Determinants of the cost of corporate debt:

The case of the oil companies

Abstract

We used the spread of corporate bonds of 28 major oil companies in order to determinate if such measure of cost of debt was related to sources of risk frequently mentioned in the literature of corporate finance such as political disturbances, changes in the systemic risk and in the value of corporate assets. We found that the cost of debt of oil companies is explained by changes in systemic risk and in the value of corporate assets. The level of oil reserves of such companies is the main factor in explaining the cost of corporate debt.

Track: Financial Markets, Investment and Risk Management.

Key words: Credit Spread, Oil Companies, Credit Default Swaps.

Introduction

The global bond market is by far the largest source of public offering instruments in the second decade of the 21st century. In this sense, according to estimates from the Bank for International Settlements (BIS), the nominal value of bonds outstanding at December 2010 was 95 billion dollars, equivalent to 130% of the world's Gross National Product (PTB), where 70% were local emissions, and was followed in importance by the global stock market capitalization with an estimated 55 billion dollars for the same date. The main issuer of the global bond market is the U.S. with 39% of the total amount issued, followed by Japan with 20%.

Despite the importance of the bonds within the investment menu in which corporations, individuals and governments put their excess resources, there are still many aspects of the valuation of these instruments on which the academic community is just beginning to develop lines of depth research.

In this regard, of there is a substantial body of work that began with Merton (1973), who was the first to develop a model for pricing corporate debt using the economic determinants financial stress that are characteristics of the issuers of such a debt, in particular, the levels of financial leverage and the volatility of its assets.

More recently, several studies have been conducted to link yield than corporate bonds earned in excess on riskless debt issued by the Federal Government which is going to be called spread along this article. The characteristics of the debt markets, of the issuers, and the variables used to explain the sovereign spread will be discussed in the following paragraphs.

Review of literature

Collin-Dufresne and Goldstein (2001) evaluated the impacts of stationary leverage ratios, stochastic interest rates and changes in the value of companies on the corporate spreads and concluded that when the leverage ratios follow stationary processes is natural to observe that market prices explain this phenomenon. The authors confirmed the impact of the ability of a company to control its debt on predictions of yield spreads and they could not prove the supremacy of leverage as an explanatory variable of the spread. Other variables no related to the firm capital structure have more explanatory of such a spread.

By studying other variables that could influence the cost of corporate debt, Campbell and Taksler (2003) found that one third of the variation in the spread was explained by the volatility of stocks and credit ratings. These authors found that the spread of corporate was greater than what could be predicted from proposed by Merton (1973), and it was very sensitive to changes in the volatility of the stock.

In line with Campbell and Taksler (2003) and Cremers, Driessen, Maenhout, and Weinbaum (2004), Ericsson, Jacobs, and

Oviedo (2009) identified a significant impact on the volatility of stock returns, financial leverage and risk-free rate in both univariate and multivariate regressions on explaining the cost of debt using Credit Default Swap (CDS).

The study of the cost of credit risk requires, in addition to identifying the factors or variables that could force investors to demand a premium for holding sovereign debt, solve problems of a practical nature as to estimate the own credit risk premium or spread from market information that is incomplete by the absence of daily transactions of securities to be studied and the difficulty of observing the structure of interest rates.

There are two sources from which the empirical data are collected to calculate the spread between risk bearing bonds and risk-free counterparts. The first source, the spot market or cash market, refers to the buying and selling securities with credit risk by market specialists (over the counter), and auctions of debt securities of U.S. central government (treasuries).

The second one, the derivatives market, refers to the purchase and sale transactions of hedge contracts against the event of insolvency of corporate and sovereign bonds, using as main vehicles the Credit Default Swap (CDS), which are put options on those securities that are marketed under the conditions set by the International Swaps and Derivatives Association (ISDA).

With respect to the cash market, the seminal works in the area of credit risk compare the difference between yields to maturity of corporate bonds and coupons bearing debt of the central government of a country, as they are considered risk free securities, both securities of similar maturity, giving to that difference the name of credit spread Elton, Gruber, Agrawal, and Mann (2001). Examples of papers using cash market measures of the spread are Campbell and Taksler (2003), Covitz and Downing (2007) and Elton et al. (2001).

As for the derivatives market, the use of the CDS premiums as estimates of the credit spread started with Duffee (1999) and Predescu, Hull, and White (2004), which stated that the price of a CDS is equals the spread between a corporate bond and a risk-free title. For such equality to be satisfied, must be fulfilled an equilibrium condition (absence of arbitrage).

Ericsson et al. (2009) evaluated the determinants of credit risk as the dependent variable using the prices of CDS. In their analysis, the authors chose to use the premium charged for the coverage of the risk of insolvency rather than the cash spread; first, because the CDS market is much more liquid than the bond market, amounting to 2006, date it ended data collection cited in the study, about 20 trillion in notional or nominal value of contracts outstanding. Second, because as the price of CDS directly measures the spread is not necessary to specify a structure of interest rates and risk free family riskless asset from which it has to be estimated, thus avoiding incorporate to the analysis the disadvantages of using a specification that is not correct and would add "noise" to the estimated spread. And finally, the CDS market, while more liquid, responds more quickly to changes in credit risk than the bond market Blanco, Brennan, and Marsh (2005).

This article explores the impact that can have on the sovereign spread a variable that has only recently captured the interest

of academics and investment managers of fixed income instruments: *"political risk"*. In this regard, in a July 2012 interview, as quoted by Goodman (2012), for the financial weekly Barron's, Mohamed El-Erian, head of Pimco, the largest family of bond funds of the planet with assets of 1,8 billion, said referring to the conceptualization of investment strategies in fixed income for the coming years: *"Market participants need to pay a lot more attention to political developments"* he says. *"Last summer's (Treasury) downgrade, Europe today, the fiscal cliff – these are all purely political issues. Plus, there's active debate as to what the euro zone, the biggest economic region in the world, will look like"*.

Despite the importance of the political issue, however, there are few references in the literature on the impact of political risk on the cost of sovereign debt. The seminal studies have focused on the fact that a non-payment is a political decision of weighing the positive impact of defaulting on a payment schedule versus reputational costs, the seizure of national assets and disruption of international business operations of the debtor country Eaton and Gersovitz (1981), Bulow and Rogoff (1989) and Gibson and Sundaresan (1999).

But it was not until the study of Moser (2007) when appears in the literature political variables measured explicitly. Moser defined sovereign risk as the ability and willingness of a country to pay down debt, and included the political risk as part of sovereign risk. To assess whether financial markets take into account political events on the valuation of sovereign debt, collected yield spreads of 12 Latin American countries during the period 1992-2007, using information contained in the index EMBI, EMBI + and EMBIG calculated by J.P. Morgan.

In this investigation we selected oil companies to explore wheter financial markets charge a premium for investing in corporate bonds where payments to its creditors may be influenced by decisions of the national government.

In the oil industry the state has traditionally played simultaneously the role of stockholder and regulator, in addition to being the industry intensive in the use of capital goods, this industry often goes to bond markets to raise part of the funds required to make such investments. This industry is, therefore, an interesting study case because the existence of debt that is traded on financial markets and hedging instruments over non-payment of these debt, and the presence of a state that can participate actively in deciding about how to use the cash flow streams generated by these companies.

This article is organized as follows: Section III presents the research objectives, section IV shows the methodology used to study the variables that affect the spread, Section V presents the results, Section VI discusses the results and Section VII presents the conclusions and possible ways to develop future research.

Research Objectives

We will study the impact of the major sources of risk identified in the financial literature on the debt spread paid by oil

companies. We will use daily prices of CDS on debt issued by these companies as an instrumental variable in the cost of credit risk. We divided these sources of risk in three groups, the first of them related to political risk faced for those countries in which these companies are incorporated; the second group includes factors related to the capital structure and the nature of the assets of the companies in the oil industry, and the third one which includes proxies for the systemic risk that is consider by the investors to calculate the required yield to buy financial instruments.

Methodology

We apply the methodology proposed by Ericsson et al. (2009) that estimates the spread paid by corporate bonds using CDS quotes. We chose a sample of the top 50 oil companies in the world as ranked by Oil & Gas Journal (2011) discarding all companies for which there are no contracts to hedge default risk.

Were taken daily prices of five-year CDS for 28 of the 50 companies constituting the sample covering the period from September 4, 2001 (date on which contributions start) until December 31, 2010. Worth noting the CDS premium of 22 of the 28 companies were trading in dollars and the remaining 6 in Euros.

Given that the information collected has a transverse component and another in time series, we decided to use as a functional linear regression model with fixed effects panel data, as presented below:

$$CDS_{it} = \beta_{1i} + \sum_{k=1}^{n} \beta_k X_{kit} + u_{it}$$

Where CDS_{it} (Credit Default Swap) represented by the premium charged for covering a default event of a five-year bond. Whose regressors (X) are:

Political Risk Proxy Variables

The set of political variables constitute the main novelty of this research. This set of six governance variables are indices calculated annually by the World Bank, using the methodology of Kaufmann, Kraay, and Mastruzzi (2010), to quantify the performance of each country in terms of the issues that are described in the following paragraphs. In the next paragraphs we present the description of each variable reported by Kaufmann et al.:

1. *Voice and accountability (VAA).*
2. *Political stability and absence of violence/terrorism (PSA).*
3. *Government effectiveness (GE).*
4. *Regulatory quality (RQ).*
5. *Control of corruption (CC).*

Proxy variables of factors related to the capital structure and the nature of the assets of the companies in the oil industry

1. *Retention rate (RR):* represents the fraction of earnings not distributed as dividends. It is calculated with the following formula $1 - \frac{dividends}{netincome}$ This variable is expected to have a negative sign because with a greater retention of resources the companies have more ability to meet financial commitments.

2. *Leverage:* variable calculated using the annual financial statements on the websites of the 28 companies selected. It is estimated by the ratio of total assets/equity of each company for each year. This variable is expected to have a positive sign because higher leverage to more exposure of creditors in insolvency events and therefore the spread charged by investors should be higher.

3. *Oil Reserves (OILRESER):* Corresponds to the oil reserves (West Texas Crude), it is an indicator of the amount of the company's oil reserves. Its sign is expected to be negative, whereas the higher the rate of oil reserves, the greater the economic potential to respond to commitments and in consequence the spread charged by investors.

4. *OIX:* The CBOE Oil Index is a price-weighted index composed of 11 large and widely-held integrated oil companies. This index represents the fluctuation of the asset's values in the oil industry which is a proxy for systemic risk as in Elton et al. (2001). The biggest the fluctuation of such values the higher the premium required by the bondholders, for this reason we expect a positive sign for this variable's coefficient.

Proxies variables for the systemic risk

1. *Liquidity:* This is the proxy for the liquidity. This is the ratio between the Ask (selling price) and Bid (purchase price) of the price of the CDS of each company in the study period. This variable is expected to have positive sign because if the company has a higher ratio, less liquid will be the bond and higher the spread charged by investors.

2. *Swap rate (SWAPR):* Represents the risk-free rate, ie, a proxy for changes in the terms structure of interest rates. These values were obtained from the daily rate quotations of the 10-year swap rate, taking the quotation of the last business day of each year. This information was obtained from Bloomberg. The expected sign for this variable is negative.

3. *VIX:* A measure of the stock market volatility, it represents the risk appetite of investors in the international financial markets. It was estimated using the VIX index which is based on S&P 500 options prices (Hartelius, Kashiwase, and Kodres (2008)). Literature predicts a positive sign for the coefficient of this variable.

Results

One goal of this research is to identify exogenous factors that may affect the cost of corporate debt, given the abundant anecdotal references about the impact of political variables in the cost of corporate debt and sovereign, we decided to evaluate this effect in a sector particularly susceptible to government intervention in their daily functioning as in the case of the oil industry, where that State is in many cases shareholder, manager and bestower of concessions for mining.

After running different versions of the model that relate the cost of corporate debt and internal factors external to the companies, we found that only the structure of interest rates, the stock market volatility, the level of oil reserves and the fluctuating values of assets in the oil sector, are relevant in explaining the spread.

Neither political variables, represented by Kaufmann et al. (2010) governance indicators', or internal business variables such as financial leverage and earnings retention policy, and variables related to the structure of the markets in which bonds are traded represented by the Ask/Bid ratio of oil bonds were significant.

In the case of political variables we find that many of the sample firms are multinational so are not exposed to political risk of a single country and not easy to weigh how exposed are to the group of countries which they have presence, in this case, we used the governance indicators of the country where the parent company is domiciled, but this measurement may not be sufficient. This paper could be extended in the scope to weigh the contributions of various national risks in the whole risk of each multinational company.

Worth noting that oil companies have low levels of leverage, when compared with other sectors of the economy, the average leverage for the companies of our sample is 2.28 (assets / equity), we rely on accounting values to calculate measures of financial leverage because no all companies of the sample were public and in consequence we did not have estimates of the market value of their equity.

While it is true that leverage is an explanatory variable mentioned frequently in the literature as a major determinant of the spread, there are articles where the impact of leveraged is reported as irrelevant, Collin-Dufresne and Goldstein (2001). As the oil industry is low leveraged, capital fluctuations are irrelevant, because capital is sufficiently robust to absorb changes in the level of assets.

Finally, the liquidity proxy represented by Ask/Bid ratio of a CDS, not significant in explaining the spread. Unfortunately this ratio is an imperfect measure of liquidity, because the price differential does not capture information related to the volume of transactions occurring at any time.

Discussion of results

To estimate the model presented below, it was we used as a statistical tool eViews 6[1] software. After evaluating different combinations of variables it was obtained the following model:

$$ln\left(CDS_{it}+3.4\right)=\beta_{1i}+\sum_{k=1}^{n}\beta_{k}ln\left(X_{kit}+3.4\right)+u_{it}$$

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.1618	0.0435	26.702	0
LOG(SWAPR?+3.4)	-0.1777	0.0163	-10.9322	0
LOG(VIX?+3.4)	0.2226	0.0204	10.9236	0
LOG(OILRESER?+3.4)	-0.2809	0.0406	-6.9204	0
LOG(OIX?+3.4)	0.2613	0.036	7.253	0

Table 1: Model parameters for the model
Source: Author's calculations

Company	Cross	Company	Cross	Company	Cross	Company	Cross	Company	Cross
_ANA-C	-0.0213	_CHEV-C	-0.1053	_EX-C	-0.181	_PET-C	-0.0269	_TAL-C	-0.0165
_APA-C	-0.0714	_CON-C	-0.0805	_GAZ-C	0.3743	_PIO-C	0.1601	_TOT-C	-0.0808
_BHP-C	-0.0401	_DEV-C	-0.0571	_HESS-C	0.0357	_REP-C	0.0931	_XTO-C	-0.0572
_BP-C	-0.0892	_ENC-C	0.0005	_LUK-C	0.4064	_SHE-C	-0.0663		
_CAN-C	0.0451	_ENI-C	-0.0754	_MAR-C	0.0029	_STA-C	-0.0761		
_CHES-C	0.3445	_EOG-C	-0.1161	_OXY-C	-0.0752	_SUN-C	0.0467		

Table 2: Fixed effect parameters
Source: Author's calculations

Table 1 shows the results of the final model, where thanks to the standardization of variables, we can say that the level of reserves accounts for 28.02% of the spread, followed in importance by OIX (26.13%), VIX (22.26%) and SWAP rate (17.77%), which shows that the variables related to factors internal to firms have greater explanatory power than those associated with systemic risk.

The specific intercept for each company in the sample is presented in table 2 and is calculated from the average intercept for the full model adding or subtracting the cutoff for each company, which we call "cross".

As already mentioned above, two types of variables were significant, the first group related to systemic risk measures such as the structure of interest rates and stock market volatility, these measures capture changes in investors' risk perception and in the required risk premiums. The significance of these variables has been confirmed in the literature by: Elton et al. (2001), Campbell and Taksler (2003) and Cremers et al. (2004), Ericsson et al. (2009), Keswani (2005), Collin-Dufresne and Goldstein (2001).

The second group of significant variables is related to the value of company assets, as measured by the level of oil reserves and the variations in the market value of the assets of the companies in the sample (OIX).

The explanatory power of the reserves in the spread confirms anecdotal evidence of the value that give investors the level of proven reserves of oil companies, such as Leon Cooperman, of Omega Advisors, who in an interview in October 2013, in

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Barron's magazine Rublin (2013) answered a question in an investment round table: *"-Barron's: Lee, you're invested in the oil patch, but not in the major producers. Why are you avoiding the Exxon's of the world? - Cooperman: If you read the annual reports of the majors, you'll see that despite the high price of oil, they aren't growing their reserve base. Oil prices could be up or down by $10 a barrel in the foreseeable future; I don't see a major break in the price. Our main focus has been on undervalued companies in the industry, such as Atlas Energy"*.

It is important to remember that Merton (1973) seminal work on the determination of the variables that affect the spread, proposed, that the volatility in the value of assets was a significant variable in explaining such spread.

In addition to oil reserves, we wanted to add another measure to reflect the behavior of the total assets of the oil industry, for this we use the OIX index, which is a price-weighted index composed of 11 large and widely-held integrated oil companies 39% of the companies in our sample represent 90.24% of OIX Index.

We use the Durbin Watson test to rule out residual autocorrelation in the 186 observations at 5% of confidence level. We obtained the following results:

0		1.72		1.80	2	2.20		2.28		4
	Reject Ho		Uncertain		Cannot reject Ho		Uncertain		Reject Ho	

Table 3: Durbin Watson test result
Source: Author's calculations

The test statistic generated by the regression was 2.0339, this value is within the no rejection region of the test, in that sense, there is no evidence of autocorrelation in the error. Additionally, we applied the test of redundancy of the fixed effects and found no evidence of it. Finally, the adjusted coefficient of determination was: $R^2 = 0.8579$.

Conclusions

We used 5-year CDS on bonds of twenty eight major oil companies in order to determine whether a set of sources of risk reported in the financial literature and in reports produced by the financial industry are relevant to explain the cost of corporate debt in this sector.

We divided these sources of risk in three groups, the first of them related to political risk faced for those countries in which these companies are incorporated; the second group includes factors related to the capital structure and the nature of the assets of the companies in the oil industry, and the third one which includes proxies for the systemic risk that is consider by the investors to calculate the required yield to buy financial instruments.

The cost of debt of oil companies is explained by changes in systemic risk and in the value of corporate assets. The term structure of interest rate (SWAPR), the stock market volatility (VIX), the amount of oil reserves (OILRESER), and fluctuation of the values of the companies' assets (OIX) are the relevant variables included in our econometric model. The

model estimated is robust with an adjusted coefficient of determination of 0.8579.

The variables that capture the systemic risk have been identified in previous studies as relevant for setting the yield of corporate debt. This paper shows in addition the impact is the nature of the oil industry assets in determining the cost of debt. The spread charged by the investors in such bonds increases with the fluctuation of prices of the industry assets and decreases with the amount of certified oil reserves.

Neither political variables, represented by Kaufmann et al. (2010) governance indicators, or internal business variables such as financial leverage and earnings retention policy, and variables related to the structure of the markets in which.

An extension of this work should insist on assessing the impact of political risk on the cost of debt of the oil companies, but this is necessary to construct a measure of risk that reflects the fact that oil companies operate simultaneously in several countries with different rules.

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