index.

	Observations	% Correct Sign	Std Deviation	Z
Not IPSA ***	243	57.61%	0.495	2.374
IPSA	560	51.79%	0.500	0.845
Total **	803	53.55%	0.499	2.011

**: Significant at 95%

***: Significant at 99%

Table 10 partitions our data depending on market capitalization. Our conjecture is that the larger the company the less relevant is the release of financial statements for updating spreads. The results confirms this by showing that smaller companies, with less

than 800 bn CLP in market capitalization issue financial statements that are relevant for updating bond spreads.

Table 10: Spread Change Sign Analysis vs. Analyst Coverage-2: Market Capitalization

CLP bn	Observations	% Correct Direction	Std Deviation	Z
0 - 800 * **	267	57.30%	0.496	2.387
800 - 3000	279	52.33%	0.500	0.778
3000 ->	257	50.97%	0.501	0.312
Total **	803	53.55%	0.499	2.011

**: Significant at 95%

***: Significant at 99%

Amounts in CLP bn

Table 11 breaks down our results according to bond amount traded. We expect that bonds that are traded less are not covered by analysts and thus information released in the financial statements is most relevant. The results confirm our expectations, showing that bonds with less than 1.49 bn CLP traded in the last 90 days may use financial statement information to update spreads.

Table 11: Spread Change Sign Analysis vs. Analyst Coverage-3: Amount Traded

CLP bn	Observations	% Correct Sign	Std Deviation	Z
**0 - 1.49 ** **	267	56.93%	0.496	2.264
1.49 - 5.20	268	54.85%	0.499	1.588
5.20 ->	268	48.88%	0.501	-0.367
Total **	803	53.55%	0.499	2.011

**: Significant at 95%

Amounts in CLP bn

Finally, Table 12 makes a similar analysis, but now looking at the number of bond trades. Again, results confirm expectations showing that bonds that have traded less than 5 times in the last 90 days, being less liquid are not followed by analysts, making financial statement releases very informative for the market.

Table 12: Spread Change Sign Analysis vs. Analyst Coverage-3: Days Traded

Number of Days	Observations	% Correct Sign	Std Deviation	Z
1 - 4 * **	245	58.37%	0.494	2.619
5 - 11	287	50.17%	0.501	0.059
12 - 42	271	52.77%	0.500	0.911
Total **	803	53.55%	0.499	2,011

**: Significant at 95%

***: Significant at 99%

The above tables confirm our conjectures that the model presented is able to predict the direction of the spread change after the financial statements are released according to two dimensions: *Transaction age* and *degree of analyst coverage*.

We show that the older the last bond transaction and the less coverage by analysts the company has, the more relevant financial statements are for determining if the bond spread will rise or decline.

2.4 Concluding Remarks

Emerging markets tend to have low liquidity. Thus the last transaction price of a security may be very old and a bad estimate of its current price. This paper explores which and how to use information released in a financial statement to update past spreads.

We propose a model that selects, from a large number of reported Liquidity, Leverage, Operating, Profitability and Market Value ratios, the set that best fits in-sample data for updating spreads. Using Chilean corporate bonds and quarterly financial statements from bond issuing companies from 2002 to 2012, we show that ROA and Market Value to EBITDA are the most important ratios.

We then test these explanatory variables out-of-sample and determine the ability of the model to choose the sign of the spread change after the financial statement is released. We analyze model results in terms of *Transaction age* finding that the older

the last transaction, the more relevant the financial statement information is for updating bond spreads.

We then analyze model results in terms of the *degree of analyst coverage.* Given that in many emerging markets this information is not readily available, we propose using as proxies if a company is included in an important index; if the company has a large Market Capitalization; if the bond has a high number of transactions; and if the bond has a high volume traded. Results confirm expectations because for all four proxies, the less coverage by analysts a company has, the more informative financial statements for updating bond spreads are.

REFERENCES

Altman, E. (1968). Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy. *The Journal of Finance,* 23(4) 589-609.

Aunon-Nerin, D., Cossin, D., Hricko, T., & Huang, Z. (2002). Exploring for the Determinants of Credit Risk in Credit Default Swap Transaction Data: Is Fixed-Income Markets Information Sufficient to Evaluate Credit Risk? *FAME Research Paper* No. 65.

Batta, G. (2011). The Direct Relevance of Accounting Information for CDS Pricing. *Journal of Business Finance & Accounting.* 38 (9-10) 1096–1122.

Bhat, G., Callen, J., & Segal, D. (2011). Credit Risk and IFRS: The Case of Credit Default Swaps. *Working paper.*

Bijnen, E. (1994) Corporate Prediction Models, Ratios or Regression Analysis? *Working paper.*

Blanco, R., Brennan, S., & Marsh, I. (2005). An Empirical Analysis of the Dynamic Relation between Investment Grade Bonds and Credit Default Swaps. *The Journal of Finance,* 60(5) 2255–2281.

Callen, J., Livnat J., & Segal, D. (2009). Impact of Earnings on the pricing of CDS. *Working paper.*

Campbell, J., & Taksler, G. (2003). Equity Volatility and Corporate Bond yields. *Journal of Finance,* 58(6) 2321-2350.

Carling, K., Jacobson, T., Lindé, J., & Roszbach, K. (2007). Corporate Credit Risk Modeling and Macroeconomy. *Journal of Banking & Finance* 31(3) 845–868.

Chen, L., Lesmond, D., & Wei, J. (2007). Corporate Yield Spreads and Bond Liquidity. *The Journal of Finance,* 62(1) 119–149.

Cortazar, G., Schwartz, E., & Naranjo, L. (2007). Term-Structure Estimation in Markets with Infrequent Trading. International Journal of Finance & Economics, Vol. 12, N°4, 353–369.

Cortazar G., Schwartz E. & Tapia C. (2012). Credit spreads in illiquid markets: Model and implementation. Emerging Markets Finance & Trade, November–December 2012, 48, 6, 53–72.

Covits, D., & Downing, C. (2007). Liquidity or Credit Risk? The Determinants of Very Short Term Corporate Spreads. *The Journal of Finance*, 62(5) 2303–2328.

Das, S., Hanuona, P., & Sarin, A. (2009). Accounting-Based Versus Market-Based Cross-Sectional Models Of CDS Spreads. *Journal of Banking & Finance,* 33(4) 719–730.

Dionne, G., Gauthier, G., Hammami, K., Maurice, M., & Simonato, J. (2010). Default Risk in Corporate Yield Spreads. *Financial Management*, 39(2) 707–731

Easton, P., Monahan, S., & Vasvari, F. (2009). Initial Evidence on the role of Accounting Earnings in the Bond Market. *Journal of Accounting Research,* 47(3) 721–766.

Elkamhi, R., & Jacobs, K. (2012). Accounting Information Releases and CDS Spreads. *Working paper.*

Elton, E., Gruber, M., Agrawal, D., & Mann, C. (2001). Explaining the Rate Spread on Corporate Bonds. *The Journal of Finance*, 56(1) 247-277.

Groppelli, A., & Nikbakht, E. (2000). Finance. *Barron's Educational Series, 4th Edition.*

Hovakimian, A., Kayhan, A., & Titman, S. (2011). Are Corporate Default Probabilities Consistent with the Static Trade-off Theory? *Working paper.*

Huang, J., & Huang, M. (2003). How much of the Corporate Treasury Yield Spread is Due to Credit Risk? A New Calibration Approach. *Working paper.*

Longstaff, F., Mithal, S., & Neiss, E. (2005). Corporate Yield Spreads: Default Risk or Liquidity? New Evidence from the Credit Default Swap Market. *The Journal of Finance*, 60(5) 2213-2253.

Lu, C., Chen, T., &Liao, H. (2010). Information Uncertainty, Information Asymmetry and Corporate Bond Yield Spreads. *Journal of Banking & Finance*, 34(9) 2265–2279.

Shumway, T. (2001).Forecasting Bankrupcy more Accuerately: A Simple Hazard Model. *The Journal of Business*, 74(1) 101-124.

Zhu, H. (2006). An Empirical Comparison of Credit Spreads Between the Bond Market and the Credit Default Swap Market. *Journal of Financial Services Research*, 29 (3) 211–235.

Zmijewski, M. (1984). Methodological Issues Related to the Estimation Of financial Distress Prediction Models. *Journal of Accounting Research* 22(1) 59–82.