Research Department   **Bank of Israel**

The Level of Leverage in Quoted Companies and Its Relation to Various Economic Factors

Eddy Azoulay* and Ran Shahrabani**

_____

Bank of Israel, http://www.boi.org.il
* Eddy Azoulay, Governor's Office; E-mail: eddy.azoulay@boi.org.il, Phone: 972-2-6552563
** Ran Shahrabani, Research Department; E-mail: ran.shahrabani@boi.org.il, Phone: 972-2-6552633

Any views expressed in the Discussion Paper Series are those of the authors and do not necessarily reflect those of the Bank of Israel

רמת המינוף בחברות בורסאיות והקשר בינה לבין גורמים כלכליים שונים

אדי אזולאי ורן שהרבני

תקציר

מדד מקובל ליציבות מקרו-כלכלית ופיננסית של משק הוא רמת המינוף של הפירמות במגזר הפרטי, כלומר היקף פעילותן הממומן בהתחייבויות שאינן ממקורות עצמיים. עבודה זו בחנה את התפתחות המינוף של חברות בורסאיות בישראל ואת החשיבות היחסית של גורמים רבים המסבירים את רמת המינוף שלהן בשנים 1995 עד 2006. זאת בהתבסס על נתוני דוחות כספיים רבעוניים. נמצא כי:

- החברות הבורסאיות העדיפו למֵמֵן את פעילותן בעיקר באמצעות חוב, והעדפה זו גדלה בעקביות במהלך העשור שהחל באמצע שנות התשעים. כך, המינוף הממוצע של החברות (המוגדר כיחס ההתחייבויות שלהן לנכסיהן המאזניים) גדל מכ-55 אחוזים ב-1995 לכ-65 אחוזים ב-2006.

- החברות הבורסאיות בחרו להגדיל המינוף בעיקר באמצעות הנפקת אג"ח קונצרניות בבורסה לניירות ערך בתל אביב. הרפורמות הפיננסיות, שהואצו מתחילת העשור, טיפחו את התיווך הפיננסי החוץ-בנקאי במתן אשראי למגזר העסקי ותמכו בהגדלתן של הנפקות האג"ח.

- רמת המינוף התאפיינה בשונות משמעותית בין החברות לפי תחומי עיסוקן. למשל: חברות הנדל"ן השתמשו בחוב למימון פעילותן בשיעור גבוה במידה רבה מהממוצע של כל הענפים, והחברות בענפי ההשקעות והמסחר בחרו בשיעור חוב גבוה במקצת מהממוצע.

- תת-קבוצה של עשרה משתנים, מתוך קבוצה של למעלה משלושים משתנים שנבחנו, מצליח להסביר באופן מובהק את השונות ברמת המינוף בין הפירמות. כך, למשל, נמצא כי פירמות שהן יציבות, גדולות וצומחות יותר מאחרות בחרו במינוף גדול יותר, ואילו פירמות בעלות רווחיות תפעולית גדולה נטו לשמור את הרווחים, ובכך להגדיל את מקורותיהן העצמיים ולהקטין את רמת המינוף שלהן.

The level of leverage in quoted companies and its relation to various economic factors

Eddy Azoulay and Ran Shahrabani

Summary

The accepted index of an economy's macroeconomic and financial stability is the extent of leverage among firms in the private sector or, in other words, the scope of activity that is financed by liabilities other than internal sources. This study examines the trend in leverage among publicly-traded companies in Israel for the period 1995–2006 and the relative importance of various factors in explaining it. The data are taken from the quarterly financial statements. The findings are as follows:

- Publicly traded companies preferred to finance their activity through debt and this tendency became more pronounced during the sample period. Thus, average leverage (defined as a firm's ratio of liabilities to balance sheet assets) rose from about 55 percent in 1995 to about 65 percent in 2006.
- Publicly traded companies chose to increase their leverage primarily by issuing bonds on the Tel Aviv Stock Exchange. The financial reforms, whose implementation accelerated at the beginning of the decade, enhanced nonbank financial intermediation in the provision of credit to the business sector and encouraged the growth in bond issues.
- The rate of leverage was characterized by significant variation between firms according to industry. For example, real estate companies used debt to finance their activity to a much greater extent than the average for all industries while investment and commercial companies chose a level of debt that was somewhat higher than average.
- A set of ten variables, out of a group of more than thirty that were chosen, was found to be significant in explaining the variation in rate of leverage between firms. Thus, for example, it was found that larger, more stable and faster-growing firms chose a higher rate of leverage while firms with high operating profit tended to preserve their profit and thus increase their internal sources of financing and reduce their rate of leverage.

1. Introduction

The question of leverage in a company and the factors affecting its level has attracted attention from researchers and policy makers for many years. It is known that a moderate level of leverage has advantages, while a high level of leverage entails risk. Leverage enlarges a firm's financial resources, and contributes to greater activity and faster growth in the long term. Given the resulting payments of interest and principal on the debt, however, a high degree of leverage increases the vulnerability of business sector companies to shocks, such as an unexpected drop in demand and a steep rise in interest rates, and is liable to have a negative impact on their ability to repay their debt.

A high rate of leverage also has significant macroeconomic and system-wide consequences, e.g. greater risk of bankruptcy and higher financing costs resulting in a reduction in investment and contraction of business sector activity. A high level of leverage is liable to aggravate an economic slowdown and aggravate negative shocks. Finally, large debt repayments reduce firms' liquidity and detract from their ability to invest in worthwhile projects, thereby hampering economic recovery. In this study, we examined the factors affecting the leverage level, particularly the risk factors at the level of the firm, the sector, and the economic environment, that explain the leverage level.

Figure 1
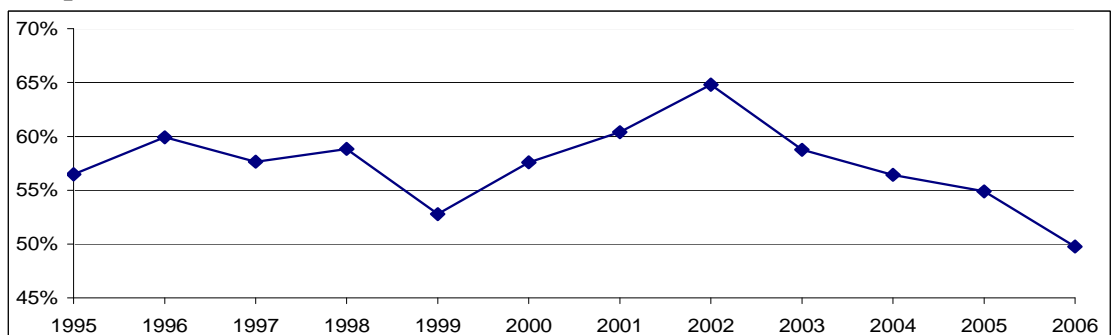**TLA* – Average ratio of Liabilities to Book Value of Assets in Publicly Traded Companies**
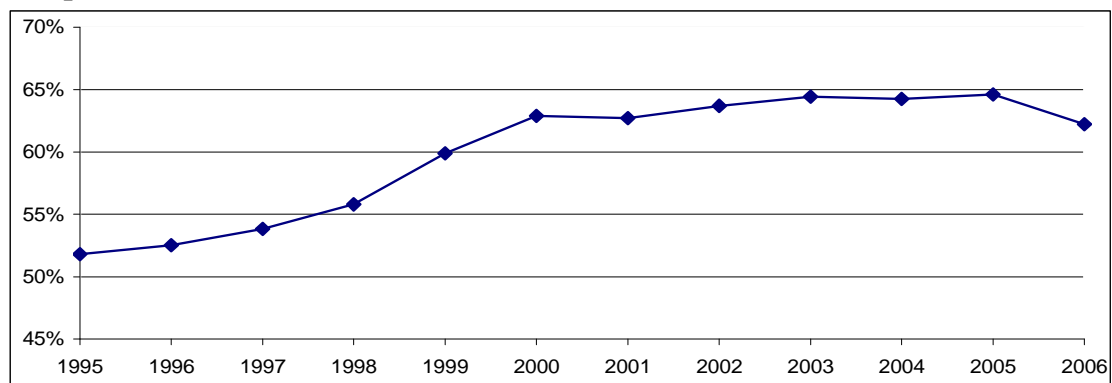
*A broad definition of liabilities that includes current liabilities

TLM* – Average Ratio of Liabilities to Market Value of Assets in Publicly Traded Companies

*A broad definition of liabilities (see the note in TLA) Source: "Ducas"

3

Business companies make decisions about the composition of their financing, in particular the volume of their debt and equity. Companies do not fully control their leverage level, since adjusting it to the desired level entails costs in money and time. Rapid adjustment is usually more expensive than slow adjustment. In the business cycle there are periods in which the cost of adjustment is particularly high. Moreover, it is therefore obvious that the desirable ratio between capital and liabilities is likely to change from time to time. How the composition of the firm's financing changes with its characteristics – characteristics of the individual firm, its sector, and macroeconomic factors – is an open question, both theoretically and empirically. Of the theories of capital structure, the most important are the tradeoff theory, according to which firms weigh the tax savings derived, among other things, from a high ratio of debt financing against the chances of bankruptcy, and the pecking order theory, which holds that financing has a hierarchal structure. Another theory is the market timing theory, according to which the decision to raise capital or debt is derived from the market conditions.

This study is cross-sectional. The figures are taken from the quarterly financial statements and stock exchange data of public companies listed on the TASE in 1994:I-2006:IV. This study contributes to our understanding of the capital structure in a firm and the changes in it in the Israeli context. We first present the theoretical statistics of the possible leverage variables and the factors that affect them. From a long list of potential factors affecting the composition of financing, we then find the most important ones. Leverage is defined as a type of ratio of the liabilities to the value of the assets according to four different definitions – the value of the assets is measured according to book value or market value, and the volume of liabilities is measured according to a narrow definition of liabilities or according to their broad definition – see Figure 1.

The factors affecting the financial structure of a firm belong to several categories, including the firm's profit, its size its growth, the nature of the sector in which it operates, the character of its assets, its taxes, the risk of the firm and its sector, financial risks for the country, the stock market situation, the debt market situation, and the macroeconomic conditions. It is possible that the affect of these factors has changed over time, since the capital market has become more accessible to Israeli firms in recent years, and they are now able to borrow and issue debt and capital more easily, both in Israel and overseas. It may be that this exogenous change has altered the firm's financing composition.

We also test the effect of the factors according to the size of the firm, because it is known that the capital markets are more accessible to large firms than to small ones, and that small firms are less able than large ones to withstand a downturn in the business cycle. Nevertheless, due to data limitations, this study will focus from the beginning on publicly traded companies, since they are usually larger, and benefit from access to the capital market. Finally, we test whether the results match the various theories, and compare the results to those obtained in a similar study of American companies – Frank Goyal (2009).

Out of a group of over 30 variables tested, the study found a subset of 10 variables to be significant in explaining the variance in leverage between companies.

The main core variables found are: *operating profit* – a profitable firm tends to retain its profit, increase its internal resources, and reduce its leverage level; *size of the firm* (according to its assets) – a large and/or veteran company, which usually enjoys easier

4

access to cheap sources of debt, is inclined to increase its leverage level; *growth* – a growing firm features large-scale investment, and such a firm tends to finance its investment plans from sources of debt, thereby increasing its leverage level; *the firm's risk characteristics* – a firm with less stable profits will find it difficult to benefit from tax credits for its debt, and financing through debt will be therefore be more expensive for it, and it will prefer a relatively low leverage rate; *the firm's sector* – for example, real estate companies featured a higher than average leverage level in 1995-2006, while electronics and chemical companies financed their activity at the average leverage level.

The results obtained in this study are on the whole consistent with what is expected under the trade-off theory of capital structure. According to this theory, in setting its optimal leverage level, a company takes into account the trade-off between savings on taxes by financing through debt and the risk of bankruptcy resulting from the need to repay interest and principal on the debt. Some of the results also matched expectations from the pecking order theory, which holds that companies prefer to finance their activity by issuing shares as a last resort, after their ability to raise debt has been exhausted. The study also found that the factors affecting the decision about the leverage level were similar for Israeli and American companies.

2. A Review of the Literature

The study by Modigliani and Miller (1956), the first study in modern financial theory, shows that given certain assumptions, the composition of financing does not affect the market value of a firm. The assumptions are that the investors and the firm have the same access to the capital market, and that whatever leverage is possible for the firm is also possible for the investors, at any level. There are important factors that the Modigliani-Miller Theorem does not take into account, such as taxation, transaction costs, bankruptcy costs, and agency conflict between a manager and a shareholder, a shareholder and a creditor, and between an internal investor and an external investor.

The important theories of capital structure are the tradeoff theory and the pecking order theory,[1] first stated by Myers (1984). There are a number of approaches to the tradeoff theory: the tax-bankruptcy approach holds that there is a tradeoff between equity financing and debt financing. Debt has tax advantages, but increases the likelihood of bankruptcy. The marginal profit from debt decreases, and the marginal cost increases, as the ratio of debt to the balance sheet total increases. The agent approach to the tradeoff theory holds that the need to repay debt disciplines managers, thereby lessening the conflict between the manager and the shareholder. At the same time, debt increases the conflict between a shareholder and a creditor. The stakeholder co-investment approach to the tradeoff theory holds that some firms require specific investments, and need a financing composition that will support this type of investment.

The pecking order theory holds that there is a hierarchy among sources of financing: companies prefer to finance their activity by issuing shares only as a last resort, after their ability to use their internal resources and raise debt has been fully exhausted. Firms do not wish to alter their dividend policy, because such as change gives a negative signal.

---

[1] See Frank and Goyal (2008) for a detailed description of the theories.

Another, less complete, theory is the market timing theory, according to which managers issue debt or raise capital according to the market conditions. There is currently no agreed model that predicts all the stylized facts in this matter; in practice, the theoretical predictions sometimes contradict the stylized facts.

We emphasize that the above-mentioned theories are imperfect; they are approaches that provide general outlines for the effects of the various factors on leverage.

2.1 The Theoretical Predictions

The connection between leverage and profit

According to the tradeoff theory, profitable firms usually enjoy access to cheap sources of financing, and their profits enable them to take better advantage of tax credits. We therefore expect profitable firms to make greater use of debt. Owing to agency considerations, increasing debt is advantageous for profitable firms, because it disciplines managers to use cash flow more efficiently (Jensen, 1986).

At the same time, in new studies based on the dynamic tradeoff theory, it is predicted that a higher profit will reduce debt – for example, in order to reserve the possibility of investing the profit in the future, and because the knowledge that distributing the profit, followed by raising debt, forces the investors to pay tax. In the pecking order theory, higher profit also means that a firm requires less debt, because it will initially choose to use its internal resources, and will therefore have less leverage.

Explanatory factor: profit – the rate of operating profit in the balance sheet

The connection between leverage and the firm's size

The static tradeoff theory (tax-bankruptcy) predicts that both large firms operating in several sectors and veteran firms are at relatively lower risk of bankruptcy,[2] and their financing costs are therefore lower. For this reason, according to this theory, more leverage is expected in large and/or veteran firms.

Large and/or veteran firms are better known, and the agency problem (the problem of asymmetry in information between a shareholder and/or the manager on the one hand and the creditor on the other is less acute, which gives them a motive to assume more leverage.

The prediction of the pecking order theory is usually the opposite of the tradeoff theory prediction: according to the pecking order theory, large and/or veteran firms can issue equity more easily, because there is more information about them, and it is therefore easier for them to issue equity.[3]

---

[2] Both large firms and veteran firms are at less risk of insolvency. This was also found in a study of companies in Israel. See also Shahrabani (2005).

[3] At the same time, the prediction of the pecking order theory is not unequivocal, for example, in a company whose assets do not correspond conventionally to its size. One such case is a relatively small capital-intensive firm, whose volume of assets is large in comparison with its size. It would be useful to also examine the size of the firm according to the number of its employees, but there are no reliable data for this.

Explanatory factors: assets, age – the logarithm of the firm's age

The connection between leverage and growth

The tradeoff theory predicts a negative relationship between growth and leverage. In a state of financial distress, growing firms (firms with a high growth rate) lose more of their market value than firms that are not growing, because some growth, which is an intangible asset, is lost in this situation.

Agency considerations also lead to a negative relationship between leverage and growth. The reason is that firms with risky debt have an incentive to under-invest in projects with a positive value; if the project succeeds, the shareholders will receive only part of the firm's increase in value, because the firm will have to pay off its bondholders. Investing in projects is more important in growing firms, because investment sparks growth. Such firms will therefore avoid under-investment through the use of equity financing, a factor that reduces leverage.

Another agency problem exists in growing firms: it is difficult for creditors to assess risks in projects, and they therefore charge firms an advance premium for this risk. This premium makes raising debt more expensive, and therefore detracts from its viability, a factor that reduces leverage.

The agency problem involving positive cash flow is less severe in growing firms. Debt, which provides a solution for the agency problem of a positive cash flow by enforcing cash flow discipline on managers, is less important in growing firms, because cash flow in these firms is used for investments, a factor that reduces leverage in growing companies.

According to the pecking order theory, since growing firms have more investments than other firms, at a given level of profit, they will also use the second preference – debt, a factor that increases leverage in growing firms.

The ratio of market value to balance sheet value is used as an estimate of the firm's growth. However, if this ratio is due to overpricing in the market, then according to the market timing theory, a high ratio will cause a reduction in leverage and its replacement by equity raising.

Explanatory factors: Mktbk – the ratio of market value to the value of the assets in the balance sheet; ChgAsset – the change in the log of the assets; Capex – the ratio of capital spending to assets.

The connection between leverage and characteristics of the sector

The accepted variables characterizing the sector are the external leverage and external growth in the sector; however, due to the lack of public firms in Israel, we do not use these variables in this study. The only sectorial variable is regulated – a dummy variable for a regulated sector. The regulated sectors are mainly in the communications industry and part of the transportation industry.

In a regulated sector, cash flow is usually stable, and the costs of financing distress are low. At the same time, such a sector also features uncertainty, due to various considerations of the regulator.

According to the tradeoff theory, firms in regulated sectors should usually have more debt. However, because managers in regulated sectors have fewer opportunities for exercising their judgment, the conflict between shareholders and managers is minor, so that enforcing discipline on managers through bonds is less important. This means that the theory does not clearly predict the effect of regulation in a sector on the degree of leverage.

The pecking order theory does not predict the effect of regulation in a sector on the degree of leverage.

Explanatory factor: regulated

The connection between leverage and the character of the assets

According to the tradeoff theory, a company's tangible assets enable bondholders outside the company to evaluate it more easily. They can serve as guarantees, and it is also more difficult to change their character – to make them more risky. The problem of information between the firm's owners and its bondholders therefore becomes less acute. Therefore, according to the agency considerations, firms whose tangible assets have a high balance sheet value will tend towards leverage. In contrast, firms belonging to sectors that employ special manpower, whose managers have greater discretion with respect to expenses, or which have R&D expenses, or whose management and general expenses are high in comparison with sales, which are equivalent to a large number of intangible assets, will tend to have less leverage.

According to the stakeholder co-investment approach to the tradeoff theory, special firms – firms employing special manpower, for example in high tech sectors and/or which feature large R&D expenses and/or sales and general expenses – have higher financial distress costs (probabilities), and will therefore raise less debt (Titman, 1984).

According to the pecking order theory, since tangible assets also reduce asymmetry in information between the manager and the external shareholders, they cut the costs of equity issues, compared to those of bond issues. Firms with many tangible assets should therefore have more equity, i.e. less leverage.

The revenues of export-oriented firms are usually more stable (because such firms do not depend exclusively on the domestic market). According to the tradeoff theory, stable revenues in firms with diverse markets reduce financial distress costs, thereby increasing leverage.

Explanatory factors: tangibility – the ratio of tangible assets to the balance sheet total; R&D – the ratio of R&D spending to sales; unique – a dummy variable for firms in high tech sectors; SGA – the ratio of management and general expenses to sales; IZU – receives the value 1 when exports account for more than 10 percent of revenues

The connection between leverage and taxes

High taxes boost the advantages of debt for a company. The tradeoff theory predicts that high taxes will motivate the firm to increase its leverage, thereby obtaining more tax credits. The tradeoff theory predicts that that tax credits that are not debt – depreciation of assets, for example – will decrease leverage, being a substitute for tax credit from debt.

The tax reform put into effect in Israel in 2004 increased the tax for individuals on both capital gains and interest income, thereby making a distribution of profits (equity) relatively more worthwhile, because these were already taxable, and consequently increasing leverage.

Explanatory factors: Depr – the ratio of a drop in the value of assets to total assets; DT03 – a dummy variable starting in 2003 for the tax reform

The connection between leverage and miscellaneous risks

The difference in yield between Israel government bonds and US government bonds reflects the financial risk for the state of Israel. When the risk rises, the cost of raising debt also usually rises, which reduces leverage.

Explanatory factors: Israel Premium – the difference in yield between US government bonds and Israel government bonds

The connection between leverage and corporate risk

Risky firms, whose cash flow is unstable, are less able to use tax credits, and their financial distress costs are therefore relatively high. Consequently, according to the tradeoff theory, they will reduce their leverage. Risk also has a negative impact on cooperation between parties at interest in a company – a firm's owners and bondholders, for example – and therefore, according to the stakeholder co-investment approach, the risk will lead to less debt.

According to the pecking order theory, risky firms suffer from negative selection, due to asymmetry of information. The premium required by external shareholders on equity is therefore very high, compared with the premium on an issue of debt. It therefore follows that such firms will have very high leverage.

The Wmahzor – turnover in thousands of NIS per share – does not directly affect leverage; it corrects distortions in the variance of the market value of the assets caused by light trading in the share on the stock exchange. Light trading in the share may increase or decrease the variance of the daily return on the company's assets (see Appendix 1, Description of the Data, for details).

Affiliated is a variable that receives the value 1 if the company is affiliated with a business group – a situation known to have a financial effect: such companies have a negative premium on the market value of their assets, which increases leverage according to the market value of the assets (see Kosenko – 2008). On the one hand, an affiliated company is riskier, because the decisions of its managers may maximize the interests of

the group as a whole rather than its own interests.[4] On the other hand, there are also other considerations: when a company is affiliated with a group, the group serves as a safety cushion for the company, which reduces the cost of financial distress, and therefore increases leverage. Furthermore, the group's bargaining power in raising credit exceeds that of a single company, which cuts the cost of raising credit, and therefore increases leverage.

Explanatory factors: StockVar (ASVar) – variance in the market value of the assets is calculated as the daily rate of return on assets;[5] Wmahzor – the turnover in thousands of NIS in 2005 prices; VABS – the absolute sectorial variance; VRELATIVE – the relative sectorial variance; Affiliated – a dummy variable for a company affiliated with a business group.

The connection between leverage and the stock market situation

Welch (2004) found empirically that firms do not balance their leverage according to changes in their share price. The return on their share is therefore very important: a rise in the market value of the firm reduces the leverage (market definition). According to the static tradeoff theory, the drop in leverage, according to the assets' market value, will be exploited to increase debt raising, causing an increase in leverage, as defined according to the assets' book value. Similarly, the market timing theory assumes that a manager will time the equity issue to take advantage of an incorrect pricing of the company. An improvement is also possible, i.e. a drop in the level of negative selection stemming from the stock market situation, as utilized for an equity issue.

Explanatory factor: Ret – the quarterly rate of return of the general shares index, net of inflation.

The connection between leverage and the debt market situation

The value of tax savings at each level of debt usually rises when inflation expectations are high – because financing expenses are higher in this case. This is not the case in Israel. During every period in Israel researched in this study,[6] reporting for tax purposes was adjusted for inflation, thereby avoiding financing expenses aimed at financing an inflationary rise in the value of the assets.[7] Starting at the beginning of 2003, due to the transition from financial reporting adjusted for inflation to financing reporting on a nominal basis, financing expenses also include expenses for inflation. Inflation expectations therefore lower the financial profit. Owing to the implementation of the

---

[4] This study does not evaluate the tendency towards financial difficulties in firms affiliated with a business group, in comparison with others. If the connection is positive, then according to the agent approach to the tradeoff theory, the cost of financial distress for these firms will be higher, and they will therefore use less debt.

[5] The variance of the share depends on the leverage; more leverage means a higher variance. The variance of a share is an endogenous variable – the leverage also determines it. We will therefore switch to the variance of the assets' market value.

[6] Actually, up until the beginning of 2008.

[7] Unlike financing through capital, financing through debt generates an expense for tax purposes. In order to prevent this discrimination, compensation is granted under the Income Tax Law – Inflationary Adjustments for financing through capital, in comparison with debt financing.

Income Tax Law – Inflationary Adjustments until the beginning of 2008, however, the inflation expectations do not alter the liability for tax purposes. For the purpose of reporting a high profit in the balance sheet, we therefore expect inflation expectations to reduce the demand for bonds, i.e. to reduce leverage, starting in 2003.

This situation differs substantially from the situation in the US, where inflation increases financing expenses, thereby lowering tax liability and decreasing the accounting profit. The consideration of expected tax savings if positive inflation expectations are fulfilled usually overcomes the consideration of reporting a profit in the financial statements. In the US, when high inflation is expected, companies will therefore issue more bonds. In other words, inflation expectations increase leverage.

According to the market timing theory, a positive connection between inflation expectations and leverage can probably be expected, both in the US and in Israel. This theory assumes that the company's managers will issue unlinked bonds when relatively high inflation is expected, in comparison with the interest rate. At the same time, when inflation expectations are high, the required yield for bonds is also expected to be high.

The term spread constitutes a signal of the economy's future performance. When the term spread is high, rapid growth is expected. The theory will therefore predict its behavior in the context of expected growth. The tradeoff theory predicts that growth boosts leverage, while the pecking order theory predicts that high growth lowers leverage (see the section on the connection between growth and macroeconomic variables).

Real Y5, Y10: the yield to maturity for five and 10 years. When the cost of raising debt is high, the use of equity will increase, and leverage will therefore be low.

Explanatory factors: TermSprd – the long-term interest rate minus the short-term interest rate; InflationExp – inflation expectations; Real 10Y and Real 5Y – the return according to the zero curve for 10 and five years, respectively.

The connection between leverage and macroeconomic variables

In periods of growth, the costs of bankruptcy are small, taxable income rises, the volume of cash is up, and so are guarantees, which tend to be pro-business cycle. Consequently, according to the static tradeoff theory, in a boom, first will increase their leverage, i.e. leverage is pro-business cycle.

On the other hand, according to agency considerations, problems of asymmetry in information are more severe in a recession, because the wealth of a manager in a firm drops by more than the wealth of investors at such a time. Since debt reconciles the manager's incentives with the shareholders' goals, leverage should be anti-cyclical – it should grow in a recession.

According to the pecking order theory, leverage should drop in a boom, because when all other things are equal, we assume that the funds' profits and surpluses increase during this period, and can also be used for investments, while less debt is issued.

Explanatory factors: MacroProf – a rise in after-tax profits; MacroGr – a rise in GDP; DTW – an increase in fixed prices in the annual volume of global trade; DYUS – the quarterly increase in US GDP in fixed SA prices.

For a summary of the predictions of the various theories, see Table 1.

2.2 The Empirical Literature Around the World and in Israel

A number of attempts were made in the US to test the factors in a firm's leverage: Frank and Goyal (2009), Strebulaev (1995), Rajan and Zingales (2007). These studies relied on data from companies listed on stock exchanges. Like Frank and Goyal (2009), our study examines which of the possible factors in leverage is the most important, and the degree of fitness of the various leverage theories, for companies listed on the Tel Aviv Stock Exchange. In contrast, Strebulaev (2007) focuses mainly on an assessment of the dynamic tradeoff theory.

In contrast to our study, which evaluates the factors explaining leverage, Ruthenberg and Hecht (2006), like Wittenberg (2001), examined the factors affecting the volume of credit for a firm and the credit risk in Israeli banking. They created a sample of 159 public companies, based on cross-checking between the information in the quarterly financial statements ("Ducas" database) and information about the volume and quality of credit that companies received from the banking system (a database of large borrowers supervised by the Bank of Israel Banking Supervision Department). The explanatory variables included the business cycle and variables of the firm, such as bonds, equity, and financial ratios. They found that larger firms were more stable, had higher returns on assets (profits) and more cash flow from current activities (liquidity), a lower ratio of debt to assets (leverage), and a higher ratio of sales to assets (activity).

Like this study, Nagar (2009) evaluated the effects of various factors on the financial strength of firms, using the same database of listed Israeli companies in a similar period, where the dependent variable is the aggregate problem debt of the banks. The explanatory factors were from two groups: factors of the business sector – company factors at the aggregate level – such as profit, leverage, and the financial ratios – and macro factors. This contrasts with the current study, in which leverage is the dependent variable. Nagar found that operating profit was a key factor in explaining the banks' problem debt, while various financial ratios, including leverage, explain a smaller proportion of the fluctuation in the firm's financial strength.

Table 1: The Factors Affecting Leverage According to the Various Theories

		Tradeoff				Pecking Order	Market Timing
		Static- Tax Bankruptcy	Dynamic	Agency Considerations	Stakeholder Co-Investment		
Profit	Profit	+	-	+		-	
Size of the firm	Assets – Log of the assets	+		+		Usually	
	Age –Log of the Firm's Age	+		+		-	
Growth	Mktbk – ratio of market value to balance sheet assets value	-		-		+	-
	ChgAsset – change in log of assets	-		-		+	
	Capex – ratio of capital spending to assets	-		-		+	
Sector character	Regulated – dummy variable for a regulated industry	Not unequivocal					
Assets character	Tang – tangible assets			+		-	
	R&D – ratio of R&D spending to sales			-	-	+	
	Unique – dummy variable for firms in high tech sectors			-	-	+	
	SGA – ratio of sales management and general expenses to sales			-	-	+	
	IZU – Value 1 for companies whose exports are over 10 percent of sales.	+					
Taxes	TaxRate – corporate tax rate	+					
	Depr – ratio of depreciation in asset value to total assets	-					
	DT03 – dummy variable starting in 2003 for tax reform	+					
Country risk	Israel Premium – the spread between Israeli and American bonds	-					
Company risk	StockVar (ASVar) – variance in daily return on assets	-			-	+	
	Wmahzor – turnover in 000s NIS in 2005 prices						
	VABS – absolute sector variance	-			-	+	
	VRELATIVE– relative sector variance	-			-	+	
	Affiliated – company affiliated with business group	Not unequivocal			Not unequivocal		
Stock market	Ret – overall quarterly rate of return net of inflation	- According to market definition; + according to book value					-
Debt market situation	TermSprd – long-term interest minus short-term interest	+				-	
	InflationExp – inflation expectations	- after 2002					Usually +
	Real 10Y – real return according to 0 curve for 10 years	-					
	Real 5Y – real return according to 0 curve for 5 years	-					
	Real Exchange – real exchange rate						
Macro Economic conditions	MacroProf – rise in after-tax profit	+		-		-	
	MacroGr – rise in GDP	+		-		-	
	DTW – annual rise in global trade volume in fixed prices	+		-		-	
	DYUS – quarterly rise in US GDP in fixed prices	+		-		-	

3. Estimation Data and Results

3.1 Description of the Data

The database contains quarterly data for 1994-2006 for companies listed on the Tel Aviv Stock Exchange (TASE).[8] The explanatory factors according to the theories and the leverage variables were produced mainly from the "Ducas" system in operation until the beginning of 2008. Figures that are not financial ratios were measured in 2005 shekels. Figures for the return on shares were obtained from the stock exchange database at FAME at the Bank of Israel. The data are listed in Appendix 1 – Description of the Data in the Model.

We want to analyze the degree of leverage of companies that are not in the financial sector, because banks, insurance companies, and other financial institutions are subject to regulation concerning their capital structure. We therefore removed them from the population of companies for the study.

The sector to which a firm belongs has a major influence on leverage; consequently, sectorial variables like the median leverage in a sector and the median growth in a sector – the median of change in the log of the assets (in each quarter) - have a very large and significant effect in explaining leverage. However, due to the relatively small number of companies in our study – only 692 active companies, compared with thousands of companies in studies conducted in the US, i.e. Frank and Goyal (2009) – we were obliged to forego the use of these sectorial variables. Instead, we used different constants for different sectors.

3.1.1 Definition of Leverage

There are several possible ways to define leverage. All of them contain a kind of ratio of the value of liabilities to the value of assets. The most important difference between the definitions is in the value according to which assets are measured – according to book value or according to market value. There are narrow definitions, in which liabilities do not include various liabilities, for example a definition that includes only long-term debt, and there are more inclusive definitions.

Each definition of leverage, whether according to the market value of assets or according to their book value, has advantages and disadvantages. Myers (1977) asserted that the value according to the market value varies according to the situation of the financial markets, and might be unreliable. If we believe that debt is supported by assets, the definition according to book value is more suitable, and if we believe that debt is supported by a firm's growth possibilities, the definition according to the market value of assets is more suitable (Barclay, Morellec, and Smith, 2006). The first studies valued assets according to their book value, because they thought that the market value was volatile, and might be a poorer reflection of the firm's policy. In later studies, on the

---

[8] The study cannot be continued for 2007 and 2008, since the new accounting standard (International Financial Reporting Standards – IFRS) that went into effect in 2007 greatly changed the definition of accounting profit. As we will see later, because of considerations of control of the data, we add a year to the database only if all four quarters exist in the system.

other hand, such as Welch (2004), it is asserted that the book value is a plug number, and is irrelevant from a company management perspective.

Rajan Zingales (1995) defined two alternatives for debt in leverage. The first definition is more inclusive – the ratio of non-capital liabilities to assets, a definition that we shall call "the definition according to the market value" (total liabilities market – TLM), and according to the book value of assets (TLA), a definition that also includes current liabilities used for current transactions, and which therefore overestimates leverage. It is not a good indication of whether a firm is at risk in the short term; it relates to the question of whether a firm is at risk beyond the short term. The second definition we chose, TDM and TDA (according to the market value and the book value, respectively), includes both long-term and short-term debt, but it does not include liabilities in respect of current transactions, such as credit from suppliers. This definition fails if there is substitution between liabilities such as credit from suppliers and non-debt liabilities, and also in cases of various accounting manipulations.[9] Substitution and manipulations are possible because a large proportion of liabilities are not debt – on the average for all the years and all the companies in the database, 43 percent of liabilities are not debt.[10] Since this definition (TDM, TDA) is the accepted definition in the literature, however, we decided to use it.

The definitions of leverage according to market value (TDM, TDA) are not precise. It would have been desirable in these definitions to record debt by its market value, as is done with equity. Since we lack comprehensive data for the market value of debt, however (corporate bonds), because only a small minority of the companies listed on the stock exchange has marketable bonds, the debt is included at its book value. We assume that the market value of debt is like the book value. This assumption is questionable, especially in recessions, in which the market value of debt can be significantly different from its book value.

3.1.2 Handling of Data for Estimation

Of some 26,700 potential observations in sectors that do not include financial companies, about 21,000 observations remain for estimation. Observations were omitted because of extreme values (for example, negative capital, quarterly values that did not match the summary in the annual report) and unreasonable values (for example, negative sales, missing information, and very small companies according to the asset book value). Companies that did not file an annual report were also omitted. Logical tests were performed on the information. See Appendix 2 for a list or the rules for accepting a company for estimation.

---

[9] There are other definitions of leverage that take into account only long-term loans, but we decided against using them.

[10] See Welch (2007) for further discussion indicating the problem with the TDA definition and advocating use of the TLA definition.

3.1.3 Theoretical Statistics

Table 2 displays theoretical statistics of the variables. It can be seen that leverage grows with the size of a company. The rates of leverage in Israel are similar to those in the US (where they are slightly higher), and profit margins in Israel are similar to those in the US (the comparison with the US is according to Frank and Goyal, 2009).

The ratio of leverage according to balance sheet total has increased over time, while the ratio of leverage according to market value had no trend. We see that according to all the definitions, leverage according to market value has lower variance than leverage according to balance sheet value.

Table 3 displays the correlations between leverage and the explanatory variables. We also divided the sample into four periods: 1994-1996, 1997-1999, 2000-2002, and 2003-2006, and again examined the correlations for the variables. Every + or – denotes a positive or negative correlation, respectively. For example, the correlation of TLA with R&D was negative in all the periods, other than for 1997-1999, and we therefore write [-+--]. The variables Unique and Profit were negatively correlated with all of the leverage variables in all of the sub-periods.

Table 2: Description of the Data
A Description of the Leverage Variables and the Explanatory Variables

	Dimensions of Observation (Time, Firm, Sector)	N*	Average	SD	Probability Distribution Quantile		
					10	50	90
Leverage Variables							
TLA	Time, firm	20957	0.559	0.229	0.229	0.580	0.851
TLM	Time, firm	20957	0.554	0.240	0.205	0.580	0.856
TDM	Time, firm	19742	0.310	0.239	0.007	0.281	0.664
TDA	Time, firm	19742	0.312	0.237	0.007	0.284	0.659
Profit Variables							
Profit	Time, firm	16601	0.017	0.028	-0.009	0.016	0.047
Size of Firm							
Asset	Time, firm	20959	0.008	0.026	0.00055	0.00196	0.0138
Age	Time, firm	20954	1.345	0.300	0.954	1.380	1.693
Growth Variables							
Mktbk	Time, firm	20959	1.098	0.479	0.722	0.993	1.536
ChgAsset	Time, firm	9328	0.011	0.152	-0.071	-0.004	0.087
Capex	Time, firm	16090	0.016	0.054	-0.016	0.010	0.058
Sector Characteristics							
Regultd	Time, sector	Dummy for Sector	0.019	0.135	0.000	0.000	0.000
Assets Characteristics							
Tang	Time, firm	20740	0.299	0.244	0.028	0.247	0.683
R&D	Time, firm	20957	0.010	0.025	0.000	0.000	0.045
Unique	Time, sector	Dummy for Sector	0.216	0.411	0.000	0.000	1.000
SGA	Time, firm	20816	0.223	0.157	0.069	0.179	0.458
IZU	Time, firm – receives values between 0 and 1	20957	0.168	0.305	0.000	0.000	0.782
Taxes							
TaxRate	Time dimension only	52	0.349	0.021	0.311	0.360	0.360
Depr	Time, firm	20957	0.006	0.008	0.000	0.004	0.012
DT03	Time dimension only	Dummy	0.275	0.446	0.000	0.000	1.000
Miscellaneous Risks							
ISR_Prem	Time dimension only	52	122.779	40.730	74.000	113.333	186.967
Company Risk							
ASVar	Time, firm	19968	0.042	0.042	0.007	0.030	0.090
Wmahzor	Time, firm	20213	528.410	3368.382	2.988	28.797	634.406
VABS	Time, sector	312	0.114	0.064	0.050	0.100	0.197
VRELATIVE	Time, sector	312	1.181	0.489	0.654	1.089	1.700
Affiliated	Time, firm (from 1995 only)	19126	0.133	0.339	0.000	0.000	1.000
Stock Market Situation							
Ret	Time	52	0.018	0.119	-0.134	0.032	0.145
Debt Market Situation							
TSpread	Time	52	-0.002	0.008	-0.014	-0.001	0.010
Infexp	Time	52	0.049	0.036	0.012	0.035	0.104
Real10Y	Time	52	4.478	0.690	3.573	4.450	5.337
Real5Y	Time	52	4.421	0.957	3.147	4.310	5.720
Real exchange	Time	52	1.888	0.195	1.639	1.868	2.159
Macro-Economic Conditions							
MacroProf	Time	52	0.052	0.077	-0.028	0.048	0.170
MacroGr_BS	Time	52	0.011	0.033	-0.034	0.012	0.054
DWT	Time	52	0.018	0.008	0.009	0.019	0.026
DYUS	Time	52	0.008	0.005	0.003	0.007	0.015
DTIME	Time	52	27.345	15.033	7.000	27.000	49.000

* N – The number of independent observations.

** The dimensions of the observations are time, firm, and sector. A variable with only the time dimension (a macro variable) will vary according to this dimension, independently of the firm or sector. A variable with a time and firm dimension (unique variables for the firm) will vary according to these two dimensions. A variable with a time and sector dimension will vary according to these dimensions, independently of the firm.

Table 3: Correlations

Correlations	TLA	TLM	TDM	TDA
Profit	-0.096	-0.182	-0.168	-0.135
	[----]	[----]	[----]	[----]
Asset	0.321	0.231	0.285	0.321
	[++++]	[++++]	[++++]	[++++]
Age	0.085	0.087	0.063	0.060
	[++++]	[++++]	[++++]	[--++]
Mktbk	-0.012	-0.430	-0.249	-0.077
	[++--]	[----]	[----]	[+---]
ChgAsset	0.076	0.028	0.019	0.040
	[++++]	[++++]	[++++]	[++++]
Capex	0.042	-0.008	0.041	0.070
	[++++]	[-+--]	[++++]	[++++]
Regultd	0.056	-0.016	-0.010	0.036
	[+-++]	[+--]	[+---]	[++++]
Tang	0.129	0.163	0.254	0.246
	[++++]	[++++]	[++++]	[++++]
R&D	-0.230	-0.309	-0.269	-0.236
	[-+--]	[----]	[----]	[----]
Unique	-0.205	-0.283	-0.339	-0.308
	[----]	[----]	[----]	[----]
SGA	-0.178	-0.205	-0.115	-0.096
	[-+--]	[----]	[----]	[+---]
IZU	-0.179	-0.226	-0.232	-0.212
	[-+--]	[----]	[----]	[----]
Tax	-0.138	0.008	-0.020	-0.087
	[-+-+]	[-+-+]	[-+-+]	[-+-+]
Depr	0.023	0.044	0.018	0.014
	[+-++]	[+-++]	[+-++]	[-+++]
DT03	0.141	-0.019	0.016	0.089
	-	-	--	-
ISR_Prem	0.007	0.006	0.010	0.010
	[+++-]	[+++-]	[+++-]	[+++-]
ASVar	-0.479	-0.547	-0.458	-0.422
	[-+--]	[----]	[----]	[----]
Wmahzor	-0.010	-0.110	-0.068	-0.017
	[++--]	[----]	[----]	[----]
VABS	-0.087	-0.074	-0.059	-0.064
	[-+-+]	[---+]	[+--+]	[+--+]
VRELATIVE	-0.042	-0.033	-0.023	-0.022
	[++-+]	[+--+]	[+--+]	[+--+]
Affiliated	0.129	0.071	0.094	0.118
	[+-++]	[++++]	[++++]	[++++]
Ret	0.047	0.000	0.010	0.030
	[++--]	[+--+]	[+--+]	[++--]
TSpread	0.039	-0.009	0.001	0.025
	[-+++]	[-++-]	[--+-]	[--++]
Infexp	-0.193	-0.003	-0.048	-0.133
	[+-+-]	[++++]	[+-++]	[+-++]
Real10Y	0.069	0.122	0.081	0.054
	[+++-]	[++-+]	[++-+]	[++-+]
Real5Y	0.031	0.085	0.054	0.026
	[++--]	[++-+]	[++-+]	[++-+]
Real exchange	0.183	0.000	0.043	0.126
	[-+++]	[--+-]	[-++-]	[-+++]
MacroProf	0.073	-0.054	-0.012	0.045
	[-+--]	[-+-+]	[-+-+]	[-+-+]
MacroGr_BS	-0.011	-0.035	-0.021	-0.009
	[+++-]	[----]	[---+]	[++-+]
DWT	-0.034	-0.091	-0.059	-0.033
	[---+]	[+---]	[+---]	[----]
DYUS	-0.058	-0.038	-0.035	-0.045
	[-+++]	[---+]	[---+]	[++++]
DTIME	0.206	0.027	0.058	0.138
	[++++]	[++-+]	[+++-]	[++-+]

The period of the study from 1994 until 2006, was divided into four sub-periods: 1994-1996, 1997-1999, 2000-2002, and 2003-2006. '+' denotes a positive correlation, and '-' denotes a negative correlation in the same periods. The leftmost sign represents the first period.

The variables Tang, ChgAsset, and Asset are positively correlated with all the leverage variables in each of the sub-periods. The variables DWT, Wmahzor, Mktbk, IZU, and SGA are usually negatively correlated. The variables Affiliated, DTIME, Capex and ISR_Prem are usually positively correlated. In most cases, variables with consistent correlations between the periods were also significant in the regression.

3.2 Estimation

The basic model is $L_{it} = \alpha + \beta F_{it-1} + \varepsilon_{it}$, where L represents the leverage of firm i at time t, and F is a vector of explanatory variables. In one version, the explanatory variables are at a one-quarter lag, and in a second version, they are at an average lag of *t-1* and *t-2*. The use of explanatory variables at a lag corresponds to the meaning of leverage, because if leverage is endogenous, it is determined on the basis of factors that were valid one or two quarters earlier.

We assume that the influence of the variables on leverage is linear, even though there are levels of leverage at which the changes in it can be non-linear, for example, at very low levels, when leverage is close to 0 – or very high levels, when it is close to 1. We note that in studies all over the world – to the best of our knowledge – the model for researching leverage is linear.

3.2.1 The Econometric Method

This data panel includes many firms, about 700, and covers many periods – 52 quarters, where the estimation is in the pool.[11] In such a panel, as in many of the panels used for estimation of financial data, the residuals are dependent, and estimation using OLS is therefore undesirable. There are two types of correlations between the residuals in the estimation: a. the firm effect – the residuals of a given firm are correlated over the periods, i.e. there is dependence between the periods [$\text{Cov}(X_{it}\varepsilon_{it}, X_{it-k}\varepsilon_{it-k})$ does not equal 0], and b. the time effect – for a given period, the correlation between the residuals of firms [$\text{Cov}(X_{it}\varepsilon_{it}, X_{kt}\varepsilon_{kt})$ does not equal 0]. Estimating using OLS simply assumes an absence of correlation between the residuals, both between the periods and between the firms. If there are correlations, however, the *t* values for the estimates will be incorrect, and in particular, the confidence intervals can be rather small. In such financial studies, it is therefore better to use a method that eliminates the clusters error problem. Pearson (2009) recommends using the clustered standard error method, since this method is the only one that corrects the estimates for stand deviations when there are two types of correlations between the residuals. Pearson (2009) found that under certain conditions, when there are enough clusters, the variance in the estimates is unbiased. This method is robust for a different variance (Pearson, 2009).

---

[11] In this study, we are interested not in the differences between specific firms (fixed effect), but in the differences between sectors (financial services, textiles, electronics, construction, chemicals, etc.), and in those resulting from the size of the company. In order to evaluate the differences resulting from the character of the sector, we estimated the constants of the various sectors. Since we are not interested in the specific time trend for a firm, we also did not estimate the random effect, and we therefore do not know what changes took place in specific firm's situation over time. We use a time variable, *t*, which is designed to reflect the time trend common to all the firms.

Other solutions are incomplete: the most accepted solution is the Fama-MacBeth standard errors procedure (Fama-MacBeth, 1973). This method is suitable only when there is a time effect; as with the White and Newey-West methods, it is suited to the panel data and the clusters only in the time dimension. The estimates for the standard deviations are biased when a firm effect exists.

We chose to estimate the clusters in two dimensions, but we could have added a dummy variable for each period, making 52 dummy variables, and then used the Fama-Macbeth estimation method or clusters in the time dimension only, which assumes that there are correlations only between firms.[12]

In evaluating the standard deviations for the OLS estimates, in comparison with the cluster in the time dimension only, the cluster in the firm dimension only, and the cluster in two dimensions, we see that the standard deviations in OLS are significantly lower than in each of the clusters estimations. It can therefore be concluded that the residuals are dependent in both the time dimension and the firm dimension. See Table 3.

3.2.2 The Variable Selection Process

Table 4.1 in Appendix 4 displays the results of the basic regressions, including many explanatory factors – before the variable selection process. Eight regressions are displayed, the result of four different definitions of leverage variables, multiplied by two different definitions of lag (t-1 and the average of the lags at t-1 and t-2). In order to test which variables contribute to the explanatory power of the regressions, we used a process of selection among the factors in two methods – according to T-Sta and according to the Bayesian information criterion (BIC).

The process of selecting the most important explanatory factors:

1. **The T-Sta criterion**: We ran a regression with all the explanatory variables. We removed the estimate with the lowest T-Sta, providing that it was not significant, and ran it again. If all the estimates were found to be significant, we were finished; if at least one estimate was not significant according to the T-Sta, we removed it and ran the regression again. We checked this procedure for eight different definitions of the model: four different definitions of the dependent variable, multiplied by two different definitions of the lags. The disadvantage of this method is that the number of significant variables is very high. The ASVar, Capex, and Profit factors passed the selection process in each of the eight regressions. The results are set forth in the table in Appendix 4.2.

2. **The BIC criterion**: Accepted criteria for selection of the explanatory variables are Akaike (AIC) and the Bayesian criterion (BIC). In both criteria, it is best to keep the number of explanatory factors as low as possible. We used only the BIC criterion. In the first stage, we used the BIC criterion as follows: we ran a regression with all the explanatory variables, removed the least significant estimate, and ran it again. We repeated this process until we were left with a single explanatory variable. For each of the regressions, the BIC value was also recorded. The selected regression was the one

---

[12] Cluster by firm eliminates the firm effect, and cluster by time eliminates the time effect.

with the best (lowest) BIC value. Every factor included in this regression passed the selection process. For a detailed description of the selection process, see Appendix 4.2. We checked this procedure on the eight definitions of the model – four different definitions of the dependent variable, multiplied by two different definitions of the lags. The ASVar factor passed the selection process in all eight regressions, and the Capex factor passed six times. Factors that passed the BIC selection usually also passed the T-Sta selection process. Factors particular to a firm influenced leverage more than macroeconomic factors. The results are set forth in Appendix 4.3.

Table 4.1: Summary of Factors that Passed the Selection Process According to the T-Sta Criterion (in bold)

Leverage Variables	Lag1_tlm Coef Est.	Lag1_tlm t-Stat	Lag1_tla Coef Est.	Lag1_tla t-Stat	Lag1_tda Coef Est.	Lag1_tda t-Stat	Lag1_tdm Coef Est.	Lag1_tdm t-Stat	Ma_tim Coef Est.	Ma_tim t-Stat	Ma_tla Coef Est.	Ma_tla t-Stat	Ma_tda Coef Est.	Ma_tda t-Stat	Ma_tdm Coef Est.	Ma_tdm t-Stat
Intercept	**0.108**	**0.54**	**0.554**	**18.28**	**0.230**	**7.46**			**0.508**	**3.64**	**0.655**	**18.06**	**0.258**	**8.73**	**-0.541**	**-2.42**
Profit Variables																
Profit	**-2.153**	**-12.48**	**-1.631**	**-10.25**	**-1.171**	**-7.21**	**-1.254**	**-6.84**	**-2.643**	**-12.60**	**-2.101**	**-9.86**	**-1.564**	**-8.13**	**-1.471**	**-6.79**
Size of Firm																
Asset	**0.811**	**3.55**	**1.054**	**3.62**	**0.901**	**3.64**	**0.871**	**4.15**	**0.445**	**1.90**	**0.917**	**3.15**	**0.732**	**3.02**		
Age[1]									-0.034	-1.81	-0.036	-2.00				
Growth Variables																
Mktbk	**-0.095**	**-7.11**	**0.090**	**4.42**	**0.053**	**3.34**			**-0.054**	**-3.77**	**0.123**	**5.46**	**0.080**	**4.49**		
ChgAsset	**0.082**	**4.07**	**0.099**	**5.08**	**0.048**	**1.94**			**0.118**	**3.44**	**0.153**	**4.25**	**0.076**	**2.06**		
Capex	**0.145**	**3.24**	**0.191**	**4.27**	**0.330**	**6.03**	**0.304**	**5.71**	**0.394**	**5.21**	**0.414**	**5.07**	**0.675**	**6.93**	**0.744**	**7.50**
Sector Chrctrtcs																
Regultd																
Assets																
Tang			0.111	3.60	0.099	3.46							0.105	3.53		
R&D	**-0.956**	**-4.28**	**-0.657**	**-2.50**	**-0.391**	**-1.86**	**-0.619**	**-3.16**	**-0.635**	**-2.70**	**-0.531**	**-1.94**				
Unique					-0.037	-2.22	-0.046	-2.95					-0.047	-3.32	-0.088	-6.46
SGA	-0.180	-4.99	-0.156	-4.29					-0.179	-4.83	-0.135	-3.57				
IZU																
Taxes																
Tax	1.807	3.40					1.784	3.90	1.461	3.80					2.683	4.35
Depr	**3.108**	**5.49**	**2.046**	**3.74**	**1.607**	**2.10**			**2.802**	**5.52**	**2.302**	**4.50**	**1.729**	**2.33**		
DT03																
Miscell-aneous Risks																
ISR_Prem									**0.000**	**-2.59**						
Company Risk																
ASVar	**-2.237**	**-8.13**	**-2.573**	**-11.90**	**-2.045**	**-11.23**	**-1.774**	**-7.36**	**-3.628**	**-11.66**	**-3.694**	**-13.30**	**-2.957**	**-12.92**	**-2.591**	**-8.86**
Wmahzor	0.000	-4.64	0.000	-4.12	0.000	-3.65	0.000	-4.62	0.000	-4.13	0.000	-4.06	0.000	-3.64		
VABS			0.159	3.52	0.121	3.80			0.169	2.93	0.244	4.16	0.227	5.35		
VRELATIVE			-0.017	-3.27	-0.012	-2.37					-0.022	-3.05	-0.018	-2.41		
Affiliated			0.041	3.39	0.039	2.69			0.023	1.87	0.040	3.41	0.036	2.40		
Stock Market Situation																
Ret																
Debt Market Situation																
Spread									1.514	3.21			1.001	2.66		
Infexp			**-0.469**	**-2.88**	**-0.323**	**-2.07**			**-1.121**	**-5.28**	**-0.652**	**-5.10**	**-0.579**	**-4.98**	**-0.621**	**-4.67**
Real10Y									-0.017	-1.99						
Real5Y													0.005	1.74		
Real exchange																
Macro-Economic Conditions																
MacroProf									0.228	2.70						
MacroGr_BS																
DWT									1.167	2.08					1.328	3.41
DYUS					-0.579	-1.77			-3.574	-3.44						
DTIME	0.001	2.11	0.001	2.07	0.001	2.67	0.002	3.82								
			BIC = 58795		BIC = 58614		BIC = 64589		BIC = 50213		BIC = 54909		BIC = 54103		BIC = 61079	
	BIC = 63971		AIC = 58797		AIC = 66078.1		AIC = 64591		AIC = 50216		AIC = 54911		AIC = 54106		AIC = 61081	
	AIC = 63973		Adj R^2 = 0.39869		Adj R^2 = 0.465731		Adj R^2 = 0.46549		Adj R^2 = 0.55319		Adj R^2 = 0.46021		Adj R^2 = 0.5076		Adj R^2 = 0.46449	
	Adj R^2 = 0.48085															

Table 4.2: Summary of Factors that Passed the Selection Process According to the Bayesian Criterion (in bold)

Leverage Variables	Lag1_tlm Coef Est.	t-Stat	Lag1_tla Coef Est.	t-Stat	Lag1_tda Coef Est.	t-Stat	Lag1_tdm Coef Est.	t-Stat	Ma_tim Coef Est.	t-Stat	Ma_tla Coef Est.	t-Stat	Ma_tda Coef Est.	t-Stat	Ma_tdm Coef Est.	t-Stat
Intercept	**0.838**	**47.32**	**0.666**	**45.29**	**0.326**	**20.10**	**0.365**	**28.48**	**0.760**	**41.91**	**0.621**	**23.72**	**0.374**	**20.71**	**-0.541**	**-2.42**
Profit Variables																
Profit	-1.879	-9.79							-3.152	-13.81	-2.063	-10.14	-1.098	-5.22	-1.471	-6.79
Size of Firm																
Asset													**0.519**	**3.53**		
Age[1]																
Growth Variables																
Mktbk	-0.110	-8.45									0.105	4.69				
ChGasset																
Capex			0.310	6.01	0.385	6.53			0.486	5.91	0.556	6.93	0.817	7.79	0.744	7.50
Sector Chrctrtcs																
Regultd																
Assets																
Tang					0.143	4.78							0.121	3.87		
R&D	-1.259	-5.57														
Unique							-0.098	-7.02					0.066	-4.23	-0.088	-6.46
SGA	-0.200	-5.47							-0.288	-6.15	-0.204	-4.97				
IZU																
Taxes																
Tax													2.683	4.35		
Depr									3.367	5.20	2.335	4.13				
DT03																
Miscell-aneous Risks																
ISR_Prem																
Company Risk																
ASVar	**-2.122**	**-7.54**	**-2.266**	**-8.13**	**-1.694**	**-7.11**	**-1.947**	**-7.29**	**-2.949**	**-6.05**	**-3.091**	**-7.46**	**-2.122**	**-7.16**	**-2.591**	**-8.86**
Wmahzor																
VABS																
VRELATIVE																
Affiliated																
Stock Market Situation																
Ret																
Debt Market Situation																
Spread																
Infexp			-0.875	-6.46	-0.767	-6.36							-0.697	-5.65	-0.621	-4.67
Real10Y																
Real5Y																
Real exchange																
Macro-Economic Conditions																
MacroProf																
MacroGr_BS																
DWT															1.328	3.41
DYUS																
DTIME																
	BIC = 66232		BIC = 65397		BIC = 65397		BIC = 65055		BIC = 60888		BIC = 61173		BIC = 61147		BIC = 61079	
	AIC = 66234		AIC = 65399		AIC = 65399		AIC = 65057		AIC = 60890		AIC = 61175		AIC = 61149		AIC = 61081	
	Adj R² = 0.44821		Adj R² = 0.40132		Adj R² = 0.40132		Adj R² = 0.40214		Adj R² = 0.42742		Adj R² = 0.37729		Adj R² = 0.44924		Adj R² = 0.46449	

In the second stage of finding the most important factors, we examined the factors that passed the selection process in a consistent manner, i.e. their sign did not change, for different definitions of leverage. At the same time, it is reasonable that for variables like Mktbk and Ret, the stock market rate of return, which are greatly affected by the market value, the signs obtained under the definition of leverage according to market value will be different than those obtained under the definition of leverage according to book value.

Nine factors were found to pass the selection process according to T-Sta at least six times and/or the selection process according to BIC (the more stringent of the two) at least five times.[13]

3.3 The Results

The influential factors that passed the selection process are: Profit – the operating profit margin from the balance sheet (-); the size of the firm: Asset – the assets (+); growth variables: Capex – the ratio of investment to assets (+), ChgAsset (+), and Mktbk, whose effect on leverage in the market value definition is (-), and on leverage in the book value definition is (+); the character of assets variable: R&D (-); Tax credits: Depr – the depreciation deducted from total assets (+); the variable for the specific risk for the firm: ASVar – the variance of the return on the market value of the assets (-), whose effect on leverage is extremely high; Infexp – the inflation expectations (-) (see the highlighted factors in Tables 4.1 and 4.2).

The effect of the firm's profit

High profits by the firm greatly reduce leverage. A profitable firm (Profit) tends to retain its profit, and increase its own resources, while reducing its leverage. It was found that the leverage of firms with low profits – in the bottom profit decile – was 0.037 higher than that of firms whose profit is at the median,[14] while the leverage of firms with high profit – in top profit decile – was 0.045 lower than that of firms whose profit is at the median.[15]

The effect of the firm's size

A large firm (according to its assets) increases leverage to some degree. A large and/or veteran company, which usually enjoys easier access to sources of cheap credit, tends to increase its leverage. It was found that the leverage of small firms – size in the lowest size decile – was 0.001 lower than firms whose size was at the median, while the leverage of large firms – in the top size decile – was 0.01 greater than firms whose size was at the median.

---

[13] It was found that in addition to the selected set of nine variables, the sector intercepts, i.e. the average leverage in a sector, significantly affected leverage – see Table 6.

[14] The calculations are for the average of the four definitions of leverage.

[15] For the significance of the variables, we referred to the section that describes the process of selecting the variables.

The effect of a firm's growth on its leverage

The effect of growth is to increase leverage. Growing firms invest more, and such a firm tends to finance its investment plans through sources of debt, thereby increasing its leverage. Firms that invest a large proportion of their cash flow in assets (according to the Capex explanatory factor) tend to increase the proportion of their financing from credit. It was found that the leverage of firms whose ratio of capital expenses to assets (Capex) is low – in the lowest decile – was 0.006 lower than that of firms whose ratio was at the median, while that of firms whose ratio of capital expenses to assets was high – in the top decile – was 0.11 higher than firms whose ratio was at the median.

The effect of miscellaneous risks on leverage

Risks related to the firm's characteristics have a major effect on leverage. The variance of a firm's return on assets (ASVar) has a negative effect on leverage, because a firm whose profit is less stable will find it difficult to benefit from tax credits on its debt, and financing through debt will be more expensive for it. It will therefore prefer a relatively low level of leverage. It was found that when the variance in assets was low – in the bottom decile of variance in assets value – leverage was 0.05 higher than when the variance in assets value was at the median; in contrast, when the variance in assets value was high – the top decile in fluctuation – leverage was 0.13 lower than when the variance of assets value was at the median. This effect on leverage was actually the greatest of all the effects of all the explanatory variables (see Table 5). It was also found that firms belonging to a business group have more leverage; their leverage was 0.035 higher on the average. Israel's risk premium (ISR_Prem) had no effect on leverage, because this variable almost always dropped out in the selection process. On the other hand, in the estimations of all the explanatory variables, it decreases leverage, i.e. when firms see that the cost of credit has risen as a result of a wider financial spread, they cut back on their credit raising.

Table 5: The Change in Leverage[1]

Leverage Variables	Lag1_tlm		Lat1_tla		Lag1_tda		Lag1_tdm	
Factors/Leverage	Moving from Bottom Decile to Median	Moving from Median to Top Decile	Moving from Bottom Decile to Median	Moving from Median to Top Decile	Moving from Bottom Decile to Median	Moving from Median to Top Decile	Moving from Bottom Decile to Median	Moving from Median to Top Decile
Profit								
Profit	-0.048	-0.059	-0.04	-0.049	-0.029	-0.036	-0.03	-0.038
Size of Firm								
Asset	0.001	0.008	0.002	0.013	0.001	0.011	0.001	0.008
Age[1]	-0.012	-0.009	-0.013	-0.009	-0.013	-0.01	-0.012	-0.009
Growth Variables								
Mktbk	-0.027	-0.055	0.022	0.044	0.013	0.026	-0.006	-0.012
ChgAsset	0.003	0.004	0.007	0.009	0.003	0.004	0.002	0.002
Capex	0.004	0.007	0.004	0.008	0.008	0.016	0.007	0.014
Sector Characteristics								
Regultd[2]	-	-	-	-	-	-	-	-
Assets								
Tang	-0.004	-0.007	0.001	0.002	0.024	0.048	0.02	0.04
R&D[2]	-	-0.021	-	-0.024	-	-0.016	-	-0.011
Unique[2]	-	-0.034	-	-0.023	-	-0.04	-	-0.043
SGA	-0.021	-0.053	-0.018	-0.046	-0.004	-0.01	-0.006	-0.014
IZU[2]	-	-0.01	-	-0.011	-	0.002	-	0.001
Taxes								
Tax	0.048	0	-0.007	0	0.005	0	0.035	0
Depr	0.009	0.019	0.007	0.016	0.006	0.013	0.006	0.013
Miscellaneous Risks								
ISR_Prem	-0.011	-0.022	0.002	0.005	0	-0.001	-0.007	-0.013
Company Risk								
ASVar	-0.057	-0.148	-0.057	-0.147	-0.045	-0.116	-0.046	-0.12
Wmahzor	0	-0.004	0	-0.004	0	-0.003	0	-0.003
VABS	0.005	0.009	0.008	0.015	0.005	0.009	0.004	0.007
VRELATIVE	-0.004	-0.006	-0.006	-0.008	-0.004	-0.006	-0.005	-0.007
Affiliated[3]	-	0.024	-	0.041	-	0.041	-	0.034
Stock Market Situation								
Ret	-0.006	-0.004	0.004	0.003	0.003	0.002	-0.002	-0.001
Debt Market Situation								
Spread	0.007	0.006	0.008	0.007	0.008	0.007	0.006	0.005
Infexp	-0.007	-0.02	-0.11	-0.034	-0.009	-0.025	-0.006	-0.018
Real10Y	0.013	0.013	0.004	0.004	0.002	0.002	0.011	0.011
Real5Y	-0.009	-0.011	0.002	0.002	0.004	0.005	-0.005	-0.006
Real exchange	0.004	0.004	-0.004	-0.005	-0.005	-0.007	-0.003	-0.003
Macroeconomic Conditions								
MacroProf	0.013	0.02	-0.001	-0.002	-0.001	-0.001	0.005	0.009
MacroGr_Bs	-0.006	-0.005	0.003	0.002	0.001	0.001	-0.004	-0.003
DWT	-0.003	-0.002	0.001	0.001	0.001	0.001	-0.001	-0.001
DYUS	-0.004	-0.006	-0.001	-0.001	-0.002	-0.003	-0.003	-0.005

[1] For example, leverage (TLM) of companies in the bottom profit decile was 0.048 higher than that of companies with median profit, and leverage of companies in the top profit decile was 0.059 lower than companies at the median.

[2] Over 50 percent of the companies do not belong to sectors defined as regulated (Regultd) and/or special sectors (Unique) and/or do not engage in R&D (R&D) and/or whose exports account for less than 10 percent (IZU). These variables receive the value 0 both at the median and in the bottom decile.

[3] A binary variable – over 50 percent of the company observations do not belong to a group; therefore, the variable Affiliated receives the value 0 both in the bottom decile and at the median.

The effect of the sector on leverage

We found that according to the sector intercept, a firm's field of business has a major and significant effect on the level of leverage. In 1994-2006, agricultural companies had low leverage; companies in financial services, textiles, electronics, construction, chemicals, and wood had average leverage; computer companies had slightly higher than average leverage; food, services, hotels, metal, investment, and commercial companies had higher than average leverage; and real estate companies had much higher than average leverage (Table 6).

Table 6: Level of Leverage According to Sector Intercept Obtained in Regression[1]

	Lower than Average Leverage	Average Leverage	Slightly Higher than Average Leverage	Higher than Average Leverage	Significantly Higher than Average Leverage
Agriculture	X				
Financial Services		X			
Textiles		X			
Electronics		X			
Construction		X			
Chemicals		X			
Wood		X			
Biomedical		X			
Computers			X		
Food				X	
Services				X	
Hotels				X	
Metal				X	
Investments				X	
Commerce				X	
Real Estate					X

[1]According to dummy variables for the sectorial intercepts.

The effect of macroeconomic variables on the level of leverage according to the size of the firm

Macroeconomic factors are more important than other factors, since some of them can be influenced through policy. It was found that macroeconomic variables had a limited effect on a company's level of leverage (Table 7). The spread, which reflects future growth expectations, usually acts to increase leverage – probably because companies expecting an increase in activity add leverage in order to renew inventory and/or increase investment. It is possible that leverage increases because it is more accessible than equity financing, because taking a bank loan usually takes less time than raising equity on the stock exchange. The effect of the spread was usually weaker in small companies than in large companies.

GDP expansion in Israel (MacroGR_BS) and the US (DYUS) should have acted to increase leverage, given that firms renew inventory and increase investment. These factors, however, were almost never significant.

Inflation expectations for the next quarter (Infexp) act to lower leverage. In contrast to the US, as a result of the Income Tax Law – Inflationary Adjustments in effect in Israel

during the period of the study, inflation expectations do not increase tax liability, and therefore do not act to increase leverage. Inflation expectations affect small companies more than large ones.

Israel's risk premium (ISR_Prem) decreases leverage. Its effect on large companies is minor, probably because their activity is diversified overseas, thereby reducing exposure to Israel, but its effect on small companies is greater and more significant.

Table 7: The Effect of Macroeconomic Factors on Leverage According to Company Size

Companies	Lag1_tdm	Lag1_tla	Lag1_tlm	Lag1_tda
	Spread Estimate			
Large	1.232**	0.565	1.115**	1.074**
Medium-sized	-0.052	0.081	0.841**	-0.314
Small	0.238	-0.023	0.610	-0.125
	MacroGr_BS Estimate			
Large	0.009	-0.033	0.024	0.002
Medium-sized	-0.053	-0.058	0.008	-0.088**
Small	0.023	-0.041	0.101**	-0.059
	Infexp Estimate			
Large	-0.442**	-0.381**	-0.615**	0.422**
Medium-sized	0.006	-0.238	-0.377**	-0.034
Small	-0.810**	-0.776**	-0.850**	-0.693**
	Isr_Prem Estimate			
Large	0.00013*	0.00020**	-4.1E-05	0.00024**
Medium-sized	-6.66E-05	8.04E-05	-3.6E-05	-1.40E-05
Small	-0.00035**	-0.00019**	-0.00041**	-0.0023**
	DYUS Estimate			
Large	-0.32	0.26	-0.70	0.26
Medium-sized	-0.59	0.66	-0.81	0.20
Small	-0.57	0.02	-1.073**	-0.33

*Significant at a 10 percent level of significance
**Significant at a 5 percent level of significance

Division into sub-periods

The time factor (DTIME) increases leverage. In order to examine whether its effect on leverage has changed over time, beyond the change measured as the time factor (DTIME), we divided the estimation into two sub-periods: 1994-2000 and 2001-2006 (Appendix Table 5). It was found that during the second period, a firm's investments in investment assets caused a steeper rise in leverage than in the first period. This finding, coupled with the huge increase in corporate bonds issued during the second period, support a hypothesis that firms relied more on credit for increasing investments in assets.

The effect of inflation expectations was not significant in the first period and negative and significant in the second period. This result matched expectations, because the Income Tax Law – Inflationary Adjustments eliminated the effect of inflationary financing expenses on tax liability during both sub-periods. During the second period, however, with the transition to nominal reporting at the beginning of 2004, the effect of inflation expectations was negative; it reduced leverage as a result of adjustment measures by firms aimed at reducing their liabilities.

Comparison of the estimation results for the theories and the results for the US

Between the tradeoff and pecking order theories, a slightly better fit was found for the tradeoff theory. In particular, the combination of static and dynamic tradeoff (for the profit variable) was a better predictor for the results in Israel than the pecking order theory. The tradeoff theory usually also predicts the directions of the factors having the strongest and most consistent effect in Israel (Tables 4.1 and 4.2). At the same time, for many estimates, the two theories predict opposite results (Table 1).

The results we obtained were only somewhat similar to the results obtained by Frank and Goyal (2009) for the US. Of 31 possible factors for leverage, 19 were estimated in both studies. The results for nine of these factors were similar in the US and Israel, the results for five of them were opposite, and lack of significance made it impossible to compare four results (Table 8).

Table 8: The Factors Affecting Leverage

		Israel – Azoulay and Shahrabani (2009)		US – Frank and Goyal (2009)	
		Very Significant	Moderately Significant	Very Significant	Moderately Significant
Profitability	*Profit*	-		-	
Size of Firm	*Assets*	+		+	
	Age		-		+ (mature)
Growth	*Mktbk*	Note 1			Note 1
	ChgAsset	+			-
	Capex	+		-	
Character of Sector	*Regultd*		Not significant		-
Character of Assets	*Tang*		+	+	
	R&D	-			-
	Unique		-		-
	SGA		-		-
	IZU		Not significant		Not estimated
Taxes	*TaxRate*		Not significant		-
	Depr	+			+
	DT03		Not significant		Not estimated
Country Risk	*ISR_Prem*		Not significant		Not estimated
Firm Risk	*ASVar*	-			-
	VABS		+		Not Estimated
	VRELATIVE		-		Not Estimated
	Affiliated		+		Not Estimated
Stock Market	*Ret*		Not significant		-
Debt Market Situation	*TermSprd*		+		-
	Inflation Exp[2]	-		+	
	Real 10Y or 5Y		Not significant		Not estimated
	Exchange Rate		Not significant		Not estimated
Macroeconomic Conditions	*MacroProf*		Not significant		-
	MacroGr		Not significant		+
	DWT		+		Not estimated
	DYUS		Not significant		Not estimated

[1]The sign of **Mktbk** changes according to the definitions of the dependent variable. In both the US and Israel, when the definition of the dependent variable is according to the market value, the coefficient of **Mktbk** is usually negative, and when the dependent variable is according to the book value, the coefficient is usually positive.

[2]The Income Tax Law – Inflationary Adjustments almost certainly caused inflation expectations to have a negative impact on leverage.

4. Summary and Conclusions

An accepted measure of macroeconomic and financial stability in an economy is the level of leverage in the private sector, meaning the extent of their activity financing by liabilities that are not from their own resources. This study examined the development of leverage of TASE-listed companies in Israel, and the relative importance of many factors in explaining their level of leverage in 1995-2006, based on figures from quarterly financial statements. The study found a set of 10 variables (from a list of over 30 variables) that succeeded significantly in explaining a major part of the variance in leverage among companies.

The principal core variables found were: operating profit – a profitable firm tends to retain its profit, increase its own resources, and decrease its level of leverage; size of the firm (according to its assets) – a large and/or veteran company, which usually enjoys easier access to cheap debt sources, tends to increase its level of leverage; growth – a growing firm features large investments, and such a firm tents to finance its investment plans through sources of debt, thereby increasing its level of leverage; risk traits of a firm – a firm with less stable profits will find it difficult to utilize tax credits for debt, and financing through debt will be more expensive for it – it will consequently prefer a relatively low leverage rate; the sector in which the firm operates – real estate companies had a higher than average level of leverage in 1995-2006, while companies in electronics and chemicals financed their activity at the average level of leverage.

It was also found that macroeconomic variables usually had a stronger effect on leverage in small firms, in comparison with large firms. This finding matches what is accepted in the literature, according to which small firms are less resilient when faced with macroeconomic shocks.

The results obtained in this study are usually consistent with what is expected under the tradeoff theory of capital structure. According to this theory, a company decides its optimal level of leverage by considering the tradeoff between the tax savings involved in financing through debt and the risk of bankruptcy resulting from difficulty in meeting payments of principal and interest on the debt. Some of the results also matched what is expected under the pecking order theory, which holds that companies choose to finance their activity by issuing shares only as a last resort, after their ability to raise debt has been fully exhausted. The study also found that similar factors affected decisions about the level of leverage by Israeli firms and firms in the US.

Appendix 1 - Description of the Data

1. General Comments

The basic database is Tel Aviv Stock Exchange (TASE) data from the "Ducas" system of the companies listed on the TASE. We focus on companies that are not in the financial sectors, because the capital structure of banks and other financial institutions is subject to regulation. We have therefore removed banks, insurance companies, and other financial institutions from the population. The panel is of the unbalanced type.

2. Variables in the Model

The definitions are from the TASE "Ducas" system, which was in operation until the beginning of 2008.

Definition of the variables:

Leverage variables

Total debt/market value of assets (TDM)[16] – total debt divided by the market value of the assets (MVA). Total debt = current debt + long-term debt: current debt - (banks and maturities BNK_HLUT), long-term debt - (total long-term liabilities LZ_HTHA). Market value of assets is according to the value of the company on the TASE, which is its equity value according to market value on the balance sheet date (ERH_SHUK) + the market value of its liabilities. The best approximation of the market value of its liabilities is its liabilities = assets (balance sheet total SH_MAAZ) minus convertible bonds (AGH_LHMR) minus total equity (HON_AZMI). Source: "Ducas".

Total debt/assets (TDA) – the total debt defined in TDM: the ratio of liabilities (current liabilities + long-term liabilities) to assets, where assets = (balance sheet total SH_MAAZ). Source: "Ducas".

Total liabilities/market value of assets (TLM)[17] – total liabilities = assets (balance sheet total SH_MAAZ) minus convertible bonds (AGH_LHMR) minus total equity (HON_AZMI). The market value of assets is defined in TDM. Source: "Ducas".

Total liabilities/assets (TLA) – total liabilities = assets (balance sheet total SH_MAAZ) minus convertible bonds (AGH_LHMR) minus total equity (HON_AZMI)) divided by assets (balance sheet total SH_MAAZ). Source: "Ducas".

Profitability of firm

Profitability – operating income before depreciation (Profit) – operating profit before depreciation and amortization from total assets, i.e.(depreciation and amortization + ratio

---

[16] Debt is part of liabilities. The data from the "Ducas" system in Israel differ slightly from the data in the US.
[17] See Footnote No. 9.

of operating profit to sales, multiplied by total revenue), **divided by the balance sheet total**. **(HZA_PHT + HHNASOT*ARVH_TFL/100)**/SH_MAAZ

Size of firm

Assets (Assets) – the logarithm of (assets (balance sheet total SH_MAAZ)), divided by nominal business GDP. Companies tend to growth with time, and assets therefore usually grow with time, making the balance sheet total non-stationary. In order to avoid a stationarity problem, we divided assets by business GDP. Source: "Ducas".

Age – the logarithm of age – a variable that receives the age of the company in the observation. Date of observation minus year of founding. *Source: D&B from various years and companies' websites.*

Growth of firm

Market to book ratio (Mktbk) – The ratio of market value to the value of asset in the balance sheet. The market value of assets (MVA) divided by total assets. Market value of assets = according to its equity value at the market value on the balance sheet date (ERH_SHUK) + market value of its liabilities. The best approximation of the market value of its liabilities is its liabilities (assets (balance sheet total SH_MAAZ) minus convertible bonds (AGH_LHMR) minus total equity (HON_AZMI) for TLA, TLM). For the other definitions of leverage, we define Mktbk differently, because the definition of market value of assets varies. Source: "Ducas".

Change in the logarithm of assets (ChgAsset) where total assets = (balance sheet total SH_MAAZ): $LOG(SH\_MAAZ)_t$ minus $LOG(SH\_MAAZ)_{t-1}$. Assets were measured according to the 2005 price index. Source: "Ducas".

Capital expenditure/assets (Capex)[18] – net cash used for investment (MZM_LHSH) divided by total assets (balance sheet total SH_MAAZ).

Regulated dummy (Regultd) – a dummy variable that receives the value 1 if the industry is regulated and 0 otherwise. Regulated industries include airlines and telecommunications.

---

[18] Capital expenditure is the amount that a business spends on purchasing or improving fixed assets. The lifespan of the expenditure is more than one year. This investment is reported in the cash flow statement under cash flow from investment activities, and is displayed in the cash flow statement as a negative value. http://en.wikipedia.org/wiki/Capital_expenditure accessed on June 26, 2008.

Assets traits

Tangibility (Tang) – the ratio of fixed assets: land, buildings, equipment, and machinery (total fixed assets RHUSH_KV) to assets (balance sheet total SH_MAAZ). Source: "Ducas".

Research and development expenses/sales (R&D) – (R&D expenses - HZA_MOP) divided by total revenues (HHNASOT). Some companies have few or no sales, and their ratio is therefore very high. In order to avoid this, we decided to assign the value 95 percent to companies whose value is higher than 95 percent. Source: "Ducas".

Uniqueness dummy (Unique) – a dummy variable that receives the value 1 for high tech companies and computer and R&D companies.

SGA expenses/sales (SGA) – sales, management, and general expenses (HZA_KLL) divided by sales (HHNASOT). Some companies have few or no sales, and their ratio is therefore very high. In order to avoid this, we decided to assign the value 95 percent to companies whose value is higher than 95 percent. Source: "Ducas".

IZU – if exports account for less than 10 percent of sales, the value of the variable is 0; otherwise, it is the ratio of exports to sales. Source: "Ducas".

Taxes

The top tax rate (TaxRate)** - the highest corporate tax rate under law, which was 39% in 1993, 38% in 1994, 37% in 1995, 36% in 1996-2003, 35% in 2004, 34% in 2005, 32% in 2006, 29% in 2007, and 27% in 2008.

Depreciation/assets (Depr) – the decline in value (depreciation expenses – HZA_PHT) divided by assets (balance sheet total SH_MAAZ).

DT03 – a variable for the reform in capital gains (equity and bonds) that receives the value 1 starting in 2003. This reform began in 2003 at a 1% turnover tax or a 15% capital gains tax. It was 15% from January 2003 until December 2005, and 20% on equity and linked bonds and 15% on unlinked bonds from January 2006.

Risk classes

Financial risk (ISR_Prem) – the spread between the return on Israeli 10-year government dollar bonds at fixed interest and the return on US 10-year Treasury notes. This series exists from the beginning of 1996, while Israel's risk premium for five years as obtained from the CDS market exists only since mid-2002. As measured by the CDS market, Israel's risk premium reflects the state of Israel's financial risk. In order to use the longer series, the correlation between the two series was tested, and found to be very high. Source: data obtained from the Bank of Israel Foreign Currency Department.

Company risk

(Affiliated) – a binary variable that receives the value 1 if the company is affiliated with a "business group". A company is affiliated if it is part of a group of three or more companies controlled by a single entity. Source: Kosenko, 2008.

Variance of asset returns (ASVar) – the variance of the daily rate of return (net of dividends and splits). The variance of a share, however, depends on leverage: higher leverage means a higher variance. The variance of a share is an endogenous variable – leverage affects it. We will therefore switch to the variance of the market value of assets. We know the variance of the share, and also know the balance sheet and equity value in each quarter. The formula is the variance of total assets divided by the total assets, i.e. the variance standardized for the size of the company. We thereby "neutralize" the variance in the market value that is due to leverage.[19] Source: the TASE database at Fame, Bank of Israel.

Turnover in thousands of NIS at 2005 prices (Wmahzor) – Turnover should not be directly related to leverage, but when turnover is very low or negligible, the variance of assets is inaccurate: it can be too low due to lack of trading, and it cannot be determined in cases in which turnover is zero. It can also be too high due to an absence of trading. The two variables together (**ASVAR, Wmahzor**) therefore affect leverage. Source: the TASE database at Fame, Bank of Israel.

Absolute variance (VABS) – the absolute variance of a specific sector share index for the sector in which a company operates. Source: Analysis of Bank of Israel databases.

Relative variance (VRELATIVE) – the variance of a specific sector share index for a company, relative to the TASE index. Source: Analysis of Bank of Israel databases.

Stock market

Cumulative market returns (Ret) – the overall quarterly rate of return, net of inflation. The index includes all the sectors on the TASE, including the companies that we examined, excluding banks, insurance companies, and investment and holding companies. An ordinary average of the index, net of inflation – the TASE indices take into account benefits, such as dividends. The weight of each share in an index is determined by its market value relative to the total market value of all the shares making up the index.[20]

---

[19] Neutralization of the variance is obtained from the assumption about the variance of the market value of assets at various leverages.
[20] See http://www.tase.co.il/TASE/Products/Indices/MainTerms/MainTerms.htm as accessed on June 26, 2008.

Debt market

Term spread (TSpread) – the long-term interest rate minus the short-term interest rate. Interest rate series for an average of 7-10 years, minus an average of one-year interest rates from the daily Gilboa series. The 7-10 year average is not available for every year. The average or the available figure was taken for each year. Source: Bank of Israel

Expected inflation rate (Infexp) – the expected change in the Consumer Price Index of the following year. Source: data from a series of the Bank of Israel Monetary Department.

Real exchange rate (Real_exc) – a quarterly average of the shekel-dollar exchange rate, net of the inflation gap between Israel and the US. Source: Bank of Israel.

Real return according to a 5-year zero curve (Real5Y) – the series begins in January 2005. In order to fill it in before this date, the gross yield to maturity of 5-year Galil bonds was taken. Source: data from a series of the Bank of Israel Monetary Department.

Real return according to a 10-year zero curve (Real10Y) – the series begins in January 2005. In order to fill it in before this date, the gross yield to maturity of 10-year Galil bonds was taken. Source: data from a series of the Bank of Israel Monetary Department.

Macroeconomic conditions

Growth in profit after tax macro (MacroProf) – the change in the logarithm of the annual aggregate after-tax profit. Industry surveys and analyses are used to obtain a series of profit and return on capital in base prices. Source: Central Bureau of Statistics, special analysis.

Growth in GDP (MacroGr) – the change in the logarithm of real GDP in 2005 shekels. The seasonally adjusted business GDP was used. Source: Bank of Israel databases.

Growth in trade volume (DWT) – the annual growth in the volume of world trade in fixed prices. Source: World Economic Outlook.

Growth in US GDP (DYUS) – quarterly growth in seasonally adjusted American GDP in fixed prices. Source: Bureau of Economic Analysis, USA.

Changes in leverage over time (DTIME)

Appendix 2 – Rules for Accepting a Company for Estimation

General matters

The study uses quarterly data, but we included companies for which quarterly data are available for every year and data from the annual report. We omitted companies that were not reported in the annual report for that year, or for which a quarterly report was missing.

Figures from the financial statements ("Ducas") through December 2003 are kept in December 2003 prices. The figures were adjusted to current data. The analyses were conducted using current figures.

Dealing with extreme or illogical values – Some of the data obtained were very extreme: for example, a company with negative capital. For most variables, we cut 5 percent from the extreme values.[21] We also evaluated the values logically. For example, we checked the compatibility of the annual and quarterly statements. When we detected a significant inconsistency, we erased the quarterly observations for that year. Companies with a small volume of assets were erased: we eliminated the 5 percent smallest companies according to assets, because the figures for small companies usually have more errors than the figures for large companies. There are other ways of handling extreme values – for example, instead of omitting them, replacing them with the most extreme value remaining (the 95th percentile and the fifth percentile) – but we have chosen to omit such companies from the estimation.

Dealing with missing information – in studies of this type, information is frequently missing – for example, a particular variable is lacking for a company, or a firm does not appear during all of the panel period. We decided to omit incomplete observations. A study similar to ours, Frank and Goyal (2007), uses a "multiple imputation" procedure to obtain a logical guess for missing values. An examination of this procedure in comparison with omitting missing values in their study shows no real difference in results.

In some years, some companies lack information in their quarterly statements – information about depreciation, for example. In these cases, we filled in the data from the annual statements.

Checking the balance sheet total – We omitted an observation if there was no figure for the balance sheet total, or if the figure for the balance sheet total in the annual statements did not match the figure for the fourth quarter. "Matching" was defined as a difference of less than 15 percent and less than NIS 500,00 in absolute value between the balance sheet totals in the two statements.

Checking revenue – If a significant difference was found between the sum of the four quarterly reports and the annual report, we removed the company for that year.

---

[21] Negative capital is unreasonable, and is therefore classified as extreme, and hence omitted from the sample. On the other hand, zero sales are feasible, because there are many companies that have not yet had sales.

Checking miscellaneous expenses – R&D spending and management and general expenses – if these expenses were not reported in the annual statements, we omitted that year. If they were not reported in the quarterly statements, we inserted the annual figure divided by 4 into the quarterly statements. In the case of an insignificant difference - less than plus or minus 15 percent and less than NIS 500,000 – between the quarterly and annual statements, we switched to the annual statements and divided by 4. If these expenses were not reported in even one quarter, we took the annual figure divided by 4. For R&D spending, we did not erase a company that did not report it in the annual statements, because a large proportion of companies had no R&D spending.

Checking the ratio of operating profit to sales – we checked that the quarterly figure was similar to the annual figure by multiplying the quarterly operating profit margin by the quarterly sales and dividing by the sales of the four quarters. We checked whether the annual operating profit margin that we calculated, $i = 1,4\Sigma(shior - tifoli_i * salse_i)/ \Sigma salse_i$, was similar to this ratio in the annual statements.

We retained the observation if the operating profit margin was similar, similar being defined as (whether the rate of deviation between the calculation for the annual report was less than 15 percent, whether the operating profit margin in both sources was less than 2 percent, whether the operating profit margin in both sources was less than 5 percent in absolute value and the rate of deviation was less than 20 percent).

Percentage of exports – only from the annual balance sheet: if the figure was missing we wrote zero. If it was less than 10 percent, we wrote zero, because companies are obligated to report this figure only when the proportion of exports exceeds 10 percent.

Appendix 3 – Checking the Necessity for the Clusters Method

The table showed large differences in variance using the clusters method in two dimensions, compared with the OLS and clusters methods in the time dimension and the clusters method in the firm dimension.

Leverage Variables – TLM lag 1	Coeff Estimate	Clusters-Firm and Time t-State	Clusters-Firm t-State	Clusters-Time t-State	OLS t-State	Absolute Value of Percentage Difference between Clusters-Firm and Time and Clusters-Firm	Absolute Value of Percentage Difference between Clusters-Firm and Time and Clusters-Time	Absolute Value of Percentage Difference between Clusters-Firm and Time and OLS
Intercept	0.773	4.74	8.26	5.05	10.87	0.74	0.07	1.29
Profit variables								
Profit	-2.183	-13.49	-15.18	-20.94	-40.33	0.13	0.55	1.99
Size of firm								
Asset	0.045	4.05	4.12	13.07	16.76	0.02	2.23	3.14
Age	-0.036	-2.02	-2	-10.97	-8.04	0.01	4.42	2.98
Growth variables								
Mktbk	-0.080	-6.16	-7.45	-9.32	-24.35	0.21	0.51	2.95
ChgAsset	0.091	2.13	2.6	2.3	4.02	0.22	0.08	0.89
Capex	0.109	2.66	2.69	3.36	4.17	0.01	0.27	0.57
Sector trait								
Regultd	-0.031	-0.73	-0.72	-4.35	-3.11	0.02	4.93	3.24
Assets								
Tang	-0.023	-0.87	-0.88	-3.6	-3.95	0.01	3.12	3.52
R&D	-0.564	-2.16	-2.16	-7.33	-7.93	0.00	2.39	2.66
Unique1	-0.038	-2.19	-2.15	-15.98	-9.35	0.02	6.30	3.27
SGA	-0.145	-4.20	-4.18	-14.25	-15.16	0.00	2.40	2.61
IZU	-0.028	-1.38	-1.36	-6.25	-5.42	0.01	3.54	2.93
Taxes								
Tax	-0.082	-0.24	-0.46	-0.25	-0.49	0.89	0.03	1.01
Depr	3.140	5.93	5.97	19.36	17.11	0.01	2.27	1.89
DT03	0.003	0.13	0.35	0.13	0.36	1.77	0.03	1.85
Company risk								
ASVar	-2.263	-9.66	-19.98	-10.39	-61.1	1.07	0.08	5.33
Wmahzor	0.000	-2.88	-2.89	-8.66	-12.7	0.00	2.01	3.41
VABS	0.082	1.51	2.99	1.5	3.1	0.99	0.00	1.06
VRELATIVE	-0.013	-1.71	-2.22	-2.11	-3.43	0.30	0.24	1.01
Stock market situation								
Ret	-0.084	-2.96	-9.73	-2.84	-7.07	2.29	0.04	1.39
Debt market situation								
Spread	1.985	3.59	9.99	3.51	8.65	1.78	0.02	1.41
Infexp	-1.004	-3.08	-7.95	-3.07	-8.59	1.58	0.00	1.79
Macro-economic conditions								
MacroProf	0.098	2.12	5.25	1.94	3.51	1.48	0.08	0.66
MacroGr_BS	-0.175	-2.00	-6.65	-1.87	-4.23	2.32	0.07	1.11
DWT	-0.417	-0.87	-2.41	-0.82	-1.73	1.78	0.05	0.99
DYUS	0.019	0.03	0.08	0.03	0.06	1.51	0.06	0.88
DTIME	-0.003	-2.41	-5.78	-2.47	-7.46	1.39	0.02	2.09
						0.73	**1.28**	**2.07**

Average of the absolute value of the difference in percentages
We see, for example, that the Asset factor has a firm effect and the MacroGr_BS factor has a time effect.

1. Regression Results

After consolidating the constants for the various sectors, separate estimates remained for agriculture, real estate, commerce, hotels, metal and investments, services, food, computers, financial services, textiles, electronics, construction, wood, and biomedical (the constants are not displayed in the table).

Appendix Table 4.1 – Regression Results

	Lag1_tlm		Lag1_tla		Lag1_tda		Lag1_tdm		Ma_tim		Ma_tla		Ma_tda		Ma_tdm	
Leverage Variables	Coef Est.	t-Stat	Coef Est.	t-Stat	Coef Est.	t-Stat	Coef Est.	t-Stat	Coef Est.	t-Stat	Coef Est.	t-Stat	Coef Est.	t-Stat	Coef Est.	t-Stat
Intercept	0.459	1.46	0.645	4.10	0.241	2.18	0.109	0.55	0.373	1.24	0.914	4.76	0.329	2.80	0.001	0.01
Profit Variables																
Profit	-1.904	-11.17	-1.586	-9.48	-1.155	-6.41	-1.215	-6.79	-2.627	-12.68	-2.082	-9.37	-1.571	-7.38	-1.676	-8.41
Size of Firm																
Asset	0.708	3.08	1.089	3.67	0.933	3.51	0.681	3.27	0.514	2.33	0.940	3.22	0.775	2.97	0.494	2.42
Age[1]	-0.028	-1.46	-0.030	-1.45	-0.031	-1.37	-0.029	-1.33	-0.035	-1.88	-0.034	-1.76	-0.035	-1.60	-0.035	-1.61
Growth Variables																
Mktbk	-0.101	-7.55	0.081	3.80	0.047	2.88	-0.022	-1.77	-0.054	-3.73	0.113	4.85	0.077	4.20	0.009	0.66
ChGasset	0.046	2.55	0.098	4.80	0.047	1.77	0.027	1.12	0.115	3.37	0.166	4.51	0.087	2.15	0.082	1.99
Capex	0.153	3.38	0.171	3.69	0.325	5.69	0.283	5.14	0.396	5.25	0.395	4.62	0.677	6.60	0.610	6.24
Sector Chrctrtcs																
Regultd	-0.023	-0.59	0.012	0.30	-0.005	-0.09	-0.047	-1.00	-0.028	-0.76	0.009	0.22	-0.011	-0.20	-0.053	-1.17
Assets																
Tang	-0.016	-0.63	0.004	0.16	0.111	3.42	0.093	2.89	-0.026	-1.07	0.000	-0.02	0.101	3.19	0.079	2.54
R&D	-0.464	-1.78	-0.530	-1.72	-0.353	-1.44	-0.240	-1.09	-0.393	-1.42	-0.380	-1.17	-.263	-1.01	-0.159	-0.68
Unique	-0.034	-1.89	-0.023	-1.17	-0.040	-2.25	-0.043	-2.68	-0.027	-1.61	-0.016	-0.84	-0.036	-2.12	-0.040	-2.55
SGA	-0.189	-5.32	-0.165	-4.40	-0.037	-0.92	-0.051	-1.26	-0.189	-5.09	-0.144	-3.70	-0.008	-0.18	-0.031	-0.71
IZU	-0.013	-0.66	-0.014	-0.66	0.002	0.11	0.001	0.05	-0.015	-0.75	-0.014	-0.69	0.006	0.29	0.003	0.15
Taxes																
Tax	0.993	1.32	-0.142	-0.37	0.096	0.40	0.723	1.56	1.525	2.10	-0.498	-0.98	0.095	0.39	1.193	3.12
Depr	2.249	4.41	1.909	3.38	1.521	1.79	1.553	1.65	2.839	5.92	2.330	4.24	1.764	2.13	1.849	2.01
DT03	-0.049	-2.07	0.006	0.42	-0.005	-0.78	-0.029	-2.46	-0.086	-2.73	0.016	1.01	0.001	0.08	-0.044	-2.34
Miscell-aneous Risks																
ISR_Prem	0.000	-2.20	0.000	1.01	0.000	-0.28	0.000	-2.34	-0.001	-2.72	0.000	0.56	0.000	-0.85	0.000	-3.10
Company Risk																
ASVar	-2.484	-10.58	-2.460	-11.16	-1.948	-10.45	-2.005	-9.98	-3.593	-11.64	-3.598	-12.30	-2.878	-11.83	-2.905	-11.19
Wmahzor	0.000	-3.96	0.000	-4.04	0.000	-3.52	0.000	-3.70	0.000	-4.16	0.000	-4.01	0.000	-4.65	0.000	-3.79
VABS	0.093	0.97	0.154	2.51	0.097	2.42	0.072	1.20	0.178	2.12	0.208	3.87	0.153	3.59	0.137	2.40
VRELATIVE	-0.010	-0.97	-0.013	-2.10	-0.009	-1.79	-0.011	-1.62	-0.004	-0.38	-0.009	-1.17	-0.010	-1.16	-0.011	-1.20
Affiliated	0.024	1.94	0.041	3.45	0.041	2.71	0.034	2.19	0.023	1.88	0.040	3.41	0.041	2.59	0.034	2.07
Stock Market Situation																
Ret	-0.037	-0.93	0.023	1.28	0.018	1.51	-0.013	-0.54	-0.027	-0.57	0.046	1.47	0.021	0.85	-0.015	-0.46
Debt Market Situation																
Spread	0.562	0.38	0.646	0.88	0.645	1.49	0.433	0.49	2.500	1.15	1.483	1.27	1.565	2.29	1.878	1.51
Infexp	-0.289	-0.90	-0.495	-3.34	-0.369	-5.03	-0.256	-1.36	-1.418	-3.19	-0.779	-2.88	-0.578	-2.97	-0.870	-3.11
Real10Y	0.014	0.36	0.004	0.24	0.002	0.25	0.012	0.54	-0.056	-0.91	0.001	0.02	-0.012	-0.57	-0.036	-1.08
Real5Y	-0.008	-0.22	0.002	0.11	0.004	0.36	-0.004	-0.21	0.031	0.62	0.014	0.51	0.023	1.51	0.030	1.08
Real exchange	0.015	0.17	-0.017	-0.38	-0.023	-1.03	-0.011	-0.23	0.149	1.40	-0.102	-1.60	-0.073	-2.08	0.056	0.98
Macro-Economic Conditions																
MacroProf	0.164	2.80	-0.015	-0.29	-0.012	-0.35	0.071	2.03	0.261	2.65	-0.097	-2.74	-0.074	-2.65	0.094	1.51
MacroGr_BS	-0.255	-0.93	0.114	0.63	0.033	0.32	-0.164	-1.04	-0.511	-0.97	0.217	0.82	-0.007	-0.04	-0.404	-1.31
DWT	-0.306	-0.50	0.130	0.33	0.149	0.77	-0.138	-0.44	1.723	2.49	0.082	0.25	0.429	2.17	1.182	3.27
DYUS	-0.820	-1.15	-0.190	-0.31	-0.339	-0.92	-0.650	-1.66	-3.671	-2.90	0.955	1.37	0.042	0.08	-2.210	-2.84
DTIME	0.001	0.46	0.001	0.95	0.002	3.89	0.002	1.59	-0.003	-1.14	0.001	0.58	0.002	1.91	0.000	-0.33
	BIC = 54687.8		BIC = 53217.2		BIC = 53028.7		BIC = 53453.9		BIC = 50314.7		BIC = 49299.8		BIC = 48631.3		BIC = 49024.8	
	AIC = 54690		AIC = 53219.4		AIC = 53031		AIC = 53456.1		AIC = 50317		AIC = 49302		AIC = 48633.5		AIC = 49027.1	
	Adj R² = 0.511		Adj R² = 0.388		Adj R² = 0.465		Adj R² = 0.495		Adj R² = 0.356		Adj R² = 0.449		Adj R² = 0.5088		Adj R² = 0.536	

2. The Selection Process

Table 4.2

Appendix Table 4.2: Factors that Passed the Selection Process according to the T-sta Criterion in 8 Regressions

8 Times	7 Times	6 Times	5 Times	4 Times	3 Times	2 Times	1 Time	0 Times
Profit	**Asset**	**Mktbk**	VABS	SGA	VRELATIVE	DYUS	Isr_Prem	Regultd
Capex	**Wmahzor**	**ChgAsset**	Affiliated	Tax	Tang	Age[1]	Real10Y	IZU
ASVar		**R&D**		DTIME		Spread	MacroProf	DT03
		Depr		Unique		DWT	VABS	Ret
		Infexp					Real5Y	Infexp
								Real exchange
								MacroGR_BS

Table 4.3

Appendix Table 4.3: Factors that Passed the Selection Process according to the Bayesian (BIC) Criterion in 8 Regressions

8 Times	7 Times	6 Times	5 Times	4 Times	3 Times	2 Times	1 Time	0 Times
ASVar		**Capex**	Profit	Infexp	SGA	Mktbk	R&D	Age[1]
					Unique	Depr	Asset	ChgAsset
						Tang	Tax	Regultd
							DWT	IZU
								DT03
								Isr_Prem
								Wmahzor
								VABS
								VRELATIVE
								Affiliated
								Ret
								Spread
								Real10Y
								Real5Y
								Real exchange
								MacroProf
								MacroGR_BS
								DYUS
								DTIME

Table 4.4 in this appendix displays the process of selecting the explanatory factors. We first estimated Equation (1) with all the factors. The least significant factor in this regression, Real5Y, appears in the first column of the last row of the table. The value of Real5Y (0.000175) and its t statistic (-0.109) appear at the bottom of Columns (2) and (3), respectively. The R^2 for this regression is at the bottom of Column (5), and the BIC criterion is at the bottom of Column (6). At the bottom of Column (4), the own R^2, appears R^2 for a regression including only the Real5Y factor and an intercept. We then eliminated this factor (Real5Y), and re-estimated the regression equation (without Real5Y). We again reported the estimate with the lowest t statistic, Tang, in the next to last row. The value of Tang is 0.004, and its t statistic, 0.16, appears in Column (3). The R^2 and BIC of this regression (without the Real5Y estimate) appear in Columns (5) and

(6), respectively. Note that the BIC in the regression without Real5Y is lower than the BIC for the regression that includes it. We continued this process until we were left with a single factor: K5. We now chose the regression for which the BIC was smallest. All the factors above the line improve the regression according to the BIC criterion, because adding them increases the negative magnitude of BIC. We carried out this process for each of the eight regressions.

Table 4.4: The Selection Process according to the Bayesian (BIC) Criterion for Lag1_Tla

(1)	(2)	(3)	(4)	(5)	(6)
	Coefficient Estimate	t-stat	Own R^2	Adj R^2	BIC
K5	-0.228	-6.78	0.003	0.003	-58116
ASVar	-2.598	-8.54	0.227	0.228	-62130
K4	0.120	7.42	0.095	0.276	-63375
Infexp	-0.852	-6.16	0.035	0.294	-63840
Capex	0.310	6.01	0.002	0.299	-63943
Profit	-0.631	-3.95	0.015	0.303	-63535
SGA	-0.197	-4.98	0.030	0.317	-63914
ChgAsset	0.100	4.43	0.003	0.319	-62237
Asset	0.583	2.16	0.014	0.323	-62337
Wmahzor	0.000	-4.14	0.000	0.332	-61260
Depr	1.891	3.02	0.001	0.336	-61366
Mktbk	0.077	3.57	0.000	0.354	-61857
D941	0.078	3.54	0.002	0.363	-62113
Affiliated	0.038	3.19	0.018	0.377	-58200
K1	0.051	3.02	0.000	0.382	-58337
D942	0.073	3.37	0.002	0.388	-58516
D961	0.071	3.25	0.001	0.394	-58663
VRELATIVE	-0.008	-1.54	0.003	0.394	-58668
VABS	0.129	2.58	0.006	0.395	-58684
R&D	-0.637	-2.42	0.053	0.398	-58775
DTIME	0.001	2.07	0.040	0.399	-58795
LAGE	-0.029	-1.54	0.006	0.400	-58830
Real10Y	0.004	1.16	0.006	0.400	-58830
Spread	0.402	1.19	0.001	0.400	-58831
MacroGr_BS	0.139	1.16	0.000	0.400	-58832
Unique	-0.014	-0.80	0.043	0.401	-58843
D944	0.027	1.03	0.014	0.401	-58862
Ret	0.019	1.00	0.003	0.401	-58863
IZU	-0.012	-0.61	0.034	0.402	-58866
Real exchange	-0.004	-0.12	0.031	0.401	-58864
Isr_Prem	0.000	0.62	0.002	0.389	-53231
DYUS	-0.197	-0.34	0.003	0.389	-53229
Regultd	0.013	0.32	0.004	0.389	-53228
TAX	-0.125	-0.32	0.019	0.389	-53226
DT03	0.004	0.31	0.017	0.389	-53225
DWT	0.067	0.15	0.001	0.389	-53223
MacroProf	-0.014	-0.30	0.005	0.389	-53221
Tang	0.004	0.16	0.017	0.389	-53219
Real5Y	0.002	0.11	0.001	0.389	-53217

Appendix Table 5: Regression according to Periods – First Period 1994-2000 and Second Period 2001-2006

	Lag1_tlm				Lag1_tla				Lag1_tdm				Lag1_tda			
	First Period		Second Period		First Period		Second Period		First Period		Second Period		First Period		Second Period	
Leverage Variables	Coef Est.	t-Stat	Coef Est.	t-Stat	Coef Est.	t-Stat	Coef Est.	t-Stat	Coef Estimate	t-Stat	Coef Est.	t-Stat	Coef Est.	t-Stat	Coef Est.	t-Stat
Intercept	0.232	1.98	0.706	11.813	-0.261	-19.646	0.755	8.875	-0.129		0.330	8.748	-0.379	0.000	0.401	7.872
Profit Variables																
Profit	-1.421	-5.997	-1.488	-7.877	-1.166	-5.829	-1.428	-7.060	-1.053		-0.916	-5.213	-1.115	-4.754	-1.093	-5.243
Size of Firm																
Asset			0.960	3.669	1.236	2.775	1.227	3.978	0.484		0.880	3.178	0.850	2.780	1.052	3.094
Age[1]					-0.034	-1.720										
Growth Variables																
Mktbk	-0.071	-4.38	-0.136	-9.288	0.150	-4.589	0.038	1.976			-0.053	-4.276	0.100	4.029		
ChGasset	0.083	3.743	0.091	3.977	0.133	5.389	0.122	4.209							0.055	1.736
Capex			0.083	1.813			0.123	2.296	0.168		0.301	4.892	0.214	2.989	0.410	6.276
Sector Chrctrtcs																
Regultd Assets																
Tang									0.077		0.111	3.075	0.086	2.553	0.134	3.585
R&D																
Unique	-0.040	-2.022							-0.028		-0.053	-2.853			-0.056	-2.674
SGA	-0.160	-3.58	-0.195	-4.848	-0.141	-3.238	-0.184	-4.010								
IZU																
Taxes*																
TAX																
Depr	1.882	4.03	2.157	2.927	1.535	3.154	2.098	2.514	1.388				1.535	2.165		
DT03																
Miscell-aneous Risks																
Isr_Prem	-0.0003	-1.98	-0.0004	-4.264	-0.0006	-9.393	-0.0005	-4.798	-0.0005							
Company Risk																
ASVar	-2.934	-7.21	-2.085	-8.687	-2.947	-8.310	-2.083	-8.905	-2.422		-1.618	-8.294	-2.297	-7.660	-1.601	-8.479
Wmahzor	-7.700E-06	-2.10	-6.100E-06	-3.998	-1.350E-05	-2.559	-6.600E-06	-3.766	-8.300E-06		-4.800E-06	-3.377	-8.900E-06	-1.960	-4.900E-06	-2.846
VABS	0.227	2.44			0.212	2.823					0.062	1.733			0.056	10.414
VRELATIVE	-0.029	-2.34	-0.010	-1.812	-0.024	-3.005			-0.018		-0.012	-2.119				
Affiliated	0.030	2.117			0.046	3.323	0.035	2.245	0.050				0.056	3.489		
Stock Market Situation																
Ret																
Debt Market Situation																
Spread							2.039	3.365								
Infexp			-1.363	-3.726			-1.125	-1.809			-0.586	-3.234				
Real10Y	0.204	7.583	0.030	3.600			-0.045	-3.608								
Real5Y	-0.171	-8.377					0.042	3.728								
Real exchange	0.374	9.928														
Macro-Economic Conditions																
MacroProf			0.065	3.525												
MacroGr_BS																
DWT	-1.401	-3.05	-0.723	-4.660	-0.864	-3.440	1.177	3.097							0.750	4.711
DYUS																
DTIME																
	BIC = 26985.4		BIC = 32467.1		BIC = 26865.9		BIC = 30838.5		BIC = 2635.2		BIC = 31541.6		BIC = 26736.6		BIC = 30494.1	
	AIC = 26987.8		AIC = 32469.4		AIC = 26868.3		AIC = 30840.8		AIC = 26317.6		AIC = 31543.9		AIC = 26766		AIC = 30496.4	
	Adj R^2 = 0.505		Adj R^2 = 0.557		Adj R^2 = 0.426		Adj R^2 = 0.368		Adj R^2 = 0.494		Adj R^2 = 0.515		Adj R^2 = 0.489		Adj R^2 = 0.455	

Bibliography

Wittenbery, R. (2001). "Assessing Credit Risk in Israel's Banking System by Means of Credit Scoring Model," Israel Economic Quarterly, Vol. 48 No. 3.

Kosenko, K., "Evolution of Business Groups in Israel: Their Impact at the Level of the Firm and the Economy," Bank of Israel, Discussion Paper Series 2008.02, Research Department, Bank of Israel.

Ruthenber, David and Hecht, Yoel, "The Relationship Between Business Cycles, Credit Outstanding, and Credit Risk, In Light of the New Basel Accord (Basel II) – The Israeli Case," Bank of Israel Banking Supervision Department.

Nagar, W. (2009), "The Financial Strength of Israel's Real Business Sector and the Banking System Credit Risk," Discussion Paper Series 2009.03, Research Department, Bank of Israel.

Shahrabani, R. (2005), "Liquidation of Companies for Macroeconomic Reasons," Bank of Israel Survey 78.

Bernanke, Ben S., Gertler, Mark, Gilchrist, Simon, "The Financial Accelerator in a Quantitative Business Cycle Framework," Handbook of Macroeconomics, Volume 1, Part 3, Chapter 21, 1999, pp. 1341-1393.

Barcklay, M.J., E. Morellec, and Smith Jr., C.W. (2006), "On the Debt Capacity of Growth Options," Journal of Business Volume 79, pp. 37-59.

Fama, E.F. and MacBeth, J.D. (1973), "Risk, Return, and Equilibrium: Empirical Tests," Journal of Political Economy, Volume 3, pp. 607-636.

Frank, M. and Goyal, Vidhan K. (2009), "Capital Structure Decisions: Which Factors Are Reliably Important?", Financial Management, pp. 1-37.

Frank, M. and Goyal, Vidhan K. (2008), "Trade-off and Pecking Order Theories of Debt," to appear in Espen Eckbo (Editor), The Handbook of Empirical Corporate Finance, Elsevier Science.

Jensen, M.C. (1986), "Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers," American Economic Review, Vol. 76, pp. 323-29.

Modigliani, F. and Miller, M. (1958), "The Cost of Capital, Corporation Finance, and the Theory of Investment," American Economic Review, Vol. 48, pp. 261-297.

Myers, S.C. (1977), "Determinants of Corporate Borrowing," Journal of Financial Economics, Vol. 5, pp. 147-175.

Myers, S.C. (1984), "The Capital Structure Puzzle," Journal of Finance, Volume 39, pp. 575-592.

Petersen, Mitchell A. (2009), "Estimating Standard Errors in Finance Panel Data Sets: Comparing Approaches" January 1, Financ. Stud., Vol. 22, pp. 435-480.

Rajan, R. and Zingales, L. (1995), "What Do We Know About Capital Structure: Some Evidence from International Data," Journal of Finance, Vol. 50, pp. 1421-1460.

Strebulaev, Ilya A. (2007), "Do Tests of Capital Structure Theory Mean What They Say?", The Journal of Finance, Vol. 63, No. 4, August.

Titman, S. (1984), "The Effect of Capital Structure on a Firm's Liquidation Decision," Journal of Financial Economics, Vol. 13, pp. 137-151.

Welch, I. (2004), "Capital Structure and Stock Returns," Journal of Political Economy, Vol. 112, pp. 106-131.