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Factors affecting stock market performance with special reference to market-to-book ratio in banking – the Israeli case

Abstract

One of the important factors affecting stock returns is the market-to-book ratio. In banking, the ratio has also been taken to be a proxy for the charter value of banks. The purpose of the paper is to derive and estimate empirically the factors that determine relative values of equity in banking. Our analytical framework is based on the discounted cash flow (DCF) approach of valuation. In our empirical test, we use data on Israeli banks. The main results are that risk, return and market and economic conditions have a significant effect on the ratio.

Keywords: market-to-book ratio, Gordon growth model, charter value.
JEL Classification: G21.

Introduction

One of the most important factors affecting stock market performance is the market-to-book value ratio. A large number of studies, using U.S. and international data, have demonstrated that this ratio has a significant explanatory power for cross-section average stock returns and that these returns are higher for stocks with high market-to-book ratios. See Fama and French (1992) for the effect in the U.S., and Chan et al. (1991), Fama and French (1998) and more recently Maroney and Protopapa-dakis (2002) for the effect in other national markets.

There are two competing explanations for the above effect. One interpretation, consistent with the efficient-market hypothesis, is that the ratio is a proxy for risk and, hence, the positive relationship found between this ratio and stock returns (Fama and French, 1992). Specifically, Fama and French (1996) and Vassalau and Xing (2004) argue that the ratio is a proxy for financial distress or default risk[1]. An alternative explanation of this effect is that it is a market "anomaly" that violates the efficient market hypothesis. Lakonishok, Shleifer and Vishny (1994) argue that cognitive biases and investors' agency costs are the reasons for this anomaly.

There is extensive literature in finance on the relationship between relative valuation and stock returns, and the factors that determine the market-to-book ratio. In the time-series, literature papers have studied whether the variation of the ratio reflects variation of expected returns (e.g., Kothari and Shanken, 1997). In the cross-section, literature papers show how much of the ratio is related to cash-flow difference (Fama and French, 1995). However, the literature on this effect is quite limited in financial service firms in general and in banking in particular.

A number of aspects make valuation of financial services firms unique. First and most important, these firms are highly regulated. Second, banks in some countries are constrained geographically (e.g., limits on branching and interstate banking that existed until recently in the U.S.) or in terms of products they can sell (e.g., Glass-Steagall act in the U.S. that until 2000 separated commercial from investment banking). Third, in most countries there are restrictions on the entry of new banks or on mergers between existing banks.

An important implication of regulation is that it restricts competition and, thus, affects valuation of banks. Studies in banking have examined the relative value of equity in the context of the charter value of the bank and its relationship to regulation and market conditions. Keeley (1990) provides empirical support for the "charter value hypothesis": an increase of competition in banking reduces charter value and, thus, causes the market value of the bank to decline relative to book value[2]. A prime example is the U.S., as barriers, were removed competition increased and consequently charter value declined. Saunders and Wilson (2001) argue that regulation that restricts competition enhances charter value and increases self-regulation by banks while deregulation does the opposite. They also found a positive relationship between charter value and capital ratios during economic expansion and argue that during such periods bank charter value increases to reflect growth.

In Israel the liberalization and privatization of money and capital markets has gathered momentum in the past decade. As part of this policy, the government withdrew from the capital market gradually and reduced its involvement in financial intermediation. Concurrently, many public companies, including banks, have been privatized. As part of the process, the shares of Israel's large banks were relisted for trading on the Tel Aviv stock exchange after having been delisted since the bank shares crisis in 1983.

The views expressed in this paper reflect the opinions of the authors only. We thank Merav Koriat for her excellent research assistance.

[1] Peterkort and Nielsen (2005) develop a leverage-based valuation model to investigate whether the market-to-book ratio is a proxy for risk.

[2] The ratio used in this paper is market value to book value of assets to obtain this ratio, one adds the book value of debt to both the market and book values of equity.

The objective of this paper is to identify and estimate empirically the factors that determine the market-to-book ratio in banking. In the paper, we test two hypotheses: the efficient market hypothesis and the charter value hypothesis in banking. Our analysis is based on the discounted cash flow (DCF) approach to the valuation of equity. In order to derive a testable equation, we make some simplifying assumptions in the valuation model. These assumptions, however, are relaxed in the empirical tests. This approach to relative valuation has been used extensively (Fama and French, 1995; and, recently, Fama and French, 2006). We use two versions of a DCF model: (1) first the dividend valuation model; and (2) the free cash flow to equity model (FCFE). The explanatory variables which we derive and later test empirically are: profitability of the bank; risk (credit and market); investment policy of the bank; macroeconomic and capital market conditions; banking structure (competition) and regulation of banks.

Section 1 provides the theoretical basis for the market-to-book (MV/BV) ratio, and the methodology for deriving the factors that affect that ratio for banks. Section 2 presents an overview of Israeli banking, summary statistics and empirical findings with regard to the MV/BV ratio and its determinants for the five largest banks in Israel, covering the period of 1994-2005. The final section presents a summary and the conclusions that arise from the empirical findings.

1. Model and methodology

In this section, we generate the basic factors that determine the MV/BV ratio. Our analytical framework is based on the valuation of equity using a discounted cash flow approach. We assume a constant payout and investment policy of the bank that imply a constant growth rate, these assumptions are relaxed in the empirical part of the paper.

Assuming that, the dividend per share will grow at a constant rate (g) the dividend valuation model can be written as follows:

$$P_0 = \frac{D_0(1+g)}{k-g} = \frac{D_1}{k-g} \quad , \tag{1}$$

where P_0 is the current price of the share, D_t is the expected dividend per share in period t and k is risk adjusted cost of equity (internal rate of return).

Following the well-known Gordon model we define the variable $b\ (0 \le b \le 1)$ as the constant rate of retained earnings or the retention ratio that equals the reinvestment rate. The complement fraction $(1-b)$ is the proportion of dividend paid out from earnings or the payout ratio, thus, $D_1 = E_1(1-b)$, where E_1 is the expected earnings per share in period 1.

We assume also a constant rate of return on equity (ROE), defined as follows: $ROE_1 = \frac{E_1}{bv_0}$, where bv_0 is book value per share at time 0.

By substituting for $E_1 = ROE_1 \cdot bv_0$ and for $g = b \cdot ROE_1$, dividing both sides of equation (1) by bv_0 we obtain the price-to-book value ratio (per share):

$$\frac{P_0}{bv_0} = \frac{ROE_1(1-b)}{k - b \cdot E_1} \quad . \tag{2}$$

By multiplying the numerator and the denominator on the left side of the equation by the number of shares listed for trading, we obtain the market value of equity of the firm divided by its book value, i.e., the market-to-book ratio (MV_0/BV_0):

$$\frac{MV_0}{BV_0} = \frac{ROE_1 - b \cdot ROE_1}{k - b \cdot ROE_1} = \frac{ROE_1 - g}{k - g} \quad . \tag{3}$$

Thus, the MV/BV ratio is determined by the return on equity of the firm (ROE_1), the risk of equity as reflected by the cost of equity capital[1] (k) and its reinvestment policy (b).

Based on equation (3), we obtain the following expected relationships between the MV/BV ratio and the explanatory variables:

$$\frac{\partial(MV/BV)}{\partial R} > 0; \quad \left.\frac{\partial(MV/BV)}{\partial g}\right|_{ROE \gtrless k} \gtrless 0$$
$$\left.\frac{\partial(MV/BV)}{\partial b}\right|_{ROE \gtrless k} \gtrless 0; \quad \frac{\partial(MV/BV)}{\partial k} < 0. \tag{4}$$

A second version of a DCF approach we use here, is the free cash flow to equity discount model (FCFE). This model uses a more expansive definition of cash flows to equity than that used in the dividend model. These cash flows are defined as those left over after meeting all financial obligations and investment expenditures.

The constant growth version of the FCFE model can be expressed as:

$$P_0 = \frac{FCFE_1}{k-g}, \tag{5}$$

where, $FCFE_1$ is the expected free cash flow to equity next year, $g = b \cdot ROE_1$ is the constant growth rate of the cash flows, where b is the reinvestment rate. As before, equation (5) can be rewritten in relative terms, i.e., as a market-to-book ratio.

[1] The cost of capital reflects the return that the investor requires or the long term rate of return on equity.

In general, the reinvestments of the firms include capital expenditure and working capital needs. In the case of a financial service firms, measuring either of these items is problematic since such firms invest mostly in intangible assets. Consequently, following Damodaran (2002) we use operating expenses as a proxy for their investments.

Our estimation equation can be expressed in the following general way:

$$\frac{MV}{BV} = f\left(\overset{+}{ROE} \ , \overset{-}{k} , \overset{+}{g} \right)$$

or (6)

$$\frac{MV}{BV} = f\left(\overset{+}{ROE} \ , \overset{-}{k} , \overset{+}{b} \right).$$

The signs over the explanatory variables express the expected directionality of the effects. In the empirical part of the paper, we shall introduce an additional variable *Z* that represents a vector of factors that affect the MV/BV ratio of banks such as regulation, the structure of the banking system privatization, and macroeconomic and capital market conditions, as a part of the charter value hypothesis.

2. Market value vs. book value in Israeli banking – empirical estimates for 1994-2005

2.1. Overview of the Israel's banking system. The Israeli banking system is characterized by a high degree of concentration, reflected by several indicators. The largest five banking groups account for about 95% of the system's assets, loans or deposits (see Table 1). The banks in Israel operate as restricted "universal" banks: in addition to classic banking intermediation, the large commercial banks heading the banking groups have subsidiaries that engage in several activities complementary to commercial banking. These activities include mortgage banking, credit cards, overseas banking (via subsidiaries and branches), direct and indirect ownership of companies that operate in the financial and capital markets (such as trading in securities, management of investment companies and investment banking), insurance companies.

The Herfindhal-Hirschman index of concentration (HHI) of the banking system is 0.210 and is one of the highest in the western world. The banking system holds over half of the assets of the public and extends more than 70% of total loans in the economy.

Table 1. Israel's banking system,
financial information in NIS billion, December 2009

	Assets	Percent of total	Credit to the public	Percent of total	Deposits from the public	Percent of total
Bank Hapoalim	301.8	28	215.6	30	225.1	27
Bank Leumi	323.6	30	203.9	28	249.4	30
Israel Discount Bank	187.5	17	115.8	16	140.4	17
United Mizrahi Bank	115.6	11	60	8	81	10
First International Bank	101.8	10	43.3	6	61.6	7
Other commercial banks*	46.7	4	37.7	11	35.8	4
Total Banking System	1.077	100.0	719.9	100.0	824.9	100.0

Note: * Include Union Bank of Israel, Bank of Jerusalem, Industrial Development Bank of Israel, Otzar Hahayal Bank Ltd i, Citibank N.A and HSBC Bank.
Sourse: Banking supervision department, Bank of Israel.

Following the bank shares crisis of 1983, four of the largest five banks were nationalized and their shares delisted from trading on the Tel Aviv stock exchange (TASE)[1]. As part of the liberalization and privatization of capital markets policies in Israel, the government relisted the shares of the banks for trade on the TASE over the period of 1993-1998 and sold its shares of the banks to the public.

For an updated detailed analysis of the performance and structure of the Israel's banking system, see the annual survey of Israel's banking system (2009).

2.2. Data summary statistics. In this part of the paper, we calculate the market-to-book ratio *(*MV/BV*)* of Israel's largest five banking groups (Bank Hapoalim, Bank Leumi, Israel Discount Bank, First International Bank, and United Mizrahi Bank) between March 1994 and September 2005.

The banking group in Israel has at its head a commercial bank (the parent bank) that owns the subsidiaries and affiliated companies of the group[2]. The shares traded on the TASE are those of the parent

[1] The exception was the First International bank, which did not participate in the manipulation of its share prices and, therefore, did not suffer from the crisis. Its shares traded continuously with no interruption.

[2] Until December 31, 2003, the reported, amounts in the financial statements were adjusted to changes in the CPI. This adjustment of financial statements for inflation was discontinued as of January 1, 2004. The adjusted amounts included in the financial statement as of December 31, 2003 were used as the starting point for financial reporting henceforth.

bank and, thus, reflect the performance of the entire group. The accounting data used in this paper is derived from the consolidated financial statement of the parent bank.

The market-value to book-value ratio of bank *i* during time *t* $(MV/BV)^i_t$ is defined as follows:

- the market value of bank *i* is the value of the firm's listed shares and warrants (excluding convertible bonds);
- the market value also includes unlisted shares, which are valued at the market price of the listed shares;
- the book value of equity includes share capital, premium and capital reserves and retained earnings on the consolidated balance sheets of the banks.

It should be noted that the data in the quarterly financial statements of the banks (as of other public firms) are released to the public with a lag of three to four months. Therefore, market value at quarter *t* relates to information released to the public at that time and refers to business results as of the end of the previous quarter.

Thus, the ratio examined in this paper is $\left[\frac{MV_{t+1}}{BV_t}\right]$.

Figure 1 plots the MV/BV ratio of the largest five banks between March 1994 and Decmber 2009.

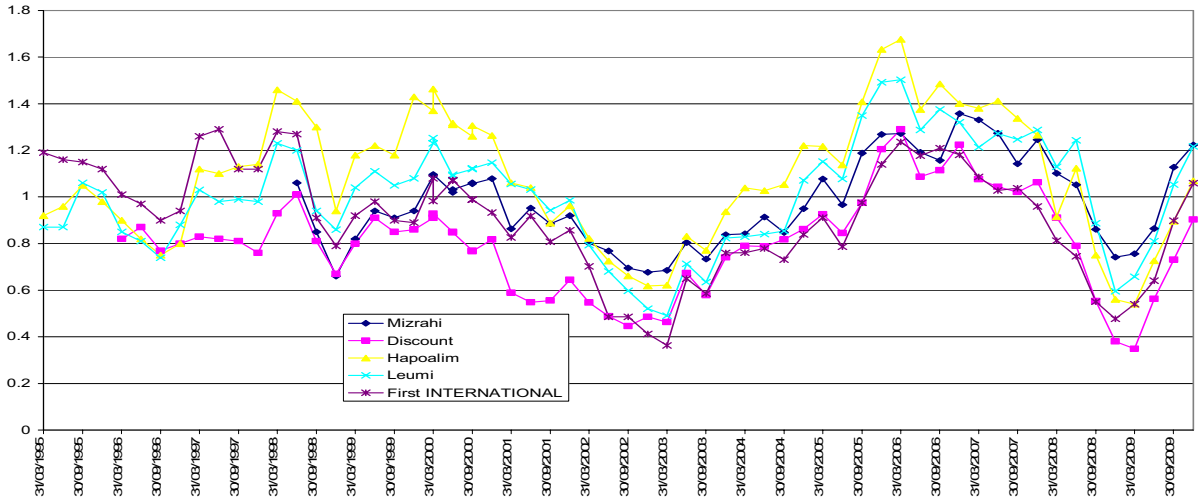

Fig. 1. MV/BV of the largest five Commercial Banks, 3/1994-12/2009

As can be observed in Figure 1 the MV/BV ratios of all the banks, without exception, have been trending down during the period from January 2000 to December 2002. The average ratio for the system fell below 1.0. Notable in this diagram the positive relationship between MV/BV ratio and the level of the firm's profitability. In late 2000 and in December 2002, it reached of 0.74. It is conceivable that the steep decrease that happened during an economic recession in Israel reflected the deterioration in the performance of the banks and the expectations that commercial banks' performance would not improve in the near future. In examining the developments of this ratio in the past six years (part of the period are not included in the sample), we see that from the beginning of 2003 after three years investors change their assessment and expected a substantial improvement in the bank's favorable results in 2004 and 2005. This was reflects by a continuous rise in the MV/BV ratio for all banks during those years. The decline in the MV/BV ratio during 2008 derived mainly from the developments and shocks in the global financial system in the real crisis which resulted from it and impacted the Israeli economy as well. The average MV/BV ratio of the five large commercial banks increased in 2009, crossing the threshold of unity, and ending the year at 1.09 as against 0.56 in 2008.

2.3. Empirical estimation of the factors determining the MV/BV ratio in banking. In this section, we estimate the determinants of the MV/BV ratio using a multivariate regression analysis. The theoretical bases for the empirical analysis are presented in equation (6).

We performed a logarithmic transformation on all variables (x) with the exception of the variables that can have a negative value, on which we performed a $ln(1+x)$ transformation.

Following are the specification of the variables used in our analysis.

The dependent variable is defined as follows:

$\left(MV/BV\right)^i_t$ – the MV/BV ratio of bank *i* in quarter *t*. Because, as we have already indicated, there is a lag of approximately three months in the publication

of the financial statements which are related to BV, we calculated the ratio $(MV_{t+1}/BV_t)^i$.

The independent variables and their hypothesized effect on MV/BV are defined as follows:

ROE_t^i – the return on equity of bank *i*, during the preceding four quarters (a year). We expect a positive relationship between ROE and the MV/BV ratio of the bank (for illustration, see Figure 2).

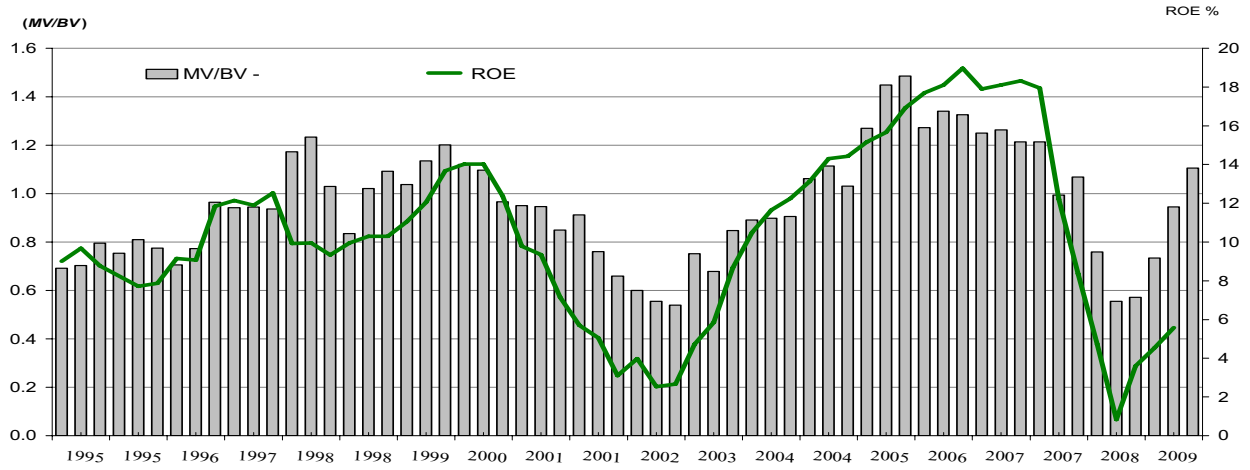

Fig. 2. (MV/BV)B ratio vs. annual return on equity (ROE) of the five largest commercial banks, 6/1995 - 12/2009

The risk of equity was estimated using two approaches. First, overall, risk is decomposed into two major types of risk: credit and market (interest, inflation, and exchange rate) risks. The risks were estimated using accounting data. Second, by estimating the systematic risk based on the capital asset pricing model (CAPM):

$$k_j - R_f = \beta_j(R_m - R_f),$$

where the excess of the required rate of return on equity k over the risk-free rate R_f is determined by the risk premium which equals the product of the market price of risk $(R_m - R_f)$ and the systematic risk beta (β), where R_m is the expected rate of return of the market.

For credit risk, we used three alternative measures:

$(L/GDP)_t$ – the bank-credit to GDP ratio. This ratio is defined as total credit to the public extended by bank *i* in quarter *t*, divided by the cumulative GDP in the preceding four quarters. As an alternative to this variable, we examined two additional credit-risk variables: the annual (the preceding four quarters) loan-loss provisions divided by total credit at quarter *t* $(LLP/L)_t$ and the risk-weighted assets/total assets ratio in quarter *t* $(RWA)_t$. All these variables examine the quality of bank credit, the higher they are, the lower is the quality of credit (the lower is the repayment ability of the borrowers or the higher is the probability of default), and vice versa. Hence, this group of variables is expected to have a negative influence on the MV/BV ratio.

For market risk, we used three alternative estimates:

- $(\sigma_{NIS/\$})_t$ – the implied standard deviation of the NIS/dollar exchange rate. The standard deviation was calculated by using the Black-Scholes formula for three-month call options on the NIS/dollar exchange rate traded on the TASE;
- p^e – expected inflation based on the capital market estimation. The estimation is done by taking the ratio of yield to maturity of non-linked government bonds (normally TB's) to the yield to maturity of CPI – linked government bonds with equal time to maturity. For that purpose, we used 12 months intervals;
- σ_p^e – standard deviation of expected inflation, using 12 months intervals.

As explained before the market risk variables are expected to have a negative effect on the MV/BV ratio.

For the estimation of systematic risk, we used three alternative measures:

- beta (β) that was estimated by an OLS regression of the monthly stock returns (R_{it}) on the monthly returns on the TASE 100 (value weighted index of the100 largest cap stocks) (R_{mt}) over a 24 months moving window: $R_{i\,t} = \alpha_i + \beta_i R_{mt} + e_{it}$;
- the risk premium $\beta_j(R_m - R_f)$, where the market price of risk $(R_m - R_f)$ was estimated as a 12 quarters' average (3 year); R_m was calculated as a geometric average over 12 quarters and R_f is the yield to maturity on a one-year treasury bill at each point in time[1];

[1] As is common in empirical studies of the CAPM the ex-ante expected rate of return of the market is replaced by an ex-post average return.

- the required rate of return $k_j = R_f + \beta_j(R_m - R_f)$, where each variable is defined above.

As before, we expect all three systematic risk variables to have a negative effect on the (MV/BV) ratio.

For reinvestment policy, we used two alternative variables:

1. b_1 – the retention ratio defined as one minus the payout ratio, the payout ratio is measured as the average dividends paid by bank *i* in the calendar year divided by the earnings (available for distribution) in that quarter. This ratio should reflect the dividend policy as declared by the bank for the upcoming calendar year.
2. b_2 – reinvestment ratio defined as the ratio of operating expenses divided by net financial income plus operating income in quarter *t*; this ratio is also known as the efficiency ratio.

The hypothesis here is that a higher reinvestment results in greater growth and, hence, a higher MV/BV ratio.

For the economic factors, we used two groups of variables:

1. To measure macroeconomic conditions we used quarterly changes (in annual terms) in GDP (*GDP*), or business sector GDP (GDP_{BS}) or changes in the composite state-of the- economy index (*CEI*)[1];
2. To measure capital market conditions we used the variable $(MV/BV)_{NB}$ defined as the MV/BV ratio of all non-bank firms traded on the TASE in quarter *t*. This variable allows us to neutralize the factors that affect the stock market in general.

The hypothesis is that a rise in economic activity and in the capital market leads to a higher MV/BV ratio in banking.

The hypotheses rely on the assumption that during economic expansions or alternatively during bull markets the charter value of the banks increases.

For the structure of the banking system, we used two alternative variables:

1. *HHI* – the Herfindhal-Hirschman index of concentration of the banking system, we measured this index using total assets.
2. S_i – the market share of bank *i* in the total assets of the banking system.

The assumption behind these two variables is that a higher degree of concentration leads to less competition and, hence, an increase in the charter value of the bank and, subsequently a rise in its MV/BV ratio.

For regulatory factors, we used two dummy variables:

1. DR – a dummy variable with a value of 1 for periods after the minimum required capital ratio has been raised by the Bank of Israel from 8% to 9% (in March 1999), and zero otherwise.
2. *DP* – a dummy variables for the privatization of the banks, with a value of 1 for the periods after the privatization and zero otherwise.

The regression that we ran for each bank *i* was as follows:

$$\begin{aligned}(MV/BV)_t^i &= \alpha_0 + \beta_0 ROE_t^i + \beta_1 (credit\ risk)_t^i + \\ &+ \beta_2 (market\ risk)_t^i + \beta_3 (reinvestment\ \ policy)_t^1 + \\ &+ \beta_4 (macroeconomic\ \ factors)_t + \beta_5 (MV/BV)_{NB\,t} + \\ &\beta_6 (banking\ structure)_t + \beta_7 (regulation)_t + \varepsilon_{ti}.\end{aligned}$$

According to our analysis the hypothesized signs of the coefficients in equation (9) are:

$$\beta_0 > 0\ ; \beta_1 < 0\ ; \beta_2 < 0\ ; \beta_3 > 0; \beta_4 > 0;\ \beta_5 > 0;\ \beta_6 > 0;\ \beta_7 > 0.$$

The second regression where systematic risk was substituted for credit and market risk is:

$$\begin{aligned}(MV/BV)_t^i &= \alpha_0 + \beta_0 ROE_t^i + \beta_1 (systematic\ risk)_t^i + \\ &+ \beta_2 (reinvestment\ \ policy)_t^i + \\ &+ \beta_3 (macroeconomic\ \ factors)_t + \\ &+ \beta_4 (MV/BV)_{NB_t} + \\ &+ \beta_5 (banking\ structure)_t + \beta_6 (regulation)_t + \varepsilon_{ti}.\end{aligned}$$

Hereinafter, we analyze the regression results obtained for each bank (each for the relevant period during which its shares were traded in the TASE).

[1] The composite state-of-the-economy index is a synthetic cyclical indicator for examining the direction in which real economic activity is moving in real time. The index is calculated from the monthly changes in five components that reflect different aspects of real economic activity: the index of manufacturing production; imports, excluding capital goods; trade and services revenue; the number of employee posts in the business sector; and goods exports (excluding agriculture, fuel, diamonds and ships and aircraft).

Table 2. Regression results of $(MV/BV)^i_t$ for the largest five banks (quarterly data)

Independent variables	Bank Hapoalim 1.1994-3.2005				Bank Leumi 1.1994-3.2005				Israel Discount Bank 1.1996-3.2005				Mizrahi Bank 2.1998-3.2005				First International 1.1994-3.2005			
	a	b	c		a	b	c		a	b	c		a	b	c		a	b	c	
Intercept (C)	-1.46 (-3.07)*	-1.27 (-3.55)*	-0.72 (-2.58)**	2.19 (1.68)	-1.38 (-5.05)*	-0.68 (-6.24)*	1.91 (1.14)	4.00 (1.53)	2.39 (1.03)	2.72 (1.13)	-0.66 (-0.52)	0.79 (0.25)	-1.91 (-4.17)*	-0.57 (-3.40)*	-1.31 (-4.04)*	-0.80 (-6.93)*	-2.35 (-5.55)*	-1.37 (-5.88)*	-1.17 (-3.43)*	-0.50 (-5.49)*
Return on equity (ROE)	7.98 (3.05)*	10.65 (2.51)**	8.12 (1.84)***	17.15 (6.69)*	10.99 (6.29)*	13.47 (7.34)*	10.41 (3.76)*	19.16 (7.58)*	5.61 (2.28)**	7.45 (3.44)*	5.62 (1.68)***	7.62 (3.36)*	7.61 (1.97)***	13.46 (3.81)*	9.83 (2.92)*	19.09 (3.25)*	8.14 (3.01)*	5.40 (1.85)***	4.74 (0.99)	19.52 (4.50)*
Credit risk:																				
Total credit / GDP (L/GDP)	-0.72 (-1.94)***				-0.37 (-1.69)***				-2.05 (-4.65)*				-0.51 (-2.91)*				-0.97 (-5.36)*			
Risky assets / total assets (RWA)		-0.60 (-1.78)***				-0.32 (-2.22)**				-0.89 (-2.63)**				-0.33 (-0.88)				-1.05 (-2.95)*		
Loan loss provision / total credit (LLP/L)			-0.07 (-0.97)				-0.16 (-2.22)**				-0.03 (-0.09)				-0.18 (-2.73)**				-0.17 (-2.46)**	
Market Risk:																				
S.D of expected inflation (σpe)						-0.06 (-1.66)***	-0.10 (-2.34)**													
Expected inflation (pe)																	-0.18 (-2.23)**			
S.D NIS / dollar (σ NIS / $)		-0.17 (-1.31)			-0.14 (-1.74)***					-0.17 (-1.99)***			-0.17 (-2.34)**					-0.23 (-2.11)**		
Systematic risk																				
ki = Rf + β(Rm-Rf)				-3.66 (-2.73)**				-2.50 (-1.74)***				-3.50 (-2.59)**				-1.10 (-0.59)				
β(Rm-Rf)																				-4.58 (-2.03)***

Note: t-values appear in parentheses under each coefficient. * indicates 1 % significance. ** 5 % significance. *** 10 % significance.

Table 2 (cont.). Regression results of $(MV/BV)^i_t$ for the largest five banks (quarterly data)

Independent variables	Bank Hapoalim 1.1994-3.2005				Bank Leumi 1.1994-3.2005				Israel Discount Bank 1.1996-3.2005				Mizrahi Bank 2.1998-3.2005				First International 1.1994-3.2005			
	a	b	c		a	b	c		a	b	c		a	b	c		a	b	c	
Reinvestment:																				
Retention ratio	0.04 (1.96)***			0.05 (2.06)**	0.06 (1.74)***	0.07 (1.97)***	0.07 (1.98)***	0.11 (2.62)**	1.11 (3.03)*	1.47 (2.64)**						0.36 (1.86)***				
Efficiency ratio												0.24 (0.73)	0.40 (2.55)**	0.57 (2.95)*	0.58 (3.51)*		0.46 (2.17)**			0.29 (1.56)
Macroeconomic conditions:																				
Changes in GDP_{BS}		0.22 (1.87)***				0.27 (2.60)**			0.24 (2.01)***					0.31 (3.66)*	0.28 (3.83)*		0.25 (2.03)**			
Changes in *GDP*	0.35 (2.00)***			0.35 (2.29)**	0.33 (2.04)**			0.48 (2.97)*		0.36 (2.15)**		0.47 (2.53)**	0.39 (3.50)*			0.49 (2.98)*				0.41 (3.08)*
Composite economic index			1.07 (1.84)***				0.89 (1.78)***				1.69 (2.18)**									
Market value / book value of non-bank firms $(MV/BV)_{NB}$	0.74 (8.01)*	0.40 (2.83)*	0.53 (3.82)*	0.66 (5.81)*	0.58 (6.20)*	0.62 (6.62)*	0.40 (2.92)*	0.60 (6.02)*	0.48 (3.57)*	0.54 (4.58)*	0.24 (5.53)*	0.56 (4.00)*	0.31 (4.30)*	0.41 (5.14)*	0.38 (5.69)*	0.36 (2.58)**	0.35 (2.96)*	0.44 (3.94)*	0.30 (2.29)**	0.17 (2.86)*
Banking structure factors:																				
Herfindhal-Hirchman index *(HHI)*							2.16 (1.75)***	3.23 (1.73)***		2.82 (1.65)		0.81 (0.37)								
Market share *(Si)*				2.54 (2.05)***					3.95 (2.97)*											
Regulation policy: Dummy variable - *DR*	-0.27 (-2.79)*		-0.22 (-2.83)*	-0.34 (-4.99)*	-0.19 (-2.53)**	-0.27 (-3.83)*	-0.21 (-3.07)*	-0.24 (-3.79)*		-0.27 (-4.63)*		-0.32 (-4.44)*					-0.24 (-2.97)*	-0.21 (-2.40)**	-0.19 (-1.92)***	
Privatization policy: Dummy variable – *DP*	0.29 (3.89)*	0.22 (1.71)***		0.28 (3.05)*																
MA(1)		0.45 (2.63)**	0.44 (2.79)*								0.97 (28.19)*								0.57 (4.04)*	1.31 (7.91)*
Adjusted R^2	0.81	0.63	0.74	0.84	0.78	0.76	0.78	0.80	0.79	0.83	0.76	0.84	0.79	0.70	0.78	0.72	0.79	0.76	0.77	0.84

The main results, presented in Table 2 are:

1. ROE was found, as expected, to have a positive and statistically significant effect on MV/BV ratio in all of the five major banks. This finding indicates that investors in bank shares take into account the profitability of the bank when they value the bank.
2. Specifically, the coefficients which reflect elasticity of $(MV/BV)^i$ with respect to ROE (i.e. $\frac{\partial \ln(MV/BV)}{\partial \ln(1+R)}$) vary between 5.4% and 19.5% in First International[1].
3. With respect to credit risk, which is considered to be the major type of risk faced by the banks, we used in equation (7) three alternative variables to represent this risk; *L/GDP*, *RWA* and *LLP/L*, all of which were defined previously. Generally, all of the three variables were found, as expected, to have a significant negative impact on $(MV/BV)^i$. The meaning of these results is that investors in bank shares believe that credit risk taken by the bank reduces the attractiveness of the shares which is reflected in its MV/BV ratio. This finding is consistent with the implication of the "efficient market hypothesis" that the inverse of the MV/BV ratio is a proxy for risk.
4. Contrary to credit risk, market risk as reflected in p^e, σ_{P^e} or $\sigma_{NIS/\$}$ proved to contribute to MV/BV only in some banks and the standard deviation of the foreign currency ($\sigma_{NIS/\$}$) proved to be the best of all (with the exception of Bank Hapoalim in which it did not contribute at all). A possible explanation of these results is that the net exposure (after hedging) of the banks to market risks is relatively small.
5. The systematic risk, which replaced credit risk and market risk and proved to be the most significant, is the cost of equity (k). It proved to influence the MV/BV ratio negatively in three banks (Hapoalim, Leumi and Discount Bank). In one bank (First International), the risk premium ($\beta_i(R_m - R_f)$) turned out to be negatively significant. These findings are consistent with the results obtained while decomposing the risk into credit to market risk.
6. The reinvestment variables proved to affect the MV/BV ratio in all banks. Between the two variables used to represent this group of variables, the retention ratio proved to be superior. Apparently, the dividends paid by the banks influenced the decisions by the investors in bank stock and, thus, effected the MV/BV ratio of the bank. As mentioned earlier in the paper, the reinvestment ratio together with the return on equity of the bank determine its growth pattern (i.e., $g = b \cdot ROE$). Thus, the finding that both *ROE* and b were found to be significant is of importance and supports the validity of the dividend growth model.
7. The influence of macroeconomic conditions as reflected by changes in three possible indices of economic activities proves to be positive and significant. One cannot say categorically that one index is superior to the other, since all of them had a positive and statistically significant effect on $(MV/BV)^i$. This finding supports the hypothesis that the charter value of banks increases during periods of economic expansion (Saunders and Wilson, 2001).
8. As can be seen the competition in the banking industry as measured by several banking structure factors, had hardly any effect on $(MV/BV)^i$. This is probably due to the high concentration of the banking industry and the small number of major banks in Israel.
9. In all banks, we found a statistically positive influence of capital market conditions, as measured by the ratio $(MV/BV)_{NB}$, on the MV/BV ratio of the banks. The values of the coefficients/elasticities vary between 0.17 (for the First International Bank) to 0.74 (for Bank Hapoalim). The existence of a coefficient smaller then one may indicate that the bank stocks behave more conservatively than the rest of the stocks traded on the Tel Aviv exchange.
10. The regulatory influence, represented by a dummy variable that creates distinction between the period prior to the increase in the minimum capital adequacy ratio (March 1999) from 8% to 9% and the period after it, was found to have a significant negative impact on MV/BV in four of the banks examined. Apparently, the requirement by the bank of Israel to raise the minimum capital adequacy ratio was interpreted as a measure designed to cope with a higher risk faced by the banks and it imposed a higher cost of equity financing on the banks.

[1] Because of negative values of ROE during some periods, we used ln(1+*ROE*), the elasticities of MV/BV w.r.t *ROE* (η_{ROE}) is calculated as follows:

$$\alpha_{ROE} = \frac{\partial ln(MV/BV)}{\partial ln(1+ROE)} = \frac{\partial ln(MV/BV)}{\partial ln ROE} \cdot \frac{\partial ln ROE}{\partial (ROE)} \cdot \frac{\partial (ROE)}{\partial (1+ROE)} \cdot$$

$$\cdot \frac{\partial (1+ROE)}{\partial ln(1+ROE)} = \eta_{ROE} \cdot \frac{1}{ROE} \cdot 1 \cdot (1+ROE),$$

$$\eta_{ROE} = \alpha_{ROE} \cdot \frac{\overline{ROE}}{(1+\overline{ROE})},$$

where the bar above the variable *ROE* indicates the average of the variable during the analyzed period. According to this formulation, the elasticities (η_{ROE}) varied between 0.045 in Bank Discount to 0.46 in Bank Leumi.

11. The variable that is supposed to capture the effect of government policy is measured by the privatization of banks during the period of 1993-2005. The dummy variable chosen for that purpose had proved to be significantly positive only for Bank Hapoalim for which we had sufficient pre- and post-privatization data. Apparently, the market expected that privatization would improve the performance of the bank in the future because of an increase in operating efficiency and/or because of more prudent risk management then in the past.
12. The adjusted R^2 ($\overline{R}^2$) were relatively high in all banks (between 63% and 84%) and there was no evidence of serial correlations in most regressions. It should be noted that whenever serial correlation existed in the regressions, we used a moving average or autoregressive error process of the first degree to correct for it. In those cases, we added $MA(1)$ or $AR(1)$ term to the regressions, the coefficients of which appear in Table 2.

In the second stage of our empirical analysis, we used a pooling method by combining cross section and time series data covering the period from the second quarter of 1998 to the third quarter of 2005. We use this approach to augment the above analysis that relied on time series for each bank separately, in light of small number of banks in the Israel's banking system.

The results we obtained using a pooling process is summarized in Table 3.

Table 3. Regression results of $(MV/BV)^i_t$, using pooling process, the largest five banks

Independent variables					
		1	2	3	1
Intercept (C)		-0.25 (-0.78)	-0.97 (-7.59)*	2.37 (1.31)	-0.38 (-6.52)*
Profitability	Return on equity *(ROE)*	9.43 (7.94)*	9.45 (6.52)*	9.96 (5.42)*	13.27 (8.80)*
Credit risk	Total credit / *GDP (L/GDP)*	-1.01 (-5.83)*			
	Risky assets / total assets *(RWA)*		-1.26 (-4.94)*		
	Loan loss provision / total credit *(LLP/L)*			-0.10 (-2.50)**	
Market risk	S.D NIS / dollar *($\sigma_{NIS/\$}$)*	-0.13 (-3.34)*	-0.16 (-3.46)*	-0.16 (-3.28)*	
Systematic risk	*B*				-0.11 (-1.66)***
Reinvestment	"Retention ratio"	0.04 (1.96)***			
	"Efficiency ratio"		0.11 (1.13)	0.04 (0.48)	
Macroeconomic conditions	Changes in GDP_{BS}		0.22 (4.92)*		
	Changes in *GDP*			0.20 (3.30)*	
	Composite economic index	0.43 (1.98)**			0.68 (2.30)**
Capital market conditions	Market value / book value of non-bank firms $(MV/BV)_{NB}$	0.21 (3.33)*	0.35 (6.29)*	0.33 (6.11)*	0.23 (3.55)*
Banking structure factors	Herfindhal-Hirchman index *(HHI)*			2.51 (1.95)***	
	Market share *(Si)*	1.29 (4.34)*			
Regulation policy	Dummy variable – *DR*	-0.06 (-1.76)***	-0.16 (-4.32)*	-0.16 (-4.56)*	-0.19 (-4.08)*
Dummy variable for time	DT: 2002	0.06 (2.77)*	0.09 (3.44)*	0.08 (2.40)**	0.08 (2.12)**
Dummy variable for bank	DB: Bank Leumi	-0.15 (-4.88)*	-0.20 (-5.25)*	-0.11 (-2.54)**	-0.09 (-2.14)**
	DB: Israel Discount	-0.26 (-1.43)	-0.47 (-6.16)*	-0.14 (-2.46)**	-0.09 (-1.60)
	DB: Mizrahi Bank	0.25 (0.77)	-0.28 (-6.09)*	-0.19 (-3.89)*	-0.10 (-2.05)**
	DB: First International	0.15 (0.43)	-0.33 (-6.73)*	-0.19 (-3.92)*	-0.10 (-1.97)***

Table 3 (cont.). Regression results of $(MV/BV)^i_t$, using pooling process, the largest five banks

Independent variables				
	1	2	3	1
AR(1)		0.29 (3.27)*	0.43 (5.10)*	0.43 (4.96)*
Adjusted R^2	0.87	0.86	0.87	0.86

Note: t-values appear in parentheses under each coefficient. * indicates 1 % significance. ** 5 % significance. *** 10 % significance.

The regression results of this process are similar to the ones obtained using time series data for each of the five large banks separately. The variables return on equity (*ROE*); credit risk (measured either by the ratio of loan-loss provisions to total credit – *LLP/L* or *RWA* or *L/GDP*); market risk (measured by the standard deviation of *NIS/$*); systematic risk (represented by β of each bank); economic factors (measured either by changes in *GDP* or in GDP_{BS}, or in *CEI*); capital market factors (measured by $(MV/BV)_{NB}$); and the banking market structure (measured by concentration indices – *HHI* or S_i). All obtained the hypothesized signs and were found to be statistically significant. With respect to the banking structure factor (measured by the *H* index of the industry), we found, as hypothesized, that the more concentrated the banking system, the greater the value of MV/BV ratio, probably reflecting a higher charter value of the banks. It should be noted that in the previous time series analysis, using each bank separately, we did not find a significant impact of this factor on the MV/BV ratio. The possible explanation for the different results is the shorter time period of the pooling data (1998-2005) during which there was a significant increase in concentration of the system.

As can be seen, the variables representing the reinvestment policy (as measured either by the efficiency ratio or by the retention ratio) were significant only in one regression, whereas the dummy variable representing the regulatory decision to raise the minimum capital ratio from 8% to 9% was found to be significant in all four regressions.

In addition to the basic variables we added two sets of dummy variables distinguishing between the different years as well as between the different banks. For this purpose, we defined distinguishing between two years sub-periods: prior to 2002, years characterized by a decline in the MV/BV ratio and after it. For the purpose of distinguishing between banks, we dropped Bank Hapoalim and, thus, all other banks are measured relative to it; in other words, Bank Hapoalim served as a reference bank for that purpose.

The results obtained for the time dummy variables indicate that, indeed, 2002 was the lowest year in terms of the MV/BV ratio of the system and the results of the cross section dummy variables indicate that Bank Hapoalim had the highest MV/BV ratio among all the banks in the sample. These findings are supported by the behavior of the MV/BV ratio over time and among banks (see Figure 1).

Again, here, we obtained a relatively high $\overline{R}^2$ and there was no serial correlation in the data (in some cases we had to add *AR*(1) in order to correct for serial correlation).

Conclusions and policy implications

In this paper, we developed, based on economic and finance theory, a model for the determination of MV/BV ratio of a business firm and adopted it to a banking firm.

Using Israel's banking data, we tested the relationship between various explanatory variables and the MV/BV ratios of the five largest banks in Israel during the period of 1994-2005 using time series and pooled data.

The two most important groups of variables that explained inter variation in MV/BV over time and across banks, are the risk (measured by either accounting data or relying on market values based on the CAPM model) and the return on equity.

The combined, opposing, effect of risk and return on the MV/BV ratios of banks, raises the importance of risk adjusted performance measures of firms particularly of banks, such as RAROC (see Landskroner, Ruthenberg and Zaken, 2005).

The findings of this paper have policy implications. They can serve bank management and investors in bank stocks in their decision-making process, once they know that a combination of return and risk determines the future values of the bank as reflected in its MV/BV ratio.

Our finding supports the efficient market hypothesis that the MV/BV ratio reflects risk of equity. We also find a positive relationship between charter value and economic activity, this supports the charter value hypothesis in banking and has important implications for regulation of banks. As deregulation increases competition and reduces charter value. On the other hand, reduced government involvement in capital markets and financial intermediation, increases charter value.

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