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Estimating the Cost of Equity Capital of the Banking Sector in the Eurozone

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Abstract

The objectives of this paper are, first, to estimate the long-run cost of equity capital for the banking sector using data from the Eurozone, US, UK, Sweden and Switzerland for the period 1999-2014. Our inference differs from that of previous studies because we employ a dynamic panel GMM model with a fixed effect and a multi-factor asset pricing framework to explain the variation of the cost of equity capital across banks in terms of risk-factors including, bank size, leverage, business cycle and regulations. Second, this model analyzes whether the cost of equity of banks in Eurozone differs from banks' cost of equity in the U.S. Our findings show that the multi-factor asset pricing framework does provide a robust explanation of the cost of equity for banking sector. Our findings are consistent with those of IIF (2011) in that a higher leverage ratio, an increase in capital requirement and regulation resulting in an increase of the cost of equity in the banking sector. However, the pattern, sign, size, and significance of these factors vary widely between the Eurozone and the US.

JEL Classification numbers: C23, G21, G3
Keywords: Cost of equity, GMM, regulations, Leverage and capital requirement.

1 Introduction

There is no doubt that the cost of equity is considered one of the most important number for bank managers, regulators, and investors alike. For bank managers, it provides a performance measure and is used as a hurdle rate for capital budget decisions. It is also the required rate of return investor's use to discount future cash flows which is crucial to value equity securities in construction of their portfolios. For regulators, it helps to provide a benchmark for policies aimed to enhance further risk management and financial stability. Hence, it is vital that banks have an accurate benchmark for performance measures in order to determine new investments and the optimum capital structure. Despite the importance of

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the cost of equity, most empirical corporate finance literature excludes banks, and asserts that the role of leverage, regulation, large off-Balance-Sheet Activities, and other factors is different in this sector. Consequently, only a handful studies estimate the cost of equity for the banking sector outside the United States.

Measurement of the cost of equity is in general one of the most difficult and controversial issue. This is because the cost of equity capital is an expected rate of return and it cannot be directly observed from the market. Three main approaches have been used to measure the cost of equity. The first is to use the realized return, i.e. return on equity (ROE) or Price/Earnings ratios, as a proxy of the expected return or cost of equity (Zimmer and McCauley, 1991, and Maccario et al., 2002). The problem with this measure is that it ignores risk and consequently, its adaption as a performance measure in the banking sector may result in distortion of shareholder value. The second approach is the CAPM (Green et al., 2003; Barnes Lopez, 2006; King, 2009; among many others). Although the CAPM is useful in estimating what the theoretical cost of bank equity should be in an equilibrium situation of capital markets, it remains the most commonly used by practitioners and financial advisers. It is, however, inaccurate given the possibility of market imperfections. The criticism of CAPM suggest that other risk factors need to be incorporated. The third and the most commonly used approach in recent literature is multi-factor model (Stiroh, 2006 and Schuermann and Stiroh, 2006; Yang and Tsatsaronis, 2012). The challenges remain to identify the factors affecting the cost of equity in the banking sector.

The new regulatory framework of Basel III that requires banks to hold a higher proportion of equity capital requirements is pointed out as an important determinant of the cost of equity capital in the banking sector and gave rise to several empirical studies to quantify the impacting consequences. Two opposite views were revealed. The first view held by the banking industry and argued that equity is more expensive than debt and any increase in the proportion of equity will increase the funding costs and thus reduce a bank's profitability. As a result banks adjusted by restricting lending or increasing the lending rate, which affected economic activities negatively (Institute International Finance, IIF, 2011). On the opposite side other studies defended the new regulatory framework. The famous theorem of Modigliani-Miller, 1958 (MM) maintained that an increase in the cost of capital caused by a higher proportion of equity would, under some assumptions, be offset by a decrease in the expected rate of return by investors. Consequently, this effect offsets (compensate) the additional cost of a higher proportion of expensive equity capital, so that the overall cost of capital remains unchanged. Many recent studies support the (MM) theorem (Kashyap and Stein, 2010, King, 2009, ECB, 2011, Miles et al, 2012, BIS and 2012). All these considerations call for a better understanding of what drives the cost of equity capital for banks.

In this paper, we employ a multi-factor asset pricing framework to estimate the long-run cost of equity for 140 banks in the Eurozone, US, UK, Sweden, and Switzerland for the period 1999-2014. Specifically, we employ a dynamic panel GMM model with a fixed effect to measure the impact of bank-specific factors, country-specific factors and regulation on a bank's cost of equity capital. Because the weights of these risk factors for a bank in a particular country are likely to be influenced by changes in regulation and supervision on the country level, the role of regulation on the cost of equity is allowed to vary across time and countries, so that the policy variables will serve as potential shift variables in the multi factor model. This allows for an analysis of the impact of existing and proposed regulation on cost of equity capital. The analysis sheds lights on the extent to which the cost of equity of banks and the pricing of risk in the Eurozone differs from behavior and pricing in the US and some other developed economies. European banks have also been exposed to the Euro-zone crisis after 2010 to a greater extent than banks in other countries

This paper extends the literature in three ways. First, we develop an augmented multi-factor model, in line with the Arbitrage Pricing Theory and Fama-French Framework, which provide a superior estimates of the cost of capital (Zhi Da et al., 2012, and Fama and French, 1993) to reflect the structure changes of risk factors on banks cost of equity in recent years. Prior studies focused mainly on one factor model (King, 2009, and Zhi Da et al, 2012, and Barnes and Lopez, 2006). Second, bank-specific factors, country-specific factors and regulation are introduced as shift variables in the risk factors in the multi-factor model. The analysis highlights the effects of regulatory reform on banks cost of equity to draw inferences for the cost of equity and its pricing, if current reform proposals of Basel III are employed. Third, previous attempts to investigate the relation between a bank's cost of equity and bank-specific factors have not convincingly overcome the potential endogeneity and simultaneity problems. To control for such dynamic endogeneit and simultaneity problems and to account for individual heterogeneity across banks and countries, we use the dynamic panel GMM estimators with a fixed effect as proposed by Arellano and Bover (1995) and Blundell and Bond (1998). The theoretical work will provide guidance on the exact specification of shift variables and dummies within the multi-factor framework.

The rest of this paper is organized as follows. Section 2 examines bank equity performance in recent years. Section 3 reviews previous studies of banks' cost of equity capital. Section 4 presents the conceptual framework for measuring the cost of equity. Section 5 presents the empirical results. The final section concludes.

2 Bank Equity Performance in Recent Years; A Cross Country Analysis

The global financial crisis of 2007-08 and the ongoing Euro area growth and debt crisis, have led to prominent anxieties in financial markets. Despite massive support programs conducted by central banks in developed economies, banks, especially in the Euro-zone, still face deleveraging, bailout, and capital flight problems (Shambaugh, 2012, and Noeth and Sengupta, 2012), which have been reflected in falling stock prices, increase in the volatility and risk premium of return, widening spreads on bank bonds and credit default swaps (CDS), and repeated ratings downgrades of many banks, write-downs and widening funding spreads. Nonetheless, the net impact on banks' cost of equity is still ambiguous since this possible rise may have been offset by the severe fall in risk-free rates and the support provided by governments and central banks. While it is too early to measure how these events might affect banks' cost of equity in the future, this paper traces changes in these factors over 1999–2014.

Figure 1 depicts the performance of bank stocks relative to the broad markets index for the countries included in our sample. There is a common pattern across all markets. Bank stocks performed strongly between 1999 and 2008, but they hugely underperformed during the last five years. Indeed, banks in the EMU countries performed the worst since 2007. In less than two years, the bank indices of both US and its EMU equivalent lost roughly 50 % of their market value. Both indices reached their lowest level in March 2009. Thanks to extensive government and central bank help, confidence and liquidity then slowly returned to the markets.

As seen from the figure, equity price declines have been the most obvious for European banks, which are more exposed to European government securities, and could be affected by growth crunches in the Euro area. Indeed, banks in European countries have performed the worst since 2007.

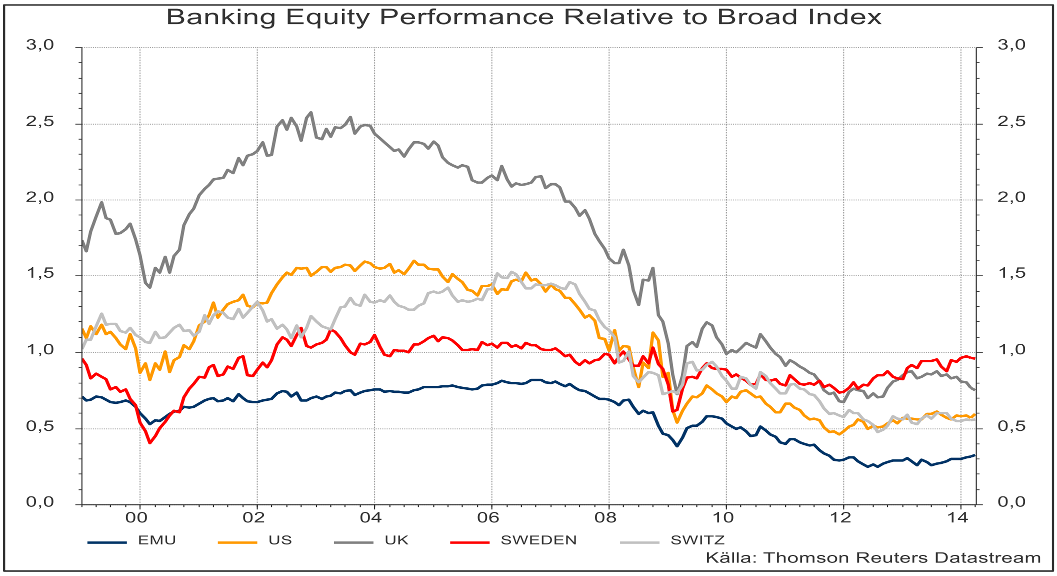

Figure 1: Banking Equity Performance Relative to Broad Index

Figure 2 depicts the share of banking market capitalization relative to the overall market capitalization. In all countries, this share grew substantially over the past two decades in line with the increase in market activities. The market capitalization of European as well as American banks saw a solid rise until late 2007. For example, at the end of 2007 banks made up around 20 %, 17% and 9% of the overall market capitalization in the EMU, the UK and the US, respectively. This was roughly double their share at the beginning of the 1990s, although only half that in 2009. Up to that point, developments in the overall market value of the Eurozone and the US were closely correlated, entering into a sideward movement. However, from 2011 on, they started to diverge strongly with shares experiencing only a temporary setback in the US, but a fall without recovery in Europe due to the European sovereign debt crisis. The market capitalization shares in the EMU, US, UK and Sweden are currently 12%, 5%, 12% and 23%, respectively.

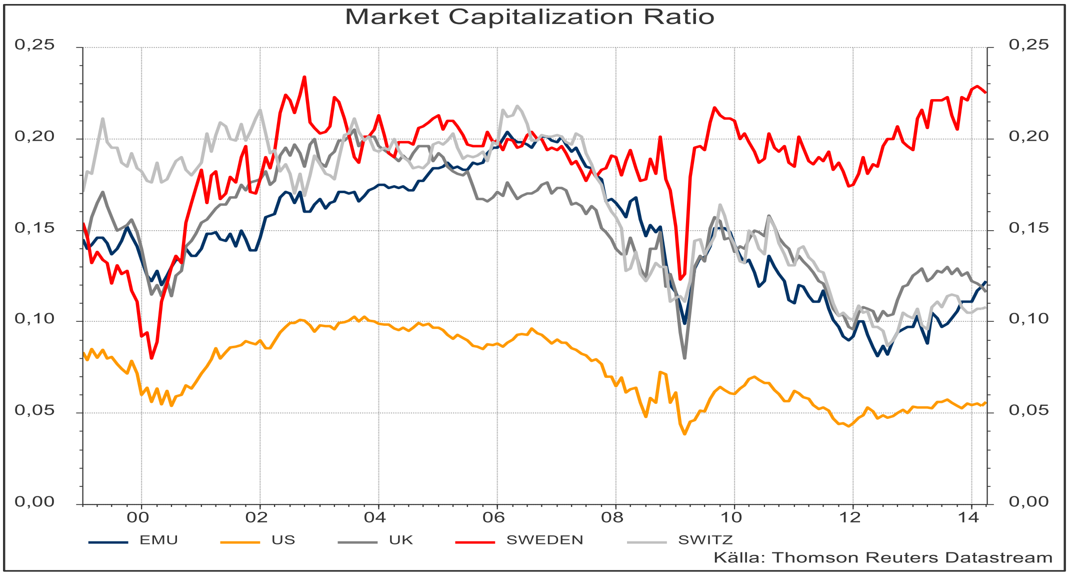

Figure 2: Market Capitalization Ratio

Figure 3 depicts the price-to-book ratio as an indication of how much equity investors are willing to pay for each net assets. Focusing on the comparison between the Eurozone and US since 2010, visual inspection of the figure shows that the stock market is still clearly skeptical about the future prospects of these banks, as shown in the valuation of price to book. There are three possible explanations for this skepticism. First, the market may perceive the book values for many banks as excessive due to nonperforming loans which can end in bank failures and lead to existing banks' recapitalization of bailouts, redemptions on publicly funded deposit insurance, or both (Reinhart and Rogoff, 2009). Banks tend to register nonperforming loans as fully performing even if the probability of repayments is very low because writing down such loans would reduce the banks' book value of equity and Capital to Risk Weighted Assets Ratio (CRAR). The second possible reason for the low price to book ratio is investors' uncertainty of future returns on banks' equity. If a bank's return is equal the cost of equity, then price to book value would be around one. Thus, banks with low (high) profitability are expected to have low (high) price-to-book value. Since an increase of sovereign default risk is priced by the market, banks with substantial exposures to European government bonds have experienced big drops in their market value. Even banks without direct exposures to European government securities have also been affected, as they have claims on banks highly exposed to sovereign debt. In addition, the restructuring of Greek sovereign debt, which resulted in a 70 percent NPV value loss for bondholders, has caused doubt on the efficiency of hedging instruments such as credit default swaps (CDS) and drove sovereign bond prices downwards (Jorge et al , 2012)

Figure 3: Price–to-Book Ratio

While the banking sector index, market capitalization and price-to-book ratio depict the general trend in bank equity prices, it is silent about the drivers of their cost of equity capital.

3 Literature Review of Bank Cost of Equity

The cost of equity capital is an expected rate of return that cannot be directly observed from the market, and different measures have been used in the literature. The first strand of literature used the realized return, i.e. return on Equity (ROE) or Price/Earnings ratios, as a proxy of the expected return or cost of equity. Zimmer and McCauley (1991) estimated the real cost of equity for 34 international banks from six countries over the period 1984–90. They used the cost of equity as a proxy by using the return on equity (ROE). They found that Japanese banks enjoy a low cost of capital, German and Swiss banks face a moderate cost of capital, and the US, UK and Canadian banks confront a high cost of capital. They traced the differences to shareholders' valuations of banks' earnings in different equity markets, difference in national saving behavioral and macroeconomic stabilization process. Maccario et al (2002) investigated the cost of tier 1 capital of major banks from twelve countries from 1993 until 2001. They estimated the cost of equity for the banking sector, defined as the inverse of price earning (PE) in G-10 countries using earning' forecasts rather than historical earnings. They found that the estimated average costs of equity of major banks in G-10 countries have been decreasing during the nine-year period from 1993 to 2001, and that the estimated costs of equity of individual banks are strongly related to both microeconomic and macroeconomic variables. The problem with this approach is that a historical return ignores risk. Consequently, its adaption as a performance measure may result in a distortion of shareholder value. Competition among banks could lead to a ROE race in which high targets are set. Attaining such a target given the current very low-risk free rate would be difficult without experiencing considerable business and financial risk and increased fear for regulators. The recent financial crisis reveals the need to incorporate risk considerations into the cost of equity.[2]

To incorporate risk into the cost of equity other studies used the Capital Asset Price (CAPM) to estimate the cost of equity. Green et al (2003) analyzed the methods used by the Federal Reserve to estimate the cost of equity for US banks. They found that the method used in estimating the average bank's cost of equity until 2002 was a combination of the historical average of earnings, the discounted value of expected future cash flows, and the equilibrium price of investment risk as per the capital asset pricing model. They showed that the current approach would have provided stable and sensible estimates of the cost of equity capital for the private sector adjustment factor (PSAF). Barnes and Lopez (2006) tested whether the CAPM estimates were robust to changes in the size of the peer group, the introduction of additional factors and variations in the calculation method. They concluded that the cost of equity estimates based on averaging CAPM estimates across a group of banks were reasonable for the purposes of the Federal Reserve System, which therefore adopted the method as the sole approach for estimating the bank cost of equity as of 2006. King (2009) estimated the real cost of equity for banks headquartered in six countries over the period 1990–2009. The estimates were based on the single-factor CAPM model used by the Federal Reserve System. The real cost of equity decreased steadily across all countries except Japan from 1990 to 2005, but then it rose from 2006 onwards. A recent report released by the Association for Financial Professionals (AFP), 2013, which allows companies to compare techniques against those of other organizations, reveals that the Capital Asset Pricing Model (CAPM) remains the one most commonly used by practitioners and financial advisers to estimate a firm's cost of equity. Although the CAPM is useful in estimating what the hypothetical cost of equity of a bank is supposed to be in a market's equilibrium and remains the most commonly used by practitioners and financial advisers to estimate a firm's cost of equity, it is imprecise to estimate the true cost of equity for a bank, given the possibility of market imperfections. In addition, problems arise when banks from different countries are compared as the systematic risk factors that affect stocks' returns can be significantly different among countries.

To overcome the problems arising from CAPM, other recent studies use the multi-factor model. Although this approach seems appealing because it counts for other risk factors besides market risk, challenges remain to identify these factors affecting the cost of equity in the banking sector. Schuermann and Stiroh (2006), for example, used the three-factor model to evaluate the impact of increased noninterest income on equity market measures of return and risk of U.S. bank holding companies from 1997 to 2004. They used the standard Fama-French factors and additional factors thought to be particularly relevant for banks such as interest and credit variables. In addition to the market beta, they have included the yield on a 3-month treasury bill, the spread between 10-year and 3-month treasury rates, the spread between the Moody's Baa-rated corporate bonds and 10-year Treasury rates. He found that the three-factor model accounted for the largest proportion of the systematic risk in individual bank stocks. Stiroh (2006) investigated whether additional factors, such as different interest rate spreads, can explain bank-level equity returns, but he did not find strong evidence supporting that fact. They concluded that the market factor

[2]Rizzi (2014) argues that the appropriate measure of performance is the spread between ROE and the cost of equity. Banks with ROE greater than the cost of equity are creating shareholder value and trade at a multiple of book value. He shows that the spread between ROE and cost of equity times the bank's book value is a bank's economic profit.

clearly dominates in explaining bank returns, followed by the Fama-French factors. Jorge et.al (2012) studied the drivers of equity returns in the banking sector of advanced economies. The drivers analyzed were sovereign risk, economic growth prospects, funding conditions, and investor sentiment or risk aversion, Euribor-OIS spread, Sovereign CDS spread, and some bank-specific factors. They found that a higher capitalization and lower leverage made banks' equity returns more resilient to adverse economic and sovereign risk shocks. They also found that tier 1 capital to risk-weighted assets had an insignificant effect. Demirgüç and Huizinga (2010) found that equity returns in the banking sector in the wake of the Great Recession and the European sovereign debt crisis have been mainly driven by weak growth prospects and heightened sovereign risk and to a lesser extent, by deteriorating funding conditions and investor sentiment. They argued that a stronger capital position is associated with better stock market performance, most markedly for larger banks, and that the relationship is stronger when capital is measured by the leverage ratio rather than the risk-adjusted capital ratio. These results are consistent with our results.

Yang and Tsatsaronis (2012) analyzed the impact of leverage, business cycle and the value of book to market n banks' stock return in the Euro area, US, UK, and Japan for the period 1989-2011. They found that the financing of the returns of bank equity is cheaper in the boom and more costly during a recession. They provide support for prudential tools that give incentives for banks to build capital buffers at times when the cost of equity is lower. In addition, banks with higher leverage face a higher cost of equity, which suggests that higher capital ratios are associated with lower funding costs.

The new regulatory framework of higher capital requirements was pointed out as an important determinant of the cost of equity capital in the banking sector and gave rise to several studies to quantify the impacting consequences. The empirical evidence for the impact of regulation on a bank's cost of equity is still ambiguous. Two opposite views merged. The first view is based on the theorem of Modigliani-Miller (MM), 1958, which argues that an increase in the cost of capital caused by a higher proportion of equity will, under some assumptions, be offset by a reduction in the cost of equity. Subsequently, this effect offsets the additional cost of a higher proportion of expensive equity capital in the balance- sheet so that the overall cost of capital is unchanged. Many recent studies support the (MM) theorem. Kashyap and Stein (2010) analyzed the impact of an increase in the level of core equity on banking activities assuming that the increase of the cost of capital will be completely echoed on the cost of credit. They make their study on a sample of large U.S. banks over the period 1976-2008 in order to quantify the impact. They found that to the extent that they are properly phased in, substantially higher capital requirements for significant financial institutions are likely to have only a modest impact on the cost of loans for households and corporations. This impact is, in and of itself, probably not sufficient to be a major cause for concern. A similar study led by the European Central Bank (ECB (2011) supports the MM theorem and the beneficial effect of an increase in the risk-weighted capital ratio for a sample of 54 banks over the period 1995-2011. Similarly, Miles et al. (2012) estimated the costs and benefits of new capital requirements on a panel of six banks in the United Kingdom over the period 1997-2010. They proposed to analyze the impact of a leverage reduction on the risk level and ultimately on the weighted average cost of capital. BIS (2012) provides a strong argument for a banking recapitalization in good times. They also demonstrated that higher capital ratios are associated with lower funding costs. More stringent capital standards can reduce not only the level of debt and the funding cost but also that part of the volatility that is not aligned with the stock market. Schich and Lindh (2012) found that implicit guarantees imply a very significant funding cost advantages for the banks that benefit from them. They thus create distortions to competition and an invitation to use them and, perhaps, take on too much risk

The second is the view of the banking and financial industry, which holds that an increase in the proportion of equity, the most expensive form of capital, will negatively affect bank's profitability and increase funding costs which, in turn, leads to a credit crunch and a decrease in economic growth (IIF, 2011). Their argument is that the initial hypothesis made by MM (no taxes, no frictions and no information asymmetries) does not completely fit reality because of the nature of banking activity and the size of the off-balance sheet activities in this sector. They argue that a higher ROE will be commanding on the short term in order to encourage investors to subscribe to the stock capital of new banks. Such a reaction is in competition with less regulated non- bank issuers offering higher yields. In addition, the risk-taking problem represents another distortion to the MM theorem. The explicit guarantees (insurance of deposits) present serious alterations with lower financing rates for banks than for firms in other sectors. As for implicit guarantees (government insurance) it implies a part of the default risk of the bank moves to tax-payers, which allows debt issuers to receive a premium on debt.

Finally, a large body of literature analyzes the impact of macroeconomic factors on stock market returns (Prabha and Wihlborg, 2014, and Zhi et al, 2012). A business cycle, for example, can influence bank equity prices through its impact on bank assets. During a boom, the default rate of loans to households and firms decline. This, in turn, boosts bank earnings and can mitigate investors´ perceptions of the risk. Barth et al (2013) provided a new data and measures of bank regulatory and supervisory policies in 180 countries from 1999 to 2011. Their measures were based upon responses to hundreds of questions, including information on permissible bank activities, capital requirements, the powers of official supervisory agencies, information disclosure requirements, external governance mechanisms, deposit insurance, barriers to entry, and loan provisioning. They analyzed changes in bank regulatory and supervisory practices over time, examined the degree to which banking policies had converged across countries, and documented how the organization of bank regulatory authorities and the size and structure of the banking system differed around the world. They found that, although there was some convergence along some dimensions of bank regulation, substantial heterogeneity remained in policies, organization, and structure.

4 A Conceptual Framework for Measuring the Cost of Equity

4.1 Model Specification

Measurement of the cost of equity is probably the most challenging and controversial topic in corporate finance literature. This is because the cost of equity capital is an expected rate of return, thus it cannot be directly observed from the market.

The recent literature reviewed above revealed that two foremost approaches can be used for estimating the cost of equity: the capital asset pricing model and the multi-factor model[3].

4.1.1 Capital Asset Pricing Model (CAPM), the One –Factor Beta model

The CAPM, developed by Sharpe (1964), Lintner (1965a,b) and Mossin (1966) is a widely used model to estimate the cost of equity for individual companies. It a is a general equilibrium model that quantifies the relationship between risk and expected return using a single risk factor and remains the most widely used approach in practice for estimating the cost of equity for individual companies as well as a measure of performance for portfolio managers (Campbell et al., 1997, and King, 2009). CAPM postulates that the nominal cost of equity capital (or expected return) for a bank is linearly determined by the nominal risk-free rate and a firm-specific risk premium and assumed to follow a simple one-factor model:

$$E(R_i) = R_f + \beta_{im}(E[R_m] - R_f) + \varepsilon_{i,t} \quad (1)$$

Where $E(R_i)$is the expected return (cost of equity) for bank i, $E[R_m]$is the expected return on the overall market portfolio, R_f is nominal yield on the risk-free asset, β_{im} is the equity beta (load factor) that measures the sensitivity of a bank's equity return to the market, and $\varepsilon_{i,t}$ is a purely idiosyncratic shock assumed to be uncorrelated across banks. The term $(E[R_m] - R_f)$ is the equity market risk premium which measures the average annual return that investors may be expected to earn on their equity portfolio relative to the risk-free rate. Equation (1) states that the only source of systematic risk is the market factor. The assumption in equation (1) is that historical returns are a good proxy for expected returns are approximately independently and identically distributed (IID) through time and jointly multivariate normal.

4.1.2 Multi-Beta Models

In spite of its popularity in academics and the real financial world, empirical support for the CAPM is poor, casting doubt about its ability to clarify the actual movements of asset returns. Its inadequacies have also threatens the way it is used in applications. The main empirical shortcoming of the CAPM is that a single market factor is not sufficient to explain the cross-section of realized returns, as understood in the large amount of studies of CAPM anomalies.

Empirical evidence suggests that additional factors may be required to adequately characterize behavior of expected stock returns and logically leads to the consideration of multi-beta pricing models. A more complicated asset pricing model consists of multi-beta framework is required in the form of the Arbitrage Pricing Theory (APT), developed by Ross (1976). The APT - is based on arbitrage arguments and assumes:

$$E(R)_i = R_f + \beta_1 X_1 + \cdots \beta_k X_k \quad + \varepsilon_{i,t} \quad (2)$$

[3]The discounted dividends model can also be used to estimate the cost of equity. However, there are a number of practical problems associated with this approach as highlighted by Ross et al. (2006)). First, the model is applicable only to companies that pay dividend. Second, the estimated cost of equity is very sensitive to the estimated growth rate. Third, the approach does not consider risk factors.

Where $E(R)_i$the cost of equity capital, and βk is measures the sensitivity of a bank's return to the kth economic factor. Given the economic factors, the parameters in the multi-beta model can be estimated from the combination of time-series and cross sectional regression (i.e. panel data), see
Jagannathan and Wang (1998). However, the major problem with the multi-beta models is that that economic theory does not specify the factors to be used in the models, so that there is no consensus on the factors. The task of identifying the factors is left to empirical research. Three main approaches have been used in the empirical literature to identify the factors affecting the cost of equity capital. The first approach relies on using economic intuition. Chen et al (1986), for example, selected five economic factors: the market return, industrial production growth, the default premium, the term premium, and inflation. The second approach is based on statistical analysis to extract factors from a cross section of stock returns (Connor and Korajczyk, 1986). The last, and the one used in this paper, is to identify factors based on empirical observation. An example of this approach is the three-risk-factor pricing model developed by Fama and French, 1993, reviewed below.
The three-risk-factor pricing model combines the Capital Asset Pricing Model (CAPM) with two additional pricing factors identified by Fama and French (1993) to explain the cross-sectional and time variation of equity returns in excess of the risk-free rate. Specifically, the typical specification of the model is of the form:

$$E(R)_i = R_f + \beta_{im}\,(E[R_m\,] - R_f) + \beta_{HML}HML_t + \beta_{SMB}SMB_t \quad + \varepsilon_{i,t} \qquad (3)$$

Where HML and SMB are the differences between the returns on diversified portfolios of high minus low book to market stocks and small minus big stocks, respectively. These three factors are designed to capture the value and firm size effects that have long been documented in empirical finance literature. If these factors are relevant for banks, they should obviously have some statistical significance and increased explanatory power relative to the CAPM in Eq. (1). Moreover, if these factors control for common variation in bank returns, the cross-sectional residuals in Equation (3) should be less correlated than in Equation (1).
Yang and Tsatsaronis (2012) augmented equation (3) by including three bank-specific characteristics as additional drivers of the systematic risk in banks' cost of equity: leverage, earnings, and book-to-market valuation. Maccario et al (2002) emphasized the role played by tier 1 capital ratio, the expected growth in earning, the payout ratio, and the gross rate of loan losses as main the determinants of bank's cost of equity. Jorge et al. (2012) showed that the drivers of equity returns in the banking sector of advanced economies is affected by sovereign CDS spread, economic growth prospects, funding conditions (approximated by Euribor OIS spread), leverage, loan-to-deposit and tier 1 capital.
We augment equation (3) by including additional drivers for the systematic risk in banks' cost of equity capital. In particular, we consider bank-specific characteristics: (i.e., leverage, tier1 capital, and loan to deposit), regulation (as in Barth 2013), business cycle, and proxy for sovereign risk, and proxies for funding conditions as the main determinants of cost of equity.
Our broadest model, therefore, combines the Fama-French three-factor model factors with 6 additional risks. The following multi-factor equation is estimated:

$$E(R)_i = R_f + \beta_{im}(E[R_m - R_f] + \beta_{HML}HML_t + \beta_{SMB}SMB_t + LEVERAGE + \text{TIER1} + \frac{L}{D} + \text{TERM} + OIS + CDS + INF + +DUMREG + DUMACT + \varepsilon_{i,t} \quad (4)$$

We refer to Equation (3) as the "Bank-Factor" model. Where $E(R)_i$ is the expected rate of return (cost of equity) given by the average return for each individual bank I, LEVERAGE is the bank's leverage, which is defined as the total asset to equity, TIER1 is tier 1 capital, and L/D is the loan to deposit ratio which indicates how much a bank relies on wholesale funding. The inclusion of the latter variable was justified, as the 2008 crisis showed that banks were vulnerable to a run on wholesale funding (Duffie, 2010; Gorton and Metrick, 2010).

We also incorporated additional interest rate factors, as control variables, thought to be particularly relevant to banks; the one-period change in the slope of the term structure (TERM), defined as the difference between the 10-year and 3-month treasury rate. To analyze the impact of sovereign risk on equity returns, we approximate sovereign risk with the arithmetic average of the 5-year credit default swap (CDS) spreads. We also include the 3-month Euribor-EONIA spread (Euribor OIS spread) to account for funding conditions and investor sentiment. To count for the impact of macroeconomic fundamentals on banks' cost of equity, we include business cycle, approximated by the inflation rate.[4] The high minus low (HML) and small minus big (SMB) factors control for value and size premium as in Fama and French (1993).

As the estimated cost of equity will be sensitive to the appropriate measure of risk-free rate, $R_{f,}$ and for the robustness of the results, we use three proxies for the risk-free rate in the Euro Area. The first is the 1-month euro overnight index average swap rate (EONIA). EONIA swaps are the most liquid instrument in the euro money markets. Since they are mark-to-market on a daily basis and do not involve exchange of principal, the rates are less affected by counterparty risk (Jorge et al., 2012). This is not the case for Libor rates, as rising default risk in the banking sector has increased unsecured borrowing costs in the interbank market. The second proxy is the 3- month money interbank rate, EURIBOR. The third proxy is the German bond yields, which may reflect market concerns of the need to bail out European countries. The proxies for the risk-free rate in the other countries are 3 month treasury bills in the US and UK, 1 month repo rate in Sweden, and Central bank lombard rate in Switzerland. In addition, the changing of regulation and minimum capital requirements following the international financial crisis are considered important detriments for a bank's cost of capital and the rates available to borrowers. Standard theory predicts that, in perfect and efficient capital markets, reducing banks' leverage (i.e., an increase in equity capital) reduces the risk and cost of equity but leaves the overall weighted average cost of capital unaffected (MM theorem).

Barth et al (2013) analyzed changes in bank regulatory and supervisory practices over time and examined the degree to which banking policies have converged across 180 countries. They constructed two indexes. The first is to measure the degree to which national regulations restrict banks from engaging in (1) securities activities, (2) insurance activities, and (3) real estate activities. The index values for securities, insurance, and real estate range

[4]For the EMU we calculated the average of the 5-year credit default swap spreads for Belgium, Germany, Estonia, Ireland, Greece, Spain, France, Italy, Cyprus, Latvia, the Netherlands, Austria, Portugal, Slovenia, Slovakia and Finland. Two EMU countries are excluded due to the data being unavailable.

from 1 to 4, where larger values indicate more restrictions on banks performing each activity. In particular, 4 signifies that an activity is prohibited, 3 indicates that there are tight restrictions on the provision of the activity, 2 means that the activity is permitted but with some limits, and 1 signals that the activity is permitted. They found a great cross-country variability in the degree to which countries restrict banks from engaging in different activities. The regulatory notion of a bank, therefore, differs markedly across countries — and, this definition changes over time within the same country. Only Switzerland was to grant banks unrestricted securities, insurance, and real estate powers. Most countries tightened the overall restrictions on bank activities following the global financial crisis and the introduction of Basel III. The second index is to measure the stringency of bank capital regulations that measure the amount of capital banks must hold and the stringency of regulations on the nature and source of regulatory capital. Larger values of this index of bank capital regulation indicate more stringent capital regulation. Their results show that most countries increased the stringency of their capital regulations following the crisis, including the United States. In addition, Portugal, Belgium, Austria, Switzerland, Greece, Cyprus, Finland, Ireland and the United Kingdom had reduced the stringency of their capital regulations in the aftermath of the crisis.

We utilize the database of Barth et al. (2013) to track changes in regulation and supervision since 1999 for the countries included in our sample by examining the change in the capital regulatory restrictions index since 2007. Since the scope of permissible activities differs across countries, banks are not the same across countries. In the empirical equation (4) we use two different deregulatory dummies. The first is DUMACT, which takes the value of unity if the country grant banks unrestricted securities, insurance, and real estate powers (i.e., Switzerland) and zero otherwise. The second is DUMREG, which takes a value of unity for banks with increasing stringency of their capital regulations following the crisis (i.e. the US and EU). The εit is assumed to be independently distributed across individuals with zero mean, but arbitrary forms of heteroskedasticity across units and time are possible.

4.2 Estimation Procedures

4.2.1 Data

This study uses a data sample of the largest 140 banks in developed economies (comprising 78 banks from the EMU, 33 banks from the US, 6 banks from the UK, 4 banks from Sweden, and 19 banks from Switzerland). For a complete list of banks, see the Appendix. The sample does not include delisted banks during the period 1999-2014, which may result in survivorship bias. The results, therefore, could be biased towards banks with large capital, banks thought too-big-to-fail that benefitted from an implied government guarantee, and regional banks that were less affected by the ongoing financial crisis due to their narrow international exposures. It is important to emphasize that, our aim is not to develop a precise asset-pricing model per se Rather we take existing models, as defined by risk factors, to explain common variation of banks' costs of equity capital using panel data regression. Monthly data series for bank-specific characteristics and country-specific factors for the period January 1999 – March 2014 were collected from Datastream and MSCI.

4.2.2 Methodology

We use the dynamic panel system of the Generalized Method of Moments (GMM) estimator as proposed by Arellano and Bover (1995) and Blundell and Bond (1998) that allows economic models to be specified while avoiding needless assumptions, such as specifying a particular distribution for the errors. As pointed out by Hall (2005), this lack of structure in the GMM made it widely applicable in econometrics because competing economic theories often imply that economic variables satisfy different sets of population moment conditions. Furthermore, GMM controls for dynamic endogeneity arising from ignored heterogeneity and simultaneity that might exist in the regression and it is robust to model misspecification (Christensen et al, 2008). We use lagged values of the cost of equity as instruments to controls for potential simultaneity and reverse causality. Thus, our estimation procedure allows all the explanatory variables (i.e., bank-specific-factors and all control variables) to be treated as endogenous.

4.2.3 Panel Unit-Root Tests

In order to investigate the possibility of panel cointegration, it is first necessary to determine the existence of unit roots in the panel data series of Equation (4). A number of researchers, especially Levin et al. (2002), Breitung (2005), Hadri (1999), and Im, Pesaran and Shin (2003) have developed panel-based unit root tests that are similar to tests carried out on a single series. Remarkably, these researchers have shown that panel unit root tests are more powerful (less likely to commit a Type II error) than unit root tests applied individually. In addition, in contrast to individual unit root tests, which have complex limiting distributions, panel unit root tests lead to statistics with a normal distribution in the limit [see Baltagi, 2001]. Theoretically, these tests are essentially multiple-series unit root tests that have been applied to panel data structures.

The Im, Pesaran and Shin (IPS, hereafter) test has been found to have superior test power by researchers in economics to analyze long-run relationships in panel data, and we employ this procedure in this study. IPS offers a test for the presence of unit roots in panels that combines information from the time series component with that from the cross section component, so that fewer time observations are required for the test to have power. Following Startz (2013), an IPS test starts by specifying a separate ADF regression for each cross-section with individual effects and no time trend:

$$\Delta y_{it} = \alpha_i + \rho_i y_{i,t-1} + \sum_{j=1}^{p_i} \beta_{ij} \Delta y_{i,t-j} + \varepsilon_{it} \tag{5}$$

where $i = 1, \ldots, N$ and $t = 1, \ldots, T$

IPS use separate unit root tests for the N cross-section units. After estimating the separate ADF regressions, the average of the t-statistics for p_1 from the individual ADF regressions, $t_{iT_i}(p_i)$:

$$\bar{t}_{NT} = \frac{1}{N} \sum_{i=1}^{N} t_{iT}(p_i \beta_i) \tag{6}$$

The t-bar is then standardized and it is shown that the standardized *t-bar* statistic converges to the standard normal distribution as N and $T \to \infty$. IPS (1997) showed that a- *t bar* test performs better when N and T are small.

4.2.4 Panel Cointegration Tests

The next step is to test for the existence of a long-run cointegration among the cost of equity and the independent variables in Equation (4) using panel cointegration tests. We use two cointegration tests: the Kao (Engle-Granger based) and the Combined Fisher and Johansen tests to determine the unrestricted Cointegration Rank to trace the maximum eigenvalue. This panel cointegration test revealed to have more power than conventional cointegrated test (Coiteux and Oliver, 2000).

The Kao (1999) test specifies cross-section specific intercepts and homogeneous coefficients on the first-stage regressors. Generally, the Kao test considers running the first stage regression in the form:

$$y_{it} = \alpha_i + \partial_i t + \beta_{1i} x_{1i,t} + \beta_{2i} x_{2i,t} + \cdots \ldots \beta_{Mi} x_{Mi,t} + e_{it} \qquad (7)$$

For t =1,…..,T; i= 1, ….,N; m=1,….,M; where y and x are assumed to be integrated of order one, e.g. I(1). The parameters α_i and ∂_i are individual and trend effects which may be set to zero if desired. A Kao test requires the α_i to be heterogeneous, the β_i to be homogeneous across cross-sections, and all of the trend coefficients must be et to zero. Kao then runs either the pooled auxiliary regression,

$$e_{it} = \rho \varepsilon_{it-1} + v_{it} \qquad (8)$$

Or the augmented version of the pooled specification:

$$e_{it} = \tilde{\rho} e_{it-1} + \sum_{j=1}^{p} \varphi_j \, \Delta e_{it-j} + v_{it} \qquad (9)$$

The Fisher (1932) test derives a combined test that uses the results of the individual independent tests. Maddala and Wu (1999) use Fisher's result to propose an alternative approach to testing for cointegration in panel data by combining tests from individual cross-sections to obtain a test statistic for the full panel. If π_i is the p-value from an individual cointegration test for cross-section , then under the null hypothesis for the panel,

$$-2 \sum_{i=1}^{N} \log(\pi_i) \to \chi^2 2N \qquad (10)$$

By default, EViews reports the value based on MacKinnon et al (1999) *p*-values for Johansen's cointegration trace test and maximum eigenvalue test

5 Empirical Framework

Table 2 presents descriptive statistics of the cost of equity of banking sector as well as the explanatory variables for the whole sample period. We highlight three points. First, on average, the cost of equity capital in thee baking sector is about 8% which is lower than the stock market returns of 8.13%. Second, the most volatile variables are CDS, HML and SMB. Third, because many statistical inferences require that a distribution be symmetrically and normal or nearly normal we report the values of skewness and kurtosis. For all variables, except HML and SMB, the distribution is approximately symmetrical. However, all variables exhibit excess kurtosis <0 (platykurtic). Exceptions are SMB, HML and CDS, which exhibit excess >0 (leptokurtic) and inflation with excess kurtosis = 0. The table also reports a more solid test; the Jarque–Bera test to investigate the hypothesis that the data are from a normal distribution. The null hypothesis is a joint hypothesis of the skewness being zero and the excess kurtosis being zero. Since the Jarque-Bera test statistic exceeds the critical values (reported below the table) for any reasonable significance level for all variables, except inflation and TERM, we may conclude that the variables do not follow a normal distribution.

Table 1: Descriptive statistics of the cost of equity capital and its determinants for 140 banks in the EMU, US, UK, Sweden and Switzerland.

	Mean	Median	Max.	Min.	Std.	Skewness	Kurtosis	Jarque-Bera	Prob.	Obs.
RI	8,063	8,015	10,843	5,852	1,36	0,31	2,177	40,463	0	913
RF	0,03	0,029	0,064	0,002	0,016	-0,234	1,977	48,149	0	913
RM	8,318	8,26	10,617	6,167	1,115	0,168	2,403	17,868	0	913
SMB	0,504	0,675	22,321	-21,96	4,621	-0,454	5,899	305,615	0	795
HML	0,111	0,155	26,347	-100	6,131	-4,704	81,593	237560,9	0	910
LEVERGE	2,486	2,975	3,643	0,483	0,976	-1,184	2,785	210,568	0	894
TIER1	16,701	16,441	18,842	15,242	0,965	0,481	2,15	61,558	0	897
SPREAD	1,702	1,601	5,814	-1,708	1,459	0,152	2,654	4,167	0,12	471
TERM	0,516	0,51	3,63	-2,89	1,4	-0,229	2,908	8,305	0,02	913
OIS	1,614	0,528	5,938	-0,103	1,754	0,837	2,268	62,774	0	451
CDS	158	48,36	1365	5,485	301,2	2,901	10,085	1268,431	0	363
L/D	1,313	1,242	2,617	0,294	0,401	0,387	2,691	25,956	0	897
INF	1,718	1,7	5,6	-2,1	1,241	0,052	3,029	0,439	0	911

Where RI refers to the log of the average expected return for the banking sector. RF is the risk-free rate, RM is the log of equity market rate of return, HML (high minus low) and SMB (small minus big) are the differences between the returns on diversified portfolios of high minus low book to market stocks and small minus big stocks, respectively. LEVERAGE is the log of assets divided by Equity, TIER1 is the log of tier1 capital, L/D is the log of loan deposit, SPREAD is the difference between the 10-year and 3-month Treasury rates, CDS is the average of the 5-year credit default swap spreads, OIS is the 3-month Euribor-EONIA spread, and INF is the inflation rate. The critical values of The Jarque-Bera test for the chi-square distribution are: 4.61 5.99, 9.21 for significance level of 10%, 5% and 1%, respectively.

Table 2 reports the results of the IPS panel unit root test at level. The results shown in column 2, with only constant, clearly show that the null hypothesis of a panel unit root cannot be rejected for most of the variables (RI, RF, RM, LEVERAGE, L/D, TERM and OIS). However, the null hypothesis of a panel unit root is rejected for HML, SMB, TIER1, CDS, and INF. The results shown in column 3-with both constant and time trend, show similar results except that the null hypothesis of a panel unit root cannot be rejected for TIER 1 Capital. Table 2 also presents the results of the tests at first difference with only a constant and constant plus time trend, column 5 and 6, respectively. The results evidently reject the null hypothesis of a panel unit root for all series in the first difference. We can conclude that the series RI, RF, RM, LEVERAGE, L/D, TERM, TIER1 and OIS are non-stationary in level but stationary in the first difference, e.g. I(1). The series HML, SMB, CDS, and INF are stationary in level, e.g. I (0). Given these results, it is possible to apply panel cointegration tests in order to test for the existence of the stable long-run relation among the variables.

Table 2: Panel Unit Root Test- Im, Pesaran and Shin W-statsticPS), for the period 1999(1)-2014(3), No of observation 908.

Variable	Level		First Difference	
	Constant	Constant + Trend	Constant	Constant + Trend
RI	0.582 (0.720)	1.195 (0.884)	-9.377 (0.000)	-8.667 (0.000)
RF	0.132 (0.552)	-1.154 (0.124)	-8.197 (0.000)	-7.340 (0.000)
RM	1.570 (0.941)	0.259 (0.602)	-8.730 (0.000)	-8.158 (0.000)
HML	-10.161* (0.000)	-9.616* (0.000)		
SMB	-9.189* (0.000)	-8.448* (0.000)		
TIER1	3.893 * (1.000)	1.375 (0.915)	-11.176 (0.000)	-11.226 (0.000)
LEVARGE	-1.392 (0.081)	-1.412 (0.078)	-11.82 (0.000)	-11.36 (0.000)
TERM	-0.956 (0.169)	-1.788 (0.036)	-10.62 (0.000)	-9.93 (0.000)
CDS	-3.498 * (0.002)	-3.199* (0.000)		
INF	-4.159* (0.000)	-3.851 * (0.000)		
l/d	0.818 0.79	0.858 (0.80)	-10.244 (0000)	-9.455 (0000)

Indicates rejection of the null hypothesis of no-cointegration at 1% levels of significance. The critical values for rejection (probability) are: -2.99, -2.75 and -2.62, for 1%, 5%, and 10%, respectively. Numbers in parenthesis refer to the probability of significance. Automatic selection of maximum lags and automatic lag length selection based on SIC. E-view 8 software of unbalanced panels of 183 observations been used.

The next step is to test for cointegration where the null hypothesis is no-cointegration. This is to investigate whether long-run steady state or cointgration exist among the cost of equity capital, RI, and the independent variables. We employ two cointegration tests: the Kao test and the Combined Fisher and Johansen. Table 3 reports the results of both tests. In column 2, we found that the estimated ADF t-statistics of -2.858 to be statistically significant at 1 percent level, which rejects the null hypothesis of no cointegration. The results for the Johansen Fisher Panel Cointegration Test, shown in column 4-8, confirm the presence of at most 3 cointegration ranks independent with or without the inclusion of constant and trend.

These results show existence of the stable long-run relation among the variables in equation (3).

Table 3: Results from cointegration test of factors determining the cost of equity capital for banking sector. Sample: 1999M01 2014M03. Null Hypothesis: No cointegration.

Kao Residual Cointegration Test			Johansen Fisher Panel Cointegration Test. Unrestricted Cointegration Rank Test (Trace and Maximum Eigenvalue)				
	t-Statistics	Prob.*					
ADF ADF	-3.258 -3.638	0.001 .001(a)	No. of CE(s)	Fisher Stat. From Trace test	Prob.*	Fisher Stat. From max-eigen test	Prob.*
			1- No Trend in Data				
			(a) No intercept or trend in CE or VAR				
			None	55,260	0,000	45,870	0,000
			At most 1	377,700	0,000	42,740	0,000
			At most 2	84,690	0,000	35,800	0,000
			At most 3	52,380	0,000	23,180	0,001
			At most 4	31,350	0,000	12,580	0,050
			(b) Intercept in CE and no trend in VAR				
			None	682,700	0,000	96,180	0,000
			At most 1	129,700	0,000	53,140	0,000
			At most 2	82,580	0,000	30,250	0,000
			At most 3	45,850	0,000	18,550	0,000
			At most 4	28,660	0,000	8,543	0,000
			2-Linear Trend in Data				
			(a) Intercept in CE or VAR				
			None	286,000	0,000	80,360	0,000
			At most 1	125,100	0,000	52,930	0,000
			At most 2	71,420	0,000	31,180	0,000
			At most 3	43,680	0,000	18,380	0,005
			At most 4	26,030	0,000	9,272	0,159
			(b) Intercept and trend in CE and no trend in VAR				
			None	379,600	0,000	92,440	0,000
			At most 1	561,000	0,000	109,300	0,000
			At most 2	59,030	0,000	25,590	0,000
			At most 3	53,370	0,000	21,110	0,002
			At most 4	32,180	0,000	10,430	0,108

Newey-West automatic bandwidth selection and Bartlett kernel. Included observations: 915. Series: ln(RI), RF, ln(RM), ln(TIER1), ln(LEV), ln(L_D), TERM, HML, SMB, CDS, INF, DUMREG, and DUMACT.

5.1 Results

Various dynamic specifications of the panel GMM were estimated using Equation (4) to control for the endogeneity bias (reverse causality) running from the cost of equity capital to the explanatory variables. In addition, we used the lag of the explanatory variables and various instrumental variables to circumvent the endogeneity problem posed. Table 4 reports the results of the GMM estimation of the cost of equity of the banking sector with fixed effect using several regressions, all stemming from our initial specification. The second column (specification 1) reports the results of CAPM estimates that take into account the stringency of regulations and permissible activities captured by DUMREG and DUNACT, respectively. The third column (specification 2) shows the results of the three-factor model. The purpose here is to test if the additional two variables, HML and SMB add any explanatory power to the cost of equity banking. Column 4 and 5 (specifications 3 & 4) show the results of two stipulations of Equation 4. The aim here is to test if the bank-specific factors, country-specific factors, and the change in regulations and the funding structure of banks, as imposed by the new so-called Basel III standards, affect a bank's cost of equity capital. The regressions seem satisfactory in terms of goodness of fit and statistical significance. Based upon these regressions we obtain predicted banks' costs of equity for the years 1999(1)-2014(3) that are not significantly different from the corresponding actual values[5]. On the basics of these results, it is possible to maintain that the model shows a good degree of reliability in estimation the cost of equity.

We now turn our attention to the economics of the Bank-Factor Model (Equation 4). The question of interest is which particular factors are considered the most important determinants of the cost of equity in the banking sector? Focusing on statistically and economically significant variables of specification 4, the main results are as follows. First, the value of the loading factor (beta) is around 1 and has the correct sign as expected by the theory and highly significant at 1% significance level. Second, the dummies for banks granted unrestricted activities (DUMACT) and stringency of bank capital regulations (DUMREG) proved to be significant at different significance levels. That is, while strengthened regulation led to an increase in the cost of equity for the banking sector, relaxing the overall restrictions on bank activities increased the cost of equity capital in this highly regulated-sector. Third, HML (value premium) and SMB (size premium) seem to be insignificant explanatory variables that can determine the cost of equity for the banking sector independent of the specification used. Fourth, an increase in the term structure (i.e., a positive yield curve), with other factors being equal, has a negative impact on a bank's cost of equity. The value of the coefficient is - 0.213, which is significant at 1 % level. This result supports the findings by Schuermann & Stiroh (2006). Although the risk free variable is significant in all specifications the sign is negative, contrary to what theory would predict. This is probably due to a collinearity or over-specification problems.

Fourth, in contrast to previous studies, e.g. Maccario et al. (2002)), a higher tier 1 capital ratio is associated with a higher cost of equity. Thus, adequate capital buffers as indicated by Basel III reduce a bank's probability of default but increase the cost of equity. The value of the coefficient is 0.258, which is significant at 1% significance level. These results support the findings of IIF (2011) and suggest that equity is more expensive than debt and any increase in the proportion of equity, the most expensive form of capital, will increase the cost of equity capital and probably increase the funding costs. Fifth, the cost of equity capital seems to be explained by the leverage. An increase in equity ratio so a decrease in leverage will increase the cost of equity capital (expected return). The value of the coefficient is 0.803, which is significant at 1% significance level. Thus the MM principle is not revealed. A higher proportion of equity and therefore a reduction in leverage lead to an increase in the expected yield by investors (cost of equity). This may explain why banks generally feel compelled to operate in such a highly-leveraged fashion, in spite of the obvious risks this poses. After all, debt is cheaper than equity, helps to maximize ROE, and

[5]These estimates have not been reported but available upon request.

provides a tax shield. In addition, debt has government guarantees (explicit and implicit). This fact is the most important reason why banks prefer leverage. Non-banks do not lever as much as banks because they do not have these guarantees. The result regarding long-run effects of the leverage on the cost of equity opposes the findings of Yang & Tsatsaronis (2012) who found that a decline in leverage (i.e. an increase in equity financing) lead to a decline of the cost of equity capital. Our findings, however, support the results of Jorge et al. (2012), who found that lower leverage was associated with higher equity performance. Thus, a leverage reduction as stipulated in the Basel III framework will increase the cost of equity. As leverage decreases, the advantageous of implicit guarantees funding also decreases.

Sixth, as the loan-to-deposit increases the cost of equity decreases. The value of the coefficient is -1.13, which significant at 1% significance level. A result that supporting Jorge et al. (2012) who find a negative and significant impact of loan-to-deposit ratio on the rate of return for European banks between 2009-2011. Seventh, the impact of CDS turned out to be significant and negative determinants of the cost of equity capital. The value of the coefficient is -0.001, which is significant at 1% significance level. Our findings add a new breadth to the common belief that credit derivatives such as the credit default swap (CDS) have lowered the cost of firms' debt financing by creating for investors new hedging opportunities and information. Ashcraft and Santos (2007), for example, argue that because speculators can take short (long) positions in credit risk by buying (selling) protection without needing to trade the cash instrument and because these potentials are hard to replicate in the secondary loan or bond markets, the prices of CDS are considered a special source of new information about firms. Duffie (2008), on the other hand, provides alternative ways where banks can use credit derivatives to hedge their exposures to borrowers. Finally, inflation turned out to be insignificant determinants of the cost of equity capital.

Table 4: 1-step GMM estimation of the cost of equity capital for banking with a fixed effect.[6]

Variables	Specification 1	Specification 2	Specification 3	Specification 4
Constant	-1,165* -7,528	-1,191* -7,13	-3,597* -8,524	-7,381* -18,042
RM	1,114* 61,825	1,117* 57,304	1,365* 46,751	1,579* 39,054
DUMREG	0,200* 4,508	0,334* 6,587	0,524* 9,512	0,270** 2,612
DUMACT	-0,536* -9,932	-0,536* -9,804	-0,736* -11,868	-0,09 -1,601
LEVERAGE			-0,399* -11,673	-0,803* -22,386
LTIER 1			0,076* 3,037	0,258* 10,246
L/D			0,264* 3,19	-1,139* -8,423
SMB		-0,005 -1,232		0,003 0,682
HML		0,001 -0,098		0,001 -0,003
TERM				-0,213* -14,682
INF				-0,012 -0,833
CDS				0,001* -5,641
R-squared	0,812	0,811	0,846	0,958

In sum, the results of our Bank-Factor Model show that loading factor, regulations, leverage, tier 1 capital and the loan-to-deposit ratio are the most important factors for determining the cost of equity for the banking sector. While an increase in loading factor, tier 1 capital and regulations, increase the cost of equity, an increase in leverage and loan-to-deposit, decrease the cost of equity for the banking sector.

5.2 Do the Drivers of Cost of Equity Capital vary across Vountries?

To check robustness, we investigate the extent to which the drivers of the cost of equity capital vary across the EMU, US and UK. We run three separate panel regressions using data samples of the largest 78 banks from the EMU, 33 banks from the US, and 6 banks from the UK. Focusing on the comparison between the EMU and the US, the results shown

[6]We examined the presence of perfect multicollinearity using the t-test of correlation coefficients as well as Variance Inflation Factors (VIF). The results, not shown but could be provided upon request, show the absence of perfect multicollinearity in the regression.

in Table (5) show that the drivers of the cost of equity in the EMU are different from the US in three aspects. The first is related to the impact leverage. While leverage affects the cost of equity negatively in the US, it asserts no impact in the EMU. For EMU banks, the results suggest that the compensation effect of MM theory is revealed. An increase in equity proportion, the most expensive sort of capital (i.e., a decrease in leverage) is offset by a reduction in the expected rate of return as investors anticipate a lower risk to be incurred. Yet, the impact is statistically insignificant with a coefficient value.

Table 5: GMM estimation of the cost of equity capital for the banking sector; cross country

	EMU	US	UK
RF	0,206**	2,331*	-0,460***
	2,548	3,029	-2,231
RM	1,286*	1,081*	0,803**
	8,264	14,710	2,613
LEVERAGE	0,162	-3,215*	0,635
	1,331	-2,815	1,722
LTIER1	-0,279*	-0,172**	-0,048
	-3,585	-2,542	-0,240
L/D	0,286	-0,529*	0,053
	3,030*	-4,019	0,126
HML	-0,005**	0,011**	-0,002
	-2,272	2,573	-0,335
SMB	0,006	-0,001	-0,001
	0,996	-0,314	-0,123
TERM	0,024	0,023	0,300*
	0,222	1,491	8,180
CDS	0,001**	-0,002*	-0,002
	-2,261	-3,287	-1,140
INF	-0,153*	-0,044*	0,077*
	-2,815	-4,766	3,341
R-squared	0,929	0,924	0,707

Instrument specification: R, LRM, HML, SMB, LLEV, LTIER 1, LL_D, TERM, CDS, and INF

This is a result that support the findings of Kashyap and Stein, 2010, King, 2009, ECB, 2011, Miles et al., 2012, and BIS, 2012). As for the US, the results shown in Table (5) support our previous findings in Table (4) and suggest that, in contrary to MM theory, an increase in equity proportion is associated with an increase in the expected rate of return. The second is related to the impact of the loan-to-deposit. While loan-to-deposit affects the cost of equity positively in the EMU, it has a significant and negative impact in the US. The third is related to the impact of HML. While the HML affects the cost of equity negatively in the EMU, it has a positive and significant impact in the US.

6 Conclusion

This paper attempts to estimate the cost of equity capital for the banking sector using data from the Eurozone, the US, the UK and Sweden for the period 1999-2014. We employ the dynamic panel GMM model with a fixed effect and a multi-factor asset pricing framework to estimate the cost of equity capital. Our results show that loading factor, regulations, Leverage, tier 1 capital and the loan-to-deposit ratio are the most important factors for determining the cost of equity for the banking sector. While an increase in loading factor, tier1 capita and regulations, increase the cost of equity, an increase in leverage and loan-to-deposit decrease the cost of equity for the banking sector. In contrast to the MM theorem, our findings support the results of IIF (2011) in that a higher leverage ratio, an increase in capital requirement and regulation results in an increase of the cost of equity in the banking sector. To check robustness, we investigate the extent to which the drivers of the cost of equity capital vary across the EMU, the US and the UK. We find that the drivers of the cost of equity in the EMU are different from the US in three aspects. The first is related to the impact leverage. While leverage affects the cost of equity negatively is the US, it asserts no impact in the EMU. The second is related to the impact of loan-to-deposit. While loan-to-deposit affects the cost of equity positively in the EMU, it has a significant and negative impact in the US. The third is related to the impact of HML. While the HML affects the cost of equity negatively in the EMU, it has a positive and significant impact in the US. The scope behind these differences a topic for future research.

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Appendix

EMU (78 Banks)	**US (33)**	**UK (6)**	**Switzerland (19)**	**Sweden (4)**
BANCO SANTANDER	WELLS FARGO & CO	HSBC HDG.	UBS 'R'	NORDEA BANK
BNP PARIBAS	JP MORGAN CHASE & CO.	LLOYDS BANKING GROUP	CREDIT SUISSE GROUP N	SVENSKA HANDBKN.'A'
BBV.ARGENTARIA	BANK OF AMERICA	BARCLAYS	JULIUS BAR GRUPPE	SWEDBANK 'A'
DEUTSCHE BANK	CITIGROUP	STANDARD CHARTERED	BANQUE CANTON.VE. 'N'	SEB 'A'
SOCIETE GENERALE	US BANCORP	ROYAL BANK OF SCTL.GP.	LUZERNER KANTONALBANK	
INTESA SANPAOLO	PNC FINL.SVS.GP.	BANK OF GEORGIA HDG	ST GALLER KANTONALBANK	
UNICREDIT	BB&T		VONTOBEL HOLDING	
CREDIT AGRICOLE	SUNTRUST BANKS		BERNER KANTONALBANK	
CAIXABANK	FIFTH THIRD BANCORP		CEMBRA MONEY BANK N ORD	
KBC GROUP	M&T BANK		EFG INTERNATIONAL N	
COMMERZBANK	REGIONS FINL.NEW		VALIANT 'R'	
BANKIA	KEYCORP		ZUGER KANTONALBANK	
NATIXIS	PROSPERITY BCSH.		BANK COOP	
ERSTE GROUP BANK	COMERICA		GRAUB KB 'P'	
BANK OF IRELAND	CREDICORP		LLB 'B'	
BANCO POPULAR ESPANOL	HUNTINGTON BCSH.		BASELLANDSCHAFTLICHE KB.	
BANCO DE SABADELL	NY.CMTY.BANC.		BASLER KB 'P'	
BANK OF PIRAEUS	FIRST REPUBLIC BANK		VP BANK VADUZ 'B'	
MEDIOBANCA BC.FIN	ZIONS BANCORP.		BANK LINTH 'N'	
NATIONAL BK.OF GREECE	HUDSON CITY BANC.			
ALPHA BANK	SIGNATURE BK.			
DEUTSCHE POSTBANK	SVB FINANCIAL GROUP			
RAIFFEISEN BANK INTL.	BANKUNITED			
BANCO ESPIRITO SANTO	CITY NATIONAL			
UNIONE DI BANCHE ITALIAN	COMMERCE BCSH.			
BANKINTER 'R'	CULLEN FO.BANKERS			
CIC 'A'	EAST WS.BANC.			
BANCA PPO.EMILIA ROMAGNA	FIRSTMERIT			
BANCA POPOLARE DI MILANO	PEOPLES UNITED FINANCIAL			
BANCO COMR.PORTUGUES 'R'	SYNOVUS FINL.			
BANCO POPOLARE	BOK FINL.			
POHJOLA PANKKI A	FIRST NIAGARA FINL.GP.			
BANCA MONTE DEI PASCHI	TFS FINANCIAL			
BANCO BPI				
CREDITO EMILIANO				
BANCA CARIGE				
BANCA PPO.DI SONDRIO				
EUROBANK ERGASIAS				
KBC ANCORA				

BCA.PICCOLO CDT.VALTELL CREDITO BERGAMASCO LIBERBANK OBERBANK BANCA PPO.ETRURIA LAZIO BANQUE NALE.DE BELGIQUE BNC.DI DESIO E DELB. IKB DEUTSCHE INDSTRBK. VAN LANSCHOT BANCA FINNAT EURAMERICA BANCA PROFILO BANK OF GREECE BANK OF VALLETTA BK.FUR TIROL UND VBG. BKS BANK CREDIT AGR.ILE DE FRANCE ESPIRITO SANTO FINL.GP. GENERAL BANK OF GREECE HELLENIC BANK HSBC BANK MALTA NOVA KREDITNA BANKA MARIBOR OLDENBURGISCHE LB. USB BANK ABANKA VIPA AKTIA 'A' AMER HYPOBANK ATTICA BANK CRCAM NORD DE FRANCE CCI CREDIT AGRICOLE BRIE PICARDIE CREDIT FONCIER DE MONACO FIMBANK LOMBARD BANK MONTEPIO PROBANKA PREDNOSTNE PREF. UMWELTBANK BANIF ESPIRITO SANTO FINL.GP. REGD. INTESA SANPAOLO RSP OBERBANK PREF.				