

DEPARTMENT OF BANKING AND FINANCIAL MANAGEMENT

Macroeconomic Conditions and Bank Funding

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1/16/2014



ΠΑΝΕΠΙΣΤΗΜΙΟ ΠΕΙΡΑΙΩΣ

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Abstract:

The recent financial crisis has exposed macroeconomic deficiencies that were previously concealed by easy access to credit. The implosion of the subprime mortgage lending bubble triggered a chain reaction of deleverage. The massive credit crunch led the interbank market to a standstill. With wholesale funding freezing, creditors began scrutinizing the solvency and liquidity of all counterparties. At the last link of this chain process were the sovereign balance sheets.

The countries with the weakest macroeconomic fundamentals found themselves unable to find creditors in the international money markets to refinance their debts at sustainable interest rates and were forced to seek help from the International Monetary Fund, -and in the Eurozone- the European Central Bank and the European Commission. Distressed countries were forced to take austerity measures while overhauling their economies in order to become more competitive. A key to a country's competitiveness and economic growth is the financial health and stability of its banking system, as it the main channel for financing productive investments that increase economic output.

In this thesis we examine the implications of a country's current account balance, i.e. how much money moves in and out of domestic borders, on the ability of its banks to draw funds from international money markets, and vice versa.

Keywords: bank funding, current account, interbank borrowing,

Contents

Abstract:.....	1
1. An Introduction in Banking	5
1.1 Risks of Intermediation	5
1.2 Bank Business Models	7
1.3 How business models led to excessive risk taking and meltdown.....	8
1.4 The role of Information.....	9
1.4.1 Transaction Costs	10
1.4.2 Information Costs	11
1.4.3 Ways of dealing with Adverse Selection Problems	12
1.4.4 Private Production of Information	12
1.4.5 Government Regulation to Increase Information	13
1.4.6 Financial Intermediation	13
1.4.7 Moral Hazard and Debt and Equity Securities	14
1.4.8 Financial Repression.....	15
1.4.9 Financial Liberalization: The Prerequisite for Proper Bank Regulation	17
1.5 Bank Regulation: An Introduction	18
1.5.1 Government Safety Net.....	18
1.5.2 Restriction on Asset Holdings and Bank Capital Requirement.....	19
1.5.3 Bank Supervision: Chartering and Examination	20
1.5.4 Assessment of Risk Management	20
1.5.5 Disclosure Requirements	20
1.5.6 Consumer Protection	21
1.5.7 Restrictions on Competition	21
1.5.8 Balancing Freedom and Risk	21
2 An Introduction to Bank Capital.....	25
2.1 Types of Capital.....	27

2.1.1 Basel III.....	30
2.2 An Analysis of Risk Weighted Assets	31
2.2.1 Why RWAs differ across countries and what could be done about it	33
2.2.2 Common equity capital, bank risk and required return on equity	34
3 Bank Funding II - Financial Literature Review	37
3.1 Bank Funding Strategy	37
3.1.1 Asset-backed securities	39
3.1.2 Mortgage-backed securities	40
3.1.3 Covered Bonds	40
3.1.4 Collateralized debt obligations (CDOs).....	41
3.1.5 Supply-side Bank Funding Strategy Prospects.....	42
3.2 Empirical Studies on Bank Funding with Emphasis on Explanatory Variables and their Theoretical Background.....	43
4 Current Account Deficits and Bank Funding	46
4.1 The Current Account (CA) Balance.....	46
4.2 The Capital Flows (CF) Balance	48
4.3 The Balance of Payments (BP).....	49
4.4 Financing Current Account Deficits.....	50
4.4.1 Current Account Deficit Repercussions	51
4.4.2 Current Account Balance, Savings and Investments	52
4.5 Current Account Balance and Market Discipline - The Mundell-Fleming Model	53
4.5.1 Balance of Payment Imbalance in Floating Rate Exchange System.....	54
4.5.2 Balance of Payment Imbalance in Fixed Rate Exchange System.....	54
5. The Data	56
6. Methodology	64
7. Results.....	65
8. Conclusions	66

9. Bibliography	68
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ΠΑΝΕΠΙΣΤΗΜΙΟ ΠΕΙΡΑΙΩΣ

1. An Introduction in Banking

In this section we will explore how banks work, how they increase economic output and life quality of the average citizen, how they are connected within the global financial system, and the possible implications from bank dysfunction on the ability of residents to consume and produce services and products.

1.1 Risks of Intermediation

The goals of monetary policy have been controversial in the past. The traditional goals of low and stable inflation and maximum employment (approximately 2 percent and 5 percent respectively), after the breakout of the global financial crisis of 2008, have been supplemented with a focus on maintaining the health and stability of the financial system. In the past, the work of central bankers has been hindered by asynchronous and inconsistent policies on a national and on a continental level. Contrary to popular belief, monetary policy cannot directly influence long-term unemployment. It can only affect short-term unemployment fluctuation around its long term trend; to the extent it can modify business cycle frequency.

A central bank does not control money supply 100 percent. It is the first link in the money supply chain, with financial intermediaries being the second and households, businesses and individuals being the third. In other words, money supply is influenced by the decisions of three factors: businesses and households, commercial banks and central banks. Consumers and businesses decide on the distribution of assets between cash and other investment vehicles. Commercial banks strive to find the optimal mix between maximizing profits and minimum liquidity. They retain a percentage of deposits as liquid reserves and utilize the remainder by loaning them to consumers and businesses, and investing them in other assets. Commercial banks increase the money supply at an amount equal to the monetary base times the money multiplier.

The largest assets on bank balance sheets are liquid reserves, loans and other investments (bonds, real estate, stocks), with loans to businesses, households, governments and other financial organizations being the largest. Bank assets are financed primarily by deposits, which are the largest liabilities on their balance sheets. Their remaining funding needs are covered by money markets in the form of wholesale funding and by capital markets in the form of long-term financing in exchange for equity securities. Bank solvency is dependent on a bank's ability to maintain a positive net worth (equity position) by perpetually ensuring that total assets (reserves, loans and other investments) are greater than total liabilities (deposits and market financing).

The "raison d'être" for financial intermediaries is the comparative advantage in economies of scale and scope they have in transforming maturity risk and size between liability and asset components. Banks manage the following risks: credit (probability of debtor default), interest, maturity and liquidity risk (stemming from financing usually, long term fixed interest rate assets with short term variable interest rate liabilities). By virtue of financial leverage, dearth of liquidity in a predicament, may rapidly lead a solvent bank into default. A bank default may trigger a full-blown self-fulfilling bank panic, financial system collapse and mass economic catastrophe. The main deterrents at the disposal of authorities for such events are deposit insurance schemes and regulation of dangerous financial business activity.

Banking decisions are regulated through the legal framework that mandates minimum reserve requirements. Furthermore, excess reserves are a function of net deposit flows, reserve credit costs and reserve opportunity costs. In the event that a bank has inadequate reserves it borrows from the interbank market, paying the relevant interest rates, or from the central bank, at the risk of being stigmatized and ostracized from the interbank market.

Central banks, in turn, use monetary policy interest rates, minimum reserve requirements and their ability to influence expectations to mitigate the negative consequences of bubbles caused by endogenous credit cycles, during which, rapid economic growth leads to increase of the supply and demand for credit, increase of consumption and investment, acceleration of growth, and so forth, with all of these factors being amplified by expectations. (Antzoulatos, 2010)

1.2 Bank Business Models

Commercial banks make money in numerous ways. Some of them follow traditional loan strategies by profiting from the deposit loan interest spreads, others follow unorthodox strategies, like credit cards banks and mortgage banks, that offer few depositor services and follow “originate and sell” business models, selling loans they make almost immediately to third parties and earning profits from the fees they charge for originating, securitizing and servicing these loans. Between those extremes there is a spectrum between traditional and nontraditional approaches to banking, such as focusing on local market or serving international clients, internet banking or traditional “brick and mortar” retail banking, serving households or business clients.

This business models array has been made possible by financial liberalization, technological progress and new financial processes. To date, very little academic research has been made on the long-term viability of these banking business models. Academic studies have tended to myopically focus on regulation and investor issues, the relationship between banking company size and business model, assuming that banking strategy space has only one dimension and that size limits model choice. In practice this is not accurate. (Rice & DeYoung, 2004)

Non-interest income has increased rapidly during the last decades, as a result of deregulation and technological progress. Those two factors have driven banks to differentiate in almost all operational aspects. Consequently different operational processes produce different output flows and performance. Each different strategy and model entails a different risk and return mix. High return strategies, such as corporate banking, tend to be high risk with the antithesis being low return-low risk strategies. On a risk weighted return basis both strategies may be viable. Very small banks operate at a disadvantage, compared to larger organizations and their number will probably diminish in the future.

The change in income strategy outlined above has had important repercussions on financial institution performance. Instead of reducing the inherent volatility in traditional banking

operations, in some cases they have increased income variance. The traditional banking activities of payment services account for two thirds of non-interest income and about 20 percent at most banks.

The rest of traditional non-interest income production methods sources include deposit account fees, asset management and trust account services, credit and debit card fees and interest, Automated Teller Machine fees, cash management services like payroll and lock boxes and lending. Non-traditional fee-generating activities include investment banking, securities brokerage, insurance activities and merchant banking. (Rice & DeYoung, 2004)

1.3 How business models led to excessive risk taking and meltdown

Banking deregulation commenced in 1980s when deposit rate ceilings were gradually removed and bans on investment banking services were removed. A wave of international mergers followed with banks taking advantage the new economies of scale which were made possible. Another major innovation which was introduced in 1971 was the introduction of money market mutual funds, which were a direct competitor to banks with their shares being similar to demand deposits with the additional advantage of paying interest to depositors. In the 1990s commercial banks were allowed to engage in investment banking activities. This led to series of mergers and acquisitions that led to the consolidation of the banking sector.

In 2008 the world the biggest financial crisis since the 1929 Great Depression. Uncertainty about systemic integrity led to unprecedented extension of public guarantees, by a series of bailouts with the use and risk of taxpayer funds. The problem with compromised organizations was evidently not their size (too big to fail) as much complexity and opaqueness, to the extent that the market, regulators and even their own senior management had difficulty monitoring and managing their risk. A possible safeguard for avoiding a similar catastrophe is to restrict some of the non-traditional banking activities outlined above that were allowed in the recent years.

Whether an activity beyond the core banking services (deposits, loans and payment services) is permissible should be examined under the criterion of whether it inordinately obstructs the markets, the management and regulators in monitoring and measuring a bank organization's risk taking. Based on this principle, banks could go on conducting traditional investment banking activities (underwriting, securities and advisory services) and asset and wealth management. Other activities, such as market making, brokerage and securities and derivative trading should not be allowed for banking organizations. While still an integral part of the modern financial system and economy, combining them with traditional banking activities can expand the costs and risks to the taxpayers a lot more than the additional benefits to a single banking organization. (Morris, 2011)

1.4 The role of Information

As we have already established, one of the main roles of a financial system is to allocate funds from savings to investments in an efficient (finance investments that create value) and effective (prioritize investments according to their risk and return profile and finance them as fast as possible) manner. In this chapter we will attempt to analyze the operations of the financial system with special emphasis on the financial contract writing process, the comparative advantages of financial intermediaries over financial markets in allocating funds to borrowers and the contribution of the financial system in the aggregate economy.

We can gain a first objective perspective on the magnitude of the relationship between macroeconomics (aggregate economic activity) and bank funding by examining the sources of external funds for American businesses: Over 90 percent of external funding is channeled through financial intermediaries (banks, mutual funds, insurance companies, pension funds and other institutional investors). Because market funding (vs. bank funding) is even less developed in the rest of the world, direct finance (through markets without institutional intermediaries), is also far less important than indirect finance on the planet.

As we focus further into the investment flows above, we notice that the majority of business funding (55.3 percent) is funneled through non-marketable bank and non-bank (but still financial institution) loans. The rest of marketable security funding for non-financial businesses is made up of stock funding (9.2 percent) and bond funding (35.5 percent). Governments are funded through marketable (i.e. sovereign long and short term bonds) marketable securities and non-marketable supranational organization (i.e. World Bank, International Monetary Fund, European Central Bank) borrowing. Contrary to what one would intuitively believe, stocks are not the most important source of external business (and apparently household) financing, even at the most extremes of market-based financing environments: In the U.S. four times more funds are raised through bank loans than through equity financing. Banks financing is even more prevalent in higher-context countries such as Germany and Japan. In developing countries banks play an even more important role in the financial system than they do in industrialized countries. Only large and well-established corporations have access to securities markets to finance their activities.

The prevalent feature of the contracts which through debt financing is performed for both households and businesses is collateralization (the transfer of ownership of property pledged to the lender to guarantee payment in the event of default). These contracts contain terms and provisions that restrict and dictate certain activities that the borrower must refrain from or perform. Thus, it is understandable that the financial system is among the most regulated sectors of any economy.

The main constraints that shape the form and nature of the financial system both on a country and a global level are information costs and transaction costs.

1.4.1 Transaction Costs

Transaction costs stem from high (usually fixed total) cost allocation -compared to the investment-, on small market participants making it difficult for them to enter the financial market and perform transactions. This also makes it more difficult for them to diversify away the unsystematic risk. Therefore Financial Intermediaries have evolved in size, to reduce those transaction costs and

allow small savers and borrowers to participate indirectly in financial markets. Through economies of scale, they bundle the funds of many investors together, and reducing the average fixed cost by allocating the total fixed cost over a greater number of invested capital/transactions. The most common type of financial intermediary that developed because of economies of scale is the mutual fund. Economies of scale lowered the financial institution infrastructure costs utilized in their operations like computers and telecommunications. Transaction costs are also lowered due to economies of scope: their advanced position on the relevant learning curves on computer technologies, telecommunications and sales.

1.4.2 Information Costs

In transactions where one party knows more or knows better whether the transaction should occur (information asymmetry), the cost of the transaction increases to factor in the uncertainty arising from two problems: a) before the transaction, the parties who are most likely to produce a non-mutually beneficial outcome are the ones most likely to pursue the transaction (adverse selection problem) and b) after the transaction, the parties that know that the potential downside of risk will be carried by the counterparty, have the incentive to undertake more risky behavior (moral hazard problem). Moral hazard also includes the risk of potential purposeful unethical borrower behavior. In an information asymmetry situation, a buyer, due to the fact that he is unable to perceive the “objective” quality of the item, is willing to bid a price that is the average between what he thinks is the low price of a low quality item and the higher price of the high value version of that item.

Because adverse selection increases the chances that a loan might be unprofitable because it will be made to a risky borrower, lenders might decide not to make loans at that price even though there are good credit risks in the marketplace. Conversely, after the transaction occurs, the lender faces the risk that the borrower will engage in activities that will compromise the loans' repayment.

Looking further into the adverse selection problem we observe that the price that the buyer bids reflects his perception of the average quality of items in the market, while the seller of a high quality item will be unwilling to settle for that price. As a result, very few high quality items will

enter the market for sale, and the average quality of an item in the market will be low and because very few buyers will want to buy a low quality item there will be few transactions and a de facto, poorly functioning market. This is exactly the case in securities markets (stock and bond) where the buyers are unable to distinguish between good firms with high expected profits and low risk and bad firms with low expected profit and high risks. In this case investors will be only willing to bid prices that reflect the prices of average firms, driving good firms out of the market. The only firms that will sell their securities are bad firms who know that the bid price is higher than what their securities worth. Adverse selection is the reason that marketable securities are not the primary source of business financing businesses in the world; At the same time it contributes a lot to the fact why stocks are not primary sources of financing for U.S. corporations.

1.4.3 Ways of dealing with Adverse Selection Problems

The way to eliminate the adverse selection problem is to find a way to establish trust between the two parties of the transaction. A way to do this is by equalizing the perceived information gap between the two parties by helping them know as much as possible. This will establish perceived information transparency and optimize the functioning of the market. The solution to the adverse selection problem in financial markets is to eliminate asymmetric information by providing the relevant information regarding borrowers (sellers of securities) to investors (buyers of securities). This can be done by making public the clearing price for as many transactions as possible and the market will do its intended job of channeling the appropriate commodities to the people who want them at the right price. This way both parties will have sufficient knowledge about the other party involved in the transaction to make accurate decisions and the transaction will take place.

1.4.4 Private Production of Information

The private companies that have stepped in to provide for this need (Standards and Poor's, Moody's, Value Line, etc.) do not completely solve the adverse selection problem because of the

free rider problem: The people who do not actually pay to bridge the information asymmetry gap, take advantage of the information other people have paid for, and eliminate any possible profits that can be made from paid information, removing thus the incentive of information providers to produce information, and the incentive of buyers to purchase the produced information, and in turn perpetuating the adverse selection problem.

1.4.5 Government Regulation to Increase Information

Governments provide a partial solution by mandating for information transparency in order to curb information asymmetry and the adverse selection problem through agencies such as the SEC, FASB, IASB and adoption of International Accounting Standards and Generally Accepted Accounting Principles. Financial Markets are among the most heavily regulated economic sectors in order to make them more efficient, however firms still have more information than investors and disclosure requirements do not always work well, because bad firms still have the incentive to misrepresent their information to the public so as to appear as good firms and sell their securities.

1.4.6 Financial Intermediation

The problem is solved by the introduction of intermediaries who minimize the asymmetric information gap by becoming an experts and establishing trust between buyers and sellers. The Financial Intermediary establishes trust by providing a form of guarantee to the buyers on the performance of investment, and a fair price to sellers of securities. Because the bank has eliminated through expertise to a large extent the adverse selection problem, it is able to earn a higher return on loans than the interest it pays to depositors, and earn a profit making the production of information possible. It also by-passes the free rider problem by dealing primarily in private loans where free riders cannot interfere. Banks, therefore, who hold non traded loans have the incentive to keep producing information unhampered by the free rider problem and succeed in reducing asymmetric information in financial markets, making them more efficient (indirect finance) than markets (direct finance) in allocating funds from buyers to sellers. As information transparency is

enhanced, securities markets will be more efficient and it will be more advantageous for firms to finance their investments through them. Also information about private firms is easier to collect the more industrialized a country is, explaining the prevalence of bank funding of private firms in developing markets.

The problem of adverse selection is also mitigated by the presence of collateral because it cuts down the potential loss of a lender. The lender can liquidate the collateral and compensate for the losses on the loan. Thus, lenders are more willing to lend collateralized loans and at potentially better rates. High net worth (assets minus liabilities of a business entity) can substitute as a form of collateral: the lender can take title of equity and liquidate it. Higher capital also serves as a cushion that it can be used to pay off loans.

1.4.7 Moral Hazard and Debt and Equity Securities

Moral hazard is the post transaction problem of information asymmetry in financial markets. In equity contracts it manifests as the principal-agent problem where the separation of ownership and control incentivizes managers (the agents) to act against the interest of the owners (the principals). The principal-agent problem would not arise if the shareholders had complete oversight (information symmetry) of the manager's actions and could prevent wasteful expenditures or fraud, or if there was no separation between ownership and control. Therefore, frequent auditing of the firm could alleviate the moral hazard problem. Nonetheless the monitoring process can be expensive giving rise to costly state verification that makes equities less attractive and explains the prevalence of debt as a means of financing. Similarly to the adverse selection situation, government regulation provides only partially effective deterrence. Again Financial Intermediaries such as venture capital firms, curtail the effects of moral hazard and free rider problem arising from information asymmetry: these firms provide equity capital in exchange for supervisory oversight in the form of appointed board members and exclusive equity shares. As a result the venture capital firm has increased monitoring ability and is safe from the free rider problem.

Debt contracts have lower moral hazard risks, by virtue of fixed interest and principal repayments at periodic intervals, regardless of a firm's accounting profitability, making them a more frequent source of financing than equity contracts. High net worth again makes the debt contract incentive-compatible, by aligning the incentives of the borrower with those of the lender, because the former will have at least as much at stake as the latter, reducing the risk of moral hazard. In order to lower moral hazard, debt contracts include complicated restrictive terms and conditions, in the forms of covenants: these include covenants to discourage undesirable behavior (such as purchasing other businesses and use the loan only to finance specific activities), covenants to encourage desirable behavior (maintaining adequate capital, maintaining minimum holdings of certain assets relative to the firm's size, carrying a life insurance that will pay off the debt in the case of the demise of a property owner), covenants to keep collateral valuable (a minimum amount of collision and theft insurance in auto loans), covenants to provide information (the lender has the right to audit and inspect the firm's books at any time). Again, covenants are not a panacea for the moral hazard problem due to the presence of potential loopholes that can be taken advantage of from clever borrowers and the lack of the exhaustiveness and limitation of their nature.

Furthermore monitoring and enforcing covenants gives rise to the free-rider problem. As we have already seen banks are more adequately equipped to deal the free rider problem, an ability that also applies to assuage the moral hazard problem inherent in debt contracts, giving them a more active role in channeling funds from savers to borrowers than marketable securities. (Mishkin, 2004)

1.4.8 Financial Repression

As we have seen already, over 90 percent of external funding of businesses and households is conducted through Financial Intermediaries. The Financial Intermediary market must be as perfectly competitive as possible to operate optimally. A prerequisite for this is the absence and elimination of financial repression: measures that make the banking market uncompetitive.

Financial repression measures in “national economies” have failed miserably in the past, because of two fundamental reasons:

- The government and appointed officials do not have superior knowledge compared to the immediately interested parties regarding what is needed to maximize overall welfare.
- The negatively affected economic factors (individuals, households and businesses), will react to financial repression measures, which are de facto against their economic survival, and eventually render them useless.

In practice financial repression measures benefit the few at the expense of the many. As a rule, they benefit the political party in power, their cronies, and selected economic sectors. They harm the well-being of depositors and everybody else. Financial repression measures include the following categories:

- **Ceilings on Deposit Rates:** Ultimately they incentivize savers to seek out alternative investment forms, and borrowers to seek out alternative means of finance.
- **Excessive Reserve Requirements:** The government-controlled reserve bank then lends them out to government cronies and selected economic sectors or to finance government budget deficits at the expense of other depositors, lenders and long term economic growth.
- **Government-directed Credit:** Banks are forced to provide mispriced credit to selected businesses and sectors in order to achieve subjective national economic growth targets, at the expense of depositors, non-selected borrowers and long term growth. Credit is extended according to political, non-banking criteria.
- **Government Ownership of Banks (Nationalization):** Again banks are forced to provide mispriced credit to selected business and sectors according to non-economic criteria. Goals and harmful consequences for society are identical to the previous category.
- **Entry Restrictions into the Financial System:** The Government in an attempt to further control monetary circulation, credit, and the “national” economy is protecting local banks from foreign institutions that are better organized and offer better products. Local institutions are favored at the expense of consumers, businesses and long term economic

growth. Depositors are subject to inferior returns and borrowers are charged increased interest rates.

- **Foreign Exchange (FX) Controls:** Limits on international capital flows from and to the country, aiming to curb the influence of international markets on the national economy. The government attempts to exercise autonomous economic policy. This situation benefits inefficient banks, inefficient borrowers and the government, that is able to temporarily continue irresponsible socialist policy. The adverse effects will be eventually magnified and will become apparent at the time of the removal of capital controls.

1.4.9 Financial Liberalization: The Prerequisite for Proper Bank Regulation

Financial Liberalization is the abolition of all the financial repression measures. Even where the financial system is completely liberalized however, it operates optimally, within a robust institutional framework. What sets apart a liberalized financial system from a suppressed one is the lack of government intervention in managerial decisions regarding: who has access to it, investments, financing and the terms under which these decisions are made. Proper regulation is limited to measures regarding depositor protection and borrower protection from unfair practices and enforcement. In such an environment depositors have the maximum probability of having access to positive real interest rates.

Financial Repression and the corruption that follows it inevitably, like any kind of oppression turns against itself: As times goes by the measures become so unproductive and distort the economic factor decisions to the extent that the political cost of maintaining them in place outweighs whatever benefits the governments and their cronies might enjoy. Fortunately, globalization and the development of international financial markets and new financial products offer the option to those that have a strong economic incentive to escape financial repression. (Antzoulatos, 2010)

1.5 Bank Regulation: An Introduction

As stated above, the need for financial intermediaries is created by the adverse selection and moral hazard problems, generated by information asymmetry between depositors and borrowers. Bank regulation falls within eight basic categories: the government safety net, restrictions on bank asset holdings, capital requirements, chartering and bank examination, assessment of risk management disclosure requirements, consumer protection and restrictions on competition.

1.5.1 Government Safety Net

As noted earlier, financial intermediaries provide the solution to the free rider problem by utilizing their superior knowledge of creditworthiness and making private loans directly to depositors. However, depositors remain asymmetrically informed about the quality of these private loans. A direct result of this information asymmetry is the lack of trust in the bank and all the banking institutions in general rendering the whole banking system inoperational. This is especially apparent in a situation, where for example, an adverse economic shock that would normally render only 5 percent of the banks insolvent, leads to a bank run on all the banks (contagion effect) because the depositors have no way of knowing which of the banks have the problematic assets and are insolvent.

A government safety net solves the contagion effect problem and can overcome reluctance of depositors in banks. One form of the safety net is are deposit guarantee schemes such as the one provided by the Federal Deposit Insurance Corporation (FDIC) in the United States, under which depositors are paid in full on the first \$100,000 of their deposits regardless of what happens to the bank. The FDIC uses two primary methods to handle a failed bank:

- *The Payoff method:* the FDIC uses the insurance premiums paid by the banks who have bought the FDIC insurance, to reimburse depositors of the failed bank up to \$100,000 and

then collects the liquidation proceedings to reimburse the remaining balances (a process that takes years to complete).

- *Purchase and Assumption method:* The FDIC restructures the bank via arranging a mandatory, for the failed bank, merger with a partner who assumes the banks liabilities and good assets, incentivizing the deal with subsidized the loans and buying itself the problematic assets that caused the failure, improving thus the balance sheet of the new entity. The net effect of the method is the guarantee of all deposits.

Other forms of government support take the form of lending by the “lender of last resort”: the central bank to troubled institutions and in other cases funds are provided directly by the government in exchange for shares, or government takeover and government guarantee. World Bank research indicated that explicit government deposit insurance has led to decreased banking sector stability and higher banking crisis frequency, in countries with weak institutional environments, especially in emerging countries. A strong institutional environment is needed to limit the moral hazard for excessively risky behavior is made possible by deposit insurance.

The moral hazard incentives are increased proportionally with the size and complexity of the banking institution and the financial consolidation in an economy where larger (“too big to fail”) institutions whose failure exposes the financial system to systemic risk can now pursue profitable gambles in non-traditional lending activities such as underwriting, insurance or real activities without risking the potential downside.

1.5.2 Restriction on Asset Holdings and Bank Capital Requirement

The need to minimize the moral hazard associated with government safety net and the associated costs for the taxpayers, created the next form of necessary regulation, bank capital requirements and restriction on asset composition. This form of regulation prohibits banks from holding volatile assets such as common stocks and from lending to particular categories or specific borrowers, over a certain amount and it also requires them to hold a specific amount of equity capital, in order to make them more accountable in negative probable events.

1.5.3 Bank Supervision: Chartering and Examination

Prudential supervision is an additional method for reducing adverse selection and moral hazard through screening proposals for new banks. This is done by regular on-site examination of compliance with capital requirements and asset holdings and CAMELS rating (Capital adequacy, Asset quality, Management, Earnings, Liquidity and Sensitivity to market risk). Whenever the rating is sufficiently low, regulators issue a *cease and desist order* until the bank alters its behavior. Chartering is given only to applicant banks that have submitted a robust business and operational plan in terms of management, earnings and capital. Once a bank has been chartered it is required to file quarterly balance sheet, income and equity statement reports that regulatory authorities and is subject to unplanned examinations and sanctions, in the case on non-compliance.

1.5.4 Assessment of Risk Management

Because traditional on-site balance sheet examinations, while more accurate from remote public record financial report examinations which lack granularity, timeliness and accuracy, still fail to capture capital adequacy and asset quality accurately, examiners are now placing a far greater emphasis on risk management processes: Quality of senior management and board of director oversight, policy and limitation of risk oversight, quality of risk measurement and monitoring systems and adequacy of internal controls for employee fraudulent and unauthorized activity. These guidelines require the establishment of interest rate risk limits and the appointment of officials to manage risk and monitor risk exposure.

1.5.5 Disclosure Requirements

To mitigate the free-rider problem, regulators can require banks to comply with standard accounting principles and disclose a wide range of information that enables the market to judge the quality of the bank's portfolio and the amount of risk exposure. This focuses especially on

information regarding internal management systems and risk exposure that is not normally included in conventional balance sheet and income statement reports.

1.5.6 Consumer Protection

Consumer protection regulation dealing with information asymmetry to consumers has taken the form of standardized interest rates (Annual Percentage Rates) and total finance charges on loans, antidiscrimination laws towards consumers (based on race, gender, marital status, age and nationality), prevention on “redlining” (geographical discrimination) and mandates on lending to all areas that banks that draw deposits from. Non-compliant banks may be prohibited from merging, branching and other new activities.

1.5.7 Restrictions on Competition

The risk of increased moral hazard as a result of increased competition due to decreasing profit levels has prompted governments to institute regulations to protect banks from competitions in the past. This has taken the form of restrictions in branching and prevention of non-bank institutions from competing in traditional banking activities (Glass-Steagall Act). These restrictions have led to higher charges to consumers and decreased the efficiency of the banking institutions and have proven not to be beneficial overall. (Mishkin, 2004)

1.5.8 Balancing Freedom and Risk

From an engineering perspective, in order for a system to operate efficiently (deliver the promised outputs in the prescribed cycle time) it needs to be protected from imperfect inputs (inputs that do not adhere to the prescribed specifications) and also from the disruption of the productive process/mechanism itself. As we have seen one of the most important inputs of the financial system is information. Information asymmetry, the inability of depositors and investors to monitor how intermediaries use their money may result in excessive risk taking, fraudulent conduct and eventually to unfavorable financial system outputs (market failure due to imperfect information).

Moreover the failure of one such system in the financial supply chain (insolvency) may lead to the contagion of healthy ones (systemic risk).

Therefore, supervisory authorities are responsible for setting specifications and standardizing financial institution operations to minimize the risk of those failures, in the form of regulation. At the same time great care must be taken in order not to impede the functioning of competition in the production of optimal equilibria in the financial institution market.

The preferably form of intervention would be one that would minimize the interference with entrepreneurial choices and one that would lead to the creation of new markets. Because the creation of a new market requires significant investment in infrastructure (such as computer networks and physical exchange floors), consensus (trading rules, participation limits and settlement procedures) and coordination (a large number of transactions are needed to cover the fixed costs) public authorities should facilitate their creation through appropriate incentives, formal acts and through non pervasive public intervention.

The Basel Committee has based its work on the optimization of the financial system on three pillars:

- Ensuring Bank Supervision.
- Ensuring adequate Bank Capitalization.
- Enhancing Market Discipline.

In order to ensure systemic integrity and operational consistency all nodes of the system have to be under supervision. Therefore, in the case of international banking institutions, all banking entities (whether they are groups or subsidiaries) need to be under consolidated regulatory oversight by both the host-country and by the home country authority. Banks should be prevented from double leveraging through tiers of subsidiaries (SPVs, etc), divest non-traditional banking

(riskier) activities through subsidiaries –while at the same time raising organizational barriers between the business units - or submit the new activities under new supervisory instruments.

The home country authority must be in a position to effectively supervise and be empowered to obtain all relevant information and prohibit corporate structures that impede supervision. The host-country authority in turn should examine the cross-country activity of a financial institution and impose restrictions or cease activity that does not abide to the agreed standards.

Regulation is necessary to ensure adequate minimum capital and to threaten managers with greater supervisory intrusion if the capital position deteriorates. Capital is a buffer against losses and protects depositors who bear the risk of the downside of leverage without benefiting from the potential profits of the upside.

The initial work of the Basel committee ignored the increasing importance of off-balance-sheet operations and treated all assets as equally risky. Basel I provided a common definition of capital elements and a weighted approach to balancing on balance and off balance credit risk. With Basel II banks were permitted to use their own market models to measure market risk as an alternative to the standard method. In-house models have failed during the last crises indicating the need for increased supervision and compliance to improved quantitative technical standards and qualitative requirements of risk control. Basel III does not seem to remove the causes of the current financial crises, setting up the foundation of the next one.

Internal models are increasingly used only for direct regulatory compliance and do not substantially serve to disclose information about the true state of financial performance and provide to the market the transparency it needs to enforce its discipline. In order for market discipline to operate there is a need for information transparency, making the need for formalized procedures, clearly identified responsibilities, centralized monitoring of positions, and effective information systems imperative.

Other facilitators of market discipline are disclosure to counterparties of relevant information about the firm's situation, risk positions, organizational structures and risk management systems. However research suggests that private incentives may not prove adequate to produce market transparency, because no participant has the incentive to go first. Therefore, regulatory intervention can be useful in breaking this kind of inertia. Disclosure and internal controls cannot entirely substitute regulation and there is no conclusive proof that internal controls and maximum transparency would make it possible to prevent market failures that make supervisory instruments necessary in the first place. It is apparent that internal, market and regulatory discipline should be viewed as complements in the optimal function of the financial system. (Calomiris & Beim, 2004)

2 An Introduction to Bank Capital

Bank Capital is largely determined by regulators. Other forms of funding is determined by the optimizing strategies of banks, an input to which is the availability of cheap deposits. In the event of asset price decline, capital is a banking institution's "safety stock". Capital that qualifies, has no contractual obligation for transfer of ownership on it, and is primarily found on the equity section of the balance sheet. Bank balance sheets do not reflect the accurate price of assets and liabilities in real time therefore, capital is necessary to safeguard a bank's third party stakeholders in the case of loss.

The three distinctive characteristics of capital are: 1) It can be transferred to third parties without breaching any contractual obligations to a fourth party, or that it has to be paid to a fourth party so far in the future that it can cover the third party until it has to be paid to the fourth party. 2) It is not legally mandated to be transferred to a shareholder or a creditor as periodic dividend or interest payment. 3) It has to be paid last, or with the lowest possible priority, to claimants during bankruptcy or other insolvency proceedings.

The forms of capital presented in order of priority is a) tangible common equity: common equity minus the value of intangible assets (such as goodwill) b) Common equity (book value of assets minus liabilities minus any form of equity other than common stock) c) Total Equity (common plus preferred stock) d) Some forms of subordinated debt (perpetual or very long term).

The amount of capital that has to be present in order to maintain financial health is equal or greater than the maximum calculated -at any given time- by the regulatory capital requirements set forth by bank regulators, by the minimum capital levels set by credit rating agencies (Standard & Poor's, Moody's, Fitch) in order to maintain the desired credit ratings, the minimum capital levels desired by investors and shareholders and by the probabilistic economic capital requirements calculated by the bank's stress tests.

Because bank shareholders bear the bulk of risk of its assets and are the first in line to lose in an adverse situation, they require higher returns than depositors, debt holders and other sources of financing, making capital costly. This cost is eventually transferred to businesses and households who borrow from the bank. Therefore capital requirements are a tradeoff between capital efficiency and bank safety. In practice capital returns remain higher than those that would be expected from the reduction in risk associated with the increased capital levels, due to implicit and explicit government guarantees and due to the fact that interest payment are tax deductible whereas dividends and share repurchases are not.

Capital requirements are set in each country by a combination of the relevant governments and banking regulators. In the U.S. for example the Federal Reserve Board (Fed), the Federal Insurance Corporation (FDIC) and the Office of the Comptroller of the Currency (OCC) have coordinated their capital requirements to avoid capital flows to entities regulated under the most profitable standards (regulatory arbitrage). The EU coordinates capital standards at a union level, although enforcement requires legislation at a national level. Internationally attempts at regulatory arbitrage elimination and financial stability are spearheaded by the Basel Committee on Banking and Supervision (Basel Committee) of the Bank of International Settlements (BIS), a coordinating organization for central bankers around the world. The first round, enacted in 1988, was colloquially known at the time as the “Basel Capital Accord” and is usually known as “Basel I”. These requirements were revised in 2004 at the second round known as “Basel II”. The 2008 financial crisis mandated the need for extensive technical revision in what is now known as Basel III. The recommendations of the Basel Committee are non-binding until ratified and incorporated into national law by the participants.

Another global coordinating body that was set up in 1999 on the initiative of the finance ministers and central bankers of the G-7 club of major world economic powers Financial Stability Forum (FSF) is the Financial Stability Board (FSB), at the behest of the expanded G-20 club. The FSB will present recommendations regarding capital requirements, in the form of broad principles that are incorporated into detailed decisions by the Basel Committee and individual national regulators.

2.1 Types of Capital

Tier I Capital consists of common stock and forms of preferred that are similar to common. Tier II includes Tier I and types of preferred stock that are less similar to common and more similar to debt, certain types of subordinated debt and accounting reserves that function in the same way as other forms of capital. The bulk of required capital is Tier I. Basel agreements require deduction of goodwill; limit the amount of certain other accounting assets like for example deferred tax assets. Part of capital adequacy is measured by the ratio of Tier 1 capital to “risk weighted assets” (RWA).

RWA the sum of the value of each asset type multiplied by a percentage reflecting its risk level, ranging from 0 percent, for safe investments like cash and AAA government debt to 100 percent for risky asset classes, in few cases exceeding 100 percent for very risky asset classes like subprime loans and risky tranches of securitizations. Commitments to lend, like credit lines, that are not carried on the balance sheet are weighted accordingly and are treated as if they were for capital adequacy calculations. Banks that have marketable security assets are required to attempt to capture both the overall market risk of different types of securities as well the specific credit risks or other risks that apply each specific security. Market risk is calculated by “value at risk” methods.

The minimum Tier I/RWA ratio is 4 percent for a bank to be considered “adequately capitalized” and at least 6 percent in order to be “well capitalized”. Not well capitalized banks face adverse regulatory restrictions incentivizing them to boost their capitalization. Generally banks aim to have a capital Tier 1 to RWA ratio of at least 8 percent or more, especially after the 2008 financial crisis. U.S. bank regulators mandate banks to maintain a sufficient “leverage ratio” (Tier I capital/Total Assets), regardless of asset risk. The disadvantage of capital tests are that they are balance sheet tests of historical accounting records that give considerable leeway to banks for “creative accounting”. This need for forward looking components in capital requirements directed the authorities to mandate additional layers of capital, based on “stress tests”, that intent to ensure that banks will operate even if the economy were to deteriorate substantially more than the consensus forecasts.

Capital requirement standards differ across the world because they are product of government legislation and regulation and as we have seen previously financial systems vary from country to country, others being a lot more bank-based vs. market based than others and different institutional and economic frameworks define the type and the levels of capital adequacy.

Capital requirements differ between banks and insurance companies. Investment Funds have no capital requirements due to varying customer bases, asset and liability structures and risk exposures and due to the fact regulatory arbitrage arises only when similar risks are treated differently between regulatory regimes. Current regulatory powers and enforcement powers for bank holding companies in the U.S. are significantly lower than banks and capital requirements based on Basel II proved inadequate to prevent the crisis.

Insurance companies face a lot more risks than banks like unexpected increase in the levels of insurance claims, lack of access to the Fed's discount window and other government sponsored support. More importantly insurers are regulated on a state by state basis, with insurance state guarantee funds being a lot less robust than the corresponding deposit guarantee funds. As a result insurance buyers at the credit ratings as the most reliable guide to credit worthiness making ratings agencies the de facto capital regulators of the insurance industry. Ratings agencies in turn use a similar analytical approach to capital adequacy calculations above, demanding however, significantly higher capital levels in order to award top ratings.

Failure to comply with capital requirements has both direct and indirect market disciplinary impact on bank operations. Failure to meet the ad-hoc standards of investors and rating agencies leads to credit rating downgrades and ultimately will lead to lower stock price and higher interest rate financing of liabilities. Failure to meet regulatory government requirements has gradually increasing legal actions according to the extent of undercapitalization.

Table 1: Regulatory capital levels in the U.S.:

Capitalization Status	Tier I/RWA	Tier (I+II)/RWA	Tier I/Total Assets
Well Capitalized	6 %	10%	5%
Adequately Capitalized	4%	8%	3 or 4%
Undercapitalized			
Significantly Undercapitalized	3%	6%	2%
Critically Undercapitalized			2%

Banks that are “well capitalized” do not face regulatory actions. If a bank meets all the “adequately capitalized” threshold but fails to meet any of the “well capitalized” thresholds starts to face regulatory constraints on its operations such difficulties in mergers and acquisitions, a ban on the accepting brokered deposits from the FDIC and deposit interest rate ceilings, usually at 75 bps above the competition average.

A bank is considered “undercapitalized” if any of its capitalization ratios (Tier I/RWA, Tier (I+II)/RWA, Tier I/Total Assets) drop below the “adequately capitalized” limits and it must submit and execute a plan under the supervision of its primary regulator showing how it will restore them, within a specific time frame. Failure to do so will result in sanctions similar to those for “critically undercapitalized” banks, which we will see below. Undercapitalized banks in the planning phase of recapitalization may be prohibited from distributing dividends to shareholders, repurchasing shares without explicit regulatory permission, restricted from asset growth on certain business activities and are subject to close monitoring by the authorities.

“Significantly Undercapitalized” are banks who fail at any of the specified respective capital levels and face the same restrictions as “undercapitalized” with a higher probability of enforcement of sanctions, and may be subject to restriction on transactions with affiliates and may be required to make changes to the whole or a part of their management team.

“Critically undercapitalized” banks in addition to restrictions applicable to all undercapitalized banks, may not make payments to subordinated debt holders and there is presumption that the authorities will seize the bank and appoint a receiver or conservator within 90 days. As we have seen the potential escalation of regulatory sanctions peaking at loss of ownership and control of a bank is a very strong incentive to shareholders and the management to maintain high capital levels.

Banks usually carry varying levels of capital over the regulatory minimum depending on the phase of the business cycle, the credit rating needed for their desired business strategy, management discretion and conservatism. (Elliot, 2010)

2.1.1 Basel III

In the aftermath of the global financial crisis of 2008, the Basel committee introduced the following proposals in September and December 2010: Basel III involves five prominent changes in the bank capital requirements, to be phased in a 7 year period:

- The capital conservation buffer composed of common equity, to be increased by 2.5 percent in addition to the current requirement of 8 percent of RWAs. If a bank capital falls below 10.5 percent level, there are the sanctions mentioned previously.
- Banks will be required to raise common equity to at least 4.5 percent of RWAs (in addition to the 2.5 % capital conservation buffer.
- The quality of allowed capital will be increased by placing limits on acceptable hybrid instruments, greater deductions (such as deferred tax assets, equity investments, goodwill etc.) in calculating common equity and an increase of Tier I from 4 to 6 percent of RWAs
- The non-risk weighted leverage ratio is mandatory at a minimum of 3 percent.
- Increased risk weights.
- The introduction of the net stable funding ratio (NSF). It will require banks to hold a minimum proportion of long term stable funding beyond a one year horizon, based on the assessment of the liquidity of assets and contingent liabilities. This proposal together with

the liquidity coverage ratio (LCR) requirement aims to address the failures in liquidity management that became apparent during the global financial crisis, particularly the use of short term funding in asset financing and the proliferation of structured investment vehicles (SIVs) and conduits relying on commercial paper and bank liquidity guarantees. (KPMG, 2011)

2.2 An Analysis of Risk Weighted Assets

The European Banking Authority's stress tests and recapitalization drill have contributed in enhancing the consistency of the numerator of the capital ratios, while at the same time improving broader understanding of capital levels through improved transparency and definition consistency. Further down the road, questions have been raised as to why there are significant differences in the denominator of the capital ratios (the capital requirements) and material differences in the regulatory parameters (Probability of Defaults and Loss Given Default's) of the banks. Differences in risk parameters and capital requirements between banks are not a sign of inconsistency per se. For example, the composition of portfolios may differ across banks as the result of differences in markets (e.g. geography), risk appetite or borrower selection criteria. However, a substantial divergence between banks may signal that the methodologies used for estimating risk parameters by some banks will require further analysis.

The key indicator selected for the analysis and assessing the materiality of differences is the overall RWA and EL outcome or 'global charge', which takes into account both unexpected losses (from standardized and IRB approach) and expected losses (EL).

Credit risk is by far the most significant component of total risk-based capital requirements, representing around 77% of total RWA. Operational risk and market risk contribute on average 8.5% and 10.5% respectively. In general, the impact of 'floor adjustment' which places a floor on RWA levels relative to Basel I, is not significant, although for some banks the floor adjustment is material.

The computation of the regulatory charges (RWA and EL) requires a high number of inputs combined with complex algorithms. Looking at the significant differences between banks in the average Risk Weights or in the Global Charge at aggregate level, it appears very difficult to distinguish between the various factors determining these differences. Indeed, if the analyses are only performed on very high-level data, any conclusion may be very misleading.

In a large sample of European banks one half of this divergence can be explained by very simple effects: the extension of IRB; the SA risk weights; IRB portfolio mix; and the share of IRB assets in default. Some of these differences appear to be driven by potentially different practices (e.g. exposures in partial use and the treatment of defaulted assets) that may require further investigation and possibly supervisory measures to foster convergence. Appropriate and consistent Pillar 3 disclosure of such information by the banks would allow third parties to breakdown GC differences in a similar way.

This is a contribution to increasing transparency in the disclosure of the regulatory charges (RWA and ELs) computed by banks.

Given the current status of the analysis it is not possible to subdivide the sources of differences between intended or unintended drivers. The top-down approach deals with factors that, on an aggregate level, can explain about half of RW and GC differences among banks. A bottom-up approach is needed to complement the present analysis. This is especially the case for corporate and retail exposures. Although a top-down exercise has been vital for clarifying about half of the differences, the residual divergence is still high and require an in depth investigation to ensure that RWA are reliable, consistent across banks and reflect their true risk profile.

In this context, it is clear that the first phase of the top-down exercise has been vital for clarifying about half of the differences but the residual divergence is still high and require an in depth investigation to ensure that RWA are reliable, consistent across banks and reflect their true risk profile. (European Banking Authority, 2013)

2.2.1 Why RWAs differ across countries and what could be done about it

Strengthening capital ratios is a key priority in the aftermath of the global financial crisis. Increasing the quantity, quality, and transparency of capital is of paramount importance to restore banking sector health. Recent regulatory reforms have primarily focused on the numerator of capital ratios, while denominator changes, i.e., risk weighted assets (RWAs), have been less prominent.

Why look at RWAs? Confidence in reported RWAs is waning. Market participants ponder the reliability and comparability of capital ratios, and hypothesize that banks may not be as robust as they are portrayed by risk-weighted capital ratios. The Basel Committee recently stated that it will review the measurement of RWAs and formulate policy responses in order to facilitate greater consensus across banks and jurisdictions.

The academic literature on capital is vast, but the focus on RWAs is more limited. Current research mostly emanates from market participants, who highlight the variability existing in RWAs across banks. There is no convergence in views about the substantiality and relative weight of these differences, and thus no consensus on policy implications.

Perceived differences in RWAs within and across countries have led to a diminishing of trust in the reliability of RWAs and capital ratios, and if not addressed, could affect the credibility of the regulatory framework in general.

A host of factors drive differences in RWA outputs between firms within a region and indeed across regions; many of these factors can be justified, but some less so. Differences in

RWAs are not only the result of banks' business model, risk profile, and RWA methodology (good or bad), but also the result of different supervisory practices. Aiming for full harmonization and convergence of RWA practices may not be achievable, and we would expect some differences to remain. It may be more constructive to focus on improving the transparency and understanding of outputs, and on providing common guidance on methodologies, for banks and supervisors alike.

A multipronged approach seems the most effective path of reform. A combination of regulatory changes to the RWA regime, enhanced supervision, increased market disclosure, and more robust internal risk management may help restore confidence in RWAs and safeguard the integrity of the capital framework. Even if RWAs are not perfect, retaining risk-sensitive capital ratios is still very important, and the latter can be backstopped by using them in tandem with unweighted capital measures. (Le Lesle & Avramova, Revisiting Risk-Weighted Assets "Why do RWAs Differ Across Countries and What can Be Done About it?", 2012)

2.2.2 Common equity capital, bank risk and required return on equity

The new Basel III standards for internationally active banks represent the cornerstone of the revised global regulatory reform. The overarching objective of Basel III is to strengthen the quantity, quality and consistency of the regulatory capital base. To achieve this aim, regulators have chosen to place particular emphasis on the component of capital which has the highest loss-absorbing capacity in a going concern, namely common equity. Under the previous regime, banks could hold as little as 2% of common equity as a share of risk-weighted assets. The new rules demand a higher common equity ratio equal to 7% of risk-weighted assets, i.e. the new minimum (4.5%) plus the capital conservation buffer (2.5%). In addition to Basel III, a parallel strand of work has addressed systemically important financial institutions (SIFIs). Joint

efforts by the Basel Committee and the Financial Stability Board have resulted in the publication of a consultative document proposing a set of measures to initially be applied to global systemically important banks (G-SIBs). These measures are specifically designed to address the negative externalities and moral hazard posed by these firms. According to the consultative document, G-SIBs will need to satisfy additional loss-absorbency requirements beyond Basel III. In quantitative terms, the framework proposes a progressive capital surcharge, ranging from 1% to 2.5% of common equity, depending on a bank's systemic importance. Crucially, regulators have chosen to focus exclusively on common equity as the eligible tool for meeting the surcharge. Overall, the regulatory focus on higher common equity requirements has evident benefits: (i) it makes an institution more resilient to adverse shocks; and (ii) it reduces the probability and the impact of default, and thus the severity of the externality imposed on the broad financial system.

The observation that higher common equity ratios are associated with lower risk premia as well as a decline in banks' required return on equity largely downplays the banking industry's concern about a material increase in funding costs. Ultimately, this evidence provides further support for the regulatory emphasis on higher minimum equity capital requirements in the overhaul of banking regulation. Overall, higher equity requirements are conducive to a less risky banking system, with only modest if any, negative effects in terms of the cost of funding. In particular, this analysis of a sample of large international banks vindicates the decision taken by international authorities that G-SIBs should fully meet the surcharge with common equity.

However, one caveat is in order. These findings relate to a broad structural link between equity ratios and the cost of equity. They do not suggest that raising equity capital in private markets is without cost. Indeed, the well-known debt overhang problem as well as asymmetric information issues suggests that capital issuance can be costly, especially under stressed market conditions. By providing an appropriately long phasing-in period for the new requirements, these concerns have been taken into account by the regulatory community. Indeed, the higher capital ratios could be

largely achieved via retained earnings. Finally, it is worth recalling that recent studies have also suggested that a positive relationship may hold between levels of capital and firm value. These findings point to potential beneficial effects of higher equity capital requirements, which go beyond the neutrality result of the Modigliani Miller model. (Financial Stability Review, 2011)

ΠΑΝΕΠΙΣΤΗΜΙΟ ΠΕΙΡΑΙΩΣ

3 Bank Funding II - Financial Literature Review

3.1 Bank Funding Strategy

Bank funding strategies are set in an environment of regulatory uncertainty with a range of relevant legislation changes in view or in progress. A common perspective of funding dissects it into four main components: local and international deposits, wholesale market funding, capital markets funding and equity. In reality we observe overlap and potential substitutability between various funding sources:

Firstly, banks that operate internationally compete in many national deposit markets. Deposits raised by subsidiaries or branches in foreign markets can be transferred (unless hampered by national restrictions) to fund lending in other markets.

Secondly, the boundaries between funding types can be blurred, such as whether to classify bank negotiable certificates of deposit as deposits or wholesale market funding. Proposed new liquidity requirements for net stable funding ratios will make such a distinction a significant influence upon future funding patterns.

Lastly, banks often accommodate borrowers by originating and guaranteeing capital market instruments. Bank accepted bills are an example where banks take on exposure to default risk do not ultimately provide the funds, but are required to display them as liabilities matched by an equivalent customer liability as an asset. Similarly, banks may securitize mortgages or other assets but neither the arrangement nor the securitized assets are recorded on the balance sheet, unless some part of the risk is retained. Another complication arises from the use of techniques such as repurchase agreements to fund holdings of specific assets. Normal accounting practice involves recording the repurchased security as an asset and the repo as a collateralized borrowing, but at least one failed US investment bank treated these transactions as a sale of the security without disclosing the underlying funding.

The banks are not individually forthcoming with information disclosure. While some information can be gleaned from annual reports and financial statements, it is limited. Basel II Pillar three mandatory disclosures, give little information, even though funding arrangements are important in assessing liquidity risk.

There is a need for better statistics on bank funding to enable analysts and investors to better understand the risks and the issues associated with bank funding patterns. At the same time international comparisons of banking statistics are notoriously difficult, and the differences reflect a variety of institutional features including relative importance of banks, capital markets, and other non-bank financial institutions. Moreover banks enter various derivative contracts which change the interest rate risk of their liability portfolio and the terms of which cause the overall portfolio cost to differ from that calculated by the initial fund raisings. Therefore it is inappropriate to compare directly, the overall cost of bank funding with the interest rate charged on an adjustable rate mortgage unless the bank liability portfolio has the same interest rate profile. A suitable comparison would be with the cost of funding at variable interest rate, where the distinction between marginal and average cost becomes substantial. When banks raise funds at a variable interest rate, the margin is locked in for the term of the borrowing but the base indicator rate can change. Movements in the base rate can be expected to be passed on the adjustable rate loans. On the other hand, if the spread required in the market increases, the bank will not need to pay the increased spread until current borrowing mature and need to be refinanced.

Fundamental to funding outlook is the continuation of foreign funding requirement from Balance of Payments (BP) deficits. The requirement for ongoing Capital Flows (CF) to finance Balance of Payments (BP) deficits indicates that either foreign bank funding will continue to be important or other substantial changes to financing patterns must occur. The later includes increase in Foreign Liabilities (FL). Currency volatility and high local interest rates are likely to inhibit foreign direct investment. Consequently, alternatives to bank funding appear to be primarily increased hot flows into equities and wholesale funding. In other words, local funding deficits need to be financed by either by foreign banks or by long term domestic investments by foreign entities such as local factories, infrastructure and real estate. However foreign investors are unlikely to invest in long

term domestic investments, if they risk losing their money either through a currency devaluation or high domestic inflation rates which will lead to loss of their investment. In countries where is such a risk which is a result of political instability and bad economic policy, foreign investors are only willing to invest in local equities and money market instruments which are easy to liquidate in the face of risk.

In general there is no typical bank funding profile: the decision on which funding instruments to choose depends on many factors such as the business model, the current market situation and the individual company situation, plus country-specific factors, like the CA. Banks are, however, always actively seeking the optimum funding mix. The search for appropriate funding instruments represents a constant optimization problem, which the bank actively attempts to solve. (KPMG, 2011)

The majority of long-term capital market funding has traditionally been senior unsecured bonds, followed by secured bonds outlined in the four main categories below. Secured bonds are backed by assets as collateral for the bond (established asset classes include mortgages and other retail client loans) and therefore compensate with lower returns.

3.1.1 Asset-backed securities

As part of the process of issuing asset-backed securities a special-purpose vehicle (SPV) is established to purchase assets from the originator and securitize them. The securities are assessed by rating agencies and secured against default via overcollateralization and the creation of a liquidity reserve.

A distinction is drawn between true-sale and synthetic securitizations: with true sales the credit risk is transferred off the balance sheet to the investor, i.e. the originator's balance sheet is reduced by the volume of the tranches that are placed in the capital market. The asset items thus cease to be owned by the seller in their entirety, including all the associated risks. The risk-weighted assets

are also reduced. With synthetic securitizations, by contrast, no contractual transfer occurs, but only a transfer of some or all of the risks associated with the asset with the aid of credit derivatives. Synthetic securitizations thus have no impact on the balance sheet, although here, too, the credit risk is transferred and the risk-weighted assets are reduced. The transfer of credit risk basically allows the redistribution of risk: the investor's claim is on the securitized cover pool, which is "static", i.e. defaults or early repayments are passed on straight to the investors. If the originator becomes insolvent, payments can still be effected from the cover pool.

3.1.2 Mortgage-backed securities

MBS are ABS of a particular kind. MBS are bonds secured on private mortgage loans and are thus either residential mortgage-backed securities (RMBS) or commercial mortgage-backed securities (CMBS). Residential mortgage-backed securities are the most important asset class of securitized products in Europe. Guarantees and the supervision of the collateral are as a rule not subject to statutory regulation, but are agreed at the individual contract level

3.1.3 Covered Bonds

Covered bonds are a form of securitization popular in Europe. They are treated as on-balance sheet funding and involve issuing debt secured against a pool of mortgage loans held by the bank. That way, investors have a claim on the bank in the form of bonds and in the event of a default, have first claim ahead of other creditors and depositors on the underlying package of mortgage loans. Given the need to meet new net stable funding (NSF) ratio requirements, use of covered bonds is an attractive proposition, which may help recycle household savings via superannuation funds back to the banking sector. They are covered by a special pool of assets which in most cases "overcollateralizes" the bond. There are also precise legal provisions specifying what is permissible for packaging in covered bonds. These include, for example, claims on local, regional or national public-sector authorities or mortgage loans that do not exceed a specific, maximum loan-to-value ratio. The result is a high-quality bond that usually receives a better rating than senior

unsecured bonds from the same issuer. The legal provisions, such as those for the German “Pfandbrief”, also prescribe strict rules for the selection of assets that may be used as collateral for the covered bond. Consequently, they can as a rule be placed in the market at a lower premium than other asset-backed securities.

In contrast with ABS/MBS during the issuance process for covered bonds there is definitely no balance-sheet transfer and thus no transfer of credit risk for the assets deposited as collateral. In addition, the investor’s claim is on a dynamic cover pool. This means that if a loan in the cover pool defaults or a loan is repaid prematurely, it is replaced by the issuer with a new, performing loan. If the issuer becomes insolvent, the statutory trustee is responsible for the settlement; with securitizations, by contrast, this is done by the investors themselves. Due to the “dual recourse” system, i.e. the right to assert a claim on the issuer and if necessary the cover pool in the case of insolvency, covered bonds generate higher compensation in the case of a default than other structured or unsecured products.

3.1.4 Collateralized debt obligations (CDOs)

CDOs securitize assets such as bonds or loans. CDOs are issued by a special purpose vehicle, as are ABS. Value and payment terms are usually derived from a portfolio of fixed-income basic instruments. The different types of CDOs are: collateralized loan obligations (CLOs) that comprise credit claims; collateralized bond obligations (CBOs) that comprise traded bonds; collateralized synthetic obligations (CSOs), which are CDOs that are mainly backed by credit derivatives; structured CDOs or commercial property CDOs and collateralized insurance obligations (CIOs), which are products backed by insurance or reinsurance contracts. During the financial crisis many of a CDO’s assets were subprime MBS bonds, which is why the CDO market has contracted significantly since the financial crisis.

3.1.5 Supply-side Bank Funding Strategy Prospects

Overall, the developments discussed are likely to result in unsecured senior bank bonds becoming less attractive to investors in future or at least more expensive for issuers. In the future they will be perceived as more risky, for example, on account of the current debate about the resolution regime and the political objective of involving bank bondholders in meeting the costs of bank restructuring in order to avert bail-outs by the taxpayers. Capital market funding of banks and in particular the costs of unsecured funding will thus remain at a structurally higher level than prior to the crisis for a sustained period.

Several banks will thus have reconsider their funding mix, since the market price that a bank has to pay for unsecured senior debt is a pivotal factor in their business model. If banks are unable to gain access to the usual volume of funding over the long term, they will have to shrink their balance sheets in order to be able to maintain their existing capital structure. The consequence is that banks will have to reduce their assets or make greater use of other additional sources of funding or a different mix of funding instruments. Structurally higher funding costs will in any event weigh on banks' profitability in future.

Investors in bank bonds will in future either demand higher yields on unsecured bonds or increased cover in the form of collateral. Since, however, collateral is only available in limited amounts, capital market bank funding could contract over the next few years. In order to overcome funding constraints in the capital market an increase in deposit funding would be conceivable.

Another possibility would be the development of other alternatives to more expensive unsecured senior debt funding; e.g. structured covered bonds or loan funds. Should new forms of collateral also be used, they would, however, in any event have to be guaranteed as being of sufficient quality. At present, though, investors still appear to be skeptical about securitizations in general and new, unconventional forms of collateral in particular.

Up until about five years ago nearly all banks had no problems with funding. Now it is becoming increasingly clear that capital market funding for banks will be in short supply in the future. (Zahres, 2012)

3.2 Empirical Studies on Bank Funding with Emphasis on Explanatory Variables and their Theoretical Background

Systemic research on bank funding with a special emphasis on macroeconomic conditions appears to be scarce. Existing literature has focused on the relationship between sources of funds and bank fragility. A bank level study of 11,000 U.S and European banks found that macroeconomic conditions have been found to affect bank probability of default. It also found that banks with overreliance on short-term wholesale funding (measured by the ratio of long-term stable funding to structural asset positions) and banks with higher leverage ratios were more vulnerable to default. However this particular study limited its perspective on GDP growth for capturing macroeconomic conditions, and money market rates for capturing monetary conditions. (Vasquez & Frederico, 2012)

The real GDP growth rate, as a proxy for the business cycle may have been also found to relate to the procyclicality of bank lending –both corporate and household- and to wholesale funding. (Jeong, 2009). Vanessa Le Lesle suggests that higher reliance on wholesale funding and high asset to deposit ratios leave banks exposed to money and capital market shocks. She also suggests a link between weak banks and weak macroeconomic fundamentals of sovereigns, judging from the relationship between banks spreads and sovereign bond spreads. (Le Lesle, Bank Debt in Europe: "Are Funding Models Broken?", 2012).

Short term rollover wholesale funding –usually in the form of large denomination certificates of deposit, brokered deposits, repurchase agreements (repos), central bank funds and commercial paper- adds value when performed by sophisticated financiers in a symmetric information environment adds value by increasing market discipline (force liquidations) of loss-making banks.

However in an opaque information environment with costless and noisy public signals (similar to crises) wholesale financiers may rely on the public signal instead of conducting their own due diligence, and have the incentive to prematurely cut bank funding and liquidate banks the disadvantage of the public. This indicates that wholesale funds are more beneficial to traditional commercial banks that have opaque non-tradable relationship loans and can create risks in banks that have highly liquid market-priced assets. (Huang & Ratnovski, 2011)

On the same note wholesale funding share appears to be positively linked to bank asset volatility; however this relationship breaks down in wholesale market distress conditions. A bank's reliance on wholesale liabilities can be a reaction to the uncertainty of the bank's "real" economic environment, as measured by loan volume volatility (Dinger & Craig, 2013).

Our hypothesis in the present thesis is that current account deficits are positively related to bank wholesale funding on a country level, which is consistent with past findings: The growth of interbank liabilities is negatively related to the growth of customer deposits at savings banks and credit cooperatives. Structurally, banks rely more on wholesale funding than the used to in the past: banks facing a funding deficit become net interbank borrowers while others that benefit from stable funding surplus (mainly deposits) become net interbank lenders. The decreasing ability of banks to attract deposits and the substitution of deposits by interbank liabilities represent provides an explanation for declining net interest result for retail banks with a funding deficit. Due to the structural changes in bank funding and to the increase in the variety of financial intermediaries that are a part of the interbank market, there is a strategic need for alternative funding means for retail banks. (Norden & Weber, 2010)

Along with capital adequacy, profitability and asset quality, funding composition played a key role in the default probability during the financial meltdown in the U.S. in 2008. A higher level of loan-to-deposit ratio as a proxy for non-deposit funding, significantly increases a bank's default probability, not only immediately after recorded but also after two or three years of an increase in wholesale funding. Furthermore, dependence on more volatile sources of deposits appears to be a

significant default risk factor. Particularly time-deposits over the level of deposit insurance, which are more “maneuverable” and in greater danger at the event of a bank default, imply a higher default probability. Brokered deposits appear to behave in the same manner. Bank funding structures affect the probability of default and clearly indicate bank solvency deterioration a lot sooner than the actual default. (Bologna, 2011)

During the 1995-2007 period, most banks attracted only a small percentage of their short term funding (deposits, interbank borrowing, certificates of deposit, short term-bonds) in forms other than deposits, with a few outliers however raising more than half of their short-term funding in non-deposits. During that time there is a positive relationship between fee income share and non-deposit funding share. Non depositing funding also lowered the bank’s rate return on assets, while it could also offer some risk reduction benefits, at small doses. During that time commercial banks reduced their reliance of non-deposit funding while investment, non-banking credit institutions and other banks increased it. Attracting some deposit funding seems to increase the proxy for bank riskiness, as indicated by the z-score. Fee income and non-deposit funding shares have a positive and significant correlation, indicating that banks non-traditional banks that have an high fee income share tend to be also non-traditional in having relatively high market funding.

Fast growing banks are utilized relatively more non-deposit funding. Similarly investment and non-bank institutions relied more on it than commercial banks. Also, regarding macroeconomic variables non-deposit funding share has negative correlation to inflation and GDP growth. Institutional factors that reduce income fee share also reduce bank risk, creating room for banks to draw on additional risk by increasing non-deposit funding share. A higher noninterest income or non-deposit funding share is associate with substantially higher risk, but the impact of either variable on the return on assets is difficult to assess due to endogeneity issues. (Demirguc-Kunt & Huizinga, 2010)

4 Current Account Deficits and Bank Funding

Cross border cash flows, and by extension, interactions between the global economy, international financial markets and domestic economies, are analyzed by three accounting statements: the Current Account (CA) balance, the Capital Flows (CF) balance, and their sum the Balance of Payments (BP).

4.1 The Current Account (CA) Balance

The Gross Domestic Product (GDP) calculated using the expenditure method equals the sum of private Consumption (C), Investment (I), Government spending (G), and the Trade balance (NX). The sum of Consumption (C), Investment (I) and Government spending (G) equals Domestic Demand (DD):

$$\text{GDP} = \text{C} + \text{I} + \text{G} + \text{NX} \quad (1)$$

$$\text{DD} = \text{C} + \text{I} + \text{G} \quad (2)$$

Therefore the Gross Domestic Product (GDP) equals a country's Domestic Demand (DD) plus Net Exports (NX), the value of products and services offered to foreign entities minus the value of products and services imported:

$$\text{GDP} = \text{DD} + \text{NX} \quad (3)$$

The Gross National Product (GNP) of a country equals its Gross Domestic Product (GDP), the sum of all products and services produced within the borders, and the Net Factor Income (NFI), the difference of Factor Receipts (FR - from income earned from citizens and domestic

organizations abroad) minus the Factor Payments (FP - made to foreign organizations and aliens for incomes earned domestically):

$$\text{GNP} = \text{GDP} + \text{NFI} \quad (4)$$

$$\text{NFI} = \text{FR} - \text{FP} \quad (5)$$

The interaction of domestic economies with foreign economies and international financial markets is measured through three accounting records: the Current Account (CA), Capital Flows (CF) and their sum the Balance of Payments (BP). The Current Account (CA) measures cash flows relevant with productive activities and net income of citizens and organizations, Capital Flows (CF) measure cash flows relevant with international investments and the Balance of Payment (BP) measures the total.

$$\text{CA} = \text{NX} + \text{NFI} \quad (6)$$

The Current Account (CA) is the sum of the Trade Balance (NX) of goods and services of a country or net exports (NX) plus the Net Factor Income (NFI) and it measures the cash inflows or outflows of a country for the specified time period. The Current Account (CA) also includes the Net Current Transfers, which take place when a foreign currency provides currency to another country with nothing received in return like pensions of citizens from abroad, donations, international aid or assistance. In our analysis Net Current Transfers will be included in Net Factor Income (NFI) without loss of accuracy. A Current Account (CA) surplus indicates that a country has currency inflows and a deficit that it has currency outflows.

$$\begin{aligned} \text{GNP} &= \text{GDP} + \text{NFI} \\ &= \{C + I + G + \text{NX}\} + \text{NFI} \\ &= \{C + I + G\} + \{\text{NX} + \text{NFI}\} = \end{aligned}$$

$$= DD + CA \quad (7)$$

By combining the GDP equation (1) with the Domestic Demand (DD) (2), the Current Account (CA) (6) and the Gross National Product (GNP) (4) definitions, we conclude that the Gross National Product (GNP) of a country equals Domestic Demand (DD) plus the Current Account balance (CA) (7). This mathematical statement indicates that when a country spends more (DD) than its income (GNP) it will lead to a Current Account (CA) deficit (8) and when it spends less it will have a Current Account (CA) surplus (9):

$$CA < 0 \Leftrightarrow C + I + G > GNP \Leftrightarrow DD > GNP \quad (8)$$

$$CA > 0 \Leftrightarrow C + I + G < GNP \Leftrightarrow DD < GNP \quad (9)$$

Whether a Current Account (CA) deficit is a negative or positive indicator of future economic output depends on the Domestic Demand (DD) composition: High Investments (I) levels create the prospects for higher levels of future economic output, and possible Current Account (CA) surpluses and sustainable future Consumption (C) levels, whereas high Consumption levels (C) compared to Investment (I) will lead to reduced future economic output, Current Account (CA) deficits and unsustainable Consumption (C) levels.

4.2 The Capital Flows (CF) Balance

This statement records cross border capital flows resulting from Foreign Asset (FA) and Foreign Liability (FL) transactions. Whenever a domestic economic entity purchases Foreign Assets (FA) there is a corresponding monetary outflow and whenever they sell Foreign Liabilities (FL), there is a monetary inflow respectively.

4.3 The Balance of Payments (BP)

The Balance of Payments (BP) mathematical identity is the sum of the Current Account (CA) balance and the Capital Flows (CF) balance and it measures the total monetary flows in a country:

$$BP = CA + CF \quad (10)$$

A Balance of Payments (BP) surplus reveals that the demand for domestic currency is greater than the supply of domestic currency and vice versa, a Balance of Payments (BP) deficit reveals that the demand of domestic currency is lower than the supply of domestic currency. Balance of Payments (BP) surpluses and deficits set in motion balancing mechanisms that eventually will restore balance in the foreign exchange markets: they will restore the Balance of Payments (BP) to a new zero equilibrium point, where there is no excess demand or supply for the country's currency.

Within a floating currency exchange rate system, a Balance of Payments (BP) surplus and the corresponding excess currency demand will lead to its appreciation, whereas a Balance of Payments (BP) deficit and the corresponding excess currency supply will lead to its depreciation. In a fixed currency exchange rate system, a Balance of Payments (BP) surplus will lead to an increase in money supply and a Balance of Payments (BP) deficit to a decrease in money supply. The change in the exchange rate and the money supply respectively, will trigger chain reactions that will tend to eliminate the generating cause: the a Balance of Payments (BP) surplus or deficit. Market dynamics restore equilibrium.

4.4 Financing Current Account Deficits

A CA deficit indicates that a country spends more than it produces during the time period of measurement. Therefore, during that period, it has a net monetary outflow for the imports of goods and services, and for the Factor Payments (FP) to Foreign Liability (FA) owners. The monetary outflow has to be financed in a reserve currency.

In order to do that it has three options: use its savings, borrow or sell assets. All three options include sale of Foreign Assets (FA) or Foreign Liabilities (FA) (see table 1). The proceeding monetary inflows will increase the Capital Flows (CF) balance and equally offset the Current Account (CA) deficit effect on the Balance of Payments (BP) - (see mathematical identity 10). The first option involves utilizing a country's reserve assets (table 1). The second option involves using increasing foreign liabilities by any combination of attracting foreign deposits, selling debt equities to foreign entities and getting loans from foreign entities (table 1). The third option involves any combination of decreasing Foreign Assets (FA) or increasing Foreign Liabilities (FL) through the sale of Foreign Assets (FA) or the sale of domestic investments (table 1). All options lead eventually, to the decrease of the country's Net Asset Position (NAP):

$$CA < 0 \Rightarrow FA - FL = NAP \quad (11)$$

Regardless of the financing channel, a Current Account (CA) deficit leads to an equal decrease in a country's Net Asset Position (NAP). Conversely, a Current Account (CA) surplus leads to an equal increase in a country's Net Asset Position (NAP). The Net Asset Position (NAP) is the equivalent of a business' shareholder equity or an individual's net worth (balance sheet records that are snapshots in time) and the Current Account (CA) and its components are flows equivalent to income statement records.

4.4.1 Current Account Deficit Repercussions

Capital Flows (CF) surpluses cannot finance Current Account (CA) deficits ad infinitum. Sooner or later, a country with continuous Current Account (CA) deficits will face a currency depreciation (in a floating exchange rate environment) or a monetary supply decrease (in a fixed exchange rate environment) due to the fact that Foreign Assets (FA) and reserve assets are finite, and there also a limit to the interest rates a country can afford in order to attract Foreign Liabilities (FL). Foreign entities invest in a country based on their expectations regarding future returns and not based on the needs of the government. This applies both to foreign direct investment and investments in the domestic capital market. The depreciation or the monetary supply decrease, in fact, will be proportionate to the procrastination on the part of the local government and central bank.

Continuous deficits increase external debt, decrease the Net Asset Position (NAP) and the probability of default. Higher interest rates, among others, affects negatively Consumption (C), Investment (I), economic output (GDP) and employment and lead to an unsustainable situation.

Consequently, the only way to restore competitiveness is to increase the Current Account (CA) balance. Within a fixed exchange rate system, the money supply decrease manifests through disinflation, this also entails the risk of deflation.

Table 2 International Investment Position Balance Sheet

International Investment Position (IIP)

(I) Foreign Assets (FA)

Direct investment

- Real estate owned by domestic entities
- Businesses owned by domestic entities
- Plants owned by domestic entities
- Foreign equity securities

Portfolio investment

- Deposits abroad of domestic entities
- Loans to foreign entities
- Debt securities owned by domestic ent.
- Equities owned by domestic entities

Other investment

Reserve assets at central bank:

Foreign currency and securities

(II) Foreign Liabilities (FL)

Direct financing

- Real estate owned by foreign entities
- Businesses owned by foreign entities
- Plants owned by foreign entities
- Equity owned by foreign entities

Portfolio financing

- Domestic deposits of foreign entities
- Loans from foreign entities
- Debt owned by foreign entities
- Equities securities owned by foreign

Other financing

Reserve liabilities at foreign central banks:

Domestic currency and securities

(III) Net Investment Position (I-II)

4.4.2 Current Account Balance, Savings and Investments

Whenever there is a Current Account (CA) deficit, investments are higher than national savings and the profitable investment opportunities are greater than national saving capacity. Vice versa, a Current Account (CA) surplus mirrors a greater national savings rate than the domestic investment rate. The supernumerary savings are invested in countries that have insufficient savings and Current Account (CA) deficits. Again, this is done through the Capital Flows (CF) channel. Therefore another interpretation of the Current Account (CA) deficit is that it gauges the portion of domestic investments in productive assets, real estate and inventory that is not financed by national savings. That is the reason that it is characterized sometimes, as net foreign borrowing or

foreign tangible investment. Reducing future Current Account (CA) deficits is contingent however, on positive private savings and investment rates.

National savings are still the main source of domestic Investment (I). As we saw above Current Account (CA) deficits are not sustainable. Investment (I) account on average for approximately 20 percent of the Gross Domestic Product (GDP) and Current Account deficits rarely go over three to four percent. A rare exception is the United States empowered by the ability to issue a global reserve currency. It is apparent that an adequate national savings rate is a necessary condition for sustainable growth.

4.5 Current Account Balance and Market Discipline - The Mundell-Fleming Model

The Mundell-Fleming model is synthesized by the Investment Saving - Liquidity Preference Money Supply (IS/LM) model and the Interest Rate Parity condition. It demonstrates the role of expectations and international investment funds in the operation of the automatic stability mechanism that tends to restore Balance of Payment (BP) imbalances. As seen previously, nominal exchange rate is the clearance point between currency supply and demand, and Balance of Payments (BP) surpluses reflect excess domestic currency demand and vice versa. Domestic currency demand originates from everybody who receives foreign currency and wish to utilize it domestically such as exporters, domestic citizens who have incomes from abroad and foreign investors who wish to invest in domestic assets. Respectively, domestic currency supply arises from those who wish to make payments in foreign currency such as importers, foreign entities who wish to convert domestic currency at their possession into foreign currency and domestic investors who wish to invest in foreign assets.

Demand meets supply in the foreign currency markets. Whenever supply is higher than demand some of those who wish to exchange foreign currency with domestic will not be able to find willing counterparties at the current price. Conversely whenever demand is higher than supply, some of

those wishing to exchange domestic with foreign currency, will also be unable to find willing counter price. The resulting consequences of this imbalance depend on the exchange rate system. Our analysis will examine the two extreme systems of the spectrum: fixed and floating, and for systems in between the outcome will be analogous to the proximity of them to the two extremes.

4.5.1 Balance of Payment Imbalance in Floating Rate Exchange System

As discussed previously excess domestic currency demand due to Balance of Payments (BP) surplus, within a floating exchange rate system, will lead to currency appreciation:

(BP) Surplus => Domestic Currency Appreciation

Whereas excess supply due to a Balance of Payments (BP) deficit, will lead to currency depreciation:

(BP) deficit => Domestic Currency Depreciation

As we will see below using the Mundell-Fleming model, the exchange rate movement will tend to eliminate the generating cause.

4.5.2 Balance of Payment Imbalance in Fixed Rate Exchange System

Within a fixed exchange rate system, the Balance of Payments (BP) surplus will lead to an equal increase in the monetary supply, and a deficit to a decrease: the Balance of surplus (deficit) will cause an equal increase (decrease) in central bank currency reserves and also in commercial bank deposits:

(Monetary Supply Decrease) = (Reserve Asset Decrease) = (BP) Deficit

The central bank, in order to protect the domestic economy from monetary supply fluctuations, caused by Balance of Payments (BP) volatility within a fixed exchange rate system, may perform sterilization: open market operations (purchase and sale of securities) that neutralize the impact of foreign exchange operations on the monetary supply. In the case of a Balance of Payments surplus, sterilization is performed through the sale of securities whose value is equal to the increase of asset reserves. That way, the central bank removes from circulation the excess liquidity resulting from the surplus through the increase in reserve asset and money supply increase. Vice versa, in the event of a Balance of Payments (BP) deficit sterilization is accomplished through the purchase of government bonds equal to the decrease in asset reserves.

However, sterilization cannot be undertaken indefinitely. In the case of a Balance of Payments (BP) surplus, it is limited by the cost of asset reserves. The foreign currency deposit interest rate of reserves is lower than the interest rate of government securities used in open market operations. In the case of a Balance of Payments (BP) deficit, the reserve assets will be sooner or later eliminated, leaving the central bank unable to neutralize excess foreign currency demand reflected by the deficit. Ergo, in the event of external imbalance, sterilization may postpone the automatic stabilizing mechanism process only temporarily. (Antzoulatos, 2010)

5. The Data

This section discusses the data on bank funding, current account balance and a range of explanatory variables in turn. Our balanced panel consists of the following 15 Eurozone countries: Austria, Belgium, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Slovak Republic, Slovenia and Spain. Cyprus, Latvia and Malta were omitted due to lack of available data, in order to ensure data quality and integrity.

The time horizon of our study covers approximately the life span of the Eurozone until the year of the global financial crisis (2000-2008). Our international sample is restricted to OECD countries in order to ensure data integrity and enhance comparability across countries. Bank funding measures are drawn from the OECD Bank Profitability Financial Statements of Banks 2010 database. Using this data we constructed four normalized bank funding measures in order to enable juxtaposition:

$$\frac{\text{Borrowing from Central Bank} + \text{Net Interbank Funding} + \text{Bonds}}{\text{Total Assets}} \quad (\text{cbibbdta})$$

$$\frac{\text{Borrowing from Central Bank} + \text{Net Interbank Funding}}{\text{Total Assets}} \quad (\text{cbibta})$$

$$\frac{\text{Borrowing from Central Bank}}{\text{Total Assets}} \quad (\text{cbta})$$

$$\frac{\text{Bonds}}{\text{Total Assets}} \quad (\text{bdta})$$

$$\frac{\text{Net Interbank Liabilities}}{\text{Total Assets}} \quad (\text{ibta})$$

As we have already seen a bank can fund itself through deposits or other short-term or long-term instruments. Non-deposit funding are considered more long-term financing, even if the term is very short as in the case of overnight interbank accounts. Non-deposit funding is also generally excluded from explicit deposit insurance schemes like the ones mentioned earlier. Therefore, providers of non-deposit funding, theoretically have an incentive to monitor bank liquidity and solvency and could withdraw their financing more rapidly than depositors if doubts about bank stability arise.

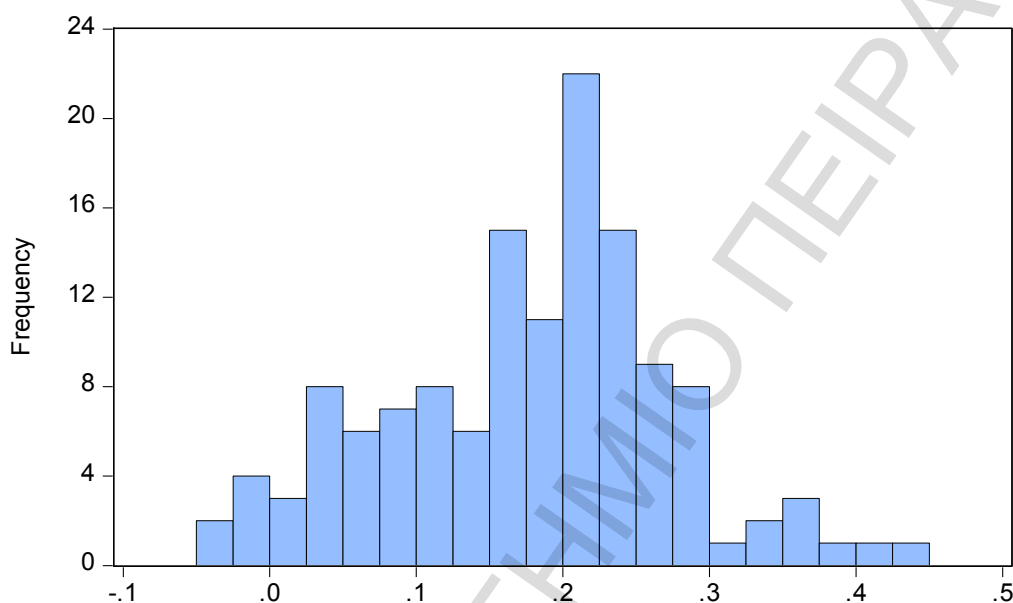


Figure 1 – Wholesale funding share (cbibbdta) distribution. The sum of central bank borrowing plus net interbank funding plus bonds over total bank assets. The horizontal axis represents intervals of the wholesale funding share. Data are obtained from the OECD Bank Profitability Financial Statements of Banks 2010 database.

We used (cbibbdta) as the most comprehensive proxy for the relative importance of a bank's wholesale funding. Net interbank funding (ib) was calculated by subtracting interbank deposits from interbank liabilities. Fig. 1 plots the frequency distribution of the wholesale funding share for the overall sample in 24 intervals sized 0.025 between -0,1 and 0,5. The distribution of the wholesale funding share peaks for values between 0.2 and 0.225. The majority of the banks seem to rely on wholesale funding between 0 and 30% with few relying over 30 and up to a maximum of 45% of total assets for the time period of observation. The overall sample mean of the wholesale funding share is 0.178. This distribution is considerably more skewed to the right than those

appearing in similar articles in the literature. (Demirguc-Kunt & Huizinga, 2010) There is a significant number of banks with wholesale funding shares between 30 percent and 45 percent.

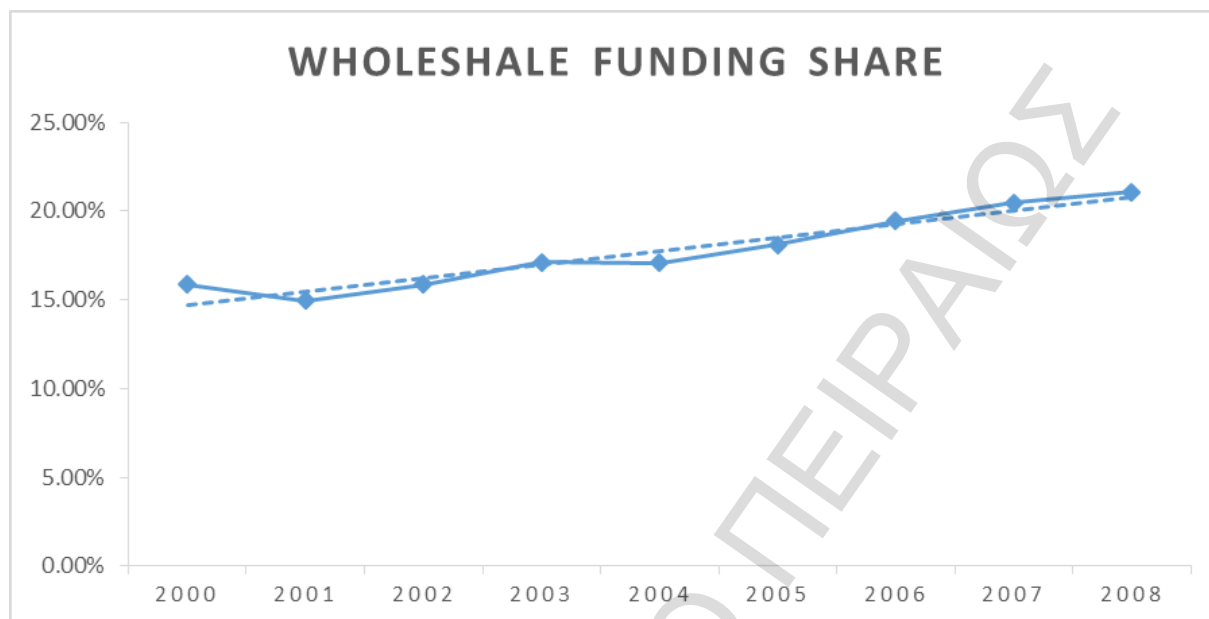


Figure 2 – Trend of wholesale funding share (cbibbdta). The wholesale funding share is the sum of central bank borrowing plus net interbank funding plus bonds over total bank assets. This figure displays the trend of wholesale funding share from 2000 to 2007 for Eurozone OECD countries from 2000 to 2008. The wholesale funding share data are yearly averages. Data are from the OECD Bank Profitability Financial Statements of Banks 2010 database.

Figure 2 shows that the overall trend in the wholesale deposit share has been on an upward trend over the 2000 to 2008 period, rising from 14.96% in 2001 to 21.07% in 2008. This signifies a 40% increase in the Eurosystem banking network in the 7 year period leading up to the crisis. This is consistent with the frequent allegation that non-deposit funding was a factor in the recent financial crisis.

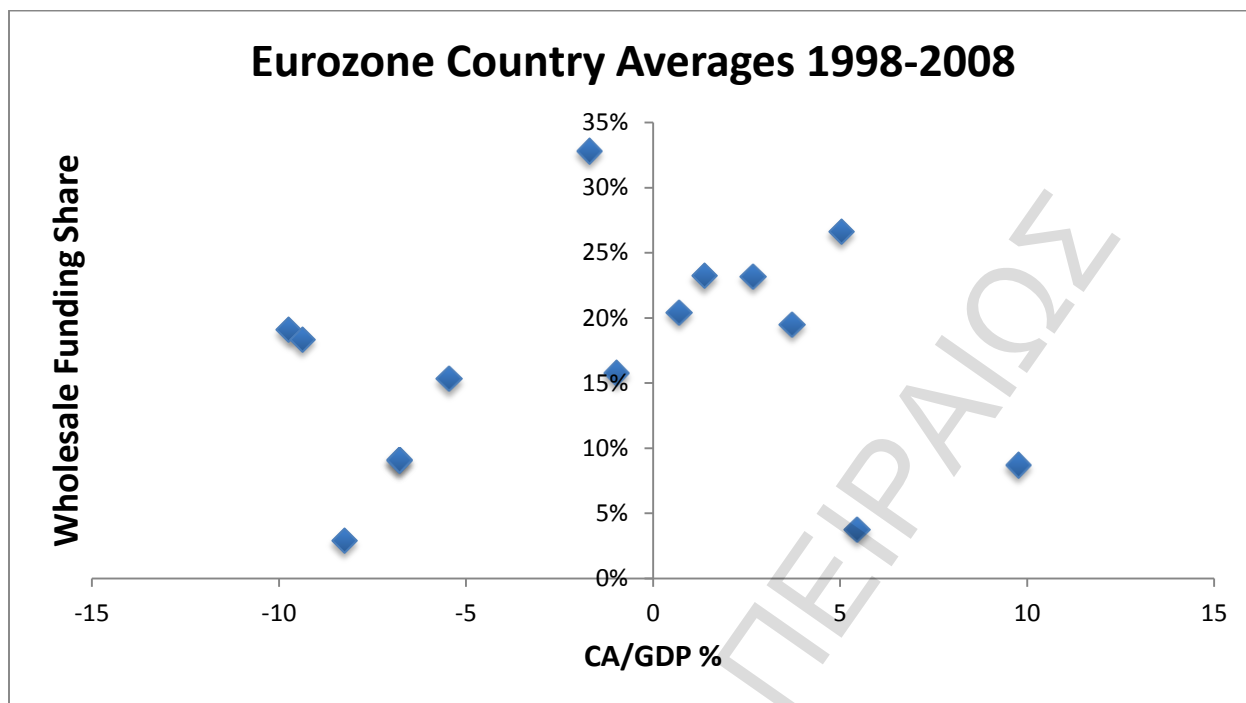


Figure 3 - Scatterplot of the 15 Eurozone members wholesale funding share and current account balance as percentage of GDP averages for the 1998-2008 decade. The graph suggests a positive correlation between current account balance and wholesale funding share (cbibbdta). The wholesale funding share is the sum of central bank borrowing plus net interbank funding plus bonds over total bank assets

The first strongest indication for an existing correlation between current account deficits and bank funding comes from Figure 4, which reflects the relationship between current account balance as a percentage of the GDP and the increasing need for external financing in order to the expanding aggregate Eurozone current account deficits in the eight years leading up to the crisis.

The bank funding metric trend that mirrors most accurately the current account trajectory is the aggregate sum of interbank and central bank funding share of total bank assets. One logical explanation is that both of these funding modes are interchangeable with the interbank market reacting more rapidly to worsening macroeconomic condition than the lender of last resort.

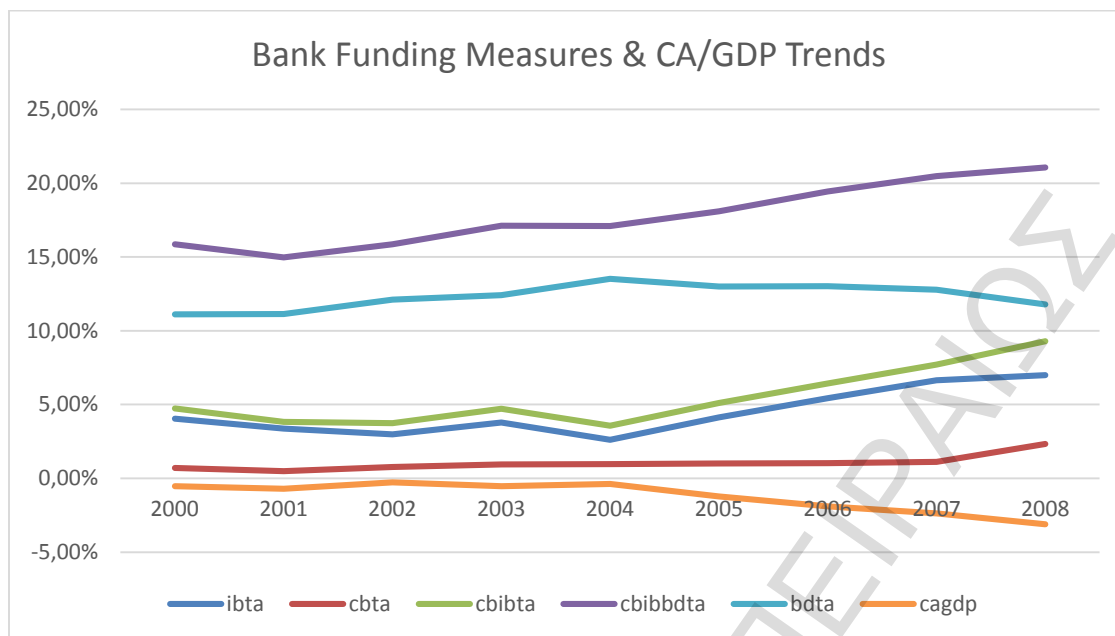


Figure 4 – Bank Funding Share Measures and Current Account / GDP percentage trend over time. Ibtta - is net interbank funding over total bank assets, cbta - is central bank borrowing over total bank assets, cbibta - is central bank borrowing plus net interbank borrowing over total assets and bdta is bonds over total assets.

The fact that the current account balance as a share of the GDP and central bank borrowing are inversely analogous and mirror each other's trends shows a strong indication of correlation, again as we stressed earlier a logical explanation for this correlation could be that when a country's banking system has cash outflows in the form of current account deficits it needs external financing to offset those cash outflows. Another interesting observation comes from the declining trend of bond funding in the two years leading up to the crisis.

Table 2 Correlations of Current Account balance as a percentage of gross domestic product with bank funding measures. *Ibta* is the share of net interbank borrowing in total bank assets. *Cbta* is the share of central bank liabilities as a share of bank assets. *Bdta* is the share of bond liabilities over total assets. *Cbibta* is the sum of central bank and net interbank borrowing over total assets. *Cbibbdta* is the share of the sum of central bank borrowing interbank borrowing and bond liabilities over total assets. *, ** and *** denote significance at 10%, 5% and 1% respectively.

Variable	ibta	cbta	bdta	cbibta	cbibbdta	cagdp
Ibta	1					
Cbta	-0.3435***	1				
Bdta	-0.0232	-0.1474*	1			
cbibta	0.9835	-0.1687*	-0.0525	1		
Cbibbdta	0.7397	-0.2390***	0.6415	0.7324	1	
Cagdp	-0.341054***	0.1159	0.301443***	-0.3325***	-0.0499	1

Table 2 reports the correlation coefficients between a bank's non-deposit funding shares and its sovereign's current account balance. A country's current account balance and its banks net interbank borrowing and central bank borrowing as share of total assets have a negative and significant correlation coefficient of -0.34 and -0.33 respectively. Thus banks that operate in regions with current account deficits tend to borrow more from the interbank markets and the central banks. Next the correlation between current account as a share of GDP and bond liabilities, is 0.30 and statistically significant which shows that countries that operate in regions with surpluses tend to have access to long term stable borrowing. Finally, interbank borrowing has a negative and significant correlation with central bank borrowing of -0.34.

In subsequent analysis we make use of a number of control variables these controls are various bank characteristics and characteristics of the macroeconomic and institutional environment that have been well documented in past research and can be expected to affect a bank's funding mix.

Bank returns are proxied by the return on equity (roe). As measure of risk we use the z-score (zscore), which is calculated by the number of standard deviations that the return on assets has to fall to lead the bank into insolvency. It is constructed as the sum of return on assets and the mean equity to assets ratio divided by the standard deviation of the return on assets. Both measures have been found to be correlated to bank default and wholesale funding measures (Bologna, 2011), (Dinger & Craig, 2013). The z-score is positive and inversely proportional to the probability of insolvency. We include the ratio of deposit money bank claims on domestic nonfinancial real

sector (as defined above) to the sum of deposit money bank and central bank claims on domestic deposit money bank assets over gdp (dbagdp) and the accounting value of bank's net interest revenue as a share of its interest-bearing -total earning- assets (netintmargin). Both have been found to be related to a bank's ability to draw funds from the interbank market, bond markets and the central bank (Jeong, 2009), (Norden & Weber, 2010) respectively. All the previous data were collected from the World Bank's Financial Structure and development database. We also used the government bond – money market interest spread. Government bond interest rates were extracted from the IMF International Statistics Database and money market rates from Eurostat. Finally we included the Frazer Institute chain summary index, as a proxy for institutional environment and market freedom. Both variables have been found statistically significant in their relationship with bank funding in past research (Demirguc-Kunt & Huizinga, 2010).

Table 3 Control Variables used and their sources.

Code	Variable	Description	Sources
Cbta	Central Bank Funding Share	Central bank borrowing to total assets	OECD
cbibta	Central Bank and Interbank Funding Share	Sum of central bank borrowing and net interbank liabilities over total assets	OECD
cbibbda	Wholesale Funding Share	Sum of central bank borrowing, net interbank liabilities and bonds over total assets	OECD
Bdta	Bond Funding	Bond liabilities over total assets	OECD
lbta	Interbank Liabilities	Net interbank liabilities over total assets	OECD
cagdp	Current Account Balance Percentage	Current account balance divided by GDP percentage	OECD
dbagdp	Loans Ratio	Claims on domestic real nonfinancial sector by deposit money banks as a share of GDP, calculated using the following deflation method.	World Bank
netintmargin	Net Interest Income	Accounting value of bank's net interest revenue as a share of its interest-bearing (total earning) assets.	World Bank
roa	Return on Assets	Pre-tax profits divided by assets	World Bank
Zscore	Bank Risk	Z-score is estimated as $(ROA + equity/assets) / sd(ROA)$; $sd(ROA)$ is the standard deviation of ROA	World Bank
gbymmr	Bond Spreads	Government Bond Yield minus Money Market Rate	Eurostat, IMF
Fcsi	Economic Freedom	Fraser Institute Chain Summary Index	Fraser Institute

6. Methodology

In the present thesis we perform a panel data analysis. Our data comprises both time series and cross-sectional elements. We observe data we believe to be related to a bank's ability to raise funding over the period of 9 years. Econometrically, our setup is described as:

$$y_{it} = c + bx_{it} + u_{it}$$

Where y_{it} is our dependent variable, c is the intercept term, b is a $k \times 1$ vector of parameters to be estimated on the explanatory variables and x_{it} is a $1 \times k$ vector of observations on the explanatory variables, $t=1, \dots, T; i=1, \dots, N^2$

Our pooled regression involves estimating a single equation in the usual fashion using on all data together, so that the dataset for y is stacked up to a single column containing all the cross-sectional observations and all of the explanatory variables are stacked into single columns in the x matrix.

The panel of data enables us to address more complex problems than we would be able to address with a plain time series or plain cross-sectional data alone. More importantly we are able to observe how the variables or the relationships between them change over time. Combing both cross-sectional and time-series data, we are able to increase the number of degrees of freedom and the power of the test, by employing information on the dynamic behavior of the 15 Eurozone at the same time. The additional variation introduced by combining cross sectional and time series data may also help mitigate problems of multicollinearity that may arise if the time series were modeled individually. By including country fixed effects in our estimation we capture time-invariant country traits. Lastly by structuring the model in an appropriate way, we can remove the impact of certain forms of omitted variables bias in regression results.

In summary this thesis contributes to the existing research in this area by showing the trends of funding shares and current account balance for a sample of aggregate data for the banks in the Eurozone area leading up to the 2008 financial crisis investigating how bank and country level

factors are correlated with these share and analyzing the relations between funding ratios and with current account data. Our results have important policy implications for the debate on fiscal responsibility.

7. Results

Table 4 reports results of regression with the sum of central bank borrowing, net interbank liabilities and bonds over total assets (*cbibbdta*) as the dependent variable. The regressions include country fixed effects. Our model appears to explain 88 percent of the wholesale bank funding variability based on the adjusted R-squared statistic. The current account over GDP ratio obtains a negative coefficient of 0.039 that is statistically significant. Thus banks that operate in countries that operate in countries with current account deficits tend to rely more on non-deposit wholesale funding from the central bank, interbank markets and bond financing.

Table 4 Wholesale funding and Current Account to GDP ratio. Wholesale funding is expressed as the ratio of the sum of central bank borrowing, net interbank deposits and bonds over bank total assets. We use one period lag of the Current Account over GDP ratio as well as wholesale funding ratio. The data for these variables are obtained from OECD databases. We estimate those regressions using country fixed effects. Probabilities denote statistical significance levels.

Variable	Coefficient	t-statistic	Probability
Wholesale Funding (t-1)	0.647797	8.434885	0.0000
CA/GDP % (t-1)	-0.003901	-2.509450	0.0137
C	0.064517	4.864666	0.0000
Adjusted R-Squared	0.881094	Durbin Watson	1.719209

$$\begin{aligned}
 cbibbdta = & c_1 \times cagdp + c_2 \times dbagdp + c_3 \times fcsi + c_4 \times gbymmr + c_5 \times netintmargin \\
 & + c_6 \times roa + c_7 \times zscore + c_8
 \end{aligned}$$

Table 5 – Net interbank deposits and bond spreads. Net interbank liabilities is defined as the ratio of interbank assets minus interbank liabilities over total bank assets. We used one period lag of net interbank deposits in the regression. The data for the bank level variables are collected from the OECD database. Data for calculating bond spreads were extracted from Eurostat and IMF databases.

Variable	Coefficient	t-statistic	Probability
Net Interbank Deposits (t-1)	0.782503	10.45278	0.0000
Bond Spreads	-0.009861	0.003437	0.0050
C	0.064517	0.005562	0.0001
R-Squared	0.884899	Durbin Watson	1.961462

Next, the regression in table 5, relates net interbank borrowing with sovereign bond spreads. The net interbank borrowing share is estimated to have a negative and significant coefficient of 0.009861 to suggest that banks within sovereigns with large bond spreads have trouble borrowing from the interbank market. This is consistent with finding in past research (Le Lesle, Bank Debt in Europe: "Are Funding Models Broken?", 2012).

8. Conclusions

The main contribution of this thesis is to provide evidence on how sovereign macroeconomic conditions affect the domestic bank financing mix. Our basic regressions suggest that current account deficits force local banks to rely more on funding from the interbank market, bonds and central bank rather on deposits and possibly making them more vulnerable to future deterioration of the financial environment. Our initial hypothesis, that current account deficits are positively related to bank wholesale funding on a country level, which was consistent with past findings, was proven.

Structurally, banks rely more on wholesale funding than the used to in the past: banks facing a funding deficit become net interbank borrowers while others that benefit from stable funding surplus (mainly deposits) become net interbank lenders.

The decreasing ability of banks to attract deposits and the substitution of deposits by interbank liabilities represent provides an explanation for declining net interest result for retail banks with a funding deficit.

Due to the structural changes in bank funding and to the increase in the variety of financial intermediaries that are a part of the interbank market, there is a strategic need for alternative funding means for retail banks.

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