An Appreciation of the Impact of the Development of Financial Markets on Financial Decisions made by Corporations in the Czech Republic[1]

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Abstract

The article attempts to evaluate the main influences on how money and capital markets have affected corporate finance and treasury in the Czech Republic. There are 5 primary factors identified, which at various times have been suspected of exerting significant influence over corporate financial decisions, i.e.: tax system evolution, interest rates changes, legislative framework, competitive environment in the sector of financial intermediates, pressure from the corporations on the banks towards improved quality of the treasury products offered (this article focuses on the influence of 3 of them). Recent changes in Czech financial markets have had a lasting impact on both financial intermediaries and corporate finance departments and treasuries. And many more changes may be expected to occur in the future, especially in connection with Czech Republic European Union accession in May 2004, and its subsequent incorporation into the Eurozone.

Key words: financial markets in the Czech Republic, tax system evolution, interest rates volatility, legislative framework, financial intermediates, treasury products.

1. Introduction

The scarcity of specific studies addressing the impact of financial market change in the Czech Republic – especially in the years following 1997 – on corporate financial decisions provided the impetus to undertake this research. The following main factors have influenced the corporate financial decisions on financial markets in the Czech Republic.

Tax system evolution

In the Czech Republic, the yield (interest income) derived from different financial market instruments is subject to different types of taxation. This situation is quite dissimilar to tax regimes prevailing in some well developed European markets, where interest income is exempt from withholding tax.

Reference interest rate evolution

Unlike the relatively stable rates of Eurozone markets, the Czech Republic has in recent years experienced a precipitous decline in the inter-bank rate PRIBOR. During the period of relatively high interest rates (1997 and 1998), Czech companies scrambled to find alternative sources of financing to be able to avoid expensive short- and long-term bank loans. The range of alternatives included CP programs for short-term and bonds for long-term financing.

From 1999 onwards, with lower interest rates, companies with cash surpluses have needed to find much more sophisticated instruments (especially from the point of view of tax regime applied to the yield) to increase their profit from financial operations.

The relatively high volatility of the reference interest rates has encouraged a significant rise in the use of interest rates hedging instruments in the market (such as FRA, IRS, caps and floors, and IRG) since 1997.

Legislative framework

The Czech money and capital markets are not subject to any special regulations restricting the choice of investment. Evolution of the regulatory framework, especially in the area of securities and

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taxes, the choice of financial instruments and amounts committed and has shaped the way institutional investors approach Czech financial markets. One example: under the Czech Insurance Act and Pension Funds Act, insurance companies and pension funds – the most important local institutional investors – are permitted to invest their technical reserves in foreign securities (OECD and EU registered).

Strong competition between financial intermediaries

The Czech financial sector, including both banking and non-bank financial intermediaries, is undoubtedly the most advanced among the Central European new EU member countries. Moreover, the Czech financial industry is still continuing its rapid development. Since the mid-1990s, Czech banking institutions have been engaged in fierce competition, especially for top-tier corporate clients. Short-term credit facilities for prime corporate borrowers may be priced at 0.2% over PRIBOR or even less, depending on borrower quality and credit risk. Banks customarily dispense with commitment and other fees when providing credit facilities to major corporate clients. In the securities placement business, banks have made a concerted effort to position themselves as intermediaries between institutional investors (financial groups, corporations, insurance companies, pension funds) and corporate issuers.

At the same time, the pressure exerted by corporate borrowers on their relationship banks has had a positive impact on the quality of treasury products offered in the Czech market today.

Because of space limitation, this article will focus on the influence of 3 out of the 5 identified factors.

2. The influence of the development and behaviour of interest rates, especially the PRIBOR and PRIBID fixed reference rates, in choosing individual tools on the financial markets for corporations

As Figure 1 illustrates, the reference interest rate in the Czech Republic declined sharply in 1997. As a result, Czech businesses were forced to operate in a very unstable interest rate environment, in comparison with their Western European counterparts. The average 3-month Dutch AIBOR (since 1999 the EURIBOR, as a result of the introduction of the Euro currency) is presented for comparison.
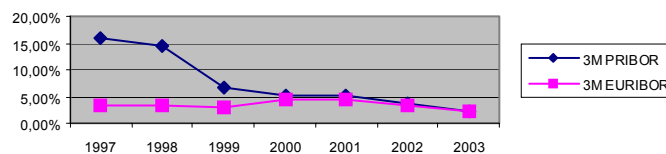
Fig. 1. Comparison of the development of the 3M reference interest rates for Czech and Dutch (i.e. since 1999 Euro) markets, yearly averages in % p.a.

Source: Czech Central Bank, De Nederlandsche Bank N.V.

The unstable interest rate environment forced Czech businesses to choose differing strategies during periods of high and low interest rates, and even expand the tools used to eliminate risk caused by such interest rate variation.

During periods of relatively high reference rates (particularly 1997 and 1998, and in terms of EURIBOR rates, even 1999 and 2000), businesses seeking financial resources looked for alternatives to short and long-term credits. In the Czech Republic, such alternatives include most notably, commercial papers issues for short and mid-term financing. For long term financing, there are alternatives to loans, namely the issue of corporate bonds. As Tables 1 and 2 show, corporate bond issues are not very wide spread, despite the inverted profile of IRS yield curve (in the years 1997-1998) for attracting fixed coupons under the appropriate PRIBOR rate. The reasons behind this include a lack of confidence from the side of investors, and at the same time, a lack of willingness from the issuers to go into long-term commitments in an environment of high and volatile interest rates.

Table 1

Advancement in volume of loans provided to the clients of Czech based banks, in billions of CZK, as at the end of respective year

	1997	1998	1999	2000	2001	2002
Loans	**1 149,6**	**1 135,4**	**1 085,7**	**952,4**	**974,5**	**949,8**
from that loans provided to corporations in bln. of CZK	986,4	917,4	851,2	720,0	631,5	555,6
in %	85,8%	80,8%	78,4%	75,6%	64,8%	58,5%
from that long term loans provided to corporations in bln. of CZK	327,5	335,8	336,2	316,8	289,2	236,1

Source: Czech Central Bank.

Table 2

Advancement in volume of corporate bonds (in nominal value) registered at the Prague Stock Exchange, in billions of CZK, as at the end of respective year

	1997	1998	1999	2000	2001	2002
Corporate bonds in NV	8,65	17,95	40,00	53,01	53,04	57,04

Source: Reuters, ABN Amro Bank N.V.

In terms of commercial papers issues, there are no central statistics. This is because such securities issues needn't be approved by the SEC. Besides this, in the Czech Republic, this program is only for debtors who belong to companies with prime credit risk ratings (particularly companies in the utility sector, or with strong foreign owners). On the other hand, there are only a few larger banks active in the Czech Republic able to act as dealers for such programmes.

2.1. The marked ambivalence of interest rates on the Czech market since 1997 has led companies to behave more cautiously and use hedging tools

Table 3

Advancement in volume of main interest rate hedging tools used by clients of Czech banking sector in the years 2000-2003, in billions of CZK

	31.12.2000	31.12.2001	31.12.2002	31.3.2003
Forward rate agreement	487,3	925,7	973,0	1012,6
Interest rate swap	398,6	760,7	1020,6	1067,9
Interest rate futures	4,1	0	0	0
Total of IR hedging tools	**890,0**	**1686,4**	**1993,6**	**2080,5**

Source: Czech Central Bank.

Table 4

Advancement in volume of main interest rate hedging tools used by clients of Czech banking sector in the years 1997-1999, in billions of CZK – rounded estimation from CNB graphs

	as of 31.12.1997	31.12.1998	31.12.1999
Forward rate agreement	132	337	423
Interest rate swap	180	220	294
Interest rate futures	31	26	4
Total of IR hedging tools	**343**	**583**	**721**

Source: Czech Central Bank.

As Tables 3 and 4 show, a marked yearly increase in interest rate hedging tools for bank clients in the Czech Republic is evident for the years 1997-2002. During the periods of high PRIBOR a PRIBID reference rates in 1997 and 1998, businesses tried first and foremost to take advantage of the negative inclination of FRA and IRS rates of return (which means that long term annual interest rates were lower than short term rates). This effort is especially clear in the issue of corporate bonds in 1997 and 1998. Bond issues in 1997 had fixed interest rates, which means that on the day of issue, an interest rate swap was placed on the entire amount of the issue, where the original floating PRIBOR + margin p.a. was exchanged for a fixed rate. In 1998, just two companies in the utility sector chose different paths. On March 5th, 1998, Severomoravska energetika, a.s. (SME) issued 1 billion CZK in bonds at a floating 6M PRIBOR + 0,40% p.a. In June of the same year, and under the same conditions, Jihomoravska plynarenska, a.s. (JMP) issued 700 million CZK in bonds. Both of these companies bet on the future decline in the PRIBOR rate, and they were proven right. However, at the time of their issue, they were going against market forecasts. Nonetheless, SME ensured itself against a potential rise in the 6M PRIBOR purchase cap with a strike price of 11,60% p.a. All in all, five caps were purchased on semi-annual coupons, however with premium payment requirements. Of these caps, only one was called, the very first coupon in September 1998, when the 6M PRIBOR was at 14.51% p.a., and the company actually paid 11.60% p.a.

The period since 1999 is characterised by the sharp continual decline of the PRIBOR rate, and in comparison with the previous two years, the positive slope the IRS curve (which indicates that annual interest rates for the longer term were higher than for the short term) and a noticeable growth in the issue of corporate bonds. But even at this time, there were companies that hedged against interest rates by issuing IRS bonds. The above-mentioned SME conformed to this trend, by exchanging its original floating interest rates from its 1998 issue for a fixed interest rate swap in 2001. In addition to that, Belgian owned company Glaverbel issued 3 billion CZK in bonds in 2000, and Skoda auto in the same year issued 50% of its 10 billion CZK with floating coupons. After 1999, corporations feared again that floating coupons would suffer from return of rising interest rates in the near future. This forecast did not come true; interest rates continued their falling trend.

2.2. In periods of lower, especially short term, interest rates (the significant decrease in rates in the period from 1997 to today), corporate investors were forced to look for sophisticated ways to use their available monetary funds

From the evaluation of the state of available funds on the Czech financial markets shown in Table 5, it can be seen that in 1997 and 1998, bank deposits formed a relatively high share of investment instruments on the financial markets. In 1997 in particular, simple and very short (from overnight to 2 weeks) deposit instruments were commonly used. This was a result of their high rate of interest during the currency crisis in the Czech Republic in May and June, 1997. In 1998, a new VAT Act was passed, and regulations concerning short term bonds were loosened, especially those concerning bank deposit promissory notes, which were first offered that same year. This became evident in the decrease of the absolute value of business deposits in banks, and more than 40% year on year increase in deposit promissory notes.

Table 5

Advancement in Czech money market investment tools amounts, in billions of CZK, as at the end of respective year

	1997	1998	1999	2000	2001	2002
Bank's deposits	1112,5	1205,3	1314,6	1408,1	1474,8	1627,9
- from that corporations	482,9	327,8	304,8	342,2	426,2	493,3
Participation certificates	11,5	16,8	53,05	76,1	84,2	99,9
CDs	1,4	2,0	3,2	2,2	0,1	0,1
Bank's P/N	80,0	115,0	130,0	159,3	127,8	92,2
T - bills	130,0	215,0	282,0	332,0	418,0	340,0

Source: Czech Central Bank, Czech Ministry of Finance.

In January 1999, a new Income Tax Act was passed that addressed the issue of taxing income from bonds. This led to an increase in investments in bank deposits as well as participation certificates of open end unit trusts. This was especially thanks to the favourable 15% withholding tax. A sharp growing trend could be seen in open-end unit trusts, which by the end of 2002 had brought in 99.9 billion CZK. At the same time, the Czech Central Bank (CNB) estimates that Czech residents invested another 30 billion CZK into foreign open end unit trusts.

In 1999, the CNB concluded a process of gradually lowering the mandatory minimal reserve rate to 2%, which conforms to the rate established by the European Central Bank for banks operating within the Eurozone. In addition to this, beginning on July 12th, 2001, reserves on clearing account with CNB were interest-bearing by a two-week repo rate. For this reason, mandatory minimal reserves no longer have an influence on the level of the gross interest yield of term deposits and current accounts. Since 2001, we can see an increase in bank deposits over all, including corporations deposits.

A host of T-bills are here only to supplement investment opportunities on the financial markets, a predominant part of which was held by the banking sector.

From the tables above, it is clear that periods of lower reference interest rates are accompanied by a rise in the volume of more sophisticated instruments. Since 1998 it was predominantly because of higher yield from bank deposit promissory notes, and from 1999 as well as a result of changes to the tax code. With almost equal yields from these notes and term deposits in 2001, there was a shift towards participation certificates of open-end unit trusts, with similar favourable yield taxation applied, but with even higher yields attained.

3. The influence of liberalized securities legislation on investments in the financial markets

We will focus on the influence legislative changes had on two of the largest groups of institutional investors – insurance agencies and pension funds. In 2001, total assets in these two sectors amounted over 250 billion CZK together. This means that any eventual outflow of their resources to foreign securities markets would influence the ability of the Czech financial and capital markets to absorb new issues, especially T-bills, or bank and corporate bonds.

3.1. The Insurance Act

The Insurance Act, passed in 1999 (and amended in 2004 due to the Czech Republic entry to the European Union), allowed for the technical reserves of insurance companies to be placed on foreign money and capital markets as of April 2000.

Table 6 shows the development of the technical reserves of Czech insurers since 1994. There is a notable rising trend especially in the reserves of life insurers.

Table 6

Development of the technical reserves in the Czech insurance sector, in billions of CZK

	1995	1996	1997	1998	1999	2000	2001	2002
Total	**72,4**	**85,2**	**96,9**	**98,3**	**109,7**	**117,2**	**135,0**	**157,9**
Life	55,0	57,7	63,8	67,9	76,7	86,3	97,8	111,2
Non-life	17,4	27,5	33,1	30,4	33,0	30,9	37,2	46,7

Source: Czech Association of Insurance Companies (CAP).

Insurance companies invest their technical reserves on the financial markets. The reserves of life insurers are long term in nature, and are therefore used for long-term financing. Considering the limitations of the capital markets (but not the money markets) in the Czech Republic, as well as its late state, it was expected that the amended Act would result in an outflow of Czech insurance funds into foreign securities with regard to financial placements and limits established under the law.

Insurers located in the Czech Republic could, as of April 2000, invest in government bonds issued by European Union member states, bonds issued by the European investment banks, the European Bank for Reconstruction and Development, as well as other securities publicly traded on the markets of EU member states or the OECD (the Organisation for Economic Cooperation and Development). As a result, insurance companies, especially life insurers, are able to acquire assets corresponding to the duration of the contractual obligation. Czech bonds normally have a maturity up to 10 years, and exceptionally 15 years, while investments into bonds in the Eurozone countries can be for as long as 30 years. This is also true for the market available interest rate swaps (IRS), for determining interest rate risks for loans in Euros, which are generally traded for between one and 30 years.

Table 7 illustrates volumes of the technical reserves placed in foreign papers by the Czech number 1 insurance company Ceska pojistovna, a.s. (CP) since the implementation of the new Insurance Act.

Table 7

Investment to foreign securities by Ceska pojistovna, a.s., in bilions of CZK and as a percentage share of total portfolio

	2000 in bln. CZK	2000 %	2001 in bln. CZK	2001 %	2002 in bln. CZK	2002 %
EU government bonds	0	0	0	0	0	0
Other securities registered in EU markets	7,3	9,2%	6,3	7,3%	0,6	0,65%
Other securities registered in OECD markets	1,6	2,0%	5,0	5,8%	1,3	1,4%
Total foreign securities investment	79,4	100%	85,9	100%	92,8	100%

Source: Ceska pojistovna, a.s.

In Table 7, the falling tendency to place technical reserves into foreign securities is visible, both in terms of the total amount and as a percentage of overall financial investment portfolio. A predominant share of the technical reserves of Ceska pojistovna was placed domestically, making it the most significant institutional investor on the Czech financial markets. The company also remained, despite the possibility of investing in foreign securities, the most significant investor in Czech corporate bonds. Among the most respected corporate bond titles in CP's portfolio are whole or partial issues of the top 100 Czech companies. In most issues, CP served as underwriter for the entire amount of the issue (as a private placement). Other significant CP investments include government and bank bonds, as well as T-bills.

To conclude this section, we can note that despite the liberated opportunities for Czech insurers even outside the domestic market, fears of an outflow of financial resources of the Czech Republic's most notable institutional investors is unsubstantiated. Ceska pojistovna in particular continues to be the most significant institutional investor in the Czech financial markets, and is in fact lowering its investment activities abroad, as a percentage of its portfolio holdings as well as in absolute numbers.

3.2. The Pension Act

The amendment of the Supplementary Pension Act with state contributions, valid as of 01.01.2000 allowed pension funds to invest administered resources in foreign bonds issued by governments of member states of the OECD or their central banks.

The investment policy of pension funds has proven to be very conservative for the time being. Foreign investment amounted to only 0.5% of the 18 pension funds' financial investments as of December 31st, 2000. Only 197 million CZK were invested into foreign securities. Besides this, only 4 of all the pension funds incorporated foreign currency bonds into their portfolios. This cautious trend continued in 2001 and 2002. One of these 4 funds didn't invest at all in foreign securities in 2001 and 2002, and the other three invested only a small part of their portfolio – from 3% to slightly less than 10%, and most of that into Hungarian and Polish government bonds. Be-

sides the above mentioned pension funds, only one other invested in foreign securities in 2001 and 2002 – and again chose Hungarian and Polish government bonds.

Even after the legislative amendment allowing investment in foreign securities, the most commonly used instruments for domestic pension funds were government T-bills and Czech government bonds.

At the close of this section it is possible to state that, just as with Czech insurance companies, there has not been an outflow of financial resources from domestic pension funds to foreign securities.

3.3. Legislation framework regarding the commercial paper issues in the Czech Republic

The legal norms of this case are established in the Bonds Act, number 530/1990 Coll., and the Promissory Notes and Cheques Act, number 191/1950 Coll.

The issue of commercial papers can take place in two ways:

Short-term bonds issues programs, in accordance with the Bonds Act, where the issuer can ask the SEC to approve the terms of issue, which should be the same for the previously undetermined number of bonds to be issued. In his request, the issuer is required to set the maturity of the bond program and the highest volume of outstanding bonds delivered within the framework of the program.

In the event that the issuer wishes to deliver the securities in accordance with the Bond Act, he must, with respect to §2, request that the SEC approve the issue terms of the bonds, bond prospects, and bond marking with an International Securities Identification Number (ISIN). In approving the bond program, the SEC commits to impose a plenty of fees on the issuer, and undertake a relatively long term approval process – the Bond Act requires the SEC to issue a decision of the terms of issue and prospectus within two months of the application.

Unsecured short-term promissory notes issue program, in accordance with the Promissory Notes and Checks Act. The program is not subject to the regulatory and fee imposing control of the SEC.

Just as with the issue of Euro commercial papers, Czech issues of so called dealer's commercial papers, in accordance with the Promissory Notes and Checks Act, are required to:

- sign a mandate letter with the dealer-bank for the provision of legal and economic inspection (so called due diligence) of the issuer, as well as a dealers contract and paying agency contract;
- prepare and publicise an information memorandum for the investors with the dealer-bank.

This process is much less time and money consuming than the short-term bond programs. In the Czech Republic, a dealers contract is signed, as is a paying agency contract and information memoranda agreement normally within 3-4 weeks of the signing of the mandate letter.

Under Czech conditions, all commercial paper issues have so far been carried out as promissory notes in accordance with the Promissory Notes and Checks Act. The main reason for the effort is to avoid the relatively expensive and complicated approval process set up by the SEC.

This parallels the trends seen in the 1990's in the largest commercial papers market in the world, the United States of America. Over the past few years, the majority of programs were not registered with the Securities and Exchange Commission. It addressed three categories of commercial papers. Section 3 (A) (2) Paper, Section 3 (A) (3) Paper, a Section 4 (2) Paper. These issue programs must be secured with back-up credit facilities, or bank guarantees. In addition, the market is used to having issuers of such non-registered commercial papers on the American market rated by one of the two biggest rating agencies (S&P, Moody's).

Investment ratings are not so strictly required in Czech companies. Among the most notable past issuers on the Czech market have been companies from the utility sector, led by CEZ, a.s. (Czech Power Plants) and Dalkia Morava, a.s. as well as companies with strong foreign owners, including Unilever and Coca-cola Amatil.

At the same time, there are only a few dealers for such programs coming from the ranks of important banks operating in the Czech Republic. Almost all issues have been made by CSOB,

the Prague branch of ING Barings, Credit Lyonnais Bank Praha, and Komercni banka.

It must also be noted that, although it is not a condition here as it is with non-registered American and Euro commercial papers, issues in the Czech Republic are made with back-up credits equal to the amount of the bond issue. These credit facilities serve to ensure short-term liquidity, and for refinancing the issued papers. This sends a strong signal to the investment community that the issuer will not have a problem paying the nominal value of the bill at maturity.

In concluding this section, we can see that the original intent of the lawmakers for issuing commercial papers according to the Bond Act has come to naught. The main reason is the time and expense incurred during the approval process. On the other hand, the market itself limits the issue of commercial papers according to the Promissory Notes and Checks Act, with the strict requirement for the issuer to have a top credit rating. It has to be said that, even when we are talking about unsecured commercial papers, issuers are limited to top companies, better yet, those with quality foreign owners. On top of that, most commercial paper issues are carried out through back up credit facilities provided by the best banks on the Czech market.

4. The influence of competition among financial intermediaries (and the development of corporations attitude towards the financial markets) towards the improvement in services in the financial sector and the creation of new financial products

In the Czech Republic, there have been two important trends in the financing and banking sectors since the late 1990's: concentration and increasing competition.

The first area, concentration, has become characteristic not only for the banking sector, but for other branches of the economy as well. As a result of mergers and acquisitions, the number of participants on the market has decreased, while at the same time, their size increased, either in terms of their equity capital, total assets, and turnover or market share. There is also a related process of concentration underway in the Czech Republic among private half-state owned banks, which are generally a consolidation with the daughter banks of their new investor, if they operate in the Czech Republic.

Since 2000, the process of concentration in the Czech Republic has been influenced by the privatisation of the state's shares in Ceska sporitelna (Czech Savings Bank), into which were later integrated the daughter banks Erste Bank Sparkassen (CR), the sale of IPB to CSOB (from Belgian KBC group), and the sale of Komercni banka to the French bank So-Ge. In addition to the sale of state shares in larger banks, there was the merger of Bank Austria Creditanstalt Czech Republic and HypoVereinsbank in 2001.

The takeover of domestic banks by foreign owners has resulted in better services and attitudes towards corporate clients (but not necessarily in the area of retail banking). Specialized client services have been improved, with the creation of specialized departments to serve their best corporate clients and expanding their dealing departments, which can now be more easily carried out in dealing offices in the home country headquarters, or in London.

Table 8

Development of concentration in the Czech banking sector

	1997	1998	1999	2000	2001	2002
Number of banks in Czech banking sector	50	45	42	40	38	37
Average of total assets per 1 bank [bln. of CZK]	46,7	54,2	55,2	56,4	65,8	67,6

Source: Czech Central Bank.

A second trend is the strong competition of the banking sector, where Czech banks are forced to battle for clients from a line of top companies. The banking sector in the Czech Republic with its total assets and the breadth of its businesses services is by far the most significant in the new European Union countries of Central Europe. For example, the total assets of the Polish banking sec-

tor from 1997 to 2002 ranged between 75 and 120 billion EUR, which is only about 150% more than the Czech Republic (Poland has 4 times the population). In Slovakia, total assets are three times less than the Czech Republic, in Hungary about half (in 2002), with a similar population.

On the other hand, a lack of quality companies suitable for actively doing business with the banks has led to a price war in the late 90's. This of course, has had a negative impact on bank profits, which are dependent on the interest rate difference between what they borrow and what they lend. Under these circumstances, the banks have had to transfer services for their most important business clients to the role of conciliator, just pairing the business lender with the business borrower. This situation is characterized by increasing role of the profits from fees and commissions making up a greater share of overall profits during the current stagnation of low interest rates.

But there has also been a stagnation of total assets in the banking sector (Table 9). This stagnation was brought about by introducing higher volumes of asset-neutral bank products, for example brokering the purchase and sale of corporate's commercial papers through banks on the money market.

Table 9

Advancement in volume of total assets and profitability in the Czech banking sector, in billions of CZK, as at the end of respective year

	1997	1998	1999	2000	2001	2002
Total assets	2335	2440	2317	2255	2500	2503
Profit from financial activities	87,4	96,9	90,3	77,3	89,4	92,6
from that: interest margin	49,7	66,0	58,3	50,6	56,9	56,1
from that: fees, commissions	11,7	12,9	14,6	17,2	21,0	23,8

Source: Czech Central Bank.

The role of conciliator was manifest in the set up and growth of CP issue programs to secure short term financing for the clients, where banks are present in the position of dealers. This program for choosing quality businesses often or completely replaces the use of credit lines. To secure long term financing through bond issues for their business clients, banks have assumed the position of issue managers, meaning that they secure placement of the issue on the market, prepare documentation, and obtain the appropriate regulatory permission. Another evolution has taken place in the provision of long-term investment credits in the Czech banking sector. In this branch, development is characterized by the apportionment of large credits. This means that, instead of providing large credits that could be very risky, individual banks work more as coordinators to obtain large credits from among banking groups. Depending upon the number of banks, we can describe them as club or syndicate loans.

The trend of growing profits from fees and commissions, is, as was mentioned, an effort on the part of banks to change the profit structure of banking activities, where a deciding role is still played by profits made on interest, and whose development is strongly dependent on the overall level of interest rates. Profits from fees and commissions, which banks can use to influence the active pricing policy, are almost exclusively determined by the operations of the client, and are for the most part assets-neutral. On the other hand, operations at other banks via the inter-bank market, including the Czech Central Bank, are, in terms of profits made from fees and commissions, loss-making. Almost three quarters of profits made from fees and commissions in the years observed were made by the 4 largest banks, which reflects the breadth of their business clients.

Last but not least, it is important to mention the growing sophistication among the treasurers (especially in the biggest corporations – members of the Czech Association of Corporate Treasurers), and their rising requirements towards the banking sector and other financial intermediaries. This has in the recent past placed pressure on the creation of tools that are tailored to meet business needs, especially in terms of maturity, yield, the currency involved, and the amount of the instruments involved.

Here we can mention new investment products in the Czech banking sector in the second half

of the 1990's, such as e.g. deposit promissory notes from 1998 and structured deposits from 1999.

5. Conclusions

The article attempts to evaluate the main influences on how money and capital markets have affected corporate treasury in the Czech Republic. There are 5 primary factors identified, which at various times have been suspected of exerting significant influence over corporate financial decisions, i.e.: tax system evolution, interest rates changes, legislative framework, competitive environment in the sector of financial intermediates, pressure from the corporations on the banks towards improved quality of the treasury products offered. Methodology used in the thesis comprises the following methods: analysis, synthesis, deduction, induction, and collation.

As the result, the influence of the all above-mentioned factors has been confirmed, with two partial exceptions. The main reason for just partial confirmation of the interest rates changes influence on corporate decisions is the fact, that accessibility to alternative sources of debt financing, such as bonds and commercial papers programs, is restricted only for top corporations.

On the other hand, the assumption of massive investment of the Czech based pension funds, life and non-life insurance companies in foreign – EU and OECD based – investment tools have not been testified since the Insurance and Pension Funds Acts legislative liberalization in 2000. In particular, life insurance companies still belong to the most important institutional investors in the Czech Republic in relation to T-bills, government, and corporate bonds.

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Structural Models and Default Probability: Application to the Spanish Stock Market

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Abstract

The Basle Committee on Banking Supervision has recently published a new Capital Agreement (Basle II) that replaces the agreement of 1988 currently in force. The theoretical inspiration for this new Agreement, which is expected to come into force at the end of 2006, is the search for convergence between economic capital and regulatory capital. Thus, one of the most encouraging aspects of the new Agreement is that it decidedly favors new and better systems of measurement of credit risk, giving financial entities the freedom and incentive to develop their own models and to employ them in the determination of bank capital.

In this article we analyze the so-called structural models, for which the model of Merton (1974) constitutes the theoretical inspiration; according to this model, the default in the obligations of a company is an endogenous variable related to the capital structure of the company, and such default occurs when the market value of the firm's assets falls below a certain critical level, related to the book value of the debt outstanding. With this approach, the default probabilities, as at December 31, 2003, are estimated for the companies that comprise the IBEX-35 index of the Spanish stock market at that date, by applying the model of Merton (1974).

The study concludes that, although the option pricing theory provides a very interesting alternative framework for estimating the risk of default of a firm, its application to countries with relatively few quoted companies presents serious limitations.

Key words: Credit risk, Structural models, Option pricing theory, Default probability, Financial entities.
JEL Classification: G13, G21, G28.

1. Introduction

In recent years a growth of interest can be observed in new and better methodologies for the measurement of credit risk. This is principally the consequence of the various proposals of the Basle Committee on Banking Supervision for a new Capital Agreement, known as Basle II, which is expected to come into force at the end of 2006[1]. One should add to this the increasing interest of researchers in analyzing the relationship between the differential of corporate bond yields and credit risk, or the spectacular growth being experienced by new types of credit derivatives.

Estimating the probability of default is a key factor in the management of credit risk, and this has made it necessary to seek different alternatives for measuring the rate of insolvency of a possible borrower.

Making such estimations is not, however, a simple task: on the contrary, it presents great obstacles. There are three possibilities that, in principle, are available to us for determining the default probability (Trujillo, 2002): utilizing the historical experience of defaults derived from internal systems of credit rating, based on the financial entity's own or shared client portfolio; associating the system of rating of the bank with the probability of default derived from the historical experience of some of the credit rating agencies; or lastly, employing some statistical or financial model to derive, from knowledge of a data series easily accessible to the analyst, the probability of default individually for each asset, without the need to link it to discrete categories of risk.

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[1] In June 2004 the Basle Committee on Banking Supervision published the document "*International Convergence of Capital Measurement and Capital Standards: a Revised Framework*", commonly termed the Basle Agreement II. The theoretical inspiration of this new Capital Agreement, which would replace that of 1988 currently into force, is the search of the convergence between economic capital and regulatory capital. In this respect, one of the most encouraging aspects of the new Agreement is that it favors better and more sophisticated systems of measurement of credit risk, giving financial entities the freedom and incentive to develop their own models and employ them in the determination of bank capital.

It is the last alternative that we explore in this study, in which we analyze a series of models for determining the probability of default; the theoretical inspiration for these models is that of Merton (1974), according to which the default is an endogenous variable related to the capital structure of the company, and a default occurs when the value of the firm's assets falls below a certain critical level, related to the debt outstanding. Consequently they are known by the name of structural models.

Merton proposes that the position of the shareholders can be considered as similar to purchasing a call option on the assets of the company, and the price at which they will exercise this option to purchase is equal to the book value of company's debt due for payment in the defined time horizon. In this way, Merton was the first to demonstrate that a firm's option of defaulting can be modeled in accordance with the assumptions of Black and Scholes (1973).

Thus, if the company is quoted on an organized market, we can utilize the option pricing theory to derive both the market value and the volatility of the asset, from knowledge of the value of the shares that comprise the equity of the company analyzed, and their volatility. This process can be considered similar to that utilized by investors in determining the implied volatility of an option from the observed option price.

Once the market value of the company and the debt due for payment in a defined time horizon are known, it should be easy to obtain the probability of a company going bankrupt at any given moment of time.

The most important restriction of Merton's model is that it assumes that the liability of a company consists of a single issue of bonds and that its insolvency can occur only when such obligation becomes due. In principle, this would prevent the probability of default being determined for a time horizon shorter than the period until the debt falls due. This hypothesis is relaxed in later studies, such as that of Black and Cox (1976) or the more recent study of Zhou (1997). In both studies the default can be considered before the debt falls due, for example, in the event that the value of the assets falls to certain lower limit. These approaches are known by the name of first-passage models.

Geske (1977) proposes a generalization of Merton's model using the idea that if a share is an option on the assets of the company, then an option on a share is one option on another, that is, a compound derived asset. In this way, several types of debt with different terms of payment can be included.

Leland (1994, 1998), Anderson et al. (1996) and Mella-Barral and Perraudin (1997) extend the models of Merton and Geske to take into account the possibility of renegotiating the debt, and the presence of agency and bankruptcy costs. In a recent article, Forte and Peña (2002) introduce the concept of a refinancing contract that would permit the repayment of the debt by the issue of new obligations.

Finally, an unrealistic hypothesis, common to several of the models, is that the risk-free rates of interest are deterministic. This is a clear limitation because unanticipated changes in interest rates can affect the value of the debt in two ways. First, an increase in interest rates reduces the actual value of the debt repayments and, therefore, their market value. Second, an increase in interest rates will tend to reduce the value of the company due to the empirical evidence of negative correlation between rates and returns from the shares. This effect will also reduce the value of the debt. The generalization of Merton's model to the case of stochastic interest rates that follow the model of Vasicek (1977), is presented in Shimko et al. (1993). In Longstaff and Schwartz (1995) we find this extension for the model of Black and Cox (1976).

Another approach being discussed in the financial literature for determining the probability of default is that whose analytical basis essentially consists of a series of ratios extracted from the financial statements of the customer.

In this approach, the principal analytical techniques utilized by the various authors in the prediction of corporate solvency are multiple regression analysis, discriminant analysis, qualitative regression (probit and logit) models and, most recently, neuronal network models.

Since Altman (1968) proposed the well-known Zeta model, there have been many researchers who have applied some of the previously-listed techniques in an attempt to determine the

default probability for a possible borrower. The majority of authors have opted to utilize the conditional probability models, logit and probit. Both statistical techniques have the objective of giving the probability that a particular observation belongs to a certain group, once the values of the independent variables for that observation are known. They are based on a cumulative probability function and require neither normality in the distribution of the independent variables nor equality of the matrices of variances-covariances.

These models constitute a valuable alternative in situations where it becomes necessary to derive the probabilities of default of companies that are not quoted on organized markets. For example, Moody´s Investors Service (2002) utilizes a logit model (RiskCalc®) to derive the default probabilities for unquoted companies. Similarly, Carey and Hrycay (2001), Westgaard and van der Wijst (2001) and Martín and Trujillo (2004) opt for a logit model to obtain rates of insolvency, through the knowledge of a series of financial ratios.

For Vassalou and Xing (2004) the most serious disadvantages of this type of "accounting" model stem, on the one hand, from the information taken as input being historical in character, in contrast to structural models that extract data from the capital market, which in theory should give them an initial advantage for determining the default probability in the future since these data incorporate the expectations of investors regarding the future development of the company. On the other hand, such models do not take into account the volatility of the company's assets in their estimation of the risk of default, which would mean that two companies with similar financial ratios, but different asset volatilities, would have similar probabilities of default. This variable, however, should play an important role in determining the probability of default and, in this respect, it constitutes a key factor in Merton's model and its later revisions.

Lastly, a more modern approach to determining default probability encompasses the so-called models of reduced form. Under this approach, the probability of default is extracted from the credit risk premium, which is determined by the market prices of the bonds traded in the financial markets. The studies of Litterman and Iben (1991), Jarrow and Turnbull (1995) and Duffie and Singleton (1999), in particular, are notable among several studies of this type.

This approach, however, does encounter a series of problems. In the first place, it is difficult to differentiate, without additional hypotheses, which part of the credit risk premium corresponds to the probability of default and which part to the rate of recovery. Added to this should be the finding of authors such as Elton et al. (2001) and Delianedis and Geske (2001) that the components associated with the risk of default explain only a very small proportion of the premium, and that the greater part of this can be attributed to factors associated with fiscal and systematic risk effects. In any case, the number of companies whose bonds are traded in organized markets is appreciably lower than the number of companies whose shares are quoted in such markets.

The article presented here aims to analyze the goodness of the so-called structural models and their possibilities for application to the Spanish market. To this end, the next part gives a brief exposition of the theoretical basis of the model of Merton (1974). In continuation, the operation of a structural model developed by the company KMV, recently acquired by Moody´s, is described. In the fourth part of the paper, we present the probabilities of default one year ahead, as at December 31, 2003, of the companies that comprise the IBEX-35 index of the Spanish stock market at this date, by the application of the option pricing theory. In the fifth part, a series of conclusions is offered.

2. Merton's model and default probability

Merton (1974) considers the equity of a firm as a European-type call option on its assets, and the price for exercising that option is the accounting value of the outstanding debt due for repayment in the defined time horizon.

If the value of the assets exceeds that of the debt on the date it falls due, whatever that value may be, the shareholders will repay the credit. The total value of the company is sufficient to do this. If the company does not have sufficient money in cash, the owners can sell part of the assets at their market value. Moreover, the shareholders will wish to repay the loan, since not to do so could force the bankruptcy of the company.

In the case that the market value of the company is less than the amount due to be amortized, the shareholders will not repay the debt, but will limit their loss to the amount of capital initially provided.

In the following we shall give a brief exposition of the bases of the model. Let us suppose, for this, a leveraged company that has made only one issue of debt, consisting of zero coupon bonds that fall due at time T. This company does not pay dividends. We also assume that the markets are perfect and that there are no frictions, such as taxes or costs of bankruptcy.

In this case, the market value of the firm´s equity, E, at time T when the debt falls due is:

$$E_T = \max (V_T - D, 0), \tag{1}$$

where V_T is the market value of the company's assets and D (the price of exercising the option or strike price) is the book value of the debt due at T. It should be noted that (1) represents the payment of a call option of the European type whose underlying security is the value of the company. Therefore, we can use the formulation of Black and Scholes (1973) to obtain the probability that the company may become bankrupt at any given moment of time.

If we assume the customary hypotheses of the Black-Scholes-Merton model (lognormality of the underlying security, volatility and constant rates of interest, continuous contracting, and perfect markets), we can relate the market value of the firm´s equity today, E_0, with the market value of the assets, V_0, and the volatility of the return on these assets, σ_V, using the known expressions of the model:

$$E_0 = V_0 N(d_1) - De^{-rT} N(d_2)$$

$$d_1 = \frac{\ln(V_0/D) + (r + \sigma_V^2/2)T}{\sigma_V \sqrt{T}}$$

$$d_2 = \frac{\ln(V_0/D) + (r - \sigma_V^2/2)T}{\sigma_V \sqrt{T}} = d_1 - \sigma_V \sqrt{T}, \tag{2}$$

where N is the cumulative density function of the standard normal distribution, r is the risk-free rate of interest in continuous terms, and the rest of the variables are as already defined.

It can be observed that the model has two unknowns, V_0 and σ_V. To estimate these parameters, we need an additional equation that relates the volatility of the option to that of the underlying security[1]:

$$\sigma_E = \frac{V_0}{E_0} \frac{\partial E}{\partial V} \sigma_V. \tag{3}$$

This equation, together with the preceding ones, shown in (2), enables us to determine V_0 and σ_V by means of a numerical algorithm using the values of E_0 and σ_E; these are variables that are easy to quantify in quoted companies.

In this model, the neutral-risk probability[2] of which the value of the company is greater than the value of the debt on the date T, that is $V_T \geq D$, is $N(d_2)$. Therefore, the risk-neutral probability that the company may default on the debt at time T determined at any time t is:

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[1] We can express the volatility of the firm´s equity, in function of the volatility of the assets, as $\sigma_E = \eta_{E,V} \cdot \sigma_V$, where $\eta_{E,V}$ denotes the elasticity of the firm´s equity against the value of the assets, that is, $\eta_{E,V} = (V/E)(\partial E/\partial V)$. This last partial derivative, $\partial E/\partial V$ is, simply, the delta of a call *option*, $\Delta = N(d_1)$, that has the assets of the company as the underlying security.

[2] A very important principle in the valuation of derivative financial assets is that known as the "risk-neutral valuation". This principle does not state that the investors are neutral to the risk, but rather that the derivative financial assets, like options, can be valued under the assumption that such investors are neutral to the risk. This means that the preferences of the investors in respect of the risk do not influence the price of the option when expressed as function of the price of the underlying assets. Risk-neutral valuation is a powerful tool because it represents two particularly simple results: 1) The expected yield of all the financial assets is the risk-free rate of interest, and 2) The risk-free rate of interest is the appropriate discount rate to apply to any expected cash flow.

$$q_t(T) = 1 - N(d_2) = N(-d_2).$$ (4)

This risk-neutral probability of default is that "foreseen" by the market and can be considered as the expected frequency of default conditional on the actual value of the company, on its leverage, volatility, structure of debt and risk-free interest rate. If the company's debt structure is more complex than a simple issue of zero-coupon bonds, one particular issue, whose duration is the weighted mean of the durations of all the outstanding liabilities due, could be utilized as an approximation.

The "natural" default probability can also be calculated, but the expected rate of growth of the company, μ, must be available for this. In this case, the probability that we seek is:

$$p_t(T) = N\left[-\frac{\ln(V_t/D) + \left(\mu - \frac{\sigma_V^2}{2}\right)(T-t)}{\sigma_V\sqrt{T-t}} \right]$$ (5)

the result of substituting the risk-free rate by the expected rate of growth of the assets, in equation (4).

3. Option models in practice: the KMV model

The empirical application of these types of model is relatively recent, since they have only begun to achieve a certain popularity in the last few years. The model developed by the KMV Corporation, a company recently acquired by Moody´s, is notable among those that are currently being developed in this field of analysis.

Insolvency is defined, as previously explained, as the situation in which the market value of the company's assets is insufficient for the repayment of its contracted debt.

There are four main variables utilized in the calculation of the *Expected Default Frequency*, *EDF* or default probability:
1. The assets of the company at market values.
2. The volatility of the future values of the assets.
3. The "shape" of the distribution curve of future values of the assets.
4. The amount of the outstanding debt falling due in the defined time horizon, an accounting value deduced from the financial statements of the company.

The expected rate of growth of the assets and the time horizon of the study, which must be defined by the analyst, should be added to these variables. The relationship between the variables is represented in Figure 1.
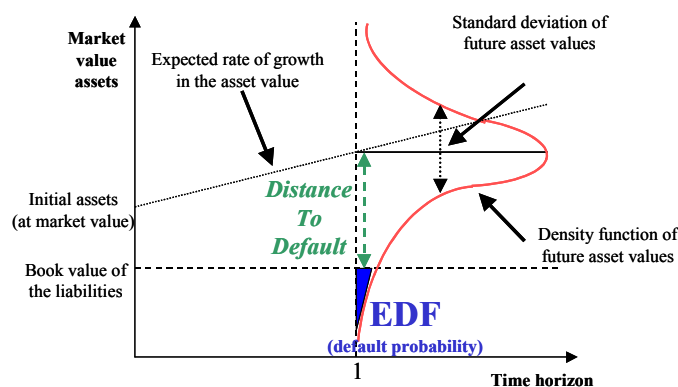

Fig. 1. Calculation of the *Expected Default Frequency*