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Design of convertible debt financing - some observations from the American market

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A convertible bond may be an attractive financial instrument that helps to achieve the optimal capital structure of a company. In this paper, we analyze 562 issues of bonds from the American market between 2002 and 2013. Using regression trees analysis, we give some hints with respect to the design of convertible debt financing, which is the main goal of the paper, considering the most important characteristics of the issuers' financial standing and the parameters of issued convertibles. Our research let us formulate a few conclusions. Firstly, we identified some relationships between a conversion premium, a conversion period and a conversion ratio applied by issuers. Secondly, it turned out that most of the issuer's financial characteristics were not statistically significant for the issued convertibles. Finally, we found out that the share of fixed assets in the balance sheet amount seems to be one of the most important factors determining the internal structure of issued hybrid instruments, which supports the assets substitution theory.

JEL Classifications: G12, G30, G32

Keywords: Capital structure, financing, convertible bond, American company, assets substitution theory

Introduction

Optimal capital structure has been the subject of discussions and studies for many decades. The analysis of reasons behind using hybrid debt represents an important thread in these considerations. By studying the conditions linking a bond and the conversion option we can not only analyze the decision taken by an enterprise but also give investors an opportunity to evaluate it. Convertible bond does something seemingly unachievable: it helps satisfy both sides. That is to increase the capital on conditions better than those offered by traditional issuing of the shares of stock or bonds and enables the investors purchasing them at more attractive prices. It is possible as a result of time that lapses between the moment pure debt is issued and its conversion into stock. The risk born by both sides is connected with erroneous estimation of the likelihood of conversion. The latter may happen too late or too quickly and deprive one of the parties of benefits in the least appropriate moment. However, the multiplicity of parameters that create the structure of a convertible bond allows designing it in such a way that a vast majority of the value is shifted towards time value, leaving the dilemma of its correct estimation to the investor.

This paper is an attempt to evaluate mutual relationships between the parameters of convertible bonds and to identify a statistically probable structure of issued instrument, assuming specific values of the remaining parameters to be stable. Our assumption is that the issuance itself confirms that the conditions have been approved by the issuer and the investor, meaning they best suit given economic circumstances, which demonstrates their optimal setup. The presence of statistically significant relationships may delineate the scope of decision available to the issuer, who by increasing or decreasing the values of selected parameters of the offered instrument, is still able to offer securities equally attractive to an investor. Our goal is to identify the nature of relationships among these

parameters. We studied issuances the moment they were placed. Hence, we have no knowledge on their economic effects, including conversion.

The paper is divided into three sections. The first one reviews literature exploring the reasons behind issuing hybrid financial instruments against the backdrop of circumstances, in which they are used. The selection of writings was dictated by the goal of the paper. Presented concepts assume that hybrid financing is motivated by the need to arrive at an understanding between an issuer and an investor. Appropriately structured convertible bonds may pave the way to the compromise, in particular when the issuer is in a difficult financial situation. Financial circumstances surrounding the issuing of convertible bonds are often discussed in literature. Hardly any publications explore parameters as determinants of financing possibilities. The paper ambition is to expand global achievements in this area. Its contribution to science consists in analyzing mutual relationships of the constituents of issued convertible bonds in the context of issuer's microeconomic circumstances. Such an approach to hybrid financing has never been analyzed more in-depth before.

The next section explains the methodology and provides the characteristics of the research sample. The use of regression trees allowed us to present selected groups of decisions concerning the structure of issued instruments and their impact upon other parameters. Thus, we have drawn the picture of the specific exchange that takes place between the issuer and the investor the moment an issuance takes place. The selection of the biggest market of hybrid debt as the case exemplifying the studied issue enabled broader generalization. In the final section we discuss the results of studies on basic parameters of convertible bonds and their linkages and mutual relationships with selected financial characteristics of the issuers.

Literature review

The issuance of hybrid financial instruments, particularly convertible bonds, has been the subject of research for more than four decades. The results of previous analyses have led to formulate several theories associated with the financing structure concept. One of them, the asset substitution hypothesis, argues that shareholders may increase debt due to the unbalanced distribution of benefits and risks around investment projects financed with external capital (Jensen and Meckling,1976). When a project is successful, shareholders obtain a higher rate of return from creditors. By contrast, if an investment fails, they lose only a potential value of their shares, while creditors risk the entire capital they have invested so far. According to the asset substitution hypothesis, a company may issue hybrid debt in order to reduce the conflict between shareholders and creditors. A conversion option built in a convertible bond may help to restrict shareholders' incentive to take excessive risk (Green, 1984). When the price of underlying shares is high, which increases the probability of conversion, shareholders avoid taking additional risk in order not to lose benefits from the future growth of company's value. Such a mechanism protects creditors from excessive risk. It means that using hybrid debt is particularly profitable for low-value companies, especially when their value achieves such a low level after a long period of recession. Because the likelihood of an increase in underlying share price is fairly high, it secures the interests of creditors until debt maturity and also gives them an opportunity to benefit from possible conversion. There are a lot of studies validating the notion of the asset substitution hypothesis. Essig notes that companies exposed to high financial risk are more likely to issue hybrid debt (Essig, 1991). The relationship between the level of debt and the degree of financial leverage vis-a-vis the level of hybrid financing has been also identified (Lewis et al., 1999). The study also shows better long-term performance of firms, which decided to issue hybrid instruments (Loncarski et al., 2006). None of the above concepts, however, tackles the structure of issued convertible bonds. Little we know when these instruments represent more

characteristics of a debt rather than equity. The consequences of issuance such as conversion premium, equity dilution or changes in maturity are also unknown.

A back-door equity hypothesis considers hybrid capital financing in a different way. According to this theory, the use of convertibles is associated with equity financing, because conversion into shares results in an increase in equity participation in the overall capital structure of a company. Therefore, convertible capital may be perceived as a deferred equity (Stein, 1992). Enterprises may use convertible instruments in order to, firstly, avoid the costs of financial distress or, secondly, to mitigate adverse selection problems and reduce negative effects of information asymmetry due to the issue of overvalued equity. It may raise the cost of capital and make companies give up profitable investment opportunities. Lower coupon, usually associated with the issuances of convertibles, and lower probability of bankruptcy may also diminish the risk of a hostile takeover. It is particularly important under unfavourable economic conditions, such as recession (Dann and Mikkelson, 1984). However, several researches proved that issues of convertible debt may lead to a bigger depreciation of underlying shares in comparison to ordinary bonds (Ammann et al., 2006). This may hinder low-valued firms to avoid a hostile takeover (Elbadraoui et al., 2010; Zeidlera et al., 2012). None of the above research devoted to back-door equity hypothesis tells how the bonds should be structured to lead to conversion and to achieve deferred equity financing.

Most of the presented theories assume that issuance of convertible bonds is more profitable to companies whose shareholders are sensitive to risk changes or which can relatively easy change such a risk. Obviously, it is not simple to measure the level of propensity to increase shareholder risk . However, several research studies identify certain circumstances where risk aversion may be lower, for example, highly leveraged companies (Myers, 1977). Moreover, D. Galai and R. Masulis, using the Black-Scholes model, demonstrate that the higher the level of indebtedness, the higher the risk of equity (Galai and Masulis, 1976). Furthermore, a high level of debt may make managers undertake risky investment projects, which potentially may turn out very profitable, but also have a high probability of failure. Such a strategy may be an attempt to rescue the superior position of managers in a firm. On the other hand, companies involved in high-risk projects may prefer hybrid debt financing compared to other means of financing due to the lower cost of capital.

Many other studies show a positive relationship between the size of issued debt, degree of financial leverage and tendency for issuing convertible bonds (Loncarski et al. 2006). However, several hypotheses do not allow for a positive verification. Hu and Mao claim that Chinese listed companies, which issued convertible bonds are characterized by low financial risk and low default risk. They also have a low stock price and shareholders' concentration (Hu and Mao, 2009). These findings justify the validity of using convertibles during recession but cannot confirm the hypothesis presented above. Moreover, issuers of convertibles appear not to be significantly different from other companies considering their fixed assets, cash flow variability and a profit. Titman and Wessels show that firms with *certain level of* fixed assets are less likely to substitute assets (Titman and Wessels, 1988). In their opinion, fixed assets act as a kind of security for liabilities and limit the ability to issue new debt . For this reason, a company with a high share of fixed assets should avoid issuing convertible bonds.

Despite the rich literary output related to the motives of using hybrid debt, relatively little attention is paid to the problems of convertible bonds structure, especially in the context of issuer's financial performance. Lewis et al. notice that companies with high growth opportunities (measured by market-to-book ratio) decide to issue convertibles with a shorter conversion period to minimize the probability of conversion, which makes the bonds more debt-like security (Lewis et al., 1998). Shorter maturity of convertibles is also observed in firms that finance investments in the R&D sector, while nonconvertible bonds are more often issued by companies investing in fixed assets (Julio et al., 2007).

However, convertible bonds have initial maturities five years longer in contrast to nonconvertible bonds.

Miller and Rock (1985) as well as Yaman (2010) only marginally make references to the subject of bond parameters in the context of their issuance. Their attention, however, is entirely focused on the relationship between the value of the issuance vis-a-vis financial performance and indebtedness of enterprises. So far, Goh and Xie (2009), have embraced the complexity of the structure of a convertible bond to its fullest, highlighting the linkages between conversion price, conversion ratio and time to maturity and the perception of bonds in investors' eyes. Their analysis is one among very few attempts to identify the impact of the structure of a convertible bond upon the likelihood of conversion. However, it does not directly concern the relationship among parameters of bonds. This area still awaits thorough analyses in international writings. Studies conducted so far allow only identifying primary reasons for the issuance of convertible bonds. Little do we know, however, what determines the structure of bond parameters.

For the above-mentioned reasons, the aim of this article is to expand the existing literature and tackle the topic, which has been widely ignored so far, namely, we want to concentrate on the hybrid debt structure financing with convertibles. In our study, we analyze the correlation between certain parameters of issues of convertible bonds related to the issuers' financial performance. We want to estimate essential level of parameters of issued convertible bonds in the context of issuers' characteristics. The problem seems to be particularly important, because comprehensiveness and diversity of hybrid debt may determine investors' behavior and influence the issuer's capital structure. It may be especially significant in the context of the previously presented theories.

Methodology and data

The design of convertible bonds was analyzed using regression trees. They are considered to be one of the most important methods of non-parametric discriminatory models. Until to date, regression trees were not used in studies on convertible bonds. Considerations in publications listed in literature review are based on logistic regression models. Regression trees, similarly to logistic regression, allow presenting the examined phenomenon in descriptive and predictive terms. Operationally, classification trees are very much similar to logistic regression. Both methods are nonparametric and variables do not need to be normally distributed. In both cases the resultant variable is qualitative although, contrary to logistic regression, not necessarily binary and the relationship among variables does not need to be linear. Regression trees help to verify hypotheses analogous to those examined in logistic regression. Similarly to logistic regression, regression trees enable to demonstrate, which factors are the most connected with studied phenomenon (i.e., impact the probability of occurrence of its particular state) but, on top of that, their advantage consists in offering the possibility to estimate the probability for specific levels of explanatory variables (the most important predictors).

This method involves sequential distribution of the m-dimensional subspace R_k variables (segments) until the moment when the dependent variable reaches the minimum level of variation (measured by an appropriate loss function). Based on that, expected level of issued convertible bond parameter was estimated for a certain level of the variable (descriptor). In case of regression trees, we assessed homogeneity distribution of each subspace, which shares the same variable using the square function:

$$Q(R_k) = \frac{1}{N(k)} \sum_{x_i \in R_k} (y_i - \alpha_k)^2, \qquad (1)$$

where: k is determined by the formula $\alpha_k = \frac{1}{N(k)} \sum_{x_i \in R_k} y_i$, and *N(k)* is the number of observations within the R_k segment.

Featured segments of units set, characterized by a set of variables called descriptors, should be homogeneous due to the chosen segmentation criterion. Since these criteria can lead to very complex patterns of distribution (very complex trees), an additional criterion, the so-called "the final stop" (trimming trees), was used. It guarantees satisfactory homogeneity of segments (classification error is committed, measured by the risk of misclassification). This method requires no assumptions about the distribution of variables and is resistant to diverged observations. It is also easy to interpret.

Among potential explanatory variables, a stepwise variable selection method was used to estimate the parameters of the model. It guarantees the optimal model using the F statistics relevance. If the value of statistics for a specified variable outside of the model was high enough, it was used in the estimation, and if the same statistics for a variable already used in the model was too low, the variable was removed from the model.

The hybrid nature of convertible bonds makes it more difficult for managers to come to proper financing decisions. A conversion option built-in the convertibles may lower the interest rate of bonds in comparison to ordinary debt, which makes them profitable to issuers, but less attractive to bondholders. In order to attract investors, a company may set a higher conversion ratio, which translates into higher number of shares which may be taken up by bondholders upon conversion. A higher return from converted shares compensates lower interest income to investors.

Another way for issuers to achieve the expected capital structure is to fix an appropriate conversion period. It directly impacts the probability of conversion. By setting short conversion period at high conversion premium the issuer makes the conversion unlikely. When a company wants to avoid redeeming its convertibles, it may settle a longer conversion period, which is usually related to the expected time span of an investment project. Profitable investment may increase market value of the issuer and result in conversion. Hence, a company will not have to redeem bonds and can benefit from a lower coupon offered by a convertible debt. Therefore, a long conversion period, with a lower cost of capital, positively affects the issuer's financial standing.

Conversion value is another parameter that may significantly determine the profitability of the issue of convertible bonds. It is influenced by two variables: a conversion period and a conversion premium. They may strengthen, weaken or substitute each other. High conversion premium is unlikely, but its probability increases with the conversion period. A successful issue of convertibles may be achieved by optimizing the relationship between longer conversion period and a lower conversion premium. The first strategy seems to be profitable in financing long-term or risky investment projects. An issuer may have enough time to increase its market value or enough time to collect buyback funds. Lowering a conversion premium may be reasonable during recession or a short conversion period imposed by a company.

The main assumption of the research is that all successful convertible bonds issues represent a consensus between the issuer and investors. It means that all convertible debt parameters were accepted by both sides and asymmetry problems were involved. In accordance with the discussion in section one, a full substitution among convertible bond parameters was assumed. The main goal of the analysis is to find some statistically significant relations between a conversion ratio, a conversion premium and a conversion period of issued convertible bonds. Then, a particular parameter is compared to several financial ratios computed from the issuers' financial statements. According to previous research studies and findings, our analysis is focused on financial risk measured by the financial leverage, liabilities and assets structure, liquidity, and profitability.

The sample was prepared using Bloomberg database and it encompasses convertibles issued in the American convertible bonds market, which is supposed to be the biggest in the world. Initial sample contained 134,574 issues from all over the world. Then, we excluded issues conducted by financial institutions. Their motives to issue hybrid debt may differ from those followed by ordinary companies due to, i.a., financial supervision requirements, especially capital adequacy ratios. The structure of financial statement of

financial institutions is different than that of other entities. The sample was also adjusted in terms of unusual, enormous observations. Only listed companies were taken into consideration. Final sample contains 562 convertibles issued by the American, nonfinancial companies between 2002-2013. It includes firms of all sizes and sectors. Issuers' financial data were taken from the last annual financial report before the issue.

Convertible bonds covered by the study were analyzed based on the major quantitative characteristics. Time-related structure of the instrument was taken into account and provided the basis for distinguishing:

- time from issuance to the first potential day of conversion;
- conversion period;
- time to maturity.

All time parameters were measured in days. Besides, consideration was given to the conversion ratio on the issuance date and relative difference between the share price on the issuance date and the conversion price, which helped to identify the conversion premium at the issuance day. Conversion ratio is expressed in times while the conversion premium in per cents. All these parameters were used in the survey designed to identify the relationships among the constituent elements of hybrid debt structure. Basic statistical characteristics of selected parameters of convertible bonds are presented in Table 1.

TABLE 1. STATISTICAL DISTRIBUTIONS OF VARIABLES TYPICAL OF ANALYZED CONVERTIBLE BONDS

Specification	n	Minimum	Maximum	Arithmetic average	Median	Standard deviation	Skewness	Kurtosis
Time from issuance to first day of conversion	475	0.000	6,156.000	70.587	0.000	423.685	10.285	138.346
Time to maturity	562	636.000	14,902.000	4,311.750	2,487.000	3,293.001	0.746	-0.567
Conversion period	554	0.000	14,493.000	4,598.567	2,601.980	3,298.973	0.729	-0.911
Conversion premium at the issuance day	293	-98.279	982.305	87.783	6.112	212.302	1.836	3.004
Conversion ratio	552	0.168	25,000.000	268.473	39.201	1,422.341	10.587	159.022

Source: Own calculations using Bloomberg database.

Some of these parameters are volatile (standard deviation is many times bigger than arithmetic average) while skewness ratio and kurtosis go significantly beyond the allowable range <-1; 1>. That is particularly true of the time from issuance to the first day of conversion and the time to maturity. The above is the effect of atypical values of these variables as issued bonds included some with the time to conversion very distant from the issuance date. Half of the population of companies allowed for the conversion on the issuance date. Very much "unstabilized" distribution of the time from issuance to first day of conversion has made us deploy the time to maturity and conversion period in the analysis. Average time to maturity is ca. 4,312 days with standard deviation of ca. 3,293 days. Conversion ratio exhibits a rather significant dispersion in value, with standard deviation exceeding 1,400 for the average of ca. 268 and skewness ratio exceeding 10. Strong differentiation was also observed for the difference between the share price and conversion price although in this case gaps in data are quite significant.

Next stage combined the analysis of instruments with financial analysis of issuers. To this end we used bond parameters and linked them with selected items form issuers' balance sheets: "Amount issued/total assets", "Amount issued/total fixed assets", "Amount issued/long-term liabilities", "Amount issued/equity". It helped us to find out what financial circumstances could dictate a particular structure of issued convertible bonds. Basic statistical characteristics of selected relationships are presented in Table 2.

The amount issued differed depending on the needs and scale at which a given company operates. While measured against total assets it remained on average at a very high level of 2.5, its differentiation and asymmetry were substantial (average deviation of 12.2). Similar conclusions can be drawn for the amount issued against total fixed assets. For the majority of remaining indicators, the relationship between the amount issued and the value of issued convertible bonds and long-term liabilities are at analogous level; also the diversity, asymmetry and kurtosis of their distribution are similar. Amount issued to long-term liabilities reaches on average ca. 13.9, however, the average is hugely overestimated as for almost 50% of companies the amount issued did not exceed 71% of their long-term liabilities. The least diversified data were observed for amount issued to equity ratio.

TABLE 2. STATISTICAL DISTRIBUTIONS OF VARIABLES DECISIVE FOR THE VALUE OF ISSUED BONDS COMPARED TO SELECTED BALANCE SHEET ITEMS

Specification	n	Minimum	Maximum	Arithmetic average	Median	Standard deviation	Skewness	Kurtosis
Amount issued/total assets	536	0.000	153.953	2.543	0.192	12.198	8.308	83.941
Amount issued/total fixed assets	518	0.000	136.269	2.796	0.269	12.202	7.674	62.367
Amount issued/long-term liabilities	492	0.000	698.743	13.866	0.711	69.001	8.884	81.031
Amount issued/equity	453	-1.793	3.955	0.608	0.306	0.899	1.761	3.812

Source: Own calculation using Bloomberg database.

The above characteristics have led us to some general conclusions. Attention is drawn to very short period between the time of issuance and conversion. It may be due to very high value of issuer's stocks, which makes quick conversion rather unlikely. By setting such a time structure of a hybrid instrument the company increases the probability of conversion at a particular maturity making it more attractive to investors. Another interesting point is highly differentiated premium achieved by a company on the issuance date, which may also be explained with the spread in applied maturity times. Compared to balance sheet items, examined issuances seem meaningful.

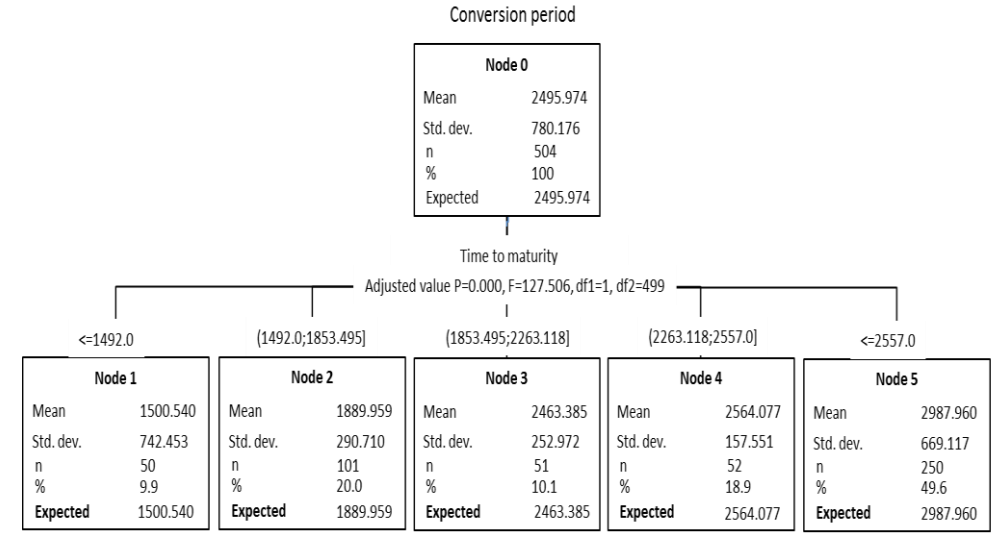
Nevertheless, we need to highlight that the comparison of parameters of issued bonds with financial data from companies does not provide grounds for any far-reaching conclusions as compared data represent different moments in time. Balance sheet data have been taken from the latest annual financial statement published before the issuance. Data concerning convertible bonds come from the prospectus. The goal of the survey was only to roughly estimate the importance of the issuance.

Results and discussion

The first area of our analysis included the relationship between the total time to maturity of bond and the time of conversion. We observed a strong relationship between these parameters. In many cases, both periods were equal meaning immediate conversion was possible. Often did the bonds have additional premature call or put option or both options simultaneously. Such a solution enables quicker conversion; however, it is the evidence of limited trust between the company and the investor and may be indicative of high risk of a given investment. Within the observed group of convertible bonds, however, companies usually specified a certain period following the issuance when the conversion was not feasible. Regression tree analysis (Figure 1) lets us note strong fragmentation of linkages between the total time to maturity of bond and the time of possible conversion. If the time of conversion is shorter than 1,492 days, time to maturity of the bond is 1,500 days on average (that is true for ca. 10% of cases). If it remains within 1,492 to 1,853 days - time to maturity will be ca. 1,889 days on average. When the

conversion time is between 1,853 and 2,263 days - time to maturity will be ca. 2,463 days on average, while for the conversion between 2,263 and 2,557 - time to maturity is ca. 2,564 days. If the conversion time exceeds 2,557 days - time to maturity will be ca. 2,998 days on average. It is worth noting that analyzed companies apply short periods when the conversion is not feasible. Besides, adopted limits point to some asymmetry in the structure of decisions. Less than 50% of observations have the conversion time longer than 2,257 days (slightly over 7 years) and the expected time to maturity of bond is more than 8 years. It means that long-term investment projects are delivered with potential benefits distant in time. It may also suggest financial difficulties of companies low-valued in the capital market. 30% of observations have similar distribution. We should also note that for nodes 2, 3 and 5 the difference between the lower threshold of the conversion time and expected time to maturity of bond are very similar and amount to ca. one year. That is true of ca. 80% of cases and shows some regularities in the planning of hybrid financing.

FIGURE 1. REGRESSION TREE FOR THE CONVERSION TIME



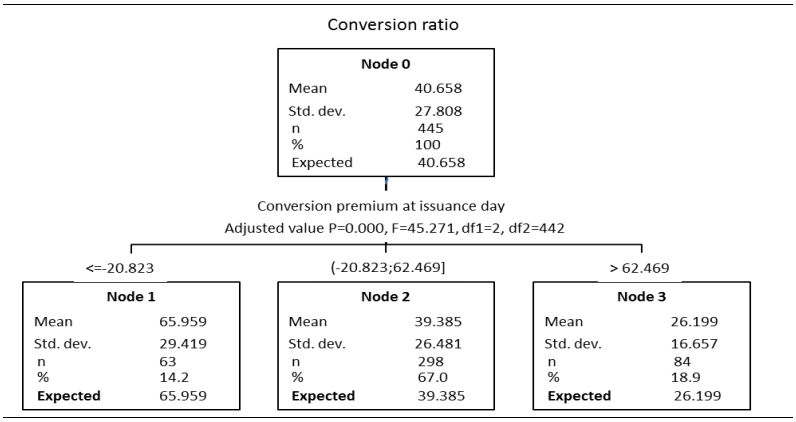
Source: Own calculation using Bloomberg database.

Next analysed parameter is a conversion ratio (Chart 2). It is similar to economic leverage because its changes may strongly determine the rate of return from investment in convertible bonds. The higher the conversion ratio, the higher investor's profits from the conversion, after a certain and sufficient growth in the price of underlying shares. Higher conversion ratio also increases the problem of equity dilution. Hence, an issuer should use this parameter to manage the attractiveness of the offered bonds.

The analysis of factors determining the conversion ratio shows a significant influence of the conversion premium at the issuance day. If the difference between conversion price and actual share price is smaller than about 20.8%, the conversion ratio is fixed on average at around 66. If the conversion premium varies between 20.8% and 62.5% - the conversion ratio remains at an average of 39.4. When the premium is higher than 62.5%, the conversion ratio reaches the average of 26.2. Therefore, it can be noted that a high conversion ratio occurs when a company is high-valued, so the conversion premium is negative. When the premium increases, conversion ratio decreases. It should be stressed that analyzed parameter exhibits very high volatility. Because of a very wide range of applied statistical significance, it is difficult to formulate practical hints on how the conversion ratio should be fixed. The interpretation of node 2 is particularly difficult due

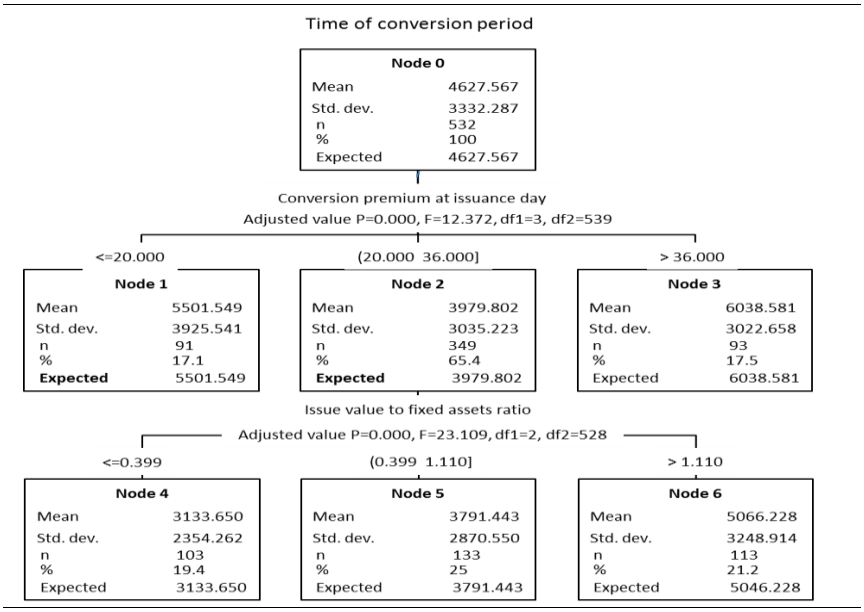
to high level of standard deviation and completely different values of the conversion premium. Such strong differentiation concerns 67% of the sample.

FIGURE 2. REGRESSION TREE FOR THE CONVERSION RATIO



Source: Own calculation using Bloomberg database.

FIGURE 3. REGRESSION TREE FOR THE TIME OF CONVERSION PERIOD



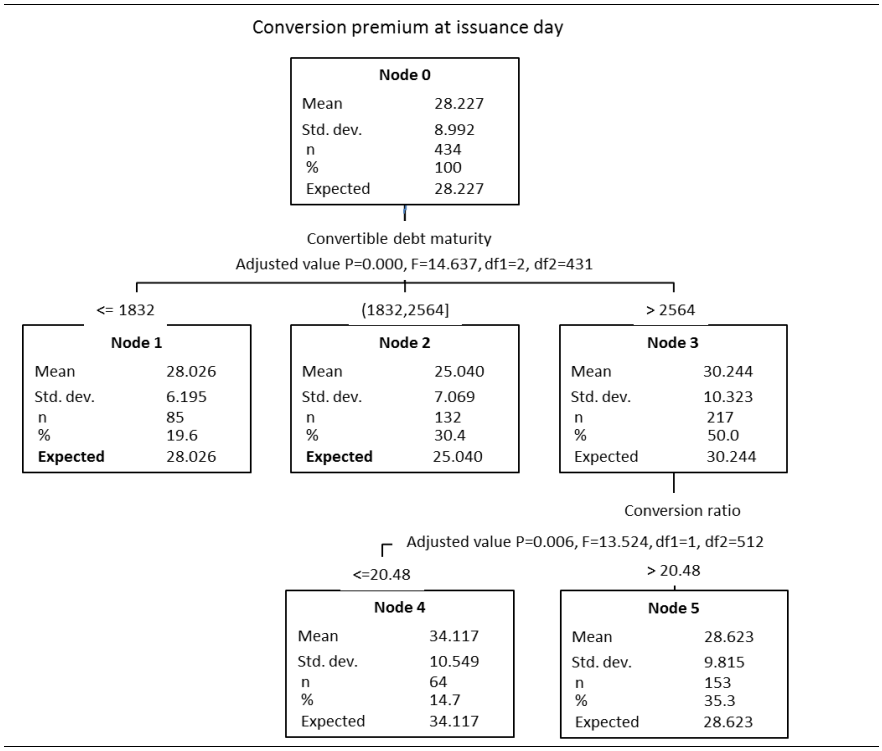
Source: Own calculation using Bloomberg database.

The first criterion that differentiates conversion period is the conversion premium at the issuance day (Figure 3). If this parameter is lower than 20%, average conversion period reaches approximately 5,501 days (this applies to about 17% of the sample) and when it is higher than 36% - it reaches approximately 6,300 days (this applies to 17.5% of the sample). If the conversion premium at the issuance day is extremely high, the conversion period is almost twice as long in comparison to a more balanced value. When the average level of the conversion premium is about 20-36%, the conversion period should reach

about 4,000 days. If the conversion premium at the issuance day varies between 20 and 36%, another important criterion appears: issue value to fixed assets ratio. The higher the ratio, the longer the applied conversion period. If the level of this variable is relatively low (up to 0.40) conversion period of about 3,133 days may be recommended. When the value of the issue in relation to issuer's fixed assets is higher than 1.11 it is recommended to expand the conversion period to approximately 5,000 days. If the ratio is between 0.4 and 1.11, the conversion period reaches approximately 3,791 days.

The relationship between the parameters of convertible bonds, their values and the level of fixed assets refers to the asset substitution hypothesis described in section 1. It is the only statistically significant relationship between the elements of convertible bond structure and issuer's financial features. Findings of this research indicate that a higher level of debt in relation to the value of fixed assets extends the conversion period of bonds.

FIGURE 4. REGRESSION TREE FOR THE CONVERSION PREMIUM AT THE ISSUANCE DAY



Source: Own calculation using Bloomberg database.

It confirms asset substitution hypothesis. Fixed assets act as security, which protects creditors. If their value in relation to a new debt is reduced, issuer's risk of insolvency increases. In order to make the issue successful, this risk must be compensated by additional benefits to investors. One solution may be to set a longer conversion period, which increases the probability of conversion and expected rate of return from an investment.

Conversion premium at the issuance day is determined by hybrid debt maturity (Figure 4). It is worth noting that this relationship is not explicit. When debt maturity is shorter than 1,832 days, conversion premium reaches an average of about 28%. If it is longer than 2,564 days - premium reaches an average of about 30%, while the lowest conversion premium is obtained when debt maturity is between 1,832 and 2,564 days. When debt

maturity is long, another important factor should be taken into consideration - the conversion ratio. If it does not exceed 20.5, conversion premium is higher (average 34.1%) than for a longer debt maturity (average 28.6%).

The relationship between conversion premium and hybrid debt maturity is related to the analysis showed in Figure 4. Time to maturity of the debt and the conversion period are very similar. They are also strongly and positively correlated. Therefore, they interact similarly to the conversion premium. The strength and direction of this influence, however, are different, which may be explained by differences between debt maturity and conversion period. The relationship between conversion premium and conversion ratio also seems to be interesting. Similarly to Figure 2, the inverse relationship between these parameters is observed. Nevertheless, it should be noted, that it concerns only bonds with the longest maturity. It confirms conversion ratio ambiguity, because it seems to be the most important parameter for bonds with a short maturity. Such bonds have the lowest time value of the conversion option. Changes in conversion ratio could significantly determine the probability of conversion.

Conclusion

Convertible bonds can support decisions that optimize capital structure of the company. The issuer has many possibilities to manage conditions, under which financing will take place. Successful issuance depends on the acceptance of investors' offer. In currently available literature, much attention is paid to the problems of asymmetry between investors and the issuer that may be solved by the issue of convertible bonds. Assumption adopted in this article is that the issuance itself constitutes an approval of the terms of issue by both parties. The study of the U.S. convertible debt market suggests that issuers try to optimize the structure of hybrid financing by setting the relationships between parameters of convertible bonds. Statistical relationships between the conversion ratio, conversion premium and conversion period were observed. First, high conversion ratio occurred when a company was high-valued, then conversion premium was negative. When the premium increased, the conversion ratio decreased. Moreover, the higher the ratio, the longer conversion period can be observed. Finally, conversion premium at the issuance day is determined by hybrid debt maturity. Despite statistical differences in observed relationships, their directions were consistent with theoretical expectations. The issuance means that investors accept conditions determined using regression trees. Their evaluations are too general to formulate any detailed guidance for optimal hybrid financing. The research shows, however, the direction of change that supports optimization.

The obtained results indicate that higher debt to fixed assets ratio extends the conversion period of bonds. This confirms the asset substitution hypothesis. It also shows that asymmetry problems come from financial risk. Fixed assets act as a security and protect creditors of the company. If their value in relation to new debt is reduced, issuer's risk of insolvency increases. For the issuance of convertible bonds to be successful, this risk must be compensated by additional benefits to investors. One of them may be a longer conversion period, which increases the probability of conversion and expected rate of return from investment. According to other findings, it may be achieved by higher conversion premium. Finally, higher conversion ratio can be applied. It will increase the equity/debt ratio and lower financial risk. Obtained results enable to identify the relationship between parameters of issued convertible bonds. Methodology applied for this survey has led us to believe that the issuance is equivalent to the approval of bonds structure by both investors and the issuer. Our methodology enabled to identify critical levels of selected parameters, which, by the same token, suggest possibilities of flexible funding of a business. We may assume that the consensus is achieved at optimum structure of a convertible bond in a given time and under given conditions. However, we must note that the survey left aside market conditions connected with the up to date and

current valuation of the issuer. Nor did it consider an overall situation in capital markets (stock exchange, changes in market interest rates) or overall economic performance. It seems these factors may also effect the shaping of convertible bonds structure and deserve our attention.

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