Bank Capital in General Capital Structure Framework

with Competition, Diversification and Liquidity

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Studies of capital structure constitute a significant part of the corporate finance literature. However, banks are routinely excluded from such studies, under the assumption that regulatory capital requirements are the most important determinant of bank leverage. Moreover, recent studies develop bank-specific capital structure theories that have not been tested empirically. We fill this void by empirically testing the determinants of bank capital structure in a large sample of the publicly traded U.S. commercial banks and bank holding companies during the period of 1973-2012. We find that the determinants of bank capital structure are similar to those identified in prior literature for non-financial firms. However, the determinants vary in different regulatory capital requirement regimes and in different macro-economic environments. Interestingly, we find evidence of moral hazard in the capital structure of systematically important financial institutions in that their capital structure is independent of their risk and collateral. We also find support for bank-specific theories of capital structure (Allen et al, 2009; Allen and Carletti, 2013; and, DeAngelo and Stulz, 2013). Bank leverage is negatively related to the level of competition in the industry and banks' loan portfolios diversification. High leverage of banks is associated with low past liquidity and high future liquidity, consistent with banks' unique role of liquidity creators. Approaching capital requirements invalidates significance of a majority of factors for book leverage, but leverage of banks does not decrease until they are within 1% of the required capital ratio minimum. Discretionary leverage factors remain significant for market leverage in presence of capital requirements violation threat.

1. INTRODUCTION

Until most recently, financial companies have been excluded from major capital structure literature. This exclusion was due to the belief that regulatory requirements prevailed over other factors in financial firms' capital structure decisions. Recent evidence, provided by Gropp and Heider (2010), suggests that the capital structure of financial companies does not depend solely on regulatory requirements. Gropp and Heider study 100 largest publicly traded commercial banks and bank holding companies in U.S. as well as100 in 15 countries of the European Union. They show that capital structure determinants for the banks in their sample are similar to the determinants of non-financial firms' capital structure, as identified by Frank and Goyal (2009). At the same time, Gropp and Heider find significant bank and time fixed effects determined by factors omitted in their study. When Gropp and Heider borrow their model from Frank and Goyal, they only use the most reliable determinants of leverage, identified using the sample of non-financial firms, with the exception of inflation and addition of risk. In searching for additional bank leverage factors, we re-introduce other variables from Frank and Goyal's study and further augment the model with bank–specific variables suggested by the recent banks capital theories of Allen et al. (2009), Allen and Carletti (2013) and DeAngelo and Stulz (2013). According to Shleifer and Vishny (1992) and Korajczyk and Levy (2003), a capital structure choice depends on the macroeconomic cycle; therefore, we study the behavior of the model during different stages of the economic cycle.

There is great interest in capital structure studies among members of the academic finance community. The capital structure research was recently discussed by Denis, in his address to the 2012 EFA annual meeting and Flannery, in his address to 2013 EFA annual meeting, as well as by Allen and Carletti (2013), who mention the scarcity of empirical tests of

capital structure of banks. This paper contributes to the existing literature on bank and general capital structure in two distinctive ways. First, it substantially extends the empirical research on determinants of bank capital structure. Secondly, it studies the capital structure of banks during different stages of the economic cycle. The following primary questions are answered as a part of this research. Do banks follow the general theory of capital? What are the bank-specific determinants of bank capital structure and how do they differ for banks approaching regulatory requirements?

We can confirm that Gropp and Heider's (2010) model of leverage with MTB, profitability, size, collateral, dividend payer dummy, and risk works sufficiently similarly in our broad sample of the U.S. banks and bank holding companies. However, some differences are observed across various capital regulation regimes. The model performs worst when the uniform capital requirements, based on the total capital and without risk weighting, are introduced in response to the S&L crisis (Pre-Basel period). It is possible that during that period of time the regulatory requirements prevailed over economic factors of leverage. When we consider Systematically Important Financial Institutions (SIFIs) separately, their leverage decisions appear to be independent from risk factors and, often, collateral, especially in the recent post-Basel period. A number of additional leverage factors considered by Frank and Goyal (2009) are tied to the classic capital structure theories (pecking order, trade-off, managerial timing, agency free cash flows) are also significant determinants of the leverage of banks. The results speak in support of the trade-off theory. Bank-specific theories contribute to the study in several ways: competition and diversification in lending are negatively correlated with bank leverage, and approaching capital requirements changes capital structure decision factors, but does not

eliminate the discretionary capital decision process entirely. Greater leverage of banks is associated with higher future market liquidity.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

This research is largely inspired by the work of Gropp and Heider (2010), which serves as a starting point for the experimental design development. According to Gropp and Heider, traditionally, financial firms were excluded from the empirical capital structure literature. Empirical studies of banks' capital structure were considered unnecessary, since leverage of all banks was, supposedly, determined by regulatory capital requirements. Gropp and Heider study 100 largest U.S. and 100 largest E.U. banks empirically and show, in contrast to common belief, the substantial variation in equity capital ratios of the banks in their sample. Further, they demonstrate plausibility of some of the leverage determinants, borrowed from the general capital structure literature for explaining banks' leverage. Gropp and Heider find that the most reliable factors of non-financial firms' leverage, determined by Frank and Goyal (2009), are similarly significant for the leverage of the banks' in their sample.

While financial firms are usually ignored in the empirical capital structure literature, a significant body of theoretical literature of bank capital structure has developed since the beginning of new millennium. Diamond and Rajan (2000), Allen et al. (2009), Allen and Carletti (2013), just to name a few, build an elaborate picture of the discretionary bank capital determinants. Allen and Carletti call for the empirical studies of bank capital structure as being much needed for closing the glaring gap in literature. We extend Gropp and Heider's tests to a broader sample of U.S. banks, as described in the "Data" section. The leverage ratios of banks in our sample vary significantly, as in Gropp and Heider's, supporting the potential presence of

discretionary capital, which is determined independently from capital requirements. We also extend the period of study back to 1973, to include time without uniform capital requirements (Pre-Uniform) with uniform capital requirements, but no risk-weighting of assets (Pre-Basel), and time since the initial Basel Accord implementation (Basel). The determinants of leverage are likely not the same across different bank capital regulation regimes. At the time of Pre-Uniform and even Pre-Basel capital regulation, different categories of banks were treated more or less differently. In the most recent version of Basel, Basel III, special attention is devoted to SIFIs (Systematically Important Financial Institutions). We test all banks and SIFIs separately within a framework of three bank capital regulation regimes.

Gropp and Heider (2010) begin their analysis with the core Frank and Goyal (2009) model and then re-introduce the risk variable. Gropp and Heider still find significant bank-specific and time-specific fixed effects. They discuss a few potential sources of the differences between bank and non-financial firms leverage, related to the general theories of capital structure and lay a ground for the study of banks' leverage within a general capital structure framework. However, Gropp and Heider do not test the relationship between leverage and general leverage explanatory variables beyond Frank and Goyal most reliable factors (except adding risk). At the same time, the core Frank and Goyal model was selected through the tests of non-financial firms' samples. Potentially, some variables, particularly important for banks but not the non-financial firms, were missed in the Gropp and Heider experimental design. While Frank and Goyal found variables in the core model to be most reliable in explaining market leverage of non-financial firms in their sample, they deem the re-introduction of the variables of minor importance useful for detailed leverage analysis. The full list of Frank and Goyal's variables was developed as a result of a fairly comprehensive survey of empirical capital structure literature of the time. We

re-introduce the Frank and Goyal secondary variables in an attempt to explore the nature of unobserved effects, questioned by Gropp and Heider and captured by their fixed effects framework. The following variables are added to the model: mature firm dummy, change in log assets, capital expenditures/assets, median industry leverage, median industry growth, selling, general and administrative expenses (SGA), top tax rate, net operating loss carryforward, depreciation/assets, investment tax credit/assets, debt rating dummy, cumulative annual stock returns, return on CRSP value-weighted index, inflation, growth in macro-profit, growth in GDP. Regulated industry dummy and uniqueness dummy are meaningless in a single-industry test and therefore omitted. R&D expenses (in all specifications), and loss carryforward and investment tax credit variables (in some specifications) are equal to 0 for all observations and therefore excluded from the models. Maturity and debt capacity are important secondary determinants of leverage according to Frank and Goyal; they are well-grounded in classic theories of capital structure. However, Frank and Goyal use very primitive measures for these two important factors. For greater accuracy in the measurement of independent variables, in addition to the Frank and Goyal variables, we include more sophisticated measures of maturity by DeAngelo et al. (2006) and the debt capacity of Lemmon and Zender (2010). Although new maturity and debt capacity variables are correlated with original similar variables, they still can be added together, since results in all models are re-confirmed by the method, robust to multicollinearity. The variable with greatest predictive power is selected correctly in the presence of a weaker similar variable by an appropriate variable selection method. In this and further specifications, we limit the research to the full sample of banks across the full period of time. The primary purpose of this paper is in identification of relevant factors in the generalized bank leverage determinants

framework. The special cases, such as behavior of the model under different capital regulation regimes and/or for various types of banks will make a valuable research extension.

Gropp and Heider (2010) discuss bank-specific theories, as an interesting avenue of future research. Allen et al. (2009) develop a model where "… competition in the loan market induces banks to voluntarily hold positive levels of [equity] capital as a way to commit to greater monitoring…" p.985. DeAngelo and Stulz (2013) propose that, "…Greater competition that squeezes bank liquidity and loan spreads diminishes equity value and thereby raises optimal bank leverage ratios…" p.2. The propositions mentioned above contradict each other, the former implies a greater degree of competition is associated with higher equity ratios (lower leverage), while the latter presumes the leverage is higher in a competitive environment.

One of the widely used bank-level measures of competition in banking literature is the Lerner index. Berger et al. (2009) calculate the bank-level Lerner index as a competition measure. Maudos and Fernadez De Guevara (2004), Turk Ariss (2010), Fonseca and Gonzalez (2010), Beck et al. (2013), Agoraki et al. (2011), among others, use the Lerner index in cross-sectional and panel regressions on a bank level. The Lerner index proxies bank's market power. It is calculated as a markup of price over marginal costs, where marginal costs are derived via a two-step procedure. First, parameters are estimated by regression based on the translog cost function of sum of log prices of labor, funds and fixed capital, log of bank output and squared bank output and interactions of output with prices and prices with each other. In a second step, estimated coefficients are plugged in to compute the costs and, then, index.

The Herfindahl-Hirschman index (HHI or Herfindahl Index) allows testing of the impact of group-level, rather than bank-level competition on leverage. We compute HHI, following

Corvoisier and Gropp (2002) and Berger et al. (2009). Corvoisier and Gropp study European countries and calculate HHI for each country in their study, on a country level. Berger et al. are concerned that HHI may not measure competition correctly for all banks in U.S., since the U.S. market is large and only the largest U.S. banks compete in the nationwide market, while many others operate in the regional markets. We address the concern of Berger et al. by limiting HHI - based tests to a sample of the hundred largest U.S. Banks. The adjustment should alleviate the concern that country-level HHI is irrelevant for smaller, regionally competing banks. Further, we calculate the Herfindahl index for the various types of loans (items from regulatory database: real estate loans, agricultural loans, commercial and industrial loans, loans for securities purchases, bank-to-bank loans, and loans to individuals), and run separate regressions with the Herfindahl index specific to each loan type. If a higher level of competition leads to greater equity capital holdings, then index value decreases, leverage falls as well (here and in further specifications, HHI is implemented in its concentration form).

In the model of Allen and Carletti (2013), equity capital is required for loan portfolio diversification. The rational is presented, for example, on p. 6: "…The benefit of diversification is higher the lower are bankruptcy costs. Thus, for low bankruptcy costs, banks diversify and lend to both sectors and both banks and firms use equity capital. For high bankruptcy costs, the higher cost of equity capital dominates the benefit of diversification…" According to Allen and Carletti, greater loan portfolio diversification is associated with lower leverage. We test this proposition empirically by adding a diversification variable to the leverage determinants regression. We measure bank loan portfolio diversification as in Lang and Stulz (1994), Demsetz and Strachan (1997), Acharya et al. (2006), and others, by computing the Herfindahl index (for each bank): a sum of the squared values of the bank's loans in each segment as a fraction of the

total value of the bank's loan portfolio. The measure is appropriate for the context of the Allen and Carletti hypothesis, developed around diversification into different lending segments. If a bank is lending to a single economic segment, the value of the diversification measure is 10,000 points, the value of the variable will decline with an increase in diversification.

According to DeAngelo and Stulz (2013), leverage of banks is naturally high due to the liquidity premium. DeAngelo and Stulz argue a role of liquidity provider as a primary banking function; high leverage levels in banking are optimal and do not, necessarily, create a systemic risk. DeAngelo and Stulz focus on a social value of liquidity, production of unique and socially valuable liquid financial claims by banks and inability of non-financial firms to self-fulfill their liquidity needs. The proposition implies a positive correlation between banks' leverage and liquidity: banks choose greater leverage to provide greater liquidity for the entire system's benefit. We test this proposition empirically by including the average market illiquidity of Amihud (2002), a common stock-based measure of liquidity in the market. The stock market liquidity is linked to the financial intermediaries' function through the joint role of the stock market and financial system in promoting economic growth. The joint stock market liquidity and financial system developments were studied by Levine and Zervos (1996), Levine (2002) and Beck and Levine (2004).

In the Gropp and Heider (2010) sample banks' capital structure is independent from capital requirements until banks get close to the required threshold. When banks approach the required minimum of capital, regulatory pressure prevails over the economic components of capital structure decisions. In their empirical framework, determinants of leverage are included as separate variables and, additionally, in interaction with a "close to requirements" dummy. The resulting model includes correlated variables, thus creating a potential multicollinearity issue

and leading to misattribution of the effect between parameters. We add a standalone "close to requirements" dummy variable to the determinants of capital structure to test the significance of capital requirements for leverage. The underlying sample is limited to U.S. banks data for 1993 – 2012 (due to data limitations – Tier 1 capital is consistently reported in COMPUSTAT only starting 1993). The dummy variable "Close" is equal to 1 for banks within 2% (alternative specification - 1%) of a minimum required capital ratio, and to 0 otherwise. The thresholds of proximity to capital requirements are selected following Gropp and Heider. The "close to requirements" dummy variable is expected to be positively correlated with leverage; obviously, banks get more levered as they approach capital requirements. More importantly, when capital requirements prevail in capital structure decisions, the addition of the dummy should attenuate the size and /or significance of other capital structure determinants.

Korajczyk and Levy (2003) find that financially unconstrained firms adjust their leverage decisions to the stages of the macroeconomic cycle. The leverage ratios are countercyclical in their study. In expansions, equity is priced generously, sometimes even exuberantly, and interest rates are high. The value of existing equity and incentive to issue new equity are high, while incentives to issue debt are low. In recession, on the contrary, debt is a more attractive source of additional capital. We divide the dataset into three samples, based on stages of the economic cycle: recession, expansion and slow growth. The recession period is identified according to NBER recession data. We use average GDP growth over the full data period as a threshold, separating slow growth and expansion times: periods of a below average growth are designated as slow growth, above – as expansion. The expansion and recession periods are short, relatively to the slow growth periods. We expect the core leverage determinants to hold their sign and

significance throughout the economic cycle. The correlations of less reliable factors with leverage may change or become less significant during recessions and expansions.

3. EXPERIMENTAL DESIGN, METHODOLOGY AND DATA

Following Gropp and Heider (2010), we use a core model of leverage determinants with the addition of risk. We test all banks/SIFIs in three bank capital regulation periods, as previously defined. Pre-Uniform, all banks (Specification 1) / Pre-Basel regulation, all banks (Specification 2) / Basel regulation, all banks (Specification 3); Pre-Uniform, SIFIs (specification 4) / Pre-Basel regulation, SIFIs (specification 5) / Basel regulation SIFIs (specification 6).

Hypothesis I: Market-to-book, Profit, Size, Tangibility, Dividends and Risk are significant determinants of leverage in the broad sample of US banks; the size and sign of the corresponding coefficients are similar to the results of Gropp and Heider (2010) based on their sample of the largest U.S. and European banks; risk is not a significant determinant of leverage for SIFIs due to implied guarantee; other coefficients in SIFIs' specifications are different in size and significant when compared to the results in all-banks' specifications.

$$Leverage = \beta_0 + \beta_1 MTB + \beta_2 Profit + \beta_3 Ln(Size) + \beta_4 Collateral + \beta_5 Dividend + \beta_6 Risk + u \quad (1\text{-}6)$$

All variables in this and further models are specified in Table 1. Following Frank and Goyal (2009), the explanatory variables in this and further models are lagged 1 year.

In the next step, we add significant determinants of firms' leverage identified by Frank and Goyal (2009), but not tested with the banks' leverage before.

Hypothesis II: There are significant determinants of bank leverage among additional factors, introduced in the specification (7):

$$Leverage = \beta_0 + \beta_1 MTB + \beta_2 Profit + \beta_3 Ln(Size) + \beta_4 Collateral + \beta_5 Dividend + \beta_6 Risk + \beta_7 MatureDummy + \beta_8 Maturity + \beta_9 \Delta Ln(Size) + \beta_{10} CapEx + \beta_{11} MedIndLeverage + \beta_{12} MedIndGrowth + \beta_{13} SGA + \beta_{14} MaxTaxRate + \beta_{15} LossCarryFwd + \beta_{16} Depreciation + \beta_{17} InvTaxCredit + \beta_{18} DebtRating + \beta_{19} DebtCapacity + \beta_{20} MktReturn + \beta_{21} CRSPVW + \beta_{22} Inflation + \beta_{23} TermSpread + \beta_{24} MacroGrowth + \beta_{25} GDPGrowth + u \quad (7)$$

Debt capacity is estimated with a two-step procedure with logistic regression, see Lemmon and Zender (2010):

$$DebtRating = \beta_0 + \beta_1 LogSize + \beta_2 Profit + \beta_3 Collateral + \beta_4 MTB + \beta_5 Leverage + \beta_6 Age + \beta_7 Risk + u \quad (7a)$$

First, use banks with existing debt rating data as a training sample. Then, apply estimated coefficients to all banks in the sample and determine their probability of having a debt rating.

The results of the variable selection by adaptive lasso and fixed effects models will serve as a basis for further model development. We will have 2 base specifications for book leverage and 2 for market leverage analysis as defined below.

Book leverage, lasso-based:

$$\sum_{i=1}^{k} \beta_i X_i = \beta_1 Profit + \beta_2 Ln(Size) + \beta_3 Collateral + \beta_4 \Delta Ln(Size) + \beta_5 CapEx + \beta_6 MedIndLeverage + \beta_7 SGA + \beta_8 MaxTaxRate + \beta_9 Inflation + \beta_{10} GDPGrowth$$

Book leverage, fixed effects-based:

$$\sum_{i=1}^{k} \beta_i X_i = \beta_1 MTB + \beta_2 Ln(Size) + \beta_3 Collateral + \beta_4 Dividend + \beta_5 MatureDummy + \beta_6 MedIndLeverage + \beta_7 MaxTaxRate + \beta_8 DebtCapacity + \beta_9 MktReturn + \beta_{10} CRSPVW$$

Market leverage, lasso-based:

$\sum_{i=1}^{k} \beta_i X_i = \beta_1 MTB + \beta_2 Profit + \beta_3 Ln(Size) + \beta_4 Collateral + \beta_5 Dividend + \beta_6 Risk + \beta_7 MedIndLeverage + \beta_8 MedIndGrowth + \beta_9 SGA + \beta_{10} MaxTaxRate + \beta_{11} DebtRating + \beta_{12} CRSPVW + \beta_{13} TermSpread + \beta_{14} MacroGrowth$

Market leverage, fixed effects-based:

$\sum_{i=1}^{k} \beta_i X_i = \beta_1 MTB + \beta_2 Profit + \beta_3 Ln(Size) + \beta_4 Dividend + \beta_5 MatureDummy + \beta_6 Maturity + \beta_7 MedIndGrowth + \beta_8 MaxTaxRate + \beta_9 DebtCapacity + \beta_{10} MktReturn + \beta_{11} CRSPVW + \beta_{12} Inflation + \beta_{13} MacroGrowth$

Competition is an important driver of many processes in banking. Recent theoretical developments in the area of bank capital structure agree on the significance of completion, as a predictor of bank leverage dynamics. However, they assign contradicting roles to competition.

Hypothesis III: Competition reduces leverage, according to Allen at el. (2009). We expect positive and statistically significant competition coefficients. Alternative results support the DeAngelo and Stulz (2013) proposition of competition, in fact, increasing leverage. Specifications (8) and (9) are based on HHI and Lerner index.

$$Leverage = \beta_0 + \sum_{i=1}^{k} \beta_i X_i + \beta_{k+1} Competition + u \quad (8\text{-}9)$$

Allen and Carletti (2013) suggest extending search for banks' leverage determinants to supply side, where monitoring function of the borrowers is tied to loan portfolio diversification. We propose a way to trace a link between loan portfolio diversification, measured by within-portfolio HHI, and banks' leverage.

Hypothesis IV: Diversification is negatively related to leverage in this specification. A positive and significant coefficient is expected, because larger within-bank HHI shows greater concentration, hence lower diversification.

$$\text{Leverage} = \beta_0 + \sum_{i=1}^{k} \beta_i X_i + \beta_{k+1}\text{Diversification} + u \quad (10)$$

Liquidity is positively correlated with leverage, according to DeAngelo and Stulz (2013)

Hypothesis V: in this specification, a negative coefficient is expected since the illiquidity measure of Amihud (2002) is lower when market liquidity is higher.

$$\text{Leverage} = \beta_0 + \sum_{i=1}^{k} \beta_i X_i + \beta_{k+1}\text{Liquidity} + u \quad (11)$$

Gropp and Heider (2010) find that in their sample, banks' approaching minimal capital requirements interferes with other factors of leverage decision. We add a dummy variable to differentiate the impact of banks within 1or 2% from the required minimum of Tier 1 capital.

Hypothesis VI: The classic determinants of leverage are not significant for banks approaching regulatory capital requirements.

$$\text{Leverage} = \beta_0 + \sum_{i=1}^{k} \beta_i X_i + \beta_{k+1}\text{CloseToRequirements} + u \quad (12\text{-}13)$$

The bank-specific leverage determinants empirically tested in the prior specifications are grounded in well-established theories and represent unique components of bank capital structure decisions. All variables, combined, build up a stronger multidimensional model of leverage. After adding each bank-specific determinant of leverage to the generalized leverage model separately, we include all variables simultaneously and form a full model of bank leverage.

Hypothesis VII: The general and bank-specific determinants of leverage maintain their sign and significance when combined together in the full model of bank leverage.

We test the full model of bank leverage over the full period of study (specification 14) and in different stages of the economic cycle: recession /slow growth / expansion (specifications 15/16/17).

Hypothesis VIII: The size and significance of coefficients change at different stages of the economic cycle. The determinants of capital structure, identified as significant in the full sample (specification 14), remain largely unchanged in the slow growth period (specification 16). In recession and expansion (specifications 15 and 17), only the most reliable factors maintain their sign, size and significance. The additional factors change or lose their explanatory power.

$$\text{Leverage} = \beta_0 + \sum_{i=1}^{k} \beta_i X_i + \beta_{k+1}\text{Competition} + \beta_{k+2}\text{Diversification} + \\ + \beta_{k+3}\text{Liquidity} + \beta_{k+4}\text{CloseToRequirements} + u \quad (14\text{-}17)$$

The majority of the results are obtained from panel estimator with time and bank fixed effects included to mitigate endogeneity issues resulting from the usual presence of unobserved explanatory variables, correlated with independent variables included in the model. Frank and Goyal (2009) cite Hastie et al. (2001), as a source of their variable selection method. Following more recent literature on variable selection methods, we use a similar, yet more powerful, modern version of the model – adaptive lasso for linear regression models with weighted approach by Zou (2006). The adaptive lasso combines the benefits of greater variable selection accuracy and estimation precision. The procedure uses SBC criterion along with other information criterion measures, such as BIC and AIC, reported in Frank and Goyal. Conveniently, the coefficients computed by adaptive lasso are robust to multicollinearity.

We use COMPUSTAT North America and COMPUSTAT Bank as sources for majority of the corporate information, CRSP for the stock-related data and the Bank Regulatory Database for the detailed bank-specific data. We obtain macro-variables from various governmental

agencies, following Frank and Goyal (2009). The details of the underlying data elements for each variable are provided in Table 1. The broad sample covers forty years of quarterly data between 1973 and 2012. The quarterly data since 1962 is available in COMPUSTAT, but market data on NASDAQ firms, including a significant number of banks, is available in CRSP starting December 1972 only. We include a significant period with no uniform capital requirements for U.S. banks (prior to 1980), to cover various capital requirements regimes in the U.S. The data period is further limited in certain specifications, where data is not available for the early years (for example, risk-weighted capital for Pre-Basel years, debt rating variable for 1985 and earlier years, regulatory data is unavailable before 1990). Many data elements, sourced from COMPUSTAT datasets are available for 81,619 firm-quarter observations over the full data period 1973-2012. The full dataset includes a significant number of missing observations. We limit the underlying data for the regressions to the records with non-missing positive major variables: book (market) total leverage, market total leverage, market-to-book, log size and collateral, and non-missing, non-zero profitability (including both positive and negative readings). The resulting dataset consists of 57,583 bank-quarter observations, 1,714 unique banks. The summary statistics of this dataset is presented in Table 2, Panel A. The summary statistics may be benchmarked against the dataset of Gropp and Heider (2010). Differences should be expected since Gropp and Heider use data from the period 1991-2004 for the 200 largest U.S. and European banks, while our dataset spans the 1973-2012 period and includes a much broader sample of North American banks. Some methodological differences in variable calculations may be warranted by the variation between data sources: Gropp and Heider use the Bankscope database, while our data comes from COMPUSTAT. Consistent with Gropp and Heider, banks are highly levered with both market and book leverage averaged just below 90%,

at 88% and 89% correspondingly. The mean market leverage of the banks in Gropp and Heider's sample was 87% and mean book leverage was 93%. Banks are more levered than non-financial firms, as expected: excess leverage measure (calculated as additional leverage, unattributed to differences in leverage determinants, as discussed in methodology section) of the banks in our sample is 16%, on average. The mean short-term portion of leverage is approximately 8%. Gropp and Heider, in their variable description section, claim that they follow the Frank and Goyal (2009) definitions of variables, without providing great details of their calculations. We follow the Frank and Goyal detailed definition of market-to-book calculation and do not include deposits in the MTB ratio calculation. Upon comparison of the summary statistics it appears that the mean value of the MTB variable in our study, 0.26, may be compared to the difference between market-to-book and deposits to book in Gropp and Heider's summary statistics Table (1.065-0.685) = 0.38. Not surprisingly, the MTB ratio is somewhat lower in our broad sample results, as compared to the Gropp and Heider's sample of large banks in more recent times. The market-to-book ratio in the sample of SIFIs over the Basel regulation period is 0.41, much higher and close to Gropp and Heider's sample value. Banks in our sample are also less profitable, with an average profitability at 0.006 as compared to Gropp and Heider's 0.051. The difference is due to a calculation based on quarterly profit in our sample, while Gropp and Heider annualize profit in their profitability calculation. The approximation of the average annual profitability in our sample is 0.024, comparable with Gropp and Heider if we keep in mind the diversity of banks in our sample. The average size of bank assets in our sample is m$ 18,945, while the average bank in Gropp and Heider's sample is more than three times larger, at m$ 64,100. the average collateral ratio in our sample is 1.06, as compared to Gropp and Heider's 0.951 (sum of liquid securities to assets 0.266 and deposits to assets 0.685). Approximately 74% of banks in our

sample are dividend payers, while in Gropp and Heider's sample 94% of banks pay dividends. The risk of assets, measured as a variance of stock returns (Frank and Goyal definition of risk) in our sample is 0.001 on average (corresponds to approximately 0.031 STD), as compared to 0.036 average risk, measured as standard deviation of stock returns in Gropp and Heider's sample of banks. A possible comparison of the 100 largest banks in our sample to the Gropp and Heider's sample will not get us an exact match, since Gropp and Heider also have 100 European banks and use the Bankscope database. We find summary statistics of our dataset sufficiently similar to the summary statistics of the Gropp and Heider's dataset and we do not proceed with further comparison of the two datasets. The remaining variables are borrowed from the Frank and Goyal study of determinants of firms' capital structure and from various bank-specific theories of capital structure. Their mean and median values are in a reasonable range, as compared to the summary statistics of Frank and Goyal dataset. A significant dispersion in the dataset is suggested by minimum, maximum and standard deviation values; presence of outliers and high leverage data points is possible and need further consideration. The R&D variable is an exception, the variable is equal to 0 across the dataset and, therefore, is excluded from further analysis.

The dataset is further separated in specifications 1-3 by the regulatory regime period as 4,281 observations are in Pre-Uniform capital regulation, 4,786 observations in Pre-Basel regulation and 48,516 observations in the Basel regulation period. The subsamples of SIFIs, in specifications 4-6, include 315, 298 and 1,149 firm-quarter observations corresponding to different regulatory regime periods. Starting with specification 7, where a bulk of dependent variables gets included, the dataset with valid observations gets further limited to 41,907 firm-quarters. When we include the Lerner index in specification 8, the dataset consists of 29,895

firm-quarters. In the variations of specification 9, where the HHI for various segments is computed and samples are limited to a maximum 100 largest institutions per lending sector, sample size varies between 2,183 and 8,212 firm-quarters. In specification to 10, the diversification variable is based on the regulatory data that is only available after 1990 and 21,188 firm-quarters are included in the analysis. In specifications 11-13, where the liquidity variable or one of the close-to-regulatory-requirements variables is included, 41,907 of valid firm-quarters are available. In specification 14, for the full model of total leverage with all previously tested variables included; the dataset is limited to 19046 firm-quarters. The dataset is divided into subsamples by stages of economic cycle in specifications 15-17 2,350 firms-quarters for recession, 11,782 for slow growth and 4,914 for expansion.

4. EMPIRICAL RESULTS

We begin our study testing the classic capital structure framework, originally defined by Frank and Goyal (2009) for non-financial firms, and later adopted by Gropp and Heider (2010) for large banks. Frank and Goyal examine publicly traded U.S. firms in 1950-2003. They chose market leverage as a key measure of capital structure and find that most reliable factors, best explaining market leverage in various periods and specifications, are: median industry leverage (+), MTB (-), tangibility (+), profits (-), log of assets (+) and expected inflation (+). Dividend paying firms have lower leverage. For book leverage, firm size, MTB, and inflation are not as reliable as for market leverage in Frank and Goyal samples.

According to Frank and Goyal, book leverage is backward looking while market leverage is forward looking, and therefore there is no reason for their determinants to match. Nevertheless, results of empirical tests in capital structure literature are often similar for both

definitions of leverage. We follow modern literature, such as Lemmon et al. (2008) and Gropp and Heider (2010), and use both market and book definitions of leverage in most specifications. Frank and Goyal (2009) use both total debt and long-term debt, but emphasize total debt. The book and market leverage measures are based on total debt value, following the Frank and Goyal and Gropp and Heider (2010) primary definition of debt.

Inflation is the least reliable factor in the Frank and Goyal (2009) core model. Only annual observations of inflation are available and it is not a part of the Gropp and Heider (2010) model. Therefore, we do not include inflation in specifications 1-6, following Gropp and Heider.

In Table 3, we present the results of specifications 1-6 (core model with risk) in three periods of bank capital regulation: no uniform requirements period (specifications 1 for all banks and 4 for SIFIs), uniform requirements with no risk-weighting (specifications 2 for all banks and 5 for SIFIs), risk-weighted capital requirements (specifications 3 for all banks and 6 for SIFIs). We confirm that MTB, profitability, size, collateral, dividends and risk are significant determinants of leverage for a typical bank in our sample in the Basel regulation period. Panels A and B results are for book leverage, as a dependent variable and Panels C and D – for market leverage.

The above results are not directly comparable to Gropp and Heider (2010). As Gropp and Heider initially do, we run the same model without risk. Gropp and Heider find a statistically significant negative correlation of large banks' leverage with market-to-book ratio, profitability and dividend payer dummy. The correlations with log of size and collateral are significant and positive. We confirm that our results are similar in the sample of large banks in Basel regulation period (the results are of secondary importance and not tabulated to conserve space). The

comparability of the initial results with existing empirical evidence, successfully establishes a basis for further research.

As Panel A of Table 3 shows, for all banks in general, collateral, risk and dividend payer dummy are all positively correlated with book leverage, while market-to-book, profit and size are correlated negatively, where significant. The majority of variables retain sign and significance when we repeat the analysis with market leverage as a dependent variable (Panel C). One exception is the size of the profitability coefficient, which is consistently larger in market leverage-based specifications across all regulatory regimes. The sign of collateral and size coefficients does not hold in market-leverage specifications, both variables appear to have an opposite impact on market leverage, as compared to book leverage. Greater collateral is associated with lower market leverage, while greater size is associated with higher market leverage.

Interestingly, the R-squared in the Basel period is much lower in book leverage-based specifications, than in previous periods. The selected determinants of leverage explain market leverage better than book leverage, consistent with Frank and Goyal (2009). The difference in results between regulatory regimes, more pronounced the book leverage-based specification, suggests a potentially interesting avenue of research. Book leverage is an underlying basis for the regulatory requirements, and, therefore, understanding the nature of variation in book leverage determinants is important for proper policy assessment.

The results for the SIFIs sample, presented in Panels B and D of the Table 3, strikingly and consistently differ from the all banks' results (Panels A and C). There is a significant body of

literature debating the relationship between moral hazard in banking and capital requirements. Moral hazard refers to excessive risk-taking, due to the presence of a safety net in the banking industry. The phenomenon is created by deposit insurance and government bailouts of the system in times of crises, with intent to maintain economic stability and reduce social costs of bank failures. Hellman et al. (2000) discuss the moral hazard issue in a context of regulatory requirements. They conclude that capital requirements may reduce risk-taking behavior in the short-run, but increase risk-taking in a longer-term perspective. Our study extends beyond capital requirements. When we explore determinants of leverage, we include both required and discretionary capital (the majority of banks in the study sample are not close to capital requirements). Our findings for the sample of SIFIs demonstrate how implied guarantee invalidates market-based controls. Apparently, leverage of SIFIs often does not depend on the size of collateral or assets risk, especially in the Pre-Basel and Basel regulation periods. These results hold for both book and market leverage and are robust to the fixed effects most of the times.

The results presented in Table 3 support our original hypothesis I. In summary, we apply the classic model of the most reliable determinants of a non-financial firm capital structure to the broad sample of U.S. banks over a significant period of time and different capital regulation regimes. We confirm that the model is plausible and consistent with Gropp and Heider (2010). The results are contrary to popular belief that leverage of banks is determined solely by regulatory requirements. Interestingly, risk and, often, collateral lose their significance in explaining leverage of SIFIs over time. The findings are consistent with moral hazard concept.

The results in Tables 4 and 5, yielded by the extended leverage model (specification 7), are similar to the findings of Frank and Goyal (2009). We use fixed effects and lasso variable

selection models. Lasso models are sensitive to outliers, therefore, we separately apply lasso to the samples with outliers only and samples without outliers and report multicollinearity-robust coefficients selected by lasso and corresponding SBC (Schwarz Bayesian Information Criterion) of the model, as it increases with the addition of each subsequent variable. The selection process stops when an information criterion of the model reaches an optimal threshold and addition of new variables does not substantially improve the predictive power of a model anymore. Only variables that contribute most to a model's predictive power are selected by lasso. We use results of fixed effects and lasso models to narrow down a list of variables in a form of two parsimonious base models of leverage for further research (the list of significant variables can be traced in the Tables 4 and 5 and is also provided in the methodology section). In many aspects, these results support static and dynamic versions of trade-off theory, including agency costs considerations. Two significant exceptions are related to risk and profitability, the positive relationship between risk and leverage identified in our study, and negative - between profitability and leverage, are more consistent with the pecking order theory explanation. However, the nature of assets risk in the financial industry differs significantly from the broad economy. The generalized explanation, applicable to non-financial firms, may not be plausible in this case. Diamond and Rajan (2010) discuss the unique nature of risks that banks face, as liquidity providers. For example, threat of borrower's early withdrawal for some reason that jeopardizes expected future cash flows and creates a potential for loss of rents and partial or full loss of invested capital. At the same time, profitability may be negatively correlated with leverage due to adjustment-to-target frictions, in line with dynamic trade-off theory. The correlation between debt market condition and leverage, speaks in support of the market timing hypothesis. The majority of our results support hypothesis II: many variables, identified by Frank

and Goyal as significant, but not included in their short list of most reliable factors, are significant determinants of banks' capital structure in our sample of banks.

We first test relationship between competition and leverage adding HHI to the base leverage models (specification 8). The HHI-based results are only obtained for the sample of 100 largest market players in every period and are substantially different from Learner index -based results, obtained from broad sample of banks. The results from different variation of the bank leverage model with competition are shown in Table 6. The negative sign of the coefficient implies positive correlation between competition and leverage. For the largest banks, competition is only significant in one market leverage – based specification. Competition of the largest banks appears to be positively correlated with their market leverage. We further test different lending segments separately, by calculating a separate HHI for each of the following types of loans: real estate, agricultural, commercial loans, loans for purchase of securities, interbank loans and loans to individuals (not tabulated). The results are similarly weak.

Further, we measure competition with a Learner index (specification 9). The Lerner index represents a price markup and serves as a measure of a bank's market power. Similarly to HHI, the positive sign of a competition coefficient in this specification implies a negative correlation between competition and leverage. We are able to test the competition effect in this form in a broad sample of banks, without size restrictions. The competition coefficient is positive and statistically significant in all four specifications, it is robust to bank and time fixed effects. Many core factors of bank leverage become insignificant in presence of competition and R-squared increases drastically for the book leverage, as compared to the base specification (7). The effect does not hold for market leverage, where competition, while strongly significant, does not

attenuate other factors and does not change the size of the coefficient of determination substantially.

The majority of results identify a negative correlation between competition and leverage. The empirical findings are consistent with the theoretical proposition of Allen et al. (2009): in highly competitive environments, lenders commit to monitoring through holding greater levels of capital. The results support hypothesis III.

The results of the general leverage model with diversification are presented in Table 7. The effect of loan portfolio diversification on leverage is assessed with specification 10. The diversification measure is computed using HHI methodology (in its concentration form), therefore a larger coefficient means less diversification and a positive coefficient of the diversification variable means a negative correlation between leverage and diversification. The diversification measure is scaled by 1000 to keep parameter estimates in a convenient range. The diversification variable is positive in both book and market leverage-based specifications, and results are robust to introduction of bank and year fixed effects. The findings identify a negative correlation between diversification and leverage. They are consistent with the theoretical proposition of Allen and Carletti (2013) that greater diversification of banks leads to higher levels of capital (lower leverage). The results support hypothesis IV.

The results of the general model with added liquidity (specification 11) are also presented in Table 7, together with leverage, to conserve the space. We do not conjecture any special commonality between diversification and liquidity in their role of the determinants of banks' leverage. We add market liquidity to the model in specification 11. The liquidity variable is an illiquidity measure of Amihud (2002). A negative estimated coefficient of liquidity shows

positive correlation between market liquidity and banks' leverage. The coefficients of the lagged liquidity measure are positive and significant in lasso selection – based specification only and robust to fixed effects. The correlation of the past liquidity and leverage is negative. One year lead and three year lead values of market liquidity and banks' leverage is, on contrary, positively correlated with bank leverage in some specifications (results are not tabulated). The most reliable factors, identified by Frank and Goyal (2009) maintain their sign and significance across specifications. Liquidity appears to be a less reliable factor. Nevertheless, in general, the presented results support hypothesis V, based on a theoretical proposition of DeAngelo and Stulz (2013). The high leverage of banks is associated with their role of liquidity providers; higher leverage is tied to lower past and higher future liquidity.

The results of the model with the approaching minimum capital requirements variables are presented in Tables 8. The minimum required Tier 1 risk-weighted capital ratio for banks is set to 4 percent since Basel Accord adoption times. Gropp and Heider (2010) argue that banks' leverage is determined independently from regulatory capital requirements, until banks approach the levels of capital within 2 or 1 percent of a minimum threshold (specifications 12-13). Gropp and Heider add the interaction of each leverage determinant with a close to requirements dummy to test their hypothesis. As discussed in the "Methodology" section, we add a dummy variable equal to 1 when a bank is approaching a required minimum and 0 otherwise. In our framework, the bank's approaching capital requirement is a significant factor for leverage when banks are within 1% of the minimum. The dummy variable is negative and statistically significant in all specifications, as expected: the regulatory pressure to decrease leverage forces banks to comply by any means, including assets fire sales, see for example Shleifer and Vishny (1992). The results partially support hypothesis VI. When banks are close to minimum capital requirements

only a few discretionary leverage factors remain significant in explaining their book leverage – subject to regulatory attention. Market leverage is determined independently from regulatory requirements, for the most part, even when banks are dangerously close to minimum. These findings suggest that markets largely ignore capital requirements issues and rather rely on general economic factors in their assessment of the banks' capital.

The results presented in Tables 9 and 10 are based on the full model of leverage, with all previously considered variables, in full period and in different stages of the economic cycle: recession, slow growth and expansion (specifications 14 -17). We have studied the effect of competition, diversification, liquidity and approaching capital requirements on the total book and market leverage of banks. These variables are found to be significant determinants of banks' leverage when added to a general model of capital structure one at a time. First we add all four variables together to the general model (s) – specification 14. The significance and sign of competition and diversification variables remain unchanged. Competition and diversification are still negatively correlated with leverage. Approaching capital requirements state within 2% of minimum becomes statistically significant in presence of other bank-specific factors and, interestingly, - positive. When banks are within 2% of the requirements, they are more levered, than counterparts, as expected, but do not decrease their leverage until they reach 1% to the minimum level. Market liquidity remains least consistent; the coefficient is negative and only marginally significant in one specification in the full period. The results are robust to the introduction of bank and year fixed effects.

The role of bank leverage determinants changes with stages of the economic cycle. The majority of general and banks-specific variables are significant and consistent with previous findings in the slow growth periods, but not in recession or expansion. Many of the core factors

(included in specifications 1-6) remain significant and maintain their sign in the majority of specifications across economic cycle stages. Debt capacity is an important determinant of leverage in recession but not in expansion. In expansion, growth is significant and robust. In recession, only liquidity, of all bank-specific variables maintains its sing and significance in one of the specifications. Competition and diversification stay negatively correlated with leverage in expansion, but not in recession. Approaching minimum capital requirements is insignificant in either recession or expansion.

In summary, the determinants of bank capital structure, borrowed from bank-specific theories, are significant and consistent across different specifications, when applied together or separately, supporting Hypothesis VII. Some differences are observed in the stages of the economic cycle, supporting Hypothesis VIII. In recession, little seems to matter for the leverage ratio, as equity values decline, business conditions and access to credit market tighten and risk increases. Expansion periods seem to be significantly driven by growth. The majority of the leverage factors are consistently significant only in the slow growth times.

5. CONCLUSIONS

According to recent research, a general approach to capital structure is feasible for banks. The financial industry, however, is usually excluded from analysis and testing under the framework of classical theories of capital structure. We contribute to the capital structure literature of financial institutions by testing banks' capital structure in the context of classical and bank-specific theories. This research significantly extends the empirical literature on banks' capital structure. Many tests are based on the most recent theories that were put forward by prominent researchers in the field in response to the recent financial crisis of 2007-2008.

We use the model of core leverage factors, identified by Frank and Goyal (2009) as the most reliable determinants of a non-financial firms' capital structure. We adjust the model similarly to Gropp and Heifer (2010) and apply it to the broad sample of the U.S. banks over the long period of 1973-2012. The period covers different capital regulation regimes: no uniform capital requirements, uniform requirements, based on total capital (without risk adjustment), and the Basel period of risk-adjusted capital requirements. We confirm that the core model is plausible for this sample and the results are consistent with Gropp and Heider (2010). However, the results differ across regulatory regimes. The model performs best during the Basel regulation period, when capital requirements are based on risk-weighted capital. We conjecture that the risk-weighted capital requirements regime is favorable for discretionary capital holdings and banks' discretionary capital is determined similarly to firms' capital. The significant differences are observed in the sample of SIFIs. The risk and collateral factors lost their importance as leverage determinants during the most recent time period. The results are consistent with the moral hazard concept.

We introduce the additional leverage explanatory variables, which were identified by Frank and Goyal (2009) as important for firms' capital structure, but omitted from the succinct model of most reliable factors. Many of the estimates, based on the sample of banks, are consistent with results obtained by Frank and Goyal for their sample of non-financial firms. The core factors of leverage remain consistent and significant in the presence of an extended array of additional factors. Similar to the Frank and Goyal full sample results for the banks maturity dummy, depreciation, CRSP return, inflation and macro-growth in book leverage specification, positively correlated with banks' leverage; growth, selling and general administrative expenses, CRSP return and inflation in market leverage specification, market return in book leverage

specification, and term spread are negatively correlated with leverage. A majority of the results supports various versions of trade-off and market timing theories.

Although a portion of banks' leverage variation may be explained by the general factors of capital structure, significant differences between capital structure of banks and firms remain unexplained. We add several bank–specific determinants of leverage to the general model(s). First, we test an effect of competition and diversification on leverage. Our findings support the theoretical propositions of Allen et al. (2009) and Allen and Carletti (2013), and suggest that competition in traditional lending markets, as well as diversification of a loan portfolio into various lending sectors, generally decrease leverage of banks. DeAngelo and Stulz (2013) propose that banks' high leverage is associated with their specific economic role of liquidity creators. We find that past market liquidity is negatively correlated, while future market liquidity is positively correlated with large bank's leverage, consistent with an idea that banks use leverage to create liquidity. We study the effect of the banks' approaching minimum regulatory capital requirements on leverage. Leverage is higher for the banks within 2 percent of the minimum threshold of Tier 1 capital, but lower for the banks within 1%. Market leverage remains discretionary, even when banks are approaching the minimum requirements, while only a few factors of book leverage, mostly related to debt capacity and credibility, remain significant as banks' capital reserves deteriorate.

Leverage is countercyclical and the relationship between some variables and capital structure change with the economic cycle. The core determinants remain significant most of the times; the majority of additional general determinants are significant only in a slow growth period. Debt capacity is important during recessions; growth seems to drive leverage in expansions. Diversification and Competition are the most stable bank-specific variable,

significant at all times, but recessions. Liquidity in full model shows consistency with general results in selected specification in slow growth and recession. Approaching minimum capital requirements is only consistent during slow growth period.

This paper demonstrates that the capital structure of banks is an important and undivided part of general capital structure studies. Inclusion of banks' capital structure is possible and necessary for completeness of capital structure analysis.

Table 1. Variable definitions.
The letter-coded names in parenthesis, such as (AT), (DLC), etc. in this appendix are COMPUSTAT field names.

Leverage	Frank, Goyal (2009)
Market leverage: The ratio of total debt (debt in current liabilities (DLC) + long-term debt (DLTT)), to market value of assets (MVA). MVA is the sum of the market value of equity (price-close (PRCC) × shares outstanding (CSHPRI)) + debt in current liabilities (DLC) + long-term debt (DLTT) + preferred-liquidation value (PSTKL) – deferred taxes and investment tax credit (TXDITC) *Book leverage:* The ratio of total debt (debt in current liabilities (DLC) + long-term debt (DLTT)) to assets (ATQ)	
MTB	Frank, Goyal (2009)
Market-to-Book ratio. MVA to ATQ, assets. MVA is obtained as the sum of the market value of price-close (PRCC) × shares outstanding (CSHPRI))+ short-term debt (DLC) + long-term debt (DLTT) + preferred-liquidation value (PSTKL) − deferred taxes and investment tax credit (TXDITC)	
Profit	Frank, Goyal (2009)
Profitability, the ratio of operating income before depreciation(OIBDP) and assets (AT)	
Ln (Size)	Frank, Goyal (2009)
Log of assets log of assets (ATQ)	
Collateral (Banks)	Gropp, Heider (2010)
(total securities + treasury bills + other bills + bonds + CDs + cash and due from banks + land and buildings + other tangible assets)/book value of assets	
Dividend	Frank, Goyal (2009)
Dummy variable, equal to 1 when firm pays dividends and 0 otherwise. (based on COMPUSTAT item cash dividends declared on common stock DVCY for banks or CDVCY for all firms)	
Risk (LogRiskM)	Frank, Goyal (2009)
Annual variance of stock returns (based on CRSP stock returns)	
MatureDummy	Frank, Goyal (2009)
Mature firm dummy, equal to 1 if firm has been listed in COMPUSTAT for more than five years	
Maturity	DeAngelo, DeAngelo, Stultz (2006)
Firm maturity Retained Earnings / Total Equity (COMPUSTAT items REQ, retained earnings, SEQQ, shareholders' equity, total)	
Δ Ln(Size)	Frank, Goyal (2009)
Year-to-year change in log book assets (see ln(size) variable above)	
CapEx	Frank, Goyal (2009)
Capital Expenditures to assets, ratio of compustat capital expenditure (CAPX), to assets (ATQ)	
MedIndLeverage (MedSampleLeverage)	Frank, Goyal (2009)
Median industry leverage. The median of total debt to market value of assets (see definition of leverage above) by SIC code and by year. Industry is defined at the four-digit SIC code level for firms. For banks, the variable represents median leverage of the sample by year.	
MedIndGrowth (MedSampleGrowth)	Frank, Goyal (2009)
Median industry growth, median year-to-year change in log assets (ATQ) for the entire sample of banks	
RnD	Frank, Goyal (2009)
The ratio of research and development expenses (XRD) to sales (SALE)	
SGA	Frank, Goyal (2009)
The ratio of selling, general and administration expenses (XSGA) to sales(SALE)	
LossCarryFwd	Frank, Goyal (2009)
The ratio of selling, general and administration expenses (XSGA) to sales(SALE)	
Depreciation	Frank, Goyal (2009)
The ratio of depreciation expenses (DPCQ) to assets (ATQ)	
InvTaxCredit	Frank, Goyal (2009)

The ratio of investment tax credit (ITCB)balance to assets (ATQ)
DebtRating Frank, Goyal (2009)
The dummy variable that is equal to 1 when senior debt rating (SPLTICRM) subordinate debt rating (SPSDRM), is less than 13 (investment grade) Actual: letter grade ratings, investment grade to BBB- per S&P: http://www.standardandpoors.com/ratings/definitions-and-faqs/en/us
Debt capacity Lemmon, Zender (2010)
Measured as propensity to have a bond rating calculated for each firm using estimates obtained from entire sample based on COMPUSTAT item senior debt rating (SPLTICRM)
MktReturn Frank, Goyal (2009)
Cumulative quarterly CRSP stock returns
CRSPVW Frank, Goyal (2009)
Annual Returns on value weighted stock portfolio, CRSP
Inflation Frank, Goyal (2009)
expected change in the consumer price index over the coming year using data from the Livingston Survey available at http://www.phil.frb.org/econ/liv/index.html
Term spread Frank, Goyal (2009)
difference between the 10-year interest series and the one-year interest series (Source: Federal Reserve files at http://www.federalreserve.gov/releases/)
Macro Growth Frank, Goyal (2009)
log of aggregate annual corporate profits after tax for nonfinancial firms. (Source: US Department of Commerce, Bureau of Economic Analysis.) Actual: Federal Reserve of St Louis, PctAnnualChange
GDPGrowth Frank, Goyal (2009)
differences in log of real gross domestic product (Source: US Department of Commerce, Bureau of Economic Analysis Actual: PctAnnualChange
Competition Berger et al. (2009)
Lerner index A price mark-up over marginal costs, where marginal costs are derived using translog function from total assets (proxy for output) COMPUSTAT item ATQ, the ratios of personnel expenses to total assets (XLRQ – salaries and wages + XPRBQ – pensions and benefits + STLCOQ = stock compensation expense to ATQ), interest expenses to total deposits (XINDCQ, interest on deposits to DPTCQ, deposits total) and other operating and administrative expenses to total assets (FEOENQ, fixed expense (occupancy and equipment) + XADQ, advertising and marketing expenses +XCOMC, communications expenses +OCOEQ , all other current operating expenses to ATQ), proxies for prices of labor, funds, and fixed capital *HHI* COMPUSTAT item LNTALQ Loans - Net of Total Allowance for Loan Loss or Bank Regulatory Database item 2125.
Diversification Lang and Stulz (1994)
Further in bank literature: Demsetz and Strachan (1997), Acharya et al. (2006) HHI for each bank based on different types of loans: Bank Regulatory database items 1410 – real estate loans, 1590 – agricultural loans, 1600-commercial and industrial loans, 1975 – loans to individuals, 2165-lease financing receivable
Liquidity Amihud (2002)
Illiquidity for each stock is an average ratio of absolute return to trading volume; aggregate measure is an average illiquidity of all stocks. Calculated based on CRSP daily closing prices – item PRCCD and volume – item CSHTRD
MaxTaxRate Frank, Goyal (2009) and http://www.taxpolicycenter.org/taxfacts/Content/PDF/corporate_historical_bracket.pdf
the top statutory tax rate. It was 42% in 1950, 51% in 1951, 52%from 1952 to 1963, 50% in 1964, 48% from 1965 to 1967, 52.8% from 1968 to 1969, 49.2% in 1970, 48% from 1971 to 1978, 46% from 1979 to 1986, 40% in 1987, 34% from 1988 to 1992, and 35% from 1993 to 2011
SlowGrowthDummy BEA data
GDP from US Bureau of Economic Analysis, the growth below average for the period
RecessionDummy NBER recession data
1 in recession, 0 otherwise

Table 2.Summary statistics of the sample

Variable	Mean	Median	Std Dev	Minimum	Maximum
BookLevTotalLead1Y	0.8901787	0.8998736	0.0955702	0.000116949	20.0833333
MktLevTotalLead1Y	0.8814244	0.8885571	0.0680097	0.000858277	1
MTB	0.2625157	0.2441232	0.123442	0.000610571	2.5271803
Profit	0.0058798	0.0055938	0.0046373	-0.1050478	0.1215623
Size	18945.08	1333.25	132434.31	6.871	3879171.8
LogSize	7.4261925	7.1961434	1.7391131	1.9273097	15.1711322
Collateral	1.061523	1.0581828	0.1919135	0.0292476	2.4840293
Dividend	0.7353559	1	0.4411473	0	1
Risk	0.0010207	0.000434	0.0044406	0	0.234772
LogRiskM	-5.2995653	-5.3284475	1.0169245	-12.1732848	0.2413316
MatureDummy	0.7286873	1	0.4446409	0	1
Maturity	0.4663683	0.5080974	0.755951	-45.7610544	70.9346734
Growth	0.3729387	0.089196	1.2938998	-2.0664116	14.7365557
CapEx	0.000474529	0	0.0016491	-0.000985203	0.0770392
MedIndLeverage	0.8072687	0.8723751	0.2483973	0	0.9662925
MedIndGrowth	0.3100931	0.0845541	1.0856806	-0.0168607	5.8097208
RnD	0	0	0	0	0
SGA	0.2563115	0.2512059	0.3073311	-52.0765509	36.61875
TopTaxRate	0.3668991	0.35	0.0418546	0.34	0.48
LossCarryFwd	3.83E-06	0	0.000687611	0	0.1506552
Depreciation	0.000478923	0.000354289	0.000852233	-0.0109411	0.036552
InvTaxCredit	7.35E-08	0	6.33E-06	0	0.00080653
DebtRating	0.2243799	0	0.4171769	0	1
DebtCapacity	0.860567	0.9833254	0.2625033	5.16E-06	1
MktReturn	0.1482076	0.1875202	0.2599139	-0.4320149	0.7259837
CRSPVW	0.1073928	0.1556202	0.1903177	-0.3821115	0.3735818
Inflation	0.0598258	0.0400426	0.0400278	0.0228515	0.1566376
TermSpread	0.0122151	0.0107	0.0115218	-0.0307	0.0333
MacroGrowth	0.099109	0.0843906	0.1817334	-0.4889244	1.0586833
GDPGrowth	0.0554935	0.051	0.0348918	-0.078	0.252
CompetLerner	0.3614932	0.3514406	0.1440164	0.000146977	0.9866575
Diversification	5645.24	5488.29	1811.96	0.9287307	12665.49
Liquidity	16.1395889	13.5966714	9.6191332	4.1371635	58.184679
Close1Pct	0.0039248	0	0.0625255	0	1
Close2Pct	0.0187208	0	0.1355384	0	1

Table 3. Classic determinants of capital structure in various regulatory environments, all banks and SIFIs.

Panel A: All banks, Book leverage (Spec 1-3)

	Pre-Uniform		Pre-Uniform Fixed Effects		Pre-Basel		Pre-Basel Fixed Effects		Basel		Basel Fixed Effects	
Intercept	0.9110	***			0.9436	***			0.8960	***		
MTB	0.0084		-0.0161	***	-0.1688	***	-0.1166	***	-0.0184	***	0.0000	
Profit	-3.3979	***	-1.5990	***	0.0591		0.6958	***	-1.6155	***	-0.8372	***
LogSize	-0.0060	***	-0.0033	*	0.0006		0.0149	***	-0.0037	***	0.0003	
Collateral	0.0584	***	0.0325	***	0.0176	***	-0.0126		0.0450	***	0.0301	***
Dividend	0.0017	**	0.0014	**	-0.0040	**	0.0006		0.0076	***	0.0066	***
LogRiskM	0.0018	***	0.0011	***	0.0044	***	0.0015		0.0038	***	0.0012	*
R2	0.2203		0.7015		0.1533		0.4501		0.0234		0.2072	
Adj R2	0.2192		0.69		0.1523		0.4164		0.0233		0.1788	
N obs	4280		4280		4782		4782		48355		48355	

Panel B: SIFIs, Book leverage (Spec 4-6)

	Pre-Uniform		Pre-Uniform Fixed Effects		Pre-Basel		Pre-Basel Fixed Effects		Basel		Basel Fixed Effects	
Intercept	0.8679	***			0.7601	***			1.1175	***		
MTB	-0.0416	***	-0.0672	***	-0.0563	***	0.0085	**	0.0605	***	0.0287	**
Profit	-1.2858	**	-1.1792	*	-1.6140	***	-1.0247		-1.2287	***	-0.8398	***
LogSize	-0.0010		0.0000		0.0069	***	-0.0016		-0.0252	***	0.0122	***
Collateral	0.0547	***	-0.0264	***	0.0642	***	-0.0035		0.0090		-0.0036	
Dividend	0.0013		0.0072	***	-0.0007		-0.0009		-0.0066		0.0034	
LogRiskM	0.0010		0.0014		-0.0047	**	-0.0022		-0.0016		-0.0001	
R2	0.3067		0.6847		0.2324		0.7317		0.4535		0.7789	
Adj R2	0.2932		0.661		0.2165		0.7102		0.4507		0.7709	
N obs	315		315		298		298		1149		1149	

Table 3. Continued

Panel C: All banks, Market leverage (Spec 1-3)

	Pre-Uniform		Pre-Uniform Fixed Effects		Pre-Basel		Pre-Basel Fixed Effects		Basel		Basel Fixed Effects	
Intercept	0.9795	***			1.0204	***			1.0369	***		
MTB	-0.0433	***	-0.0505	***	-0.2922	***	-0.2319	***	-0.2222	***	-0.1562	***
Profit	-5.4868	***	-1.9970	***	-2.0350	***	-0.5052	***	-3.2174	***	-1.3821	***
LogSize	0.0010	***	0.0150	***	0.0091	***	0.0085	***	0.0018	***	0.0151	***
Collateral	-0.0014		-0.0020		-0.0677	***	-0.0374	***	-0.0583	***	-0.0173	***
Dividend	0.0021	***	0.0002		-0.0027	*	0.0004		0.0022	***	0.0049	***
LogRiskM	0.0004		-0.0005	*	0.0035	***	0.0026	***	0.0074	***	0.0010	***
R2	0.2658		0.7661		0.4285		0.7679		0.25		0.6624	
Adj R2	0.2647		0.757		0.4278		0.7537		0.2499		0.6503	
N obs	4280		4280		4782		4782		48355		48355	

Panel D: SIFIs, Market leverage (Spec 4-6)

	Pre-Uniform		Pre-Uniform Fixed Effects		Pre-Basel		Pre-Basel Fixed Effects		Basel		Basel Fixed Effects	
Intercept	0.9665	***			1.0540	***			0.8924	***		
MTB	-0.0293	*	-0.1252	***	-0.2068	***	-0.0340		-0.3380	***	-0.2278	***
Profit	-9.7194	***	-2.9829	***	-7.7661	***	-0.7190		-5.2638	***	-2.2581	***
LogSize	0.0030	***	0.0268	***	0.0063	***	-0.0080	**	0.0115	***	0.0151	***
Collateral	-0.0087		-0.0404	***	-0.0765	***	-0.0527	***	0.0034		-0.0726	***
Dividend	0.0014		-0.0073	***	0.0333	***	0.0079		-0.0099		-0.0049	
LogRiskM	-0.0027	***	0.0039	***	0.0090	***	-0.0027		0.0016		0.0036	*
R2	0.4813		0.8222		0.5615		0.9072		0.5465		0.8107	
Adj R2	0.4711		0.8089		0.5524		0.8998		0.5441		0.8039	
N obs	315		315		298		298		1149		1149	

Table 4. Determinants of bank capital structure: extended classic model with fixed effects

	Book leverage		Market leverage	
MTB	0.031526	***	-0.13849	***
Profit	-0.323149	*	-1.311912	***
LogSize	0.004729	**	0.015911	***
Collateral	0.050317	***	-0.005899	
Dividend	0.005398	***	0.004997	***
LogRiskM	0.000209		-0.00065	
MatureDummy	0.007924	***	0.003047	**
Maturity	0.000087941		-0.00097	**
Growth	-0.000325		-0.000764	*
CapEx	0.330841		0.137526	
MedIndLeverage	0.017887	***	-0.003362	
MedIndGrowth	0.001058		0.004457	***
SGA	-0.003838	*	-0.002046	
TopTaxRate	8.361992	***	13.017287	***
LossCarryFwd	-136.641616		-31.797655	
Depreciation	-1.297488		-0.410771	
InvTaxCredit	-5.48732		-27.520083	
DebtRating	0.003445		0.0022	
DebtCapacity	0.028746	***	0.024332	***
MktReturn	0.085519	**	0.139133	***
CRSPVW	-0.127802	***	-0.212883	***
Inflation	-0.158536		-0.389536	***
TermSpread	-0.038007		-0.058854	
MacroGrowth	-0.00479		-0.010532	***
GDPGrowth	0.009541		0.002878	
R^2	0.1598		0.408	
Adj R^2	0.1349		0.3904	
N obs	41907		41907	

Table 5. Determinants of bank capital structure: extended classic model, lasso variable selection

Panel A: book leverage					
No outliers or leverage points			Outliers and leverage points only		
Variable	Estimate	SBC	Variable	Estimate	SBC
Intercept	0.911994	-190493.07	Intercept	0.804645	-55346.984
Profit	-2.45771	-191334.85	Collateral	0.039435	-55368.242
Collateral	-0.001543	-192218.3	DebtCapacity	0.025413	-55536.933
LogSize	0.015054	-193041.87			
Growth	0.013824	-193240.55			
CapEx	-0.774774	-193380.98			
MedIndLeverage	-0.005551	-194374.43			
SGA	-0.003724	-194466.08			
Inflation	0.01322	-194472.15			
TopTaxRate	-0.015102	-195116.53			
GDPGrowth	0.000203	-195134.62			

Panel B: market leverage					
No outliers or leverage points			Outliers and leverage points only		
Intercept	0.986659	-145211.52	Intercept	0.803253	-66547.707
Profit	-0.115376	-149537.94	MTB	-0.091698	-66648.614
TopTaxRate	-12.850132	-157337.71	Profit	-1.466509	-66823.972
MTB	-0.001666	-162330.6	TopTaxRate	0.237409	-67060.771
DebtRating	-0.043703	-166274.43	Inflation	0.132572	-67505.098
MedIndGrowth	-0.001805	-166654.27			
TermSpread	0.003314	-166680.11			
SGA	-0.028754	-166757.31			
MedIndLeverage	-0.144128	-167473.69			
MacroGrowth	-0.036477	-167883.41			
LogRiskM	0.359502	-170209.84			
Collateral	0.005256	-173372.24			
LogSize	-0.004142	-173501.39			
Dividend	-0.546978	-173566.09			
CRSPVW	-0.017805	-174027.84			

Table 6. Bank capital structure with competition.

Panel A. Book leverage

Lasso selection - based					Fixed Effects selection - based				
	HHI		Lerner			HHI		Lerner	
Profit	-0.2370		-0.6375	***	MTB	0.0389	***	0.0078	
LogSize	0.0368	***	-0.0010		LogSize	-0.0046	**	-0.0025	
Collateral	0.0790	***	0.0156	***	Collateral	0.0316	***	0.0063	
Growth	0.0002		-0.0003		Dividend	-0.0031		0.0022	*
CapEx	0.3574		-0.0731		MatureDummy	-0.0162	***	0.0105	***
MedIndLeverage	-0.0207	***	0.0027		MedIndLeverage	0.0034		-0.0058	
SGA	0.0696	***	0.0091		TopTaxRate	-3.9174	***	79.6798	***
TopTaxRate	3.9133		81.4219	***	DebtCapacity	0.0009		0.0283	***
Inflation	-1.6563		-0.2346	*	MktReturn	0.0411		-0.0020	
GDPGrowth	0.0120		-0.0145		CRSPVW	-0.0689		0.0246	
Competition	-0.0086		0.0299	***	Competition	0.0036		0.0285	***
R^2	0.5040		0.5074		R^2	0.3865		0.4766	
Adj R^2	0.4853		0.4879		Adj R^2	0.3650		0.4576	
N obs	8175		40848		N obs	7496		31204	

Panel B. Market leverage

Lasso selection - based					Fixed Effects selection - based				
	HHI		Lerner			HHI		Lerner	
MTB	-0.1686	***	-0.1591	***	MTB	-0.1430	***	-0.1381	***
Profit	-1.5098	***	-1.4187	***	Profit	-2.0641	***	-1.6477	***
LogSize	0.0549	***	0.0129	***	LogSize	0.0266	***	0.0111	***
Collateral	-0.0001		-0.0308	***	Dividend	0.0006		0.0015	
Dividend	0.0063	**	0.0042	***	MatureDummy	-0.0224	***	0.0035	**
LogRiskM	0.0014		0.0000		Maturity	0.0012		-0.0020	
MedIndLeverage	-0.0366	***	-0.0094	*	MedIndGrowth	0.0031	***	0.0122	**
MedIndGrowth	0.0047	***	0.0038	***	TopTaxRate	4.2158		78.3539	***
SGA	0.0158		0.0196	**	DebtCapacity	0.0195	***	0.0224	***
TopTaxRate	-2.7417		76.8041	***	MktReturn	0.1391		0.1108	***
DebtRating	-0.0059	**	0.0007		CRSPVW	-0.2121		-0.1718	***
CRSPVW	0.0817	***	0.0545	***	Inflation	-0.5779		-0.3361	***
TermSpread	-0.2298		0.1409		MacroGrowth	-0.0135	***	-0.0131	***
MacroGrowth	-0.0128	**	-0.0114	***	Competition	-0.0187		0.0394	***
Competition	-0.0272	**	0.0352	***					
R^2	0.6119		0.4967		R^2	0.5971		0.4714	
Adj R^2	0.5972		0.4774		Adj R^2	0.5828		0.4522	
N obs	8208		43900		N obs	7497		31205	

Table 7. Bank capital structure with diversification and liquidity.

Panel A. Book leverage								
Lasso selection - based					Fixed Effects selection - based			
	Diversification		Liquidity			Diversification		Liquidity	
Profit	-1.1062	***	-2.3227	***	MTB	0.0162	***	0.0291	***
LogSize	0.0508	***	0.0405	***	LogSize	-0.0018		0.0054	***
Collateral	0.1766	***	0.2798	***	Collateral	0.0202	***	0.0444	***
Growth	0.0009		-0.0114	***	Dividend	-0.0032	***	0.0051	***
CapEx	-0.1981		-0.5918		MatureDummy	0.0011		0.0086	***
MedIndLeverage	-0.3353	***	-0.0262	***	MedIndLeverage	-0.0065		0.0161	***
SGA	0.0054		0.0034		TopTaxRate	-1.6031	**	5.6916	***
TopTaxRate	28.9759	***	0.0360		DebtCapacity	0.0004		0.0276	***
Inflation	-0.5606	*	-1.7704	***	MktReturn	0.0157		-0.0273	
GDPGrowth	0.0216		0.0050		CRSPVW	-0.0005		0.0941	
Diversification	0.0089	***			Diversification	0.0027	***		
Liquidity			0.0018	***	Liquidity			0.0001	
R2	0.7644		0.8009		R2	0.3116		0.1585	
Adj R2	0.7564		0.7953		Adj R2	0.2889		0.1343	
N obs	30863		66512		N obs	21840		43774	
Panel B. Market leverage								
Lasso selection - based					Fixed Effects selection - based			
	Diversification		Liquidity			Diversification		Liquidity	
MTB	-0.2715	***	-0.1054	***	MTB	-0.1377	***	-0.1358	***
Profit	-1.8278	***	-3.1600	***	Profit	-2.1089	***	-1.2377	***
LogSize	0.0553	***	0.0493	***	LogSize	0.0151	***	0.0153	***
Collateral	0.1218	***	0.1678	***	Dividend	-0.0029	**	0.0047	***
Dividend	0.0162	***	0.0266	***	MatureDummy	-0.0051	***	0.0039	***
LogRiskM	0.0051	***	0.0064	***	Maturity	-0.0011	**	-0.0009	*
MedIndLeverage	-0.3106	***	-0.0224	***	MedIndGrowth	0.0189	***	0.0068	*
MedIndGrowth	0.0063	***	-0.0154	***	TopTaxRate	0.9617		12.2150	***
SGA	0.0027		0.0051	**	DebtCapacity	0.0078		0.0189	***
TopTaxRate	28.9658	***	0.1067		MktReturn	0.1339	***	0.1402	***
DebtRating	-0.0150	***	-0.0361	***	CRSPVW	-0.2128	***	-0.2174	***
CRSPVW	0.0877	***	0.1347	***	Inflation	-0.3498	***	-0.3754	***
TermSpread	0.0727		0.9070	***	MacroGrowth	-0.0111	***	-0.0091	**
MacroGrowth	-0.0369	***	-0.0396	***	Diversification	0.0021	***		
Diversification	0.0087	***			Liquidity			0.0000	
Liquidity			0.0015	***					
R^2	0.7353		0.8134		R^2	0.5119		0.3923	
Adj R^2	0.7265		0.8082		Adj R^2	0.4958		0.9748	
N obs	32791		71091		N obs	21841		43775	

Table 8. Bank capital structure and capital requirements.

Panel A. Book leverage

Lasso selection					Fixed Effects selection				
	2%		1%			2%		1%	
Profit	-0.5202	***	-0.5517	***	MTB	0.0125	*	0.0123	*
LogSize	-0.0005		-0.0004		LogSize	-0.0005		-0.0002	
Collateral	0.0191	***	0.0196	***	Collateral	0.0049		0.0055	
Growth	-0.0005		-0.0005		Dividend	0.0010		0.0008	
CapEx	-0.2359		-0.2424		MatureDummy	0.0117	***	0.0117	***
MedIndLeverage	-0.0030		-0.0028		MedIndLeverage	-0.0047		-0.0048	
SGA	-0.0015		-0.0015		TopTaxRate	-2.8738		-3.1161	
TopTaxRate	-0.8747		-1.0450		DebtCapacity	0.0245	***	0.0247	***
Inflation	-0.3679	***	-0.3725	***	MktReturn	-0.0095		-0.0117	
GDPGrowth	-0.0213		-0.0214		CRSPVW	0.0537		0.0588	
Close	0.0027		-0.0136	***	Close	0.0037		-0.0120	**
R2	0.3905		0.3906		R^2	0.3506		0.3507	
Adj R2	0.3631		0.3633		Adj R^2	0.3239		0.3240	
N obs	35317		35317		N obs	27015		27015	

Panel B. Market leverage

Lasso selection - based					Fixed Effects selection- based				
	2%		1%			2%		1%	
MTB	-0.1416	***	-0.1419	***	MTB	-0.1176	***	-0.1182	***
Profit	-1.0680	***	-1.1087	***	Profit	-1.2923	***	-1.3460	***
LogSize	0.0169	***	0.0170	***	LogSize	0.0158	***	0.0160	***
Collateral	-0.0185	***	-0.0178	***	Dividend	0.0000		-0.0002	
Dividend	0.0051	***	0.0049	***	MatureDummy	0.0066	***	0.0066	***
LogRiskM	-0.0009	*	-0.0007		Maturity	-0.0005		-0.0006	
MedIndLeverage	-0.0219	***	-0.0218	***	MedIndGrowth	0.0098	*	0.0100	**
MedIndGrowth	0.0043	***	0.0044	***	TopTaxRate	0.5029		0.6388	
SGA	-0.0009		-0.0009		DebtCapacity	0.0189	**	0.0195	**
TopTaxRate	-1.1534		-1.1618		MktReturn	0.1392	***	0.1403	***
DebtRating	-0.0051		-0.0051		CRSPVW	-0.2125	***	-0.2137	***
CRSPVW	0.0721	***	0.0725	***	Inflation	-0.3872	***	-0.3992	***
TermSpread	0.0751		0.0742		MacroGrowth	-0.0114	***	-0.0113	***
MacroGrowth	-0.0102	***	-0.0101	***	Close	-0.0015		-0.0338	***
Close	-0.0005		-0.0308	***					
R^2	0.4401		0.4406		R^2	0.4022		0.4028	
Adj R^2	0.4154		0.4159		Adj R^2	0.3776		0.3783	
N obs	37738		37738		N obs	27015		27015	

Table 9. Full model of bank capital structure and economic cycle

Panel A. Book leverage								
Lasso selection - based					Fixed Effects selection - based				
	Full Period		Slow Growth			Full Period		Slow Growth	
Profit	-1.2325	***	-1.1582	***	MTB	0.0051		0.0048	
LogSize	-0.0055	***	-0.0048	***	LogSize	-0.0017		-0.0015	
Collateral	0.0148	***	0.0137	***	Collateral	0.0172	***	0.0193	***
Growth	0.0010	***	-0.0007		Dividend	-0.0029	***	-0.0039	***
CapEx	0.0060		0.1327		MatureDummy	0.0009		0.0025	
MedIndLeverage	0.0011		-0.0093		MedIndLeverage	-0.0085	**	-0.0182	
SGA	-0.0229	***	-0.0246	**	DebtCapacity	-0.0041		-0.0078	
Inflation	-0.1106		-0.0248		MktReturn	-0.0063		0.0444	
GDPGrowth	-0.0040		-0.0657	*	CRSPVW	0.0371		-0.0689	
Competition	0.0227	***	0.0152	***	Competition	0.0162	***	0.0128	**
Diversification	0.0017	***	0.0013	**	Diversification	0.0024	***	0.0020	***
Liquidity	0.0000		-0.0002	*	Liquidity	0.0001		-0.0002	
Close	0.0165	***	0.0217	***	Close	0.0200	***	0.0259	***
R^2	0.4207		0.4178		R^2	0.3920		0.4269	
Adj R^2	0.3959		0.3774		Adj R^2	0.3683		0.3909	
N obs	22610		13926		N obs	17490		10796	
Panel B. Market leverage								
Lasso selection - based					Fixed Effects selection- based				
	Full Period		Slow Growth			Full Period		Slow Growth	
MTB	-0.1557	***	-0.1548	***	MTB	-0.1418	***	-0.1443	***
Profit	-1.9537	***	-2.3230	***	Profit	-2.2789	***	-3.0483	***
LogSize	0.0124	***	0.0108	***	LogSize	0.0155	***	0.0132	***
Collateral	-0.0200	***	-0.0233	***	Dividend	-0.0034	***	-0.0056	***
Dividend	-0.0008		-0.0025	*	MatureDummy	-0.0040	**	-0.0029	
LogRiskM	-0.0003		-0.0008		Maturity	-0.0029	***	-0.0012	
MedIndLeverage	-0.0149	***	-0.4610	***	MedIndGrowth	0.0156	***	-0.4422	***
MedIndGrowth	0.0049	***	-0.0104	**	DebtCapacity	0.0117		0.0111	
SGA	0.0023		-0.0029		MktReturn	0.1216	***	-0.4282	*
DebtRating	-0.0019		-0.0044		CRSPVW	-0.1952	***	0.9354	**
CRSPVW	0.0457	***	0.0831	***	Inflation	-0.2839	***	0.7240	*
TermSpread	0.1525	*	0.2704	*	MacroGrowth	-0.0113	***	-0.0294	***
MacroGrowth	-0.0119	***	-0.0230	***	Competition	0.0264	***	0.0198	***
Competition	0.0224	***	0.0103	*	Diversification	0.0018	***	0.0017	**
Diversification	0.0010	**	0.0012	*	Liquidity	-0.0001		0.0007	***
Liquidity	-0.0002	**	0.0006	***	Close	0.0127	**	0.0136	**
Close	0.0118	**	0.0150	***					
R^2	0.5871		0.5929		R^2	0.5687		0.5925	
Adj R^2	0.5696		0.5648		Adj R^2	0.5519		0.5668	
N obs	23753		14575		N obs	17490		10797	

Table 9. Continued

Panel A. Book leverage								
Lasso selection					Fixed Effects selection			
	Recession		Expansion			Recession		Expansion	
Profit	-1.4912	***	-1.0586	***	MTB	0.0325	**	0.0250	*
LogSize	-0.0068	***	-0.0065	**	LogSize	0.0044		-0.0036	
Collateral	0.0340	***	0.0100		Collateral	0.0427	***	0.0112	
Growth	-0.0060		0.0021	***	Dividend	-0.0088	***	0.0007	
CapEx	0.0468		0.5016		MatureDummy	0.0073		-0.0018	
MedIndLeverage	-0.1303		-0.3171	*	MedIndLeverage	-0.0219		-0.1890	
SGA	-0.1130	***	0.0145		DebtCapacity	0.0447	**	0.0081	
Inflation	-0.1346	**	0.0918		MktReturn	-0.0180		0.0862	
GDPGrowth	0.0220		0.1763		CRSPVW	0.0166		-0.1601	
Competition	-0.0227	**	0.0466	***	Competition	-0.0105		0.0294	***
Diversification	0.0016		0.0033	***	Diversification	0.0009		0.0035	***
Liquidity	0.0003	**	0.0007		Liquidity	0.0002		0.0016	**
Close	0.0057		0.0125		Close	0.0026		0.0167	
R^2	0.7377		0.5547		R^2	0.5643		0.5369	
Adj R^2	0.6872		0.4743		Adj R^2	0.4852		0.4637	
N obs	3415		5268		N obs	2201		4492	
Panel B. Market leverage								
Lasso selection					Fixed Effects selection			
	Recession		Expansion			Recession		Expansion	
MTB	-0.1060	***	-0.1375	***	MTB	-0.0944	***	-0.1247	***
Profit	-2.1920	***	-1.3363	***	Profit	-2.6175	***	-1.5050	***
LogSize	0.0142	***	0.0097	***	LogSize	0.0317	***	0.0094	***
Collateral	-0.0269	***	-0.0056		Dividend	-0.0039		0.0011	
Dividend	-0.0034		0.0001		MatureDummy	-0.0025		-0.0022	
LogRiskM	0.0055	***	-0.0020	*	Maturity	-0.0071		-0.0275	***
MedIndLeverage	-0.2987	**	-0.3350	**	MedIndGrowth	-0.3863	**	-0.8316	***
MedIndGrowth	0.4377	***	0.0083	***	DebtCapacity	0.0500	**	0.0175	
SGA	-0.0512	**	0.0531	**	MktReturn	-0.0569	***	-0.0606	
DebtRating	0.0109		0.0039		CRSPVW	0.0514	***	0.2541	
CRSPVW	-0.0083		-0.0431		Inflation	0.3174	***	0.2527	**
TermSpread	0.4877	***	-0.8492	*	MacroGrowth	0.0064		-0.0029	
MacroGrowth	-0.0041		-0.0019		Competition	-0.0077		0.0557	***
Competition	-0.0068		0.0643	***	Diversification	-0.0033	*	0.0023	*
Diversification	-0.0008		0.0014		Liquidity	-0.0001		0.0009	
Liquidity	0.0000		-0.0025	***	Close	-0.0105		0.0087	
Close	-0.0099		0.0224	**					
R^2	0.8119		0.6579		R^2	0.7471		0.6280	
Adj R^2	0.7755		0.5966		Adj R^2	0.7009		0.5690	
N obs	3513		5665		N obs	2201		4492	

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