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Foreign Exchange Activity Department

Assets and Liabilities Unit

Factors Affecting Credit (Yield) Spreads

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Introduction

The Government of Israel and Israeli corporations raise capital abroad in a number of ways; one of them being the issue of foreign currency tradable bonds abroad. Interest rates for new bond issues are determined relative to that on risk-free bonds which serve as a benchmark, and the credit (yield) spread of an issue above the prevalent risk-free bond rate reflects an issue's creditworthiness.

Credit spreads of USD Israeli government and Israeli corporation tradable bonds can be readily accessed, and USD interest rates are those that will be discussed in this paper. Changes in the spread of Israeli tradable bonds serve as an index of the perception of Israel's risk in the eyes of foreign investors - who hold the majority of these bonds.

Aim of study

This paper discusses the factors affecting USD credit spreads in general and those affecting Israeli government USD issues. In this context the effect, on the spread, of Israeli resident holdings of Israeli government USD tradable bonds will be examined. In addition, an attempt will be made to estimate the credit spread difference between bonds in various (investment grade) credit rating groups and between bonds of differing term structures. This study focuses on long-range trends in a historical perspective.

Factors affecting yields and credit spreads (in general and re Israeli issues)

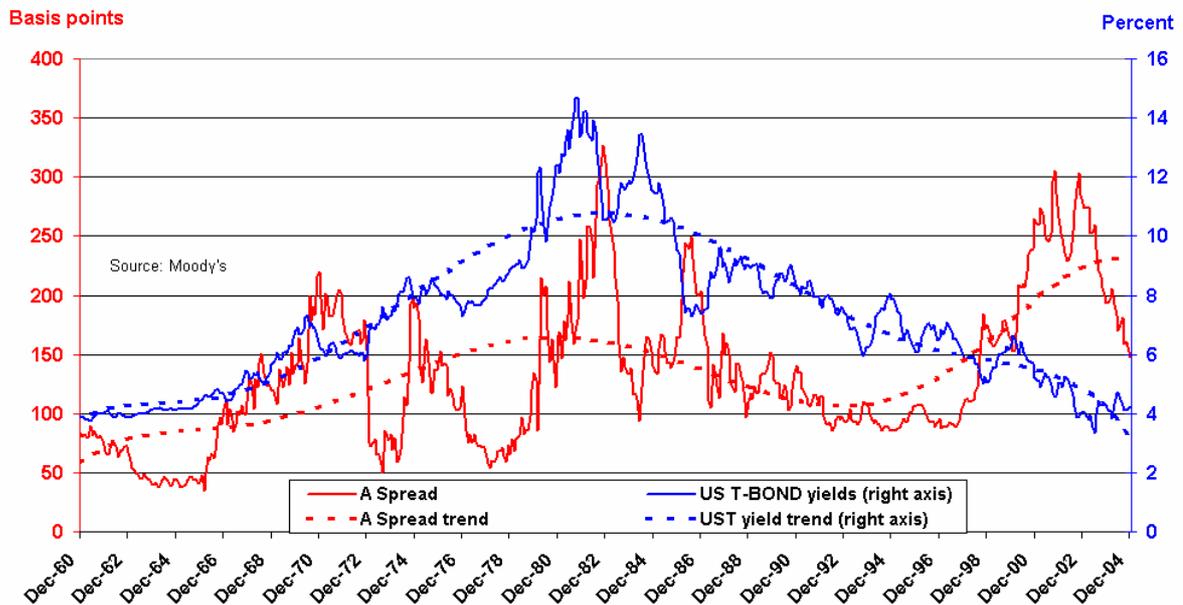
The yields of tradable non-risk-free bonds in the primary market as well as of those traded in the secondary market are influenced by a number of factors:

- √ Risk-free bond yields
- √ Global financial crises
- √ Bond term structure
- √ Issuer specific risk
- √ *Israeli resident holdings of Israeli USD issues*

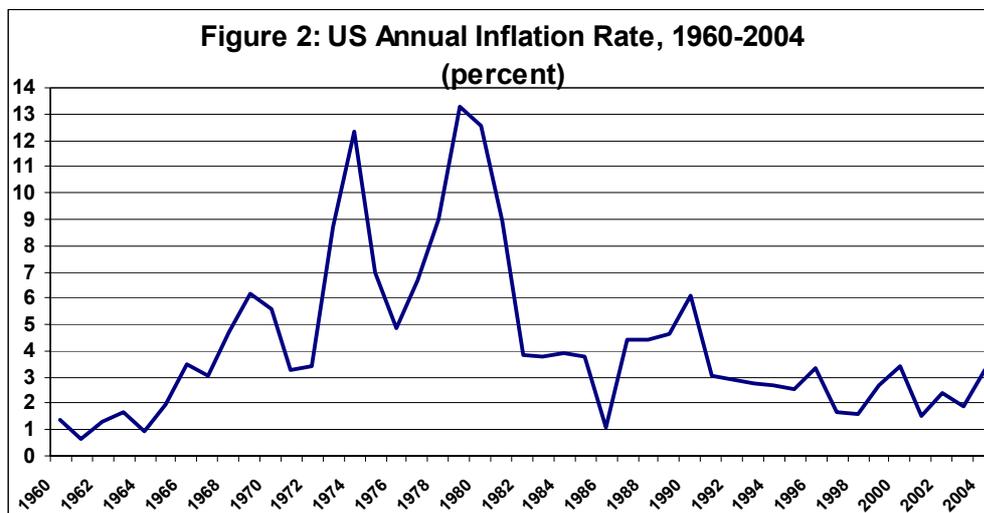
Risk-free bond yields

Figure 1 presents the yields on 20-year US Treasuries, which are risk-free, and the spread on A-rated bonds of similar maturity. The data (from Moody's) covers the period of January 1960 to June 2004. The figure shows that yields on US government bonds followed a general upward trend until 1981, from a level of about 4% in 1960 to around 15% at the end of 1981. This was followed by a downward trend to a level of around 4% again in 2004.

Figure 1: Long-Term US Treasury Yields and A Rated Corporate Credit Spreads (monthly averages)

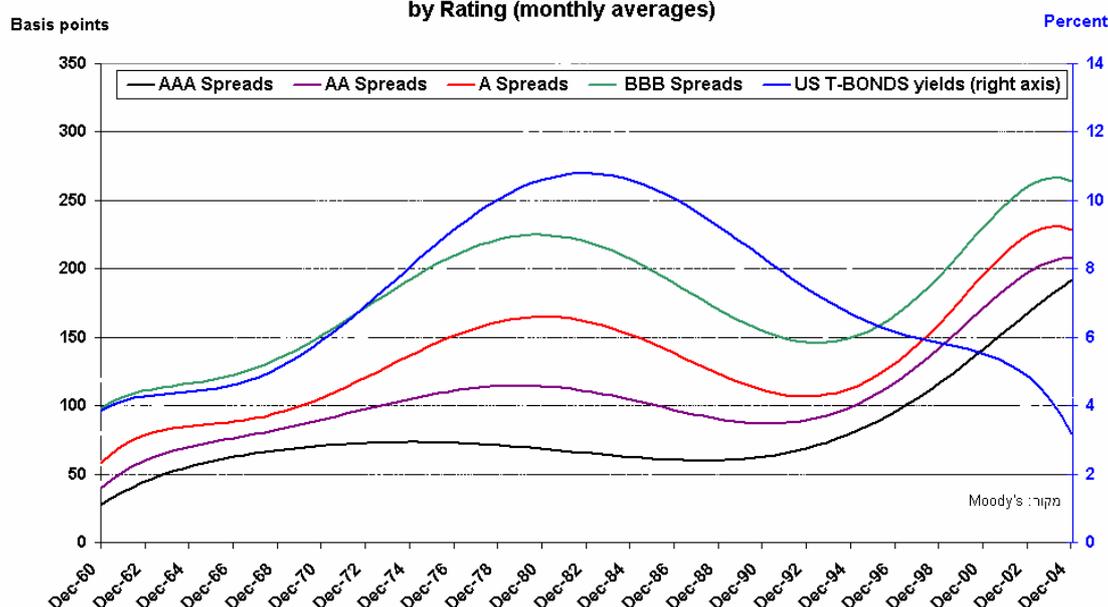


The rise in yields during the 70s and 80s was the result of high inflation during those years (Figure 2). This was accompanied by a general upward trend in credit spreads as well, with the spread on A-rated bonds increasing from about 50 basis points during the first half of the 1960s to a peak of about 300 basis points in 1981. The decline in yields on US government bonds which began in 1982 led to a parallel decline in spreads on A-rated bonds to about 90 basis points during the first half of the 1990s. Starting in the second half of the 1990s until the end of 2001, we see an opposite trend in which spreads on A-rated bonds increased despite the continuing decline in the yields on US government bonds. This phenomenon, which is discussed in more detail in the following section, can be explained by the series of global crises, which begin in the 90s, and which led to increased spreads despite the continuing decline in the yields on US government bonds.



Figures 1 and 3 show an increase in spreads accompanied by a rise in yields on US government bonds from 1960 until 1981 and a decline in spreads when yields fell during the period of 1982 until the mid-1990s. This implies that the market demands a higher risk premium, as measured in terms of the size of the spread, as yields on US government bonds (the benchmark) rise. The increase in the annual rate of inflation, which continued until the end of 1981, led to an increase in yields on US government bonds. As a result, the market demanded a higher risk premium on bonds since investors came to view them as increasingly risky from the investors' point of view with respect to the ability of issuers to redeem bonds at maturity. Figure 3 shows that the lower the rating of a bond, or in other words, the higher its level of risk, the higher the risk premium demanded by the market, and also the riskier the bond the **more** the rise in the risk premium is **in tandem** with the rise in US Treasury rates.

Figure 3: Long-Term US Treasury Yield Trends and Corporate Credit Spreads by Rating (monthly averages)



Research in recent years¹ has found a negative correlation between risk-free bond (US Treasury) yields and yield spreads. However, looking at **long-range trends** (of over 40 years) we see the opposite phenomenon during most of the surveyed period. An increase in yields on risk-free bonds is accompanied by an increase in the spread with a similar relationship for a decrease US Treasury yields. It is worth noting that in two studies (Longstaff and Schwartz (1995) and Leland and Toft (1996)) that found a negative statistical relationship, the authors stated that the results were "counterintuitive" and "unexpected".

As expected, an analysis of the spreads of bonds with different credit ratings shows that spread values increase with an increase in the risk level. Table 1 and Figure 4 (for investment grade bonds) show the difference in spreads during the "low spread" period (the average for the years 1960-1964) and for the yields during the "high spread" period (the average for 1979-1983). For very low-risk bonds with an AA

¹Leland, H.E. and K.B. Toft, 1996, Optimal capital structure, endogenous bankruptcy, and the term structure of credit spreads, *Journal of Finance* 51, 987-1019.
Longstaff, F.A. and E.S. Schwartz, 1995, A simple approach to valuing risky fixed and floating rate debt, *Journal of Finance* 50, 789-819.

rating, the minimum spread was found to be 50 basis points with the maximum 140. In contrast, for higher-risk bonds (BBB rating), the minimum spread was 100 basis points with the maximum 240. Israel has an A- rating and looking at the table, Israel's spread (for corporate A- long-term issues) should be between 75 and 200 basis points depending on the level of yields in the bond market. The average difference in spread between each rating seems to be around 5 basis points at the beginning of the 1960s when yields were low and 20 basis points in the early 1980s when yields were high. A country with an A- rating, such as Israel, will have to "pay" for a decline in rating with an increase in spread of between 10 to 15 basis points, at the prevailing level of yields and spreads.

Table 1: Estimated Long-Term Corporate Spreads by Rating

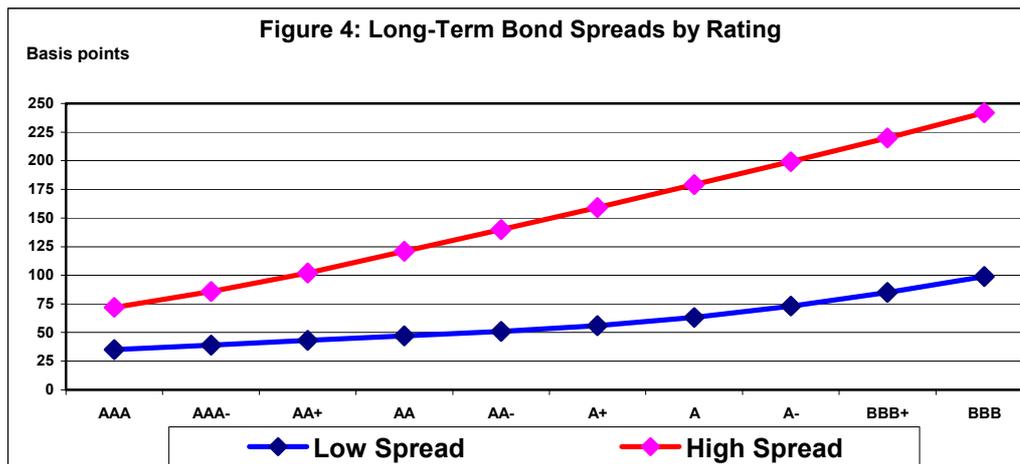
Rating	Low Spread	High Spread
AAA	35	72
AAA-	39	86
AA+	43	102
AA	47	121
AA-	51	140
A+	56	159
A	63	179
A-	73	199
BBB+	85	220
BBB	99	242

Source: Moody's

Low Spread: Average for years 1960-64.

High Spread: Average for years 1979-83.

Note: Main rating categories (bold) are original data, with calculated linear iterations in-between.



Global financial crises

Global financial crises have always influenced bond yields in world financial markets. In 1973, in the wake of the Yom Kippur War, the first oil crisis broke out and the oil producing countries, represented by OPEC, made the first oil embargo on the West. A few years later, in 1979, the second oil crisis erupted in the wake of the overthrow of the Iranian Shah. Oil prices skyrocketed during these periods and so did the annual US inflation rate, which led to a rise in US Treasury rates. In 1984 the savings and loan association bankruptcies shook up the US financial markets and not long afterwards came "Black Monday" (October 19, 1987) with the Dow-Jones Industrial average falling 23% in one day, these events leading to a further rise in USD yields. In the 1990s came a new set of crises. The first of these was the Mexican crisis in 1994, followed by the Asian crisis at the end of 1997 and the Russian and LTCM crises in 1998. In 2000, the hi-tech bubble burst, followed by the Twin Towers terror attack. A more detailed analysis of world crises appears in Appendix 1. The crises of the 1990s brought about a change in the perception of risk among the participants in the financial markets with regard to interest rates that was also manifested in a change in yield spread trends. Increasing uncertainty due to the cumulative effect of these series of financial crises in the light of the globalization of the 1990s (expressed by a greater interdependency among country economies) led to a trend reversal, where decreasing US Treasury yields did not lead to a lowering of spreads as was the long term trend in the past.

Figure 5 presents yield spreads for long term A rated corporate bonds covering the periods of global financial crises. During the period 1994 to 2002, yields spreads on A rated bonds **increased** by 200 basis points, despite the **decline** in yields on risk-free bonds during the same period by 300 basis points (Figures 6 and 7).

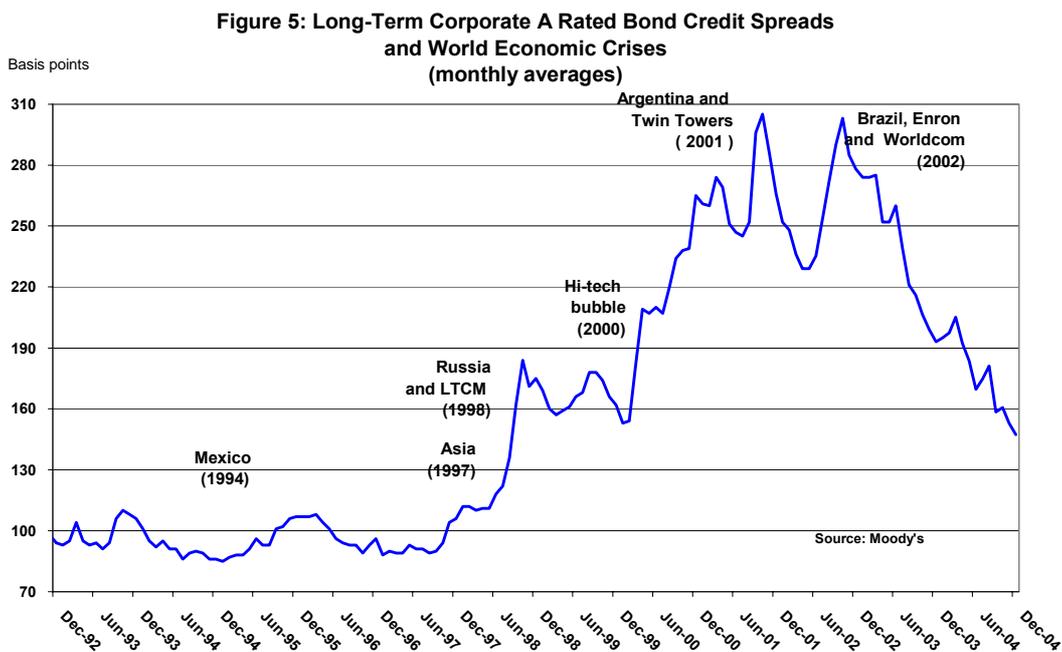


Figure 6: Long-Term US Treasury Yields and A Rated Corporate Credit Spreads, 1994-2004 (monthly averages)

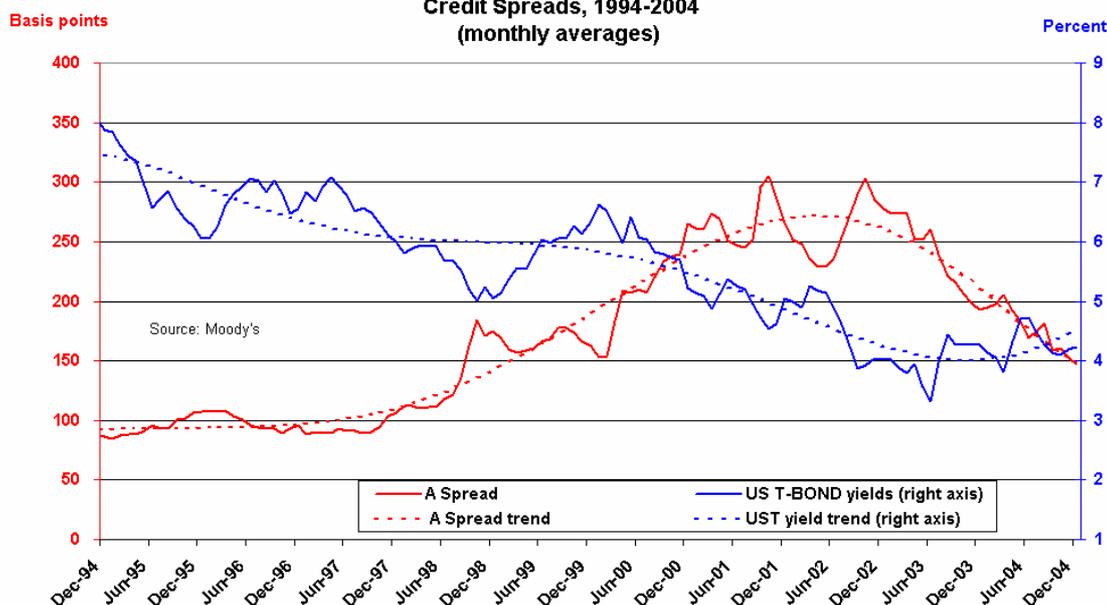
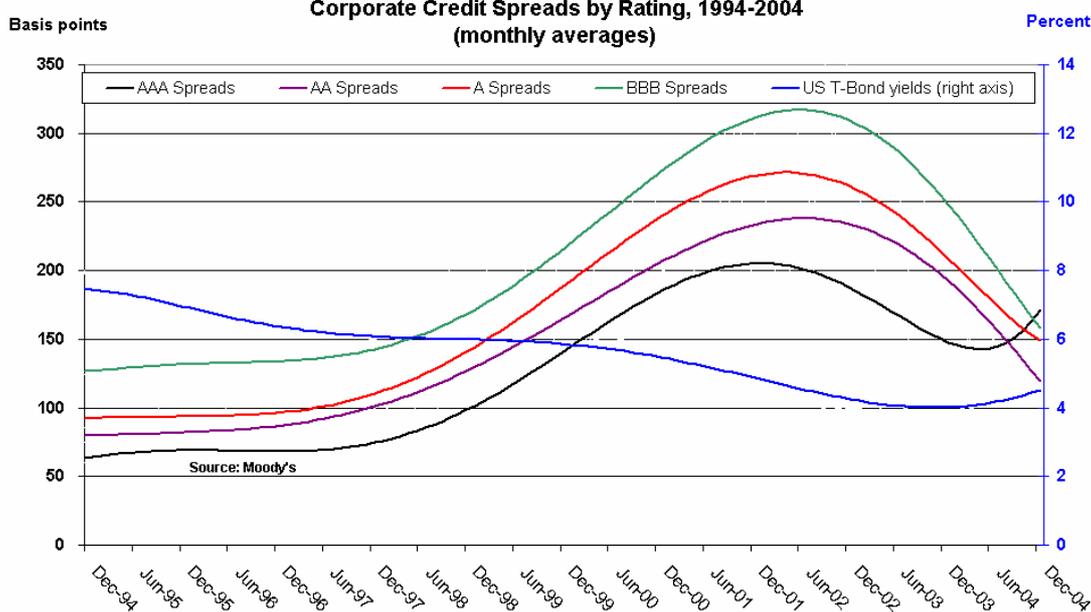


Figure 7: Long-Term US Treasury Yield Trends and Corporate Credit Spreads by Rating, 1994-2004 (monthly averages)



Bond term structure

In general, bond purchasers demand a greater return on bonds held for a longer period. Figure 8 presents yields on risk-free US government bonds with various terms to maturity over the past few years. In table 2, we calculate the yield spread as a function of the term to maturity for various bond ratings. Since the yield curve does not have a monotonic trend on average (but rather sometimes rises and sometimes

falls), a comparison of this type should neutralize the influence of expectations on the yield curve and leave only the influence of the “liquidity premium”.

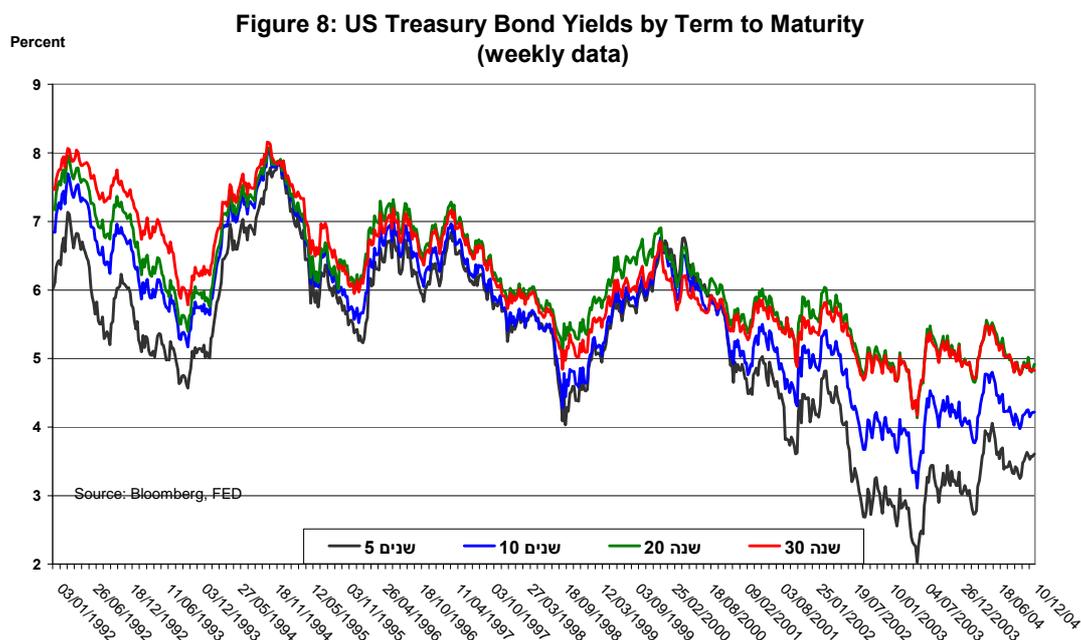


Table 2 presents the spreads between bonds of differing maturities: between 30-year and 20-year bonds, between 20-year and 10-year bonds, and between 10-year and 5-year bonds. Term structure spreads are compared for investment grade US industrial bonds.

Table 2: Yield Comparisons by Term Structure and Rating

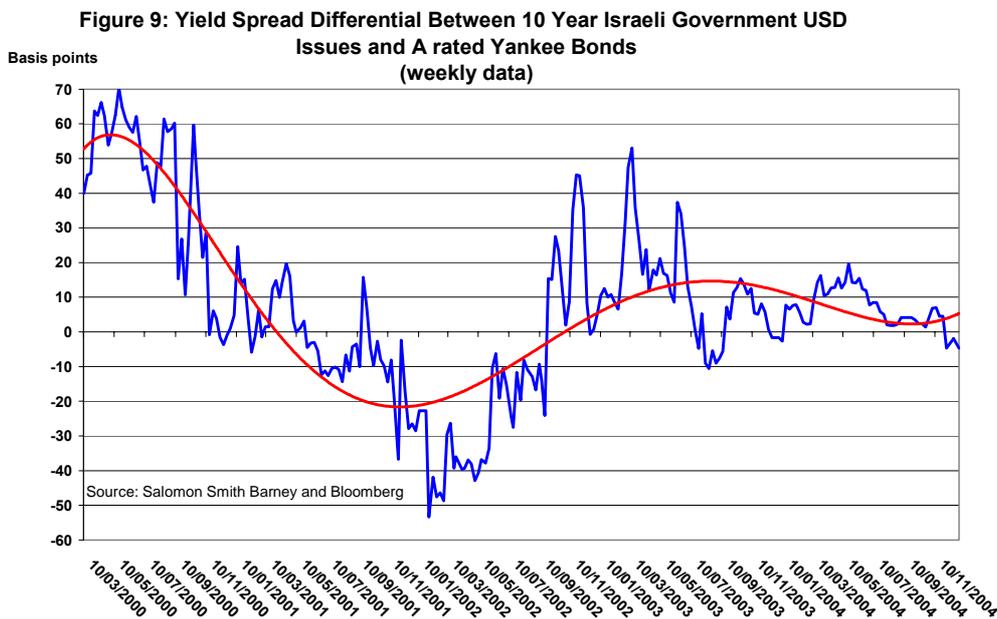
Year	AAA			A			BBB		
	Difference between			Difference between			Difference between		
	10-5	20-10	30-20	10-5	20-10	30-20	10-5	20-10	30-20
Years	Years	Years	Years	Years	Years	Years	Years	Years	
1992	82	33	33	77	44	27	70	52	36
1993	73	27	46	73	58	16	72	59	24
1994	40	41	-12	51	40	8	52	49	16
1995	19	38	-8	29	47	-3	29	58	2
1996	26	38	-12	35	41	7	44	53	10
1997	13	33	-8	25	34	13	28	40	13
1998	11	45	-14	20	46	12	25	45	14
1999	10	55	-32	19	47	4	21	50	4
2000	-12	20	-29	19	29	4	22	25	3
2001	47	61	-14	64	71	-6	66	71	-6
2002	80	82	-15	93	76	0	90	65	4
2003	105	94	-5	117	114	-10	112	108	-3
Min. diff.	-12	20	-32	19	29	-10	21	25	-6
Max. diff.	105	94	46	117	114	27	112	108	36
Avg. diff.	41	47	-6	52	54	6	53	56	10

Source: Bloomberg

It can be concluded that during the sample period, if an issuer was interested in marketing bonds with a longer term, he had to offer buyers an additional 50 basis points on average as a liquidity premium in order to extend the term of the bond from 5 to 10 years or from 10 to 20 years. An issuer interested in extending the term of his bonds from 20 to 30 years would have to pay only an additional 10 basis points. Thus, the liquidity premium increases with the term to maturity but the rate of the increase declines with the length of term.

Issuer specific risk

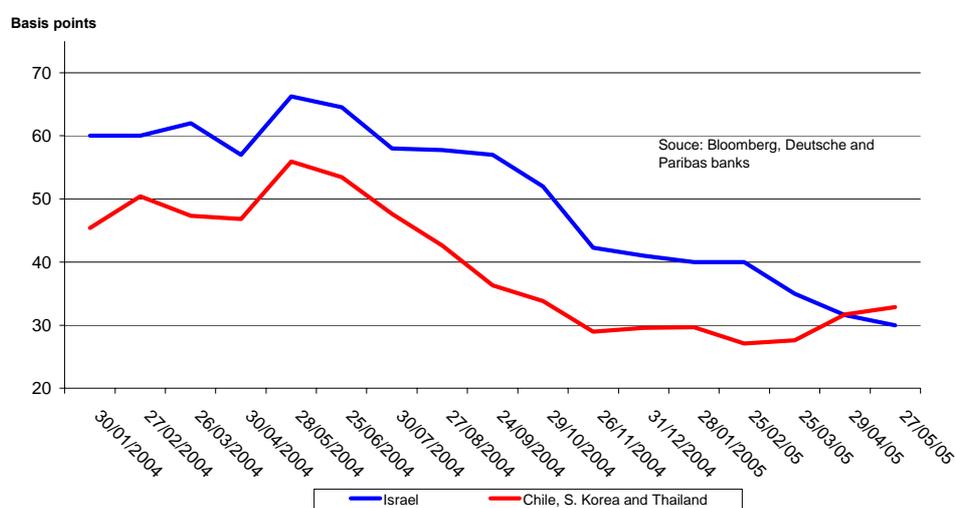
Financial markets value the bonds of a country or corporation according to the variables described above and **in addition** according to the specific risk of the issuer (whether a country or corporation). In order to examine this type of risk, the other influences mentioned above must be neutralized. Figure 9 presents the difference between Israel's yield spread and that of A-rated 10-year Yankee bonds (which constitute a benchmark for Israeli issues). It can be seen, that during the first quarter of 2000, Israel's yield spread was higher than that of the A rated group by some 60 basis points. At that point, a gradual process of credit improvement began until Israel's yield spread reached 50 basis points **below** that of the A rated group. However, during 2002, the spread differential widened as a result of local security and political events. From the beginning of 2003 until today, the spread has been 0-20 basis points above that of the A rated Yankees. Issue and issuer (for sovereign issuers) specific risk can be tracked by means of the CDS credit derivative – see Box 1 below.



Box 1- Credit Default Swap (CDS)

Issue and issuer (for sovereign issuers) specific credit risk can be gauged by examining Credit Default Swap² premiums. A CDS contract, a liquid credit derivative, insures against credit default on a bond (the underlying asset) for a price (a premium). Changes in the premium signal a change in the risk of the bond (or sovereign issuer). Credit spread fluctuations are directly tied to fluctuations in the the CDS premium. Figure 10 shows CDS premiums for Israel and countries with the same credit risk rating.

Figure 10 : 5 Year CDS Premiums for Israeli Government and Similarly Rated Sovereign Debt



²See Biber, T., January 2001, A Close look at the Risk Premium, Mabat Calcali (Hebrew), BOI, Issue no. 8.

and

Bank of Israel Annual Report 2003 (English), Foreign Currency Department, pgs. 61-63:

http://www.bankisrael.gov.il/deptdata/mehkar/doch03/eng/pe3_2.pdf

Israeli resident holdings of Israeli USD issues

The Government of Israel and Israeli corporations issue bonds abroad. Most of the corporate bonds are issued by the Israel Electricity Company. The spreads on these bonds should reflect the perception of risk among foreign residents with respect to the Government of Israel and Israeli corporations. Israeli residents currently hold close to 30% of the Government of Israel's freely traded bonds and some 20% of Israeli corporate bonds. The perception of risk by Israelis with respect to Israeli bonds traded abroad is less than that of foreign residents. As a result, the spread on Government of Israel bonds abroad reflects a perception of risk which is held by a mixture of foreign and Israeli residents. In order to isolate the influence of the holdings of Israeli residents on the spread, their share of the bonds traded abroad must be taken into account (see Box 2). The effect of the holdings of Israeli residents on spreads during the years 2001 and 2002 was a negative 20 basis points on average. During the years prior to 2001, the influence was smaller because the share of their holdings was smaller. At the same time, the premium demanded by foreign residents only, which is derived from the yields on Government of Israel bonds, was higher by between 4 and 50 basis points in comparison to the bond yield observed in the market which is also influenced by the holdings of Israeli residents.

Box 2 – The Effect of Israeli Resident Holdings of Government of Israel Tradable USD Bonds on the Credit Spread

In this exercise we isolated the effect of local resident holdings by comparing Israeli government USD issues (issued abroad) with Israeli government USD-linked issues. Gilboa bonds served as the basis of comparison with USD Israeli government bonds. These bonds are indexed to the US dollar and pay a variable rate of interest every six months on the basis of the USD LIBOR rate. The share of foreign resident holdings of Gilboa was negligible (only 3% at its peak) and therefore we can assume that foreign resident holdings had no influence on Gilboa yields.

follows:

$$\Delta r_{il} = (T + sp_{IL}) - (T + \text{swap spread}) = sp_{IL} - \text{swap spread}$$

where:

T – Yield on 10 year US government bonds.

sp_{IL} – Spread of Government of Israel bond yields over US government bond yields.

swap spread – Yield above US government bond yield in an interest rate swap (for 10 year bonds, Bloomberg data).

The yield on USD Israeli government issues is affected both by foreign residents and Israeli residents. We calculated the influence of the residents in terms of the spread above LIBOR as follows:

$$\Delta r_{il} = (w * \Delta r_g) + (1-w) * \Delta r_f$$

where:

Δr_g – Yield on Gilboa bonds less the six-month LIBOR rate.

Δr_f – Spread above LIBOR according to risk perception of foreign residents.

w – Weight of Israeli residents' holdings of Government of Israel USD bonds.

1-w – Weight of foreign residents' holdings of Government of Israel USD bonds.

A solution for Δr_f is obtained by rearranging the equation:

$$\Delta r_f = (\Delta r_{il} - (w * \Delta r_g)) / (1-w)$$

Results (monthly averages, basis points)

<u>Year</u>	<u>w(%)</u>	<u>Δr_{il}</u>	<u>Δr_f</u>	<u>$\Delta r_f - \Delta r_{il}$</u>
1998	7	80	84	4
1999	5	68	69	1
2000	10	74	80	6
2001	24	87	114	27
2002	32	84	98	14
2003	31	77	132	55

Conclusion

The Government of Israel has issued and continues to issue tradable (not guaranteed by the US government) bonds in international markets. The credit (yield) spread on these bonds reflects investors' perception of risk with respect to the Israeli economy and serves as a benchmark for the valuation of Israeli corporate bonds both in the primary and secondary markets.

In this study, we have seen that USD credit spreads (in general and for Israeli government tradable issues) and credit spread changes are affected by the following factors: risk-free bond yields, global financial crises, bond term structure, issuer specific risk and (for Israeli issues) Israeli resident holdings of Israeli USD issues. Israeli residents who hold Israeli bonds traded abroad contribute to the lowering of these bond yields; alternatively, the spread demanded by foreign residents alone is higher than that apparent from the yields on Government of Israel USD bonds.

We also found , that a change of one level in the credit rating of a bond (for investment grade bonds) as determined by one of the rating agencies is equivalent in value to between 10 and 15 basis points. It was also found that issuing bonds for a longer term increases the interest rate as follows: from 5 to 10 years and from 10 to 20 years by about 50 basis points and from 10 to 20 years by only around 10 basis points.

In this study, we have seen that a great part of the changes in Israel's credit spread over US Treasuries are the result of **exogenous** factors. The focus of this paper on long-range trends in a historical perspective has permitted for a broad overview of the factors affecting credit spreads in general.

Appendix 1 –Global Crises , US Treasury Yields and Credit Spreads

Figure 1 presents long-term US Treasury yields for almost half-a-century, starting from 1960. The dramatic rise in these yields, which affected credit spreads can be traced to the following economic crises:

- ✓ In 1973, in the wake of the Yom Kippur War, the first oil crisis broke out and the oil producing countries, represented by OPEC, made the first oil embargo on the West.. Oil prices rose dramatically and so did the annual US inflation rate, which reached 12% in 1974 (see Figure 2) leading to a rise in US Treasury rates, which rose from 6% at the end of 1972 to 8% in the years 1974-75.
- ✓ A few years later, in 1979, the second oil crisis erupted in the wake of the overthrow of the Iranian Shah which was followed by the start of the war between Iran and Iraq in September of 1980. Annual US inflation reached a peak of 13% in 1979, with US Treasury rates rising concurrently to 14% in 1981.
- ✓ In 1984 the savings and loan association bankruptcies shook up the US financial markets, with US Treasury rates rising from 11% in mid-1983 to over 13% in 1984.
- ✓ Not long afterwards and possibly affected by the savings and loan crisis, came "Black Monday" (October 19, 1987) with the Dow-Jones Industrial average falling 23% in one day due to, among other causes, program trading. Long-term US Treasury yields rose from around 7.5% in 1986 to around 10% at the end of 1987.

Figure 5 presents long-term A rated corporate bond spreads from the early 1990s. It demonstrates the effect of financial crises on spread increases. Listed below are several global crises, from 1994 onwards, that affected spreads.

- ✓ Following the Mexican crisis in early 1994, spreads increased slightly by about 0.2%. This was followed by a gradual downward trend which continued for four years till previous levels were reached.
- ✓ In late 1997, the Asian crisis began which led to the increase in spreads during 1998.
- ✓ The Russian crisis broke out in August 1998 and was immediately followed, in September 1998, by the LTCM crisis. The two crises raised the credit spread by some 0.6% in just two months. Following this, the downward trend in the yield spread resumed for a period of five months.
- ✓ The hi-tech crisis, which began in early 2000, again raised the yield spread. Over the course of that year, it rose by 1.1%. This crisis reflected an accumulated lack of confidence in the financial markets in the US and elsewhere which led to an increase in the spread of long-term A-rated bonds to 2.7% by the end of 2000.
- ✓ Latin American crises, in the light of increasing world globalization, had their effect on global USD credit spreads from 2001 onwards.

Argentina defaulted on \$82 billion debt in November of 2001 and Brazil was rescued from default by an unprecedented IMF loan of \$30 billion in August of 2002. It is likely that these events contributed to the trend **change** close to the approach of the new millennium, where falling US Treasury rates were accompanied by rising spreads.

- √ The attack on the Twin Towers in September 2001 raised the spread, which reached a peak level of 3.1% in November 2001.
- √ The Enron and Worldcom bankruptcies raised the spread to 3% at the end of October 2002. Since then, there has been a gradual downward trend in credit spreads which has continued for the past couple of years.

Bibliography

Biber, T., January 2001, A Close look at the Risk Premium, Mabat Calcali (Hebrew), BOI, Issue no. 8.

Duffee, R. G., 1998, The relation between treasury yields and corporate bond yield spreads, *Journal of Finance* 53, 2225-2241.

Jacoby, G., January 2002, On estimating the relation between corporate bond yield spreads and treasury yields, I.H. Asper School of Business, University of Manitoba.

Leland, H.E., and K.B. Toft, 1996, Optimal capital structure, endogenous bankruptcy, and the term structure of credit spreads, *Journal of Finance* 51, 987-1019.

Longstaff, F.A., and E.S. Schwartz, 1995, A simple approach to valuing risky fixed and floating rate debt, *Journal of Finance* 50, 789-819.

Sarkar, S., 2003, Risk-free interest rates, the call feature, and corporate bond yield spreads, McMaster University.