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Adrià Rodríguez Porras

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Univ. Prof. Gerhard Sorger

Abstract

This thesis examines methodically the three mainstream theories that try to explain the money creation role of commercial banks in nowadays society, since their inception until today. In the intermediation model banks act merely as mediators between savers and borrowers, in a process that requires accumulation of real resources prior to lending; the credit creation theory sustains that banks create deposits every time they accept a lending opportunity, and that they can do so instantly only limited by their search for profitability. The third view believes that the whole banking system acts as a collective unit, and that through a money multiplier mechanism the decisions of the Central Bank directly affect the volume of the money supply. Using pre-existing empirical exercises we reach the conclusion that a series of unanticipated shocks result in much greater effects for the real economy, in magnitude and speed, under the assumptions of the credit creation view than with the other two theories. This is in fact more in line with historical data than the outcomes from the other two alternatives. As a consequence, we believe that the incorporation of the “better” theory in current and future macroeconomic models would result in substantial forecast improvements.

Key words: commercial banks, money creation, Intermediation of Loanable Funds, Financing through Money Creation, Deposit Multiplier, macroprudential policy, capital regulation.

CURRICULUM VITAE

Name: Adrià Rodríguez Porras

Address: Ettenreichgasse 26, Tür 9

1100 Wien

Date of birth: 15.10.1989

Place of birth: Barcelona, Spain

Mobile phone: 06504421531

E – Mail: adria.rodriguez01@gmail.com

Academic Studies:

September 2013 – June 2017: Master in Quantitative Economics, Management and Science, at Uniwien

January 2010 – 6 Months: Erasmus in Oslo (Norway), language learnt and all exams passed

2007-2011: Bachelor in Macroeconomics, in English, at the Universitat Pompeu Fabra in Barcelona

1999-2007: High School in Col·legi Badalonès C.E.

Languages:

Spanish and Catalan (native), English (C1-level), German (C1-Level), Portuguese (B1-Level), Norwegian (B1-Level).

Job experience:

June – August 2007: „Greyt Asesores“, company for accounting and tax advice

August – November 2009: „Dia Supermercados“, salesperson in a supermarket

January - June 2010: Spanish Teacher Assistant in „Norwegian School of Management“

November 2011-January 2012: Point-Of-Supply-Manager for Nestlé España

April – October 2012: Feinkost (Delikatessen) seller in Billa

November 2013 – June 2014: Assistant in PACE Project, IHS

September 2015-February 2016: Internship in OMV AG at the department „Competitive Intelligence“

March 2016 – Today: Junior Analyst in Erste Bank AG, at „Equity Research“

Additional information:

Driving license: A1, B

Computer Knowledge: Word, Excel, Powerpoint, Stata, R

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Introduction

Motivation

Currency and coins, also called “narrow money”, are only some of the ways how money can be found in nowadays economies. In fact, those means of exchange represent only a small percentage of the total broad money, while the vast majority of the money supply in any modern society consists of demand deposits at commercial banks. These deposits are customarily created by commercial banks every time they accept the granting of loans, which means that these entities have a great power (and responsibility) that has to be controlled in order to keep the money creation of a particular economy within desirable levels.

Commercial banks have therefore become important elements for policymakers who want to achieve healthy real economies, and especially since the financial crisis macroeconomic models have started to regard banks as potentially vulnerable entities. The problem now is that this renewed interest of macroeconomists arrives when old disputes still have not been settled; that is, when there still are three different mainstream currents that try to explain the way how commercial banks actually operate.

These three different theories agree on the important role that banks play in the economy, but they do not coincide in establishing the way how banks actually operate, or what’s the same: how they manage to expand the aggregate deposits in the market for all the agents. The Intermediation of Loanable Funds (we might refer to it as ILF from now on), for example, depicts banks as mere intermediaries between a saver and a borrower, while the Financing through Money Creation theory sustains that banks can create money “out of nothing”. The third theory, the Deposit Multiplier, grants much power to the Central Bank, until the point when it believes that the policy measures can directly control the money supply. In further chapters of this thesis we will go through the particularities of each of these theories more in detail.

If these differences were not enough, there are also huge inequalities in how these theories have been promoted and established as truthful or not. Papers, journals, textbooks and almost every macroeconomic model developed nowadays are strongly based on one of these theories, the Intermediation of Loanable Funds, while the other two methods have seen their importance reduced. Then we asked ourselves: what if the prominent theory failed to explain correctly how banks create money, therefore leading to imperfect formulations and predictions? That is exactly what some recent authors like *Jakab and Kumhof (2015)* and *Faure and Gersbach (2014)* argue: that the Intermediation of Loanable Funds presents important deficiencies that can lead to substantial prediction errors when applied to the real world.

All of these issues seemed like an interesting research topic for a paper. On that account, this master thesis tries to throw some light upon the different versions of commercial banks, with the hope that after the research some (or all) the questions asked here can be finally answered with more clarity.

Approach

To discuss all these questions and investigate about the origins and evolution of the different theories of commercial banking, the methodology in this master thesis was a detailed analytical review of relevant literature in all possible forms: journals, papers, textbooks and articles. The earliest documents analyzed date back to the mid 19th century and cover practically every decade since then.

The research question was to find out everything possible about each of the three models of commercial banking, focusing on their origins, evolution and the opinion that different authors and scholars had towards them in every point of time. The aim of this research was to determine which of the theories presents more veracity, who and why supported each of them and decide if there is indeed a “better” explanation compared to the others, or if all three are valid in a way.

For the empirical part of this thesis some recent works were used, where DSGE models were developed in order to check the responses of the agents in the economy to external shocks, and how they vary for one scenario or the other. The most important sources of knowledge for that purpose were, amongst others, the 2016 paper from Collard, Dellas, Diba and Loisel named “*Optimal monetary and prudential policies*”, the 2014 paper from Faure and Gersbach with the title “*Money creation, monetary policy and capital regulation*” and above all the 2015 paper from Jakab and Kumhof “*Banks are not intermediaries of loanable funds - and why this matters*”.

Main insights

The analysis of relevant literature and the three different models produced several main conclusions. First, the Intermediation of Loanable Funds model is indeed a deficient explanation of how commercial banks work; the prominent role it has achieved in specialized literature, probably due to its simplicity, is not justified once we see the inaccurate predictions it produces when used in macroeconomic models. Examples show how for both monetary and non-monetary transactions no aggregate deposits are created by banks by simply acting as intermediaries between savers and borrowers.

Second, the Financing through Money Creation is a more plausible way that also achieves what the other two theories don't: money is created by banks through the act of lending. This theory is the oldest of the three, as it was created in the middle of the 19th century, and nowadays its importance is being reconsidered as the flaws of the ILF version have become more apparent. At the same time, it succeeds in showing why banks have such a special role

amongst financial intermediaries due to regulation.

Third, the Deposit Multiplier view of banking is essentially wrong in many aspects. The money multiplier is a nice concept for starters, but this theory of commercial banking gives too much power to the Central Bank and some of its premises are not correct. For instance, the policies of the Central Banks do not target money volumes but the “price” of money, and bank reserves cannot be lent to non-bank agents. These and other reasons are why this theory of commercial banking has fallen out of favor lately, despite having been depicted in relevant literature as the ultimate explanation for money creation until very recently.

Last, from the two remaining theories, the Financing through Money Creation (alternatively mentioned as FMC) is the one that predicts results that fit better what we find in the real world. This conclusion was reached thanks to the application of a series of shocks implemented in different DSGE models where the only difference between the ILF and the FMC settings was the way how banks lend capital: accumulating deposits in the former, and spontaneously lending in the latter. The experiment clearly showed that with the application of FMC scenarios in macroeconomic models, more accurate predictions and policies could be attained.

Structure of the paper

The master thesis is organized as follows. In Chapter 1 the reader can find a detailed explanation of the Intermediation of Loanable Funds theory, starting with its inception and providing two examples: one with a cheque deposit transfer, and one with a non-monetary transaction. Chapter 2 deals with the Financing through Money Creation theory, where we find an in-depth description of the mechanism and two further examples: one monetary and another one conceived to show the differences between commercial banks and other financial intermediaries. The third Chapter discusses the Deposit Multiplier method, explains in detail how the money multiplier mechanism works under a fractional reserve system, and reproduces the process in an example, before concluding the section with an elaborated critique meant to repel any possible defenders of that view of banking.

Each of the aforementioned chapters provides references from famous authors and practical examples to better illustrate the functioning of the models. Chapter 4 includes a detailed description and analysis of a simulative exercise performed by Zoltan Jakab and Michael Kumhof in their 2015 paper “*Banks are not intermediaries of loanable funds - and why this matters*”. To be precise, our analysis revolves around their empirical comparison between the Intermediation of Loanable Funds and the Financing through Money Creation models, where DSGE models are developed to test the reaction of the agents under particular shocks depending on whether banks function in the ILF or the FMC way. The last chapter concludes the master thesis by giving some overview about potential applications of the findings. At the very end of the thesis there is also a list of the formulas and notation used, should the reader need to refer to them.

Chapter 1

The ILF model

The starting point of this paper’s money creation description could not be other than the intermediation of loanable funds (ILF) model, the prevailing view amongst mainstream economists. Taught in most money and banking courses as the standard way of money creation, truth is that this simplistic description of how commercial banks create money is inaccurate and closer to fantasy than one could expect. How can economists make meaningful policy contributions in times of distress when they haven’t been provided with the right tools and understanding of such a capital issue as money creation?

Some heterodox economists argue that the real world does not seem to operate under the constraints observed in most of the literature. In following chapters we will offer insights into the model’s assumptions, implications, how it operates and its deficiencies. After that, we will test the effect of shocks under different scenarios, and use the results to give suggestions for improvement.

1.1 Origin of ILF

Let’s go a little bit back in history. The establishment of the ILF view dates back to the fifties, when two American economists, J.G. Gurley and E.S. Shaw, introduced a distinction between intermediated and direct debt that contradicted the work of important scholars at the level of Keynes and Schumpeter.

In two of their conjoint papers, Gurley and Shaw (1955, 1956) reduced the role of banks to that of simple intermediaries, and their liabilities to just another form of debt. With this replacement of the distinction between banks and other non-financial intermediaries (which, as opposed to banks, cannot create their own funds through the act of lending) they inflicted serious damage on the general understanding of how banks create money.

Although the authors immediately received criticism from their contemporary colleagues, e.g. Culbertson (1958) and Smith (1959), the fact that a prominent economist such as James Tobin backed up their contribution helped the ILF model to become the new dominant representation of the money creation process by commercial banks. In his 1963 paper *Commercial Banks as Creators of “Money”*, Tobin explicitly argues against the FMC view, the main alternative to the ILF model.

A more detailed explanation of Tobin's paper can be found in an upcoming section. For the moment, it is important to note that the analysis of the monetary functions of banks started losing importance and presence in the literature by the end of the 60s, allowing the ILF view to stay as the dominant paradigm until these days.

1.2 Description of ILF

"The banker with a worm eye's view says he lends only the money depositors entrust to him"

Tobin, J., "Commercial Banks as Creators of "Money"" (1963), page 1

According to this view of the banking universe, lending starts with banks first receiving real resources from an external agent, a non-bank saver. Following that deposit, the bank will lend those real funds to another non-bank agent, a borrower. This intermediation of resources, which could be even qualified as simple bartering, is supposed to have increased the aggregate deposits in the whole banking system. Thus, in theory, more money should be available for being offered to non-bank borrowers in the system.

Needless to say, this bartering activity performed by the commercial bank does not result in an increase whatsoever of the aggregate deposits in the financial system. Deposits have indeed been transferred within the financial system, but with help of the following practical example we hope to illustrate why this does not contribute to any money creation.

In the following example, the bank's assets are shown on the left side of each balance sheet, while the liabilities can be found on the right side. The deposit itself is a liability owed by the bank to the depositor, and the same logic applies to the loans. Exactly as if they were companies, the assets and liabilities of each bank - and therefore, of the whole system - must balance. These, together with the assumptions of banks having no net worth (for simplicity) and that each entity must keep an amount of at least 10% of their deposits in form of Central Bank reserves, enable us to demonstrate how a deposit transfer affects (or in this case, doesn't affect) the Banking System.

1.3 Example of how banks operate after a cheque deposit transfer, according to ILF

There exist two different commercial banks in this world, Bank 1 and Bank 2. Together they compose the total of the Banking System. Before any movement takes place in this world, the initial balance sheets look like this:

Bank 1		Bank 2		Banking System	
L1: 513	D1: 570	L2: 819	D2: 910	LT: 1332	DT: 1480
-----		-----		-----	
R1: 57		R2: 91		RT: 148	

Where each D stands for deposits, L for loans and R for Central Bank reserves. The indices 1, 2 and T refer to bank 1, bank 2 and the Total of the banking system, respectively. Please note that the sizes depicted do not correspond to the actual percentages of each entry's weight in the balance sheets.

We will divide the whole process in steps for illustration purposes.

1. Deposit and exchange of reserves: A non-bank saver, which we will name "Depositor", gets a cheque from his boss after a month's work. The cheque has a value of 38, and the agent Depositor chooses to deposit it in his bank, Bank 1. But these 38 have to be withdrawn from the Bank of the "Boss", which is Bank 2, a different bank than that of "Depositor". These actions alter the balance sheets as follows:

Bank 1		Bank 2		Banking System	
L1: 513	D1: 570+38=608	L2: 819	D2: 910-38=872	LT: 1332	DT: 1480
-----		-----		-----	
R1: 57+38=95		R2: 91-38=53		RT: 148	

After Bank 1 has received the cheque, it creates a new deposit entry on the liabilities side. But since double-entry bookkeeping states that for every new entry there has to be a simultaneous matching, Bank 1 creates a parallel entry on the asset side for the same value.

Already at this point we can observe two interesting things: first, the balance sheet of Bank 2 decreases by the amount of the money withdrawn, while the one at Bank 1 increases by the same amount. The movement clearly affects the different balance sheets in a microeconomic perspective, but when we observe the aggregate of the Banking system – representing the macroeconomic perspective - we observe that it is not affected by this transaction. Most probably the error lies in the confusion of microeconomic and macroeconomic arguments.

2. Interbank lending of reserves: Bank 1 has now more reserves than the 10% legally required by the financial authority. These extra reserves cannot be lent to non-bank agents, because they are exclusively used to make payments between banks. Apart from higher holdings of such reserves, the only alternative Bank 1 has is to lend these Central Bank reserves back to Bank 2 via an Interbank Loan.

Bank 1 then does this: lends 34 in form of an Interbank Loan IL to Bank 2, and keeps an amount of 61 in form of reserves that allow it to still be compliant (as it now has 608 in deposits). On the balance sheet of Bank 2 this movement reflects into the IL appearing on the liability side, and a corresponding increase in reserves on the left side.

Bank 1		Bank 2		Banking System	
L1: 513	D1: 608	L2: 819	D2: 872	LT: 1332	DT: 1480
-----		-----		-----	
R1: 61		R2:			
IL1: 34		53+34=87	IL2: 34	RT: 148	

3. Final balance sheets: after the interbank loan transfer has been absorbed by both commercial banks' balance sheets, the final balance sheets in our world present the following structure:

Bank 1		Bank 2		Banking System	
L1: 513	D1: 608	L2: 819	D2: 872	LT: 1332	DT: 1480
-----		-----		-----	
R1: 61					
IL1: 34		R2: 87	IL2: 34	RT: 148	

Note: In case the reader is wondering why the sum of the two commercial bank's assets and/or liabilities does not add up to the amount expressed in the Banking System's balance sheet, the reason behind is that the Banking System does not take into account Interbank transactions. Only the sum of loans, deposits and reserves in the world is reflected there.

Conclusions extracted from the example:

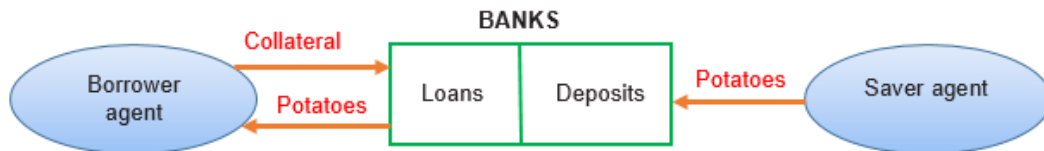
Indeed, one the most noteworthy findings from our exercise has been that at no moment of the process has the balance sheet of the aggregate Banking System varied a single bit. This proves our hypothesis that transferring deposits within the financial system does not contribute to any money creation.

The second takeaway is that when a commercial bank finds itself with more reserves than it needs to abide by the legal requirement, we could maybe expect the lending of that bank to indirectly increase, therefore increasing lending in aggregate. But even if this indirect, hypothetical effect of the reserve transfer was true, the opposite would then happen to its counterpart, the bank with less reserves now. The aggregate level of lending would, in the end, not likely change because the overall amount of reserves had not suffered any variation.

Under the ILF model of banking, a commercial bank is simply unable to increase lending to non-bank borrowers after having received a deposit and the corresponding Central Bank reserves. This constraint could be solved if it was allowed to create new deposits through lending, like in the FMC model discussed in the next chapter.

We saw how the ILF view failed to explain money creation with a cheque deposit. From that we infer that with a cash deposit the same conclusion would be reached, because cash can only be withdrawn from an existing electronic deposit, leading us to the same situation. Also, cash accounts form a very small amount of the modern money stock, and such an exercise doesn't provide much practical value. In the end the only remaining alternative to explain money creation by ILF banks would be with deposits of physical goods, which is exactly what we try in the subsequent section.

1.4 Example of non-monetary transaction under ILF view:



As we can see in this example, the Saver agent (typically represented by a household) goes to the bank to deposit certain amount of potatoes that he has produced in excess during a period. At the same moment the bank records this new deposit of potatoes for the Saver agent, the double-entry bookkeeping forces the bank to record a matching entry on the asset side. It will do so by creating an entry on the left side, to reflect the increase in the Inventory of potatoes. The balance sheet of the banks looks like this at this point:

Bank	
Previous Loans	Previous Deposits
Inventory of potatoes	New deposit of potatoes

What happens next? We can assume that another non-bank agent, which we will name Borrower, goes to the bank looking for a loan because he wants to buy a dog. If the bank considers that Borrower has enough creditworthiness, usually checked after the provision of certain Collateral, they might approve the loan. Now the problem comes: in this ILF model with real goods the loan is going to have to be in potatoes, which is what the previous Saver agent deposited before. Then the bank does the following:

Bank	
Previous Loans	Previous Deposits

New loan of potatoes (to Borrower)	New deposit of potatoes (by Saver)

A new loan in the form of potatoes has been provided to the Borrower, and it takes the places of the Inventory of potatoes in the asset side of the bank's balance sheet. Borrower 1 leaves the bank with his newly acquired potatoes, but since what he wanted was a dog, he is now going to have to search for another agent, either bank or non-bank, which owns a dog and is willing to exchange it for potatoes.

In the end the bank has intermediated loanable funds in the form of potatoes. This situation is not optimal, especially for the Borrower, since it is still left with the necessity of further looking for a solution. Whenever the transactions are done with real goods, the role of banks reduces to simple bartering – and, unless the person interested in borrowing is looking for exactly the same good that the Saver deposited in advance (it has to be in this order), the transaction does not translate in any improvement for the parties.

This example is essentially non-monetary, and the ultimate purpose of the transaction can only be satisfied with goods against goods. The commercial bank becomes nothing but a bartering institution, which obviously cannot be applied to reality. What's more, there is no money creation in any stage of the process. With all, we can safely say that the ILF view of money creation by commercial banks presents notorious deficiencies all along the process.

1.5 The ILF view of banking and its consideration amongst influential scholars

1.5.1 ILF in the early 20th century

Despite today's dominance of the theory that describes banks as intermediaries of funds, after over 40 years of discussion there is still a division of opinion amongst world's top economists. Many leading authors and scholars avoid to voice their opinion on the issue, while a bunch of them have even given their support to one theory or another at different points of time, although they are mutually exclusive. In this section we will state what some of the most influential authors have shared on the ILF model of money creation by commercial banks.

The first economist who referred to banks' intermediation role was no other than Ludwig von Mises, the prominent classical liberalist from the Austrian School of thinking. In his book *"The Theory of Money and Credit"* from 1912, during an extensive description of the functions and roles of banks he mentions the following:

"The activity of the banks as negotiations of credit is characterized by the lending's of other people's, i.e., of borrowed, money. Banks borrow money in order to lend it; ... Only those who lend the money of others are bankers; those who merely lend their own capital are capitalists, not bankers"

"It is just the existence of this (credit) risk which makes it worth while for the bank to play the part of an intermediary between the granter of credit and the grantee of it"

L. von Mises, "Theory of Money and Credit" (1912), pages 262-263

The Austrian economist was of the opinion that banks could act in two different ways: when they acted as financial intermediaries, this would not allow them to create money; but they could stop behaving as financial intermediaries and function as creators of money supply. Although this seems a bit hard to imagine in terms of bank accounting, his legacy prepared the ground for the ILF and also the DM theories of banking.

Before jumping to the Keynesian authors, we would like to mention Edwin Cannan, who said the following in 1921:

"The most abandoned cloakroom attendant cannot lend out more umbrellas or bicycles than have been entrusted to him, and the most reckless banker cannot lend out more money than he has of his own plus what he has of other people's... The extent to which he can borrow in this way limits the extent of his lending"

Cannan, E., "The meaning of bank deposits" (1921), page 31

1.5.2 The Keynesian view

Another very influential personality who tried to describe the ILF view of banking was the founder of the Keynesian Economics, John Maynard Keynes. In his 1936 book “The General Theory of Employment, Interest and Money” he defines saving and investment the following way:

“Saving is that part of the income of a period which has not passed into consumption... By current investment we mean the addition to the value of the capital equipment which has resulted from the productive activity of the period – this is, clearly, equal to what we have just defined as saving”

*Keynes, J. M., “The General Theory of Employment, Interest and Money”
(1936), page 46*

Although the British economist was at times in favour of the other two theories of money creation, from his statements it can be deduced that he considered savings to be the first step for investments to take place, which could be similarly applied to the money creation process. This line of thought is in consonance with the ILF model of commercial banking: an excess of income over expenditure of consumption must be brought to the bank by a saver agent in form of deposits, in order for loans to be made.

Keynes was the first author from the Keynesian School of economics who dealt with the ILF model of banks as financial intermediaries, but he was not the only one. His work was supported by economists such as Harrod (1939) and Evsey D. Domar (1947). The conclusions of Keynesian economists were widely used for monetary policy decisions after World War II. Interpretations of their work was the reason why international banks started providing lending to developing countries which couldn't generate domestic savings after the war, hoping to foster economic growth in those areas. For them these newly available loans were the basis for money creation in war-torn countries, from which re-lending could contribute to money creation. We consider important to mention that the only clear results from these policies were high levels of indebtedness and an increase in international borrowing by developing countries in the years following the war.

1.5.3 The work of Gurley, Shaw and Tobin

These three authors belong also to the Keynesian school, but they were so important for the ILF model of banking that they deserve a section on their own.

As we briefly mentioned in the beginning of this chapter, J. G. Gurley and E. S. Shaw wrote in the fifties a series of papers together that became very popular. In them, the revolving topic was the blurring of the lines traditionally separating banks from other financial intermediaries, drawing the distinction between direct and intermediated debt instead. Here is for example an extract of what they think about different regulatory requirements for banks and non-banks:

“A monetary authority which is tempted to stay within the bounds of its traditional controls because they are quantitative, general, and impartial, may find itself more and more out of touch with credit developments in critical growth areas where lending by nonbank institutions is predominant”

Gurley, J., and Shaw, E., *“Financial Aspects of Economic Development”*
(1955), page 537

This extract illustrates how both authors considered other financial intermediaries as capable as banks of creating credit. They also suggested these other agents exert more influence on the optimal rate of money supply than it was previously thought. Their views on the credit creation process were ground-breaking at that time, and their contribution was influential that it even served as a reference for modern monetary policy.

We do not need to advance much in time to find another influential economist who believed in the ILF model: James Tobin. The neo-Keynesian economist based much of his 1963 paper “Commercial Banks as creators of “money”” on the work of Gurley and Shaw, and his fame and prestige were a big reason why the ILF got established as the reigning theory for the rest of the twentieth century.

James Tobin dedicated so much effort to defend the ILF view of commercial banking that he would deserve a subsection on his own. The American economist, who was a governor of the Federal Reserve and won a Nobel Prize for Economics Sciences, heavily argued against what he named “the Old View”, which is basically a mixture of the DM and the FMC theories of banking, and expressed his support to “the new view” of banks seen as intermediaries. He refers to the authors who describe the fountain pen money process as heretics, and he agrees with the ILF ideas of blurring distinctions between money and other assets, and between commercial banks and other financial intermediaries.

The Harvard and Yale Professor believes that the essential function of financial intermediaries, including commercial banks, is to satisfy simultaneously the portfolio preferences of two types of individuals or firms: on one side there are the borrowers, who wish to expand their holdings of real assets beyond the limits of their own net worth, and on the other side we find the lenders, who wish to hold part of all their net worth in assets of stable money value with negligible risk of default. The financial intermediaries enable these different needs to meet by accepting the obligations of the borrowers as assets and the assets of the lenders as liabilities in their balance sheets.

“Any autonomous increase in the amount of financial intermediation in the economy can be expected to be, ceteris paribus, an expansionary influence. This is true whether the growth occurs in intermediaries with monetary liabilities, i.e. commercial banks, or in other intermediaries”

Tobin, J., *“Commercial Banks as creators of “money””* (1963), page 6

How can then an increase in financial intermediation result in economic growth? According to Tobin:

“... financial intermediaries assume liabilities of smaller default risk and greater predictability than their assets. Bank depositors can require payment on demand, while bank loans become due only on specified dates”

Tobin, J., Brainard, W.C., “Financial Intermediaries and the Effectiveness of Monetary Controls” (1963), page 385

The reason why financial institutions can accomplish the transformations between the nature of the obligation of the borrower and that of the asset of the ultimate lender are the expertise they possess in negotiating and collecting, a reduction of risk per dollar achieved after pooling of independent risks together, and the fact that their liabilities are guaranteed by the government. For these reasons, intermediation allows borrowers to expand their assets at lower rates and easier terms than if they had to borrow directly from the lenders.

Tobin also considers the rationale that gives a special status to banks because they “create” means of payment far from convincing. He argues that this differentiating feature is not special - there are other differentiating features, and they don’t lead to special categories - and doesn’t per se make commercial banks suitable for special analytical treatment. Like other differences, the means-of-payment attribute has its price. In the same order of things, he charges against the widow’s curse proposition, by saying:

“Quite apart from legal reserve requirements, commercial banks are limited in scale by the same kinds of economic processes that determine the size of other intermediaries”

Tobin, J., “Commercial Banks as creators of “money”” (1963), page 7

In his critique to the money creation theory, Tobin states that bank’s liabilities do not rise along with its assets when they extend a loan. They do so only for “a fleeting moment”, and borrowers do not incur debt in order to hold idle deposits any more than savings and loan shares. The reader might now wonder: how can then the banking system expand its assets? According to Tobin, there are 2 ways:

1. By purchasing or lending against existing assets. Here no increase in private wealth occurs in conjunction with the expansion, leading to no new private saving and investment.
2. By lending to finance new private investment in inventories or capital goods, or buying government securities financing new public deficits. In this case, new private saving occurs.

In neither case 1. nor 2. will there be an automatic increase in saver’s demand for bank deposits equal to the expansion in bank’s assets. Although in the second case there is an increase in private wealth, even if we assume a closed economy the community will not ordinarily wish to put 100% of its new savings in bank deposits. This is because if all new saving takes the form of bank deposits, other things cannot stay equal: the yields and other advantages of the competing assets will have to fall enough so that savers prefer bank deposits. This is a natural

economic limit to the scale of commercial banking industry, meaning that the widow's cruse will run dry at the moment when the marginal returns of lending and investing don't exceed the marginal cost to the banks of attracting and holding additional deposits.

"In a world without reserve requirements, the preferences of depositors and borrowers would be very relevant in determining bank deposits. The volume of assets and liabilities of every intermediary would be determined in a competitive equilibrium"

Tobin, J., "Commercial Banks as creators of "money"" (1963), page 10

When it comes to granting bank-created money the same status as to printing press money, the author is reluctant. For him printing press money is much more difficult to extinguish, as it would require the reversal of the budget policies that lead to its creation. For bank-created money, however, the mechanism of extinction is easier: if bank deposits are excessive relative to public preferences, banks will see that they tend to decline in order not to lose money.

The author finally says that the main differences between commercial banks and other financial intermediaries are of degree, not of kind. These differences have intrinsically little to do with the monetary nature of the bank liabilities. In truth, the differences are related to the reserve requirements and the interest rate ceilings to which banks are subject, and Tobin considers that all his propositions would be true for any other financial intermediary subject to the same kind of regulations under which banks operate. These limits give the widow's cruse certain plausibility, but even under these circumstances the scale of bank assets and deposits is affected by depositor preferences and by the lending and investing opportunities available to banks.

1.5.4 Contemporary authors' views on ILF

After Tobin's contribution we have to move 30 years in the future to find academic work addressing the issue of money creation. Already in the mid-90s we find Bernanke and Gertler, who wrote in 1995 a paper for the National Bureau of Economic Research with the title "Inside the Black Box: the credit channel of monetary policy transmission". There they mentioned the concept of "credit view" and said that the differences from banks and non-bank financial institutions (describe in their balance-sheet channel) are small:

"Despite financial reform and innovation, it remains likely that the demand for bank's managed liabilities is not perfectly elastic... but while the behaviour of interest rate spreads and terms of lending are consistent with the bank lending channel, it must be noted that they are also potentially consistent with the operation of a balance-sheet channel"

Bernanke, B., Gertler, M., "Inside the black box: The credit channel of monetary policy transmission" (1995), pages 20-21

A few years later, in the early two thousands, Kashyap, Rajan and Stein (2002) present a model of banking which worked very much as the ILF view describes: banks first acquire assets in the form of deposits (or equity, or bonds) and then buy assets with those funds:

“The total assets to be financed at date 0... are financed partly by demandable deposits... In addition to deposits, the bank can also issue claims in the public market”

Kashyap, A., Rajan, R., Stein, J., “Banks as liquidity providers: An explanation for the coexistence of lending and deposit-taking” (2002), page 9

Not only papers have supported the ILF model of banking. Influential textbooks are also advocating for the intermediation theory. One of them dates from 2005 and was written by Shelagh Heffernan, a Professor of Banking and Finance at several universities. In her book *“Modern Banking”* she wrote:

“Thus, the core activity (of banks) is to act as intermediaries between depositors and borrowers”

Heffernan, S., “Modern Banking” (2005), page 24

Her statement doesn’t leave any room for doubt. In the same order of statements, we found that Cecchetti wrote the following in 2008:

“An institution like a bank stands between the lender and the borrower, borrowing from the lender and then providing the funds to the borrower”

Cecchetti, S. G., “Money, Banking and Financial Markets” (2008), page 39

Matthews and Thompson wrote this in their *“The Economics of Banking”* book from 2005:

“Financial intermediation is a process which involves surplus units depositing funds with financial institutions who in turn lend to deficit units... the bank will collect a number of smaller deposits, parcel them together and lend out a larger sum. This is called ‘size transformation’”

Matthews, K., Thompson, J., M., “The Economics of Banking” (2005), pages 33-34

Their sentences do not leave much room for doubt: the authors clearly believe that deposits, big or small, have to enter the banking facility physically. Afterwards, they carry out size, risk and maturity transformation.

Finally, one of the latest group of academics that delved into how banks create money was Stein et al. in their 2015 paper “Banks as patient fixed-income investors”. In this paper they try to define the business model of banks in a modern economy where they have to compete against intermediaries such as “shadow banks”, which they define as intermediaries that manufacture money-like claims in a similar way as banks, but without relying on the government safety net. Here is how they define banks and their activity:

“Traditional banks are in the business of taking deposits and investing these deposits in fixed-income assets that have certain well-defined risk and liquidity attributes, but which can be either loans or securities”

Stein, C., “Banks as patient fixed-income investors” (2015), page 8

After such an extensive display of scholar opinions defending the ILF model of banking, where banks are merely seen as intermediaries, we hope that the reader can better realize the magnitude of the theory and the weight it has had for the economic literature in the last hundred years.

Chapter 2

The FMC model

In chapter 1 the reader has been introduced to the notions of the Intermediation of Loanable Funds model, where banks' role is to serve as an intermediary between saver and borrower households. Thanks to examples and insights in that view we were able to discern the main characteristics of a notion of commercial banking which found much support in the literature during most of last century.

The second chapter from our paper deals with what undoubtedly is the most popular alternative to the ILF model of commercial banking: the Financing through Money Creation model of banking. We will see how this view is not only the enjoying a decent amount of support from contemporary authors, but also provides a much more accurate description of how the money creation process actually works. This current of thought defends that each commercial bank is able to create its own funding, deposits, in a transaction that involves no intermediation whatsoever. How is this possible? Let's first get back to its commencement.

2.1 Origin of FMC

In case the reader is asking himself when did scholars start to suggest the FMC view as a viable option instead of the ILF model, let us clarify the following: this question is fundamentally wrong. Although it is tempting to think that ILF view of banking, with its popularity dating back to the early decades of the 20th century, was somehow the first to be adopted, truth is that the FMC model is even older.

Sometimes called the credit creation theory of banking, its origins date back to the middle of the 19th century. Henry D. Macleod, a Scottish economist and one of the founders of institutional economics, tried to emphasize the importance of analysing all the different aspects of the banking world altogether. In his 1856 book *Theory and Practice of Banking*, the author coins what later would become a basis for the Financing through Money Creation theory, creating first a theory of credit as a base for a theory of money and not the other way around.

In spite of the fact that Macleod failed to achieved recognition, a consequence that Joseph Schumpeter attributed to *"his inability to put his many good ideas in a professionally acceptable form"* (History of Economic Analysis, page 1115), Macleod's legacy was widely disseminated by posterior authors such as Withers (1909) and Schumpeter himself (1954). As we

commented in the previous chapter, it was not until the fifties when Gurley and Shaw introduced their new model proposition; since then, the acceptance of the FMC amongst scholars diminished. It is finally now when a revival seems to be taking place.

2.2 Description of FMC

“Banks do not take deposits of existing money from savers and lend it out to borrowers: they create credit and money ex nihilo – extending a loan to the borrower and simultaneously crediting the borrower’s money account”

Lord Adair Turner, former head of the UK Financial Services Authority, 2013

In rough terms, this view of the banking universe sustains that banks are not financial intermediaries. The advocates of this model believe that, as opposed to the ILF model of banking, the saver going to the bank to leave a deposit is not the beginning but rather the end of the money creation process. Moreover, it is not necessary that anybody leaves his money or goods in advance in the bank premises.

According to the FMC model of banking, the story begins with a borrower going to a bank to ask for a loan. If the bank accepts the contract, it will make the money available to the borrower and enter the loan as a new asset in its balance sheet, while at the same time matching the entry on the liability side with an equally big deposit. Both entries will be in the same name, that of the borrower. No other agent apart from the borrower and the bank has intervened in the transaction, therefore it cannot be said that there has been any intermediation.

The money given by the bank to the borrower might potentially travel along the financial system in different ways, but the essence of the theory is that in fact the money has been created out of thin air. In a similar example to the one we used in chapter 1, we try to illustrate how this credit creation by banks actually achieves what the ILF claimed to do: it increases the aggregate deposits in the financial system.

2.3 Example of how banks create money according to the FMC view

The first thing we need in our setting is a non-bank agent who we name Borrower. Imagine the Borrower as a person who just got a job and needs a motorbike to drive to work every day. What this agent does is what most people in his situation would do: he goes to his bank (Bank 1) and asks for a loan. At this point of time, before any transaction has taken place, the initial balance sheets in this economy (which for simplicity consists of only Bank 1 and Bank 2, exactly as in Chapter 1) look like this:

Bank 1		Bank 2		Banking System	
L1: 1,287	D1: 1,430	L2: 1,593	D2: 1,770	LT: 2,880	DT: 3,200
-----		-----		-----	
R1: 143		R2: 177		RT: 320	

Where D stands for deposits, L for loans and R for Central Bank Reserves. The latter is because banks have to keep a certain percent of the deposits as reserves, and in our example we made this be 10%. The third balance sheet can be obtained by adding the corresponding elements of each individual bank.

1. Granting the loan: now Bank 1 faces a choice: to grant the loan or not. For our scenario, we will imagine that this person has a good credit history and that he always returned every loan in the past. This, together with the fact that he will soon start earning a regular amount of money from his new job convinces the bank to grant a loan of 300 monetary units (the value of a new motorcycle) to the Borrower. The process affects the Balance Sheets of the economy in the following fashion:

Bank 1		Bank 2		Banking System	
L1: 1,287+300 -30=1,557	D1: 1,430+300= 1,730	L2: 1,593	D2: 1,770	LT: 3,150	DT: 3,500
-----		-----		-----	
R1: 143+30 =173		R2: 177		RT: 350	

Bank 1 has expanded both his assets and liabilities by an amount of 300 units. They do so by crediting the Borrower's bank account with a bank deposit of 300 units, at the same time when they expand the assets with the new loan of 300. After that Bank 1 immediately allocates 30 monetary units from Loans to Reserves, in order to be compliant with the legal requirements.

A remarkable thing in this exercise is that, as opposed to the ILF example in chapter 1, here we already see an increase in the aggregate deposits of the Banking System by an amount equal to the motorcycle loan. This proves how commercial banks under the FMC model create new money by making new loans. New deposits have not only increased the assets and liabilities of the Borrower, but also the aggregate assets and liabilities in the economy.

We mentioned in the previous chapter Tobin's concept of "fountain pen money". This is a flamboyant way to describe how bankers can create money via the FMC model with just "a stroke of their pen" by simply approving loans to borrowers who are willing to sign the contracts. Tobin already introduced this concept in his 1963 paper, where he

said that bank-created deposits don't fall into the same category as the physical money printed by the government, and that they faced different limitations. We will investigate these a bit further in upcoming sections.

2. Borrower buys the motorbike: we stopped at the point where the bank granted the loan to the Borrower, expanding its balance sheet as a result. The natural continuation is that our Borrower uses these 300 monetary units to acquire the motorbike from a non-bank agent called Seller, transferring him the money in exchange for the motorbike he needs to drive to work. At this moment, Seller becomes a saver. He becoming a saver is not the cause, but the consequence, of the loan and of the investment. His intention before the transaction was to sell motorbikes and accept payment for them, not to become a saver; but in our nowadays society, sellers have to accept such payments if they want to remain in business, meaning that either he or somebody whom he will pass his deposit has to become a new saver at some point.

For simplicity we will now assume that the bank of Seller is the same as that of Borrower, namely Bank 1. Let's take a more detailed look to Bank 1's balance sheet movements once the Seller deposits his new money:

Bank 1		Bank 1	
Previous loans	Previous deposits	Previous loans	Previous deposits
Loan contract with Borrower	Deposit of Borrower	Loan contract with Borrower	Deposit of Seller

On the left side we see a simplified version of Bank 1's balance sheet after the loan contract has been accepted. On the right side we find the same balance sheet once the money has been transferred from Borrower to Seller, making the Deposit of Borrower disappear from the liability side and reappear as Deposit of Seller once Seller has received the transfer. Apart from that difference in the agent's identity owning the deposits, the balance sheets of the economy look the same as in the previous figure:

Bank 1		Bank 2		Banking System	
L1: 1,557	D1: 1,730	L2: 1,593	D2: 1,770	LT: 3,150	DT: 3,500
R1: 173		R2: 177		RT: 350	

Conclusions extracted from the example:

After having seen in Chapter 1 how under the ILF model of banking money creation did not occur by simply transferring deposits within the financial system, in this example we showed how under the FMC model there is an actual increase in the economy's aggregate deposits, achieved by banks granting loans to borrowers who take as much deposits as they want to, limited only by the bank's pursuit of profitability.

In our example, the balance sheet of the bank involved in the loan contract with the Borrower expanded in an amount equal to the loan contract. The other bank, Bank 2, had nothing to do with the operations that took place in the process and its balance sheet was completely unaffected by the loan, removing the necessity to settle interbank debt by means of interbank loans. The consequence of this was an increase in the Banking System's aggregate assets and liabilities, proving that the FMC actually achieves money creation by means of lending. Our example also proved this will hold true even in the simplest universe with only one commercial bank in the economy.

Another thing we were able to corroborate was that in an FMC setting saving in the form of money is the consequence, not the cause, of lending and investment. In ILF the initial requirement for lending was an external agent leaving his deposit in a bank, whereas in FMC the borrower can obtain a loan at any time, independently of that bank having received deposits previously or not. Saving might become the (final) consequence of lending once the loan exchanges hands, but the availability of resources accumulated prior to the transaction is not required for economic activity to flourish.

The final takeaway is that the FMC view of banking does not describe banks as financial intermediaries, neither in an individual nor in an aggregate way. This is because even though the final balance sheet of Bank 1 presents two different identities for the Borrower and the depositor (the Seller), this is not because Bank 1 has acted as an intermediary between those two non-bank individuals. The fact that two different agents appear in the balance sheet is because Bank 1 created purchasing power by lending to Borrower, a power which was later transferred from Borrower to Seller through the clearing system. This is a critical difference between ILF and FMC that will translate in important macroeconomic implications, which we will discuss in later sections of this paper.

2.4 What makes commercial banks different from other financial intermediaries?

It is often sustained that commercial banks are special financial units, in the sense that they share with the Central Bank the honour of being the only entities capable of money creation in the economy. At the same time, commercial banks are considered to belong to the group of financial intermediaries (FI), but can other FI create money the same way banks do? By means of a comparative accounting analysis perspective, Richard A. Werner attempts to throw some light upon this and other issues in his 2014 paper *"How do banks create money, and why can other firms not do the same"*.

In the example provided below we illustrate the balance sheets of three different types of FI: a “normal” commercial bank, a non-financial corporation (NFC) which for simplicity will be a manufacturer extending a loan to a client, and an another financial institution (AFI) different than a bank, e.g. a broker extending a loan to a client. The aim of this exercise is to determine the following: what exactly makes banks different from other FI, so that the latter cannot create money as banks do? Werner proves that different corporate lenders can be distinguished by the way how they do accounting, and that lending is the differentiating factor between banks and other intermediaries. Let’s see some evidence of this.

Example: comparative accounting analysis of a loan extension

If a loan of 200 monetary units is extended, this is how accounting works for each intermediary in terms of balance sheet operations:

Bank		NFC		AFC	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
Loan: +200	Client Deposit: +200	Loan: +200	0	Loan: +200	0
		Deposit: -200		Deposit: -200	
200	200	0	0	0	0

In the two non-bank cases, the loan contract is a claim on the borrower, added as an asset on the left side of the balance sheets. When the moment to disburse the loans comes, the borrower agents discharge their obligations and both the NFC and/or the AFC draw down their cash reserves or monetary deposits. The result is that in each case the initial gross asset increase is compensated with a decrease of equal size on the same side, leaving no variation in the total assets after the process.

For the commercial bank, the picture of the balance sheet looks very different: in this case, the disbursement of the loan does not appear as a negative entry on the asset side. Instead, a new positive entry shows up on the liability side, not counter-balancing the increased assets, but expanding both sides of assets and liabilities.

What is it that allows banks to discharge loans without drawing down assets? Werner found the answer after breaking the lending down into two steps. In the first step all entities get an “accounts payable” liability of the same amount as the loan they got on the asset side. The interesting thing comes in the second step, when the firm discharges its obligations after paying the loan back. Here the author saw the bank is the only of the three entities which lowers the item “accounts payable” instead of reducing the deposit on the asset side. This is a crucial step on the liability side of the bank, because the bank acts as if the money had been disbursed to the customer and renames the obligation to “customer deposit” of the borrower with the bank. Step 2 is better described here:

Bank		NFC		AFC	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
Loan: +200	Accounts payable: 0	Loan: +200	Accounts payable: 0	Loan: +200	Accounts payable: 0

	Client Deposit: +200	Deposit: -200		Deposit: -200	
200	200	0	0	0	0

The bank has not actually made any money available to the borrower. Indeed, the impression given is that the bank has transferred money from its capital, reserves or other account to the borrower's account, but in reality there is no depositing of funds involved. The bank simply re-classified its liabilities, changing the "accounts payable" obligation to another liability called "customer deposits".

Does this mean the bank has created money in the process? Yes, because bank deposits are part of the official monetary supply, according to most Central Banks' definitions. By inventing those fictitious customer deposits, indistinguishable from real deposits, banks create credit - they create money. And these newly created deposits account, in fact, as the main component of the official money supply.

How come other financial intermediaries cannot achieve net credit creation? Because a necessary condition to be allowed to reclassify liabilities is that the lender ordinarily maintains customer deposits and is in charge of those customer's deposits. The maintenance of customer deposits is not part of the regular business activity of the other non-bank financial institutions, preventing them from being able to engage in net credit creation the same way commercial banks do.

Another point where banks substantially differ from other non-bank financial intermediaries is regulation. To illustrate these differences Werner refers to the Client Money Rules in the UK, which requires that all firms that hold client money need to clearly segregate that client money in separate account from the rest of the assets and liabilities of the firm itself. Only financial intermediaries that have been granted a banking authorisation are exempted from this, while all other FI that hold client assets must keep them off-balance sheet, the depositor remaining as legal owner. With this regulatory prohibition of mixing the client deposits accounts with other liabilities towards other clients, any non-bank financial intermediary is simply not able to engage in the re-classification exercise the same way that commercial banks do.

Thanks to this analysis the author identifies the following differences between banks and non-bank financial intermediaries:

1. Commercial banks combine what a priori seem two different businesses, lending and deposit-taking, in order to fall within a special category that allows entities maintaining customer deposit accounts to create money supply by means of the act of lending and then re-classifying liabilities. It is in the business of taking deposits where rules are very different for banks and non-banks.

2. Unlike the rest of financial intermediaries, commercial banks are exempt of the Client Money Rules. This means that holding a banking license enables them to mix client accounts with their own, and re-label and mix different liabilities incurred when entering into loan contracts, thereby expanding both sides of their balance sheets and creating money.
3. Much of the terminology in the banking world is misleading and not known to the public. People with little understanding of the banking universe believe that money deposited in a bank is “safer” than if they give it, for example, to a broker. The reality is precisely the opposite: money deposited by a customer with a bank is, by law, no longer the depositor’s property.
4. The regulation that allows only banks to perform such “creative accounting” puts them in a leading position with respect to other intermediaries that could potentially be abused. A way of implementing a monetary reform to bring transparency to the money supply creation process would be, for instance, revoking the privilege of banks being the only exemption to the client money rules.

2.5 The FMC view of banking and its consideration amongst influential scholars

Since its inception almost a century and a half ago, there has been quite a striking number of authors that have defended the credit creation theory of money by commercial banks. If we then consider that this theory did not manage to consolidate itself the main explanation of how banks create money, the figure becomes even more impressive.

Here we present some of the opinions from authors that have expressed their support to the theory in a chronological manner, starting from the first references to the process until we arrive to our days.

2.5.1 FMC in the 19th century

Earlier in this chapter we already commented the importance of Henry D. Macleod’s work. He was in fact the first author whose writings refer to the credit creation role of commercial banks. In his 1856 book *“The Theory and Practice of Banking”*, the Scottish economist presents his thoughts on the theory of credit, which ultimately were his principal contribution to the study of economics. Among other things, he said:

“It is an entirely misconception of the nature of banking to say that a banker is merely an intermediary between those who want to lend and those who want to borrow”

“A banker is a trader who buys money, or money and debts, by creating other debts. He always buys commercial debts with his own credit, or with his “promise

to pay”, and experience shows that his credit may exceed several times the cash in his possession. Thus, the business of banking is essentially to create credit”

*Macleod, Henry D., “The Theory and Practice of Banking” (1866),
pages 109-110*

“The credits created by the banker are currency, or circulating medium. From this manifestly follows that banking credit is banking capital; We arrive at the conclusion that credit is capital”

“Banking does not only distribute existing capital, banking adds capital”

“It is unquestionable true that no mode of banking can create actual gold sovereigns. But if by means of their credit bankers can circulate their promises to pay, and if these be voluntarily received and accepted by the community at large as if they were actual sovereigns, then they are to all intents and purposes an addition to existing capital”

*Macleod, Henry D., “The Theory and Practice of Banking” (1866),
page 128*

The messages from Macleod’s work are clear: he did not believe that banks were intermediaries, as the ILF theory suggests, but strongly supported the notion of banks creating credit. Despite not having enjoyed much support at that moment, half a century later a very important Swedish economist of the Stockholm school, Knut Wicksell, picked up some of Macleod’s thoughts and wrote a theory of interest in his book *“Interest and Prices”* (original title: *Geldzins und Güterpreise*, 1898). Amongst others, he stated sentences as the following:

“No matter what amount of money may be demanded from the banks, that is the amount which they are in a position to lend (so long as the security of the borrower is adequate)”

“The banks have merely to enter a figure in the borrower’s account to represent a credit granted or a deposit created. When a cheque is then drawn and subsequently presented to the banks, they credit the account of the owner of the cheque with a deposit of the appropriate amount (or reduce his debit by that amount)”

Wicksell, K., “Interest and prices” (1898), page 110

The first sentence clearly refers to one of the only limits faced by a bank in an FMC setting: profitability. As long as the creditworthiness of the person who asks for a loan is good enough, the bank will benefit from lending the money and will proceed with the contract. This is not dependent on previous amounts of deposits already present in the bank. Then, in the second paragraph extracted from his book the author describes a way of deposit creation which is practically the same as other authors will use a century later. This corresponds in broad terms to what the FMC theory tries to defend.

Wicksell's work is known to have influenced Keynesian and Austrian schools of economic thought. Some exponents of those will be presented shortly, therefore we considered important to show some insight into such an important work as his before moving on to later scholars.

2.5.2 Early 20th century

With the change of century, more and more authors joined the group of proponents of the credit creation theory as the best explanation how money and deposits were created by commercial banks. One of the first economists who contributed to the theory in the new century was Hartley Withers, who between 1916 and 1921 went about his daily duties as the editor of *The Economist*. He wrote two books related to money and credit creation, and in the first one we can find a chapter on the right to draw a cheque where he writes the following:

"Most of the money stored by the community in the banks consists of book-keeping credits lent to by its bankers. It is usually supposed that bankers take money from one set of customers and then lend it to other customers; but in most cases, the money taken by one bank has been lent by another."

Withers, H., *"The Meaning of Money"* (1909), page 58

"Whenever a bank makes a loan, whatever the collateral... in each case it gives the borrower or the seller of the bill a credit in its books - in other words, a deposit; and though this deposit is probably - almost certainly - transferred to another bank, the sum of banking deposits is thereby increased... as long as the loans are in existence"

Withers, H., *"The Meaning of Money"* (1909), page 66

From these statements one can deduce that the Englishman opposes the ILF belief, which defends that the resources to lend have to be previously accumulated through saving. In a posterior work from 1916 the financial journalist said:

"It would not always happen that the parties to whom the cheques are paid would also bank with the same bank. They would pay the cheques into their own banks, whose deposits will be increased, and if we could look at an aggregate balance sheet of the whole of the banks of the country we should see that any increase in loans and advances would have this effect of increasing the deposits... "

Withers, H., *"The Business of Finance"* (1916), page 42

"It may be objected that the deposits have to come first before the banks can make advances. Does this necessarily follow? Even if a bank were starting business to-day... it would be in a position to make advances to a certain extent without having received any deposits... and in the case of an existing bank, it is certainly in a position to make an advance without waiting to receive a further deposit first"

Withers, H., *"The Business of Finance"* (1916), pages 44-45

What we just read is an accurate description of what the FMC claims. Withers' popularity as an editor helped him spread Macleod's credit creation further, but his influence is nowhere near the level of Schumpeter's work. The Austrian-American economist wrote *"The Theory of Economic Development"* (1912), a book where he clearly argues that a bank has the ability to create money out of nothing:

"The banker would not be an intermediary, but manufacturer of credit, i.e. he would create himself the purchasing power that he lends to the entrepreneur... One could say, without committing a major sin, that the banker creates money"

Schumpeter, J., "The Theory of Economic Development" (1912), page 197

Schumpeter's opinions about the FMC were also gathered in his posthumous book *"History of Economic Analysis"*, published 4 years after his death. There he argued against the other theories of money creation by commercial banks with sentences like:

"It is much more realistic to say that the bank create credit, that is, that they create deposits in their act of lending, than to say that they lend the deposits that have been entrusted to them... The theory of credit creation not only recognizes patent facts without obscuring them by artificial constructions; it also brings out the peculiar mechanism of saving and investment that is characteristic of full pledged capitalist society and the true role of banks in capitalist evolution"

Schumpeter, J., "History of Economic Analysis" (1954), page 1114

2.5.3 American support of the FMC in the 1910's

So far it would seem that the support for the credit creation theory was only found in Europe. There were also some early defendants of this view of banking in the other side of the Atlantic. Amongst them we will cite some contributions from Howe and Davenport:

"It is almost universally believed that the so-called deposits are deposits in actual cash, while the truth is, in so far as the deposits exceed the cash on hand, they are the proceeds of discounted commercial paper. Banks do not loan money. They loan credit. They create this credit and charge interest for the use of it"

"The checks drawn and paid in the US amount to between two hundred billion and two hundred and fifty billion dollars a year. It is clear that it would be a physical impossibility to do this amount of business by the use of gold coin... The banks have created fifteen billions of dollars of credit by discounting the notes of merchants and manufacturers, and crediting the proceeds to the borrower's account under the head of deposits"

Howe, R.H., "The Evolution of Banking" (1915), pages 23-25

Howe was not the only one describing how the American commercial banks created money out of "limited" gold reserves. Davenport, the American economist of the Austrian school, wrote the following:

“Banks do not lend their deposits, but rather, by their own extensions of credit, create the deposits... Banks are, in truth, mostly intermediaries between debtors and creditors – but not in the sense of borrowing funds from one (class of customers) to the other, but rather in the sense of creating for their borrowing customers’ funds which may be used by these borrowers as present purchasing power”

Davenport, H.J., “The Economics of Enterprise” (1918), page 263

2.5.4 Keynes and post-Keynesians in the 1930’s

Yes, Keynes was mentioned in the previous chapter as being a supporter of the ILF theory of banking, but that was in the late thirties. It seems that a decade before that he was still undecided about which theory was more accurate, and given his fame these years of doubt were enough to encourage some authors to follow him before he changed his mind.

In his book *“A tract on monetary reform”* the early Keynes seems to assert that banks create credit and money:

“The internal price level is mainly determined by the amount of credit created by the banks... The amount of credit, so created, is in its turn roughly measured by the volume of the bank’s deposits... now there is no necessary reason a priori why the proportion between the bank’s deposits and their cash in hand at the Bank of England should not fluctuate within fairly wide limits in accordance with circumstances”

Keynes, J.M., “A tract on monetary reform” (1924), page 178

We can now guess that the circumstances Mr. Keynes referred to were good lending opportunities presented to the bank on the spot. These fluctuations were then caused by the temporary mismatch due to the granting of loans without requiring previously accumulated deposits to back them up.

The Macmillan Committee was a committee formed by the British Government after the 1929 stock market crash. It was formed mainly by economists, amongst them Keynes, whose task was to determine whether the contemporary banking and financial system was helping or hindering trade and industry. One of the statements of the “creationist” case in the Macmillan Report started with the following sentence:

“The bulk of the deposits arise out of the action of the banks themselves, for by granting loans, allowing money to be drawn on an overdraft or purchasing securities a bank creates a credit in its books, which is the equivalent of a deposit”

The Macmillan Report (1931), page 34

The fractional reserve theory became very dominant in the 30s, but by that time there were already a few post-Keynesian authors that went on with Keynes’ legacy. One of them was Irving Fisher, regarded as the greatest American economist, who kept defending the net credit creation approach even when that theory’s popularity was starting to fade. In his 1935 paper, the Yale Professor wrote:

“Under our present system, the banks create and destroy check-book money by granting, or calling, loans. When a bank grants me a \$1000 loan... that “money I have in the bank” is new. It was freshly manufactured by the bank out of my loan and written by pen and ink on... except for these pen and ink records, this “money” has no real physical existence”

“Our national circulating medium is now at the mercy of loan transactions of banks... there is little practical difference between permitting banks to issue these book credit which perform monetary service, and permitting them to issue paper currency”

“Borrowed money creates further new book entries which serve as money. That is, lending creates new money which expands the money supply. Paying back a loan destroys money and ultimately if all bank loans were paid, no one would have a bank deposit, and there would not be a dollar of currency or coin in circulation”

Fisher, I., “100% money” (1935), pages 2-5

Fisher here insists on the veracity of the FMC theory of commercial banking, saying that they can easily manufacture money and that this bank-created money is essentially the same in terms of payable means as the notes coming from the printing press.

2.5.5 End of the century and contemporary supporters of the FMC

From the 30s onwards the FMC was relegated to a secondary role by the other two dominant monetary models, the ILF and the Fractional Reserve (also called Deposit Multiplier) theories. Nevertheless, there are a few authors worth mentioning, who did not give up in their efforts to insist on the veracity of the FMC as the central theory for money creation.

The first of the authors we analyze here is Basil Moore. Considered a central figure in post-Keynesian economics, Moore is a student of neoclassical Austrian Fritz Machlup. During his career, the Canadian University Professor emphasized the mechanics of credit creation, especially the credit extended by banks and the money supply. His views on monetary economics were culminated in his 1988 book *“Horizontalists and verticalists: the Macroeconomics of Credit Money”* where we can find statements like these:

“Changes in reserve requirements imposed by the central bank do not directly affect the volume of bank intermediation”

Moore, B., “Horizontalists and verticalists: the Macroeconomics of Credit Money” (1988), page 65

This statement is different from the ones we have seen until now, because instead of arguing against the ILF theory of banking it attacks the fractional reserve theories, the third major line of thought that won prominence during the century. As of defending the FMC, he was of the opinion that banks grant loans to customers by “simply crediting the amount to the borrower’s account”. While reading Moore we found out that the core of his reasoning was

that the Central Bank could not control the monetary base, which according to him is endogenous, making the credit creation process endogenous as well. And this is a trait that he shared with other post-Keynesian writers like Rochon and Rossi, who jointly wrote the following in 2013:

“As the economy grows, banks supply more credit to meet the growing needs of the system, either to pay out wages or to purchase any factors of production. As soon as a firm receives credit, it can pay out wages: at this very instant, money is created by the bank carrying out the payment”

Rochon, L.P., Rossi, S., “Endogenous money: the evolutionary versus revolutionary views” (2013), page 214

Another special mention goes to Austrian writers, who as a group remained very active in the US since the post-war era, and were a pocket of adherents to the FMC view during the decades where it lost importance. Some of their famousponents were Hoppe, Hülsmann and Block, authors of a 1998 article for the Journal of Austrian Economics from which we rescued interesting sentences such as:

“(Fiduciary media) are not the result and documented outcome of an additional supply of property... Instead, they represent an additional supply of property titles, while the supply of property has remained constant. It is precisely in this sense that it can be said of fiduciary media that they are created out of thin air”

*Hoppe, H.H., Hülsmann, J.G., and Block, W.,
“Against fiduciary media” (1998), page 22*

“A fractional reserve banking agreement implies no lesser an impossibility and fraud than that involved in the trade of flying elephants or squared circles”

*Hoppe, H.H., Hülsmann, J.G., and Block, W.,
“Against fiduciary media” (1998), page 26*

Richard Werner, a German author and Professor in the University of Southampton, is a very active literature contributor in support of the credit creation theory. He wrote several books during the 1990's and 2000's, and in this decade he has also published a series of papers in which he shows to be an advocate of the FMC model. For instance, in his 2014 Paper “Can banks individually create money out of nothing?” he performs an empirical test of the three dominant theories of banking, only to conclude this:

“The empirical evidence shows that of the three theories of banking, it is the one that today has the least influence (the FMC) ... that is supported by the empirical evidence. It is the theory which was widely held at the end of the 19th century and in the first three decades of the twentieth. It is sobering to realise that since the 1930s, economists have moved further and further away from the truth, instead of coming closer to it”

*Werner, R.A., "Can banks individually create money out of nothing?" (2014),
page 16*

Werner's final reflection seems an appropriate way to close this section, although the outlook is not as pessimistic as we could think after reading his words. This is because lately a number of leading Central Banks have shown progress in incorporating the FMC views into DSGE models that can be used to study the role of banks in macroeconomic cycles. For example, and looking no further, two papers from the Bank of England were key contributions to this master thesis. There is still a yarn of hope that finally the FMC theory of banking can reclaim the leading position in explaining how commercial banks create money, a position where, according to evidence, it belongs.

Chapter 3

The DM model

At this point of the paper the reader should be familiar with the Intermediation of Loanable Funds and the Financing through Money Creation models. Those two are probably a little bit more important than the alternative which we develop in this chapter; the former because it has been present in mainstream literature for most of the last century, the latter because it has proved to be the most empirically accurate in describing how the real world works.

This is going to be the last of the three theories that tries to describe how banks operate and the origin of the money supply: the Deposit Multiplier model of commercial banking. Also known as fractional-reserve banking, some believe it is an extension of the ILF theory, but we consider it deserves a chapter of its own. Let us properly introduce the last model on which our analysis is based.

3.1 Origin of the DM view

The first references to the Deposit Multiplier theory are older than one could expect. An early defendant of the fractional-reserve theory was Alfred Marshall, considered one of the most influential authors of the late 19th century. The English economist wrote *“Principles of Economics”* (1890), what later became the dominant economic textbook in his country.

One of the founders of neoclassical economics, it was in his *“Report by the gold and silver commission of 1887”* (1888) where we find the first references to the fractional reserve system. In that paper he criticized Macleod’s propositions, the same that later inspired the development of the credit creation theory. His view did not overcome the popularity of the FMC model at the beginning, but after the first World War a number of authors started inspiring their works in the model first presented by Marshall.

As we explained in the previous chapter, the FMC model (sometimes referred as “the old theory”) started losing ground to newer views during the 1920s and especially the 30s, a time when the role of banks was disputed and experts switched sides often, mostly moving away from the FMC theory towards the Deposit Multiplier one. By the end of the 30s there were already a number of scholars backing up the DM theory, and a decade later Samuelson wrote his *“Economics”* (1948), a book which set a precedence for the mainstream DM views from the 1960s and 1970s.

3.2 Description of DM

“The creation of multiple deposits may seem somewhat like a magician’s trick of pulling rabbits out of a hat... But it is, in fact, a process with a physical trail... The rules of deposit creation – in particular, the fractional reserve requirements – also give rise to the system’s ability to expand deposits by a multiple of the original deposit increase”

Stiglitz, J., Walsh, C., “Economics” (2005), pages 624-626

The last model that tries to explain money creation by commercial banks claims that banks produce additional broad money aggregates by repeated re-lending of an initial high-powered money injection. According to the authors defending this theory, there are two types of money in this world: central bank money and commercial bank money. When central bank money is deposited in a commercial bank’s vault, the money is added to the reserves of that commercial bank and removed from public circulation. It is important to note that the pre-existence of central bank reserves in the system is a required condition for the DM model to create additional money.

Now imagine there is a legal requirement that forces banks to keep a certain percentage of their deposits as reserves, in order to meet the demand of the depositors in case they want to withdraw their money from the entity. The bank will then typically keep the minimum required amount as reserves, and lend the rest for more profitable enterprises to Borrower agents. A Borrower will then likely use the loan to pay back some debts or bills, therefore re-introducing the money in the banking system, either in the same bank or in another. The main conclusion here is that the financial system will recover the excess reserves, partially or even fully, and since the legal requirement will still the same percentage as in the beginning, the bank which receives those excess reserves will be able to further lend that money in a chain of dwindling expansions.

The Deposit Multiplier theory shares with the ILF model the premise which says that banks are financial intermediaries, which is why many authors believe that the two theories somehow belongs together. What makes these two theories different is that, as opposed to the ILF view, the DM introduces the notion of government as an agent via the apparition of the Central Bank (from now on referred as CB). Also, the DM view rejects the ILF assertion that confers banks the ability to create money individually. Instead, its proponents believe that the banking system as a collective entity is able to create money through systemic interaction and the “money multiplier” mechanism, a process of multiple deposit expansion which we will explain more in detail in later sections. For now, let us show how the DM actually works with an example.

3.3 Example of how banks operate according to the DM view:

Before any economic activity starts in this world, we need to introduce the aforementioned Central Bank high-powered money into the system. This is because as an early version that

inspired the ILF view of banking, the DM model requires banks to have some resources already stored in their vaults before being able to lend anything. The resources can be either physical printed bills or electronic money, but they need to be there before the lending starts.

How does the Central Bank then get this newly created money into circulation? Under some circumstances the CB can lend money directly to certain commercial banks, but the more common way is that the CB uses the newly created money to purchase securities (usually very safe ones) from the open market. Whoever was the owner of the securities before, now they will have these new bills in their hands and they can either spend them or deposit them in a commercial bank. In any case, even if they spend those bills, at some point someone will deposit them in a private bank, so they will (in most part) return to the financial system. It is maybe easier to imagine the situation with the following concrete example:

1. Initial Balance Sheets with 100% reserves: imagine the Central Bank creates 1,500 monetary units of resources and wants to get them into the banking system. In order to do so they buy securities from Agent A worth 600 monetary units, and spend the remaining 900 units in acquiring securities from Agent B. Now imagine also there are only two banks in the system, namely Bank 1 and Bank 2, and that Agent A always deals with Bank 1 while Agent B chooses Bank 2. For simplicity we will assume they immediately want to save their money into their bank accounts, so once the two agents have sold their securities and brought the money to Banks 1 and 2 the Balance Sheets in this economy look like this:

Bank 1		Bank 2		Banking System	
Reserves:	Demand	Reserves:	Demand	Reserves:	Demand
600	Deposits:	900	Deposits:	1,500	Deposits:
	600		900		1,500

Like in the previous chapters, the left side of each balance sheet represents the assets of a bank, while the right side represents the liabilities. And since Bank 1 and Bank 2 form the totality of the Banking System, by adding their entries we obtain the third balance sheet on the right.

What do we see now? The totality of the money deposited in the vaults is held as a cash asset (the item Reserves), and to balance these assets we find Demand Deposits for the same amounts. In a system like this, where reserves are 100% of the deposits, commercial banks' role is that of simple secure warehouses. Depositors can leave their money there for safekeeping, and in exchange they will pay a fee once they retire the money. But does this have any effect on the money supply and the macroeconomy? Obviously not. We can safely say that in a banking system where reserve requirements are 100% no money creation takes place.

2. Fractional reserve banking: allow us to introduce a differentiating feature in our setting. What would happen if banks learnt that they do not have to keep 100% of their deposits as reserves in order to face the eventuality of depositors wanting to withdraw the money in big amounts? Since this would be quite an unlikely scenario, we explore the implications with a situation where the monetary authorities permit the commercial banks to operate by keeping reserves equal to at least 12% of deposits. Banks will now keep that legal minimum amount of reserves and engage in lending/investing the remaining 88% of their high-powered money to borrowers with decent creditworthiness, transforming their balance sheets and making them look like this:

Bank 1		Bank 2		Banking System	
Reserves:		Reserves:		Reserves:	
72	Demand	108	Demand	180	Demand
-----	Deposits:	-----	Deposits:	-----	Deposits:
Investments:	600	Investments:	900	Investments:	1,500
528		792		1,320	

This is hardly the end of our example. Let's focus for instance on the 528 monetary units invested by Bank 1. That money has been lent to Agent C, a borrower who entered a loan contract with Bank 1 because he needed to repay his bills to Agent D. Once Agent C uses the 528 units to do so, the creditor who receives the money will get it back into a bank of his choice; for simplicity we make the money go back to the same bank, but the process would be exactly the same if these resources would have ended up in Bank 2 instead.

Excuse us if too many agents are appearing in our universe. The main takeaway you should extract from here is that there is going to be a bank, either Bank 1 or Bank 2, which will have excess reserves in an amount of 528 monetary units once the creditor Agent D brings the money back to the system. After the latest depositor has re-introduced the excess reserves into a bank of his choice, this is how the balance sheets look:

Bank 1		Bank 2		Banking System	
Reserves:		Reserves:		Reserves:	
72+528 =	Demand	108+792 =	Demand	1,500	Demand
600	Deposits:	900	Deposits:	-----	Deposits:
-----	1,128	-----	1,692	Investments:	2,820
Investments:		Investments:		1,320	
528		792			

In the second balance sheet we observe how exactly the same process also occurred to the money invested by Bank 2. In a similar manner as in Bank 1's balance sheet, after having been lent, these 792 monetary units will eventually return to the system as excess reserves.

And here we can already see what the authors mean by money creation. Take a look at the Banking System demand deposits. They have grown, and they have not just

grown at any rate: they increased 88% after the first re-lending. This is of course not a coincidence but a consequence of the money multiplier mechanism.

3. Final system equilibrium: if we consider that the reserve requirement is still 12% from the deposits, there is no reason why the bank would keep that money idle in his accounts. The entities will naturally re-lend these newly acquired deposits, always making sure the 12% legal minimum is satisfied. With every iteration of the deposit-lending-redeposit process the total demand deposits/broad money of the economy will increase a further 88% from their previous positions, and the amount lent will become less and less, until the amount is so small that the bank can't lend it anymore.

At the end of the process, the total amount of deposits and money in this economy will be:

$$\begin{aligned}
 \text{Total demand deposits} &= 1,500 + 1,500 * 0,88 + 1,500 * 0,88^2 + \dots \\
 &= 1,500 * [1 + 0,88 + 0,88^2 + 0,88^3 + \dots] \\
 &= 1,500 * \frac{1}{1 - 0,88} = 1,500 * \frac{1}{0,12} = 12,500
 \end{aligned}$$

Or what's the same, the total bank money will be equal to the initially injected reserves multiplied by the money multiplier, which we found out to be the inverse of the reserve ratio.

This is how the final balance sheets of our world look:

Bank 1		Bank 2		Banking System	
Reserves:	Demand Deposits:	Reserves:	Demand Deposits:	Reserves:	Demand Deposits:
600		900		1,500	
Investments:		Investments:		Investments:	
4,400	5,000	6,600	7,500	11,000	12,500

Conclusions extracted from the example:

Thanks to our example we have seen how much broad money can potentially be created with a given base money of 1,500 units and a reserve ratio of 12%. Our findings are consistent with the literature defending the Deposit Multiplier model, which claims that the banking system can produce additional broad money aggregates by repeated re-lending of an initial high-powered money injection.

We have also seen how the money multiplier heuristic applies in a world where banks were subject to reserve requirements of 12% of deposits, allowing them to always lend the remaining 88%. The final balance sheets in our setting depict a situation where the maximum broad money creation was achieved. This theoretical maximum is rarely or never attained in reality, because some of the reserves get lost in the way, being kept as cash outside the banks and

not getting back into the system. We exposed the extreme “best case scenario” in order to better illustrate the operations of the model.

Another finding we can derive from the final balance sheets is that the re-lending money multiplier cumulative process must come to an end when every bank in the system has reserves equal to 12% of deposits. In other words, commercial banks will stop lending and creating deposits once all excess reserves have been lent out, so the original reserves (in our case, 1,500 monetary units) account for the reserve requirement (12%) of the total money in circulation. This situation will be reached when the Demand Deposits in the Banking System reach $1,500/0,12=12,500$ monetary units.

The last takeaway we would like to educe from our exercise is meant to soothe the reader’s doubts regarding bank runs and viability of the model. Yes, we are aware that even though the central bank printed/created a certain amount of money here, there is a lot more money in the system. And yes, if everyone went at the same time to withdraw their deposits from the bank there would be trouble. How does this system then sustain? A key factor we should not forget is that the depositors of the money do not need to physically withdraw bills every time they wish to purchase something. They can write checks, and the person receiving the check will be the owner of that multiplied money in the system, without the bills having left the banking system at any time of the process.

Before we go on with the chapter, it is important to point out that our example was merely intended to exhibit the functioning of the DM model to the reader. The fact that our example reaches the same conclusions than the literature does not mean we consider the DM explanation the right way of money creation by commercial banks, especially not after we already expressed our support for the FMC model in the previous chapter. There are some underlying assumptions in the Deposit Multiplier model which defy evidence, but this issue will be discussed in an upcoming section of the chapter.

3.4 The DM view of banking and its consideration amongst influential scholars

As we indicated at the beginning of this chapter, the Deposit Multiplier theory dates back to the late 19th century. Nowadays overshadowed by the ILF and the FMC models, there was a time when its quantity of supporters made it a popular explanation of how commercial banking worked. These periods of notability contrast with darker decades, where this view practically got ignored by scholars.

It is often true that being the last in an enumeration also implies being the last in importance, and this is not an exception. FMC first and ILF later presented challenges too hard to overcome for the Deposit Multiplier model. Nevertheless, every now and then an important economist was drawn to this theory and some influential pieces of literature were written to back it up. The aim of this section is to precisely present a sample of leading opinions favourable to the DM model since its formation until today, starting from the earliest authors until we reach contemporary views on the theory.

3.4.1 Early support in the late 19th century and during the interwar period

A few pages ago we mentioned Marshall's work in trying to define the Deposit Multiplier for the first time. It was a period of clear support to the FMC view of banking, but against dominant conventions the English author dared to propose an alternative theory which stated some of the following points of view:

"... there is a much more rapid increase in the amount of capital which is owned by people who do not want to use it themselves... Much of this capital passes into the hands of bankers who promptly lend it to anyone of whose business ability and honesty they are convinced... the opportunities for direct borrowing are now so great that a moderate increase in the amount of capital required for a start in business is no very serious obstacle in the way of a person who has once got over the initial difficulty of earning a reputation for being likely to use it well"

Marshall, A., "Principles of Economics" (1890), page 179

In these lines Marshall indirectly criticized Macleod's early FMC formulation, and said that capital needs to be accumulated prior to being lent. He also mentioned the role of banks as intermediaries, to finally conclude that during periods of rapid increase in capital there is no problem to obtain loans, indirectly implying that in the opposite situation (with lower capital accumulation) even a borrower with good creditworthiness would find it hard to get a loan. These thoughts are very consistent with the ILF view and differ from the work of his contemporaries.

Going back to the fractional reserve theory, we found the following paragraph in another document where the economist addressed a jury trying to deliberate about the role of banks:

"I should consider what part of its deposits a bank could lend... and then what part of the loans made by other banks would be received... as deposits. Thus I should get a geometrical progression; the effect being that if each bank could lend two thirds of its deposits, the total amount of loaning power got by the banks would amount to three times what it otherwise would be"

Marshall, A., "Testimony in front of a government committee about the role of banks" (1888), page 530

What Marshall allegedly said here served as a predecessor to what later became the fractional reserve system. Our author described a setting with a 33% reserve requirement, where the money multiplier increased the aggregate money (the amount of loaning power) three times due to the $\frac{1}{0,33}$ rule.

The different proposals of the neoclassical economist did not enjoy much popularity until many years later, when Chester Phillips rescued Marshall's assertions and used them in his 1920 *"Bank Credit"*. In the chapter where he makes a critical analysis of the traditional theory (the FMC view) we found:

“The loan expansion in the banking system. . . is several times greater than the loan expansion practicable for an individual bank acquiring the same amount. What is true for the banking system is not true for an individual bank that constitutes only one of many units in that aggregate”

“As the individual bank increases its loans in order to re-establish its normal reserve-deposits ratio, reserve is lost to other banks and the new reserve, split into small fragments, becomes dispersed among the banks of the system. Through the process of dispersion it comes to constitute the basis of a manifold loan expansion”

Phillips, C.A., “Bank Credit” (1921), page 40

What we gather from the text is that Phillips considered each individual commercial bank an intermediary, and that through the process of dispersion and reiteration the individual function of the banks results in an expansion of the aggregate money supply. Every time we see more clearly how Phillips’s thoughts became a stepping stone towards the posterior formulation of the fractional reserve theory of banking.

The last early author in this section is Wilfred F. Crick, an economist who together with his colleagues managed to deemphasize the role of the credit creation theory. Their main goal was to convince the public opinion that the FMC theory was a blurry mechanism and that the government had actually everything under control. Some of the statements found in his paper are:

“The final result of the addition of £1 million to the reserves of Bank A is thus achieved by a cumulative process, acting and reacting through all five banks. . . (Banks) have, merely by working to a regular ratio, added £10 million to their aggregate deposits and £9 million to their earning assets. This they have done. . . in the faith and knowledge that they will not suffer a commensurate loss of cash”

Crick, W., “The genesis of bank deposits” (1927), page 196

“to say (that a bank) cannot create deposits at all. . . is untrue, because we know as a fact that an addition to bank cash is accompanied, or closely followed by, a multiple addition to deposits, which cannot be attribute to any other cause but action by the banks”

Crick, W., “The genesis of bank deposits” (1927), page 201

Crick just defined a money multiplier example with 10% reserve requirement, while defending that commercial banks have individually very little scope for policy and that the Central Bank (Bank of England in this case) controls them as passive agents, so long as they maintain steady ratios of cash to deposits. When he mentions multiple addition to deposits he is, in fact, describing the Deposit Multiplier view.

3.4.2 Keynes and the 1930s

The 30s were undoubtedly a period where disputes between supporters of one and other theories appeared to be the order of the day, and it was seen as normal if scholars changed sides at some point of the debate. The best example for it was J.M. Keynes, who already appeared as a supporter of the previous two theories and now reprises his role as main exponent during the 30s. It seems that one of the most famous economists from the 20th century was not sure about which theory on money creation by commercial banks was most correct, because between his support to the FMC in the early 20s and that to the ILF in the late 30s, Keynes also found time to dedicate a book to the fractional reserve theory. These are some of the ideas we have extracted from his “*A Treatise on Money*”:

“A banker is in possession of resources which he can lend or invest equal to a large proportion (nearly 90 per cent) of the deposits standing to the credit of his depositors”

Keynes, J.M., “A Treatise on Money” (1930), volume II, page 213

“For the banking system as a whole, the “creation” of credit in this way (granting a loan and creating an additional deposit) is only “excessive” if it results in a loss of gold, which reduces the reserves of the banks and thus indicates the necessity for “reducing” the volume of credit. If, however, the supplies of gold are ample, then there need be no obstacle to the act of creation”

Keynes, J.M., “A Treatise on Money” (1930), volume II, page 218

The first sentence clearly describes how a fractional reserve system works. In the lines preceding the second paragraph, Keynes argues that bankers have a monopoly of magic, and that they exercise their powers in order to raise the price. These institutions demand a suitable proportion of gold, or other form of reserves, to back the new creation of loans and deposits. Another sentence worth being reproduced here is:

“There can be no doubt that... all deposits are “created” by the bank holding them”

Keynes, J.M., “A Treatise on Money” (1930), volume I, page 30

Without neglecting the inverted commas when discussing money “creation”, a way used probably to show his skepticism with the FMC theory, Keynes is probably referring here to the increase in bank deposits. He thought that via money transfers the bank was able to “create” new deposits.

The other author we will talk about in this subsection is Friedrich Lutz, a German economist more known for developing the expectations hypothesis. A little bit before writing his famous seminal paper “*The structure of interest rates*”, Lutz contributed to the *Economica* journal with an important article that both supported the fractional reserve theory and already started showing the stream of thought that would lead to the ILF theory of banking. Some of the most important sentences from there are the following:

“The “multiple expansion” theory of the creation of bank deposits (of the Phillips or Crick variety) explains the creation of deposits by the fact that the same cash (in decreasing amounts) is successively paid into different banks... (the expansion of deposits) would disappear if the separate banks were merged into one. In that case the deposits would be regarded as coming into existence by outright creation”

Lutz, F., “Velocity analysis and the theory of creation of deposits” (1939), page 166

In this extract of text the author not only explains the Deposit Multiplier as conceived by earlier authors such as Phillips and Crick, but also points out the difference between that view and the FMC theory: that it is a system of banks, and not a single entity, who create money. Furthermore, he later adds:

“This seems to lead not to a new, but to a very old theory of the function of banks: the function of a mere intermediary. If entrepreneurs have confidence in each other, the power of the banks to create deposits is not essential for the process of expansion”

Lutz, F., “Velocity analysis and the theory of creation of deposits” (1939), page 167

In these lines Lutz sets the ground for posterior ILF contributions, saying that banks are basically institutions existing to guarantee the trust between a lender and a depositor that would otherwise not engage in financial activity.

3.4.3 Samuelson and the 1940s

The change of decade did not bring many changes with respect to the late 30s. A few years after Lutz’s paper, Whittlesey appeared in the American Economic Review, a leading journal of that time, saying this:

“The process (of banking operations), whereby deposits are created – and may conceivably be destroyed – on the basis of fractional reserves and against changes in the volume of debts held by banks, is still fundamentally the same”

Whittlesey, C.R., “Problems of our domestic money and banking system” (1944), page 247

This is a clear declaration of the author in favor of the Deposit Multiplier and the fractional reserve system. Along these pages he showed as well awareness of the fact that this theory was based on rather strong assumptions, but nevertheless claimed that banks create money and that they have a sovereign function of issuing it. What’s more, in the same chapter Whittlesey expressed his concerns in relation to the assumption that maintains the similarity in the behavior of different banks when it comes to create credit:

“Studies made by the Federal Reserve authorities... disclosed wide differences in the volume of excess reserves held by member banks. These differences were a rough measure of the failure of the assumption to hold true that banks move in close harmony in the matter of credit creation. Under such conditions the effect of bank reserves in bringing about similarity of policies among banks is probably exaggerated”

Whittlesey, C.R., “Problems of our domestic money and banking system” (1944), page 250

There were indeed several economists at that time playing with the idea of the Deposit Multiplier model, but if one of them deserves special recognition that is, without a doubt, Paul Samuelson. He did not only publish what can be regarded as the most influential post-war textbook in economics, but also played a key role in dismissing the credit creation theory and replacing it with the fractional reserve view. Samuelson, the first American awarded with the Nobel Memorial Prize in Economic Sciences, developed in the original 1948 edition of his masterpiece *“Economics”* a detailed example (which served as inspiration for our own example in chapter 3.3) where the reader got in touch with the money multiplier mechanics in a very didactic way. Just before doing that, he dismissed the FMC theory referring to it as *“false explanations still in wide circulation”*:

“According to these false explanations, the managers of an ordinary bank are able, by some use of their fountain pens, to lend several dollars for each dollar left on deposit with them... They only wish they could do so. As every banker well knows, he cannot invest money that he does not have”

Samuelson, P., “Economics” (1948), page 324

In more modern editions of the same book from 50 years later, the chapter reserved to fractional reserve is much shorter. The attack to the FMC is not present anymore, which leads us to think that the original critiques damaged the alternatives enough so that the authors could present their theory in an unchallenged way. Still, future editions like the one from 1995 show support to a mixture between the ILF way of banking and the DM model. Take a look for example at this:

“Each small bank is limited in its ability to expand its loans and investments. It cannot lend or invest more than it has received from depositors”

Samuelson, P., Nordhaus, W. “Economics” (1995), page 496

“All banks together do accomplish what no one small bank can do – multiple expansion of reserves”

“All banks can do what one can’t do alone”

Samuelson, P., Nordhaus, W. “Economics” (1995), pages 492-493

These are, without discussion, the best example of statements supporting the Deposit Multiplier model that managed to survive many decades and still be influential long after they had been first written.

3.4.4 The 1950s and 1960s

In chapter one we introduced the work of Gurley and Shaw, two of the authors that most heavily contributed to the establishment of the ILF view as the predominant theory of commercial banking. Their paper from 1955 originated big reactions, both from supporters and opponents, making the late 50s and the 60s a period of much literature dealing with commercial banking and money creation. Most of the criticism was directed at their assertions claiming that there is no difference between banks and other non-bank financial institutions, in the sense that they were both financial intermediaries able to “create financial claims”. Quite often the critics used the chance to also express their views on the fractional reserve system, and this is what we collected in this section.

The first and fiercest opposition to Gurley and Shaw was posed by John Culbertson, in a paper with the suggestive name *“Intermediaries and monetary theory: a criticism of the Gurley-Shaw theory”*. Here the University Professor confronted Gurley and Shaw’s ideas which defended the ILF model:

“The banking system “creates credit” by acquiring debt and creating demand deposits to pay for it. The commercial banks do not need to “borrow loanable funds from spending units with surpluses” in order to extend credit”

“Commercial banks cannot perform the characteristic role of an intermediary in taking loan funds created elsewhere and passing them on to ultimate borrowers”

Culbertson, J. M., “Intermediaries and monetary theory: a criticism of the Gurley-Shaw theory” (1958), pages 121-122

After having shown his disbelief regarding the ILF theory of banking, Culbertson proceeds to give some hints showing he is a supporter of the Deposit Multiplier model:

“It seems clear that ordinarily changes in the volume of bank credit are caused mainly by changes in bank reserve positions”

Culbertson, J. M., “Intermediaries and monetary theory: a criticism of the Gurley-Shaw theory” (1958), page 124

The next author who discussed Gurley and Shaw’s arguments was Joseph Aschheim. In the pages of a famous journal of his time, the author conducted an elaborated critique that first dealt with the inconvenience of using the ILF models, to then continue with a clear statement of main notion of the DM model:

“Under a fractional reserve system, net new creation of money is performed by the central bank and the commercial banks. Commercial banks are creators of loanable funds in the ex-ante sense. Gurley and Shaw... are mistaken in inferring... that commercial banks are brokers, rather than creators, of loanable funds”

“Even with loanable funds redefined as ex-post savings (the way Gurley and Shaw do), it is still true that, under a fractional reserve system, commercial banks can

create loanable funds: their operations can make ex post savings exceed ex ante savings”

Aschheim, J., “Commercial banks and financial intermediaries: fallacies and policy implications” (1959), page 66

The support for the DM model did not wane in the 60s. At the beginning of that decade the main defence of this view of banking came from a Swiss economist, Karl Brunner, who was very interested on the nature of the money supply process. First alone and later in collaboration with Allan Meltzer, they developed a multiplier model that became standard in most economic books in the same way as Samuelson’s model did. Here we offer a statement related to that mechanism:

“The interaction between banks and public, which forms the essential core of money-supply theory, generates the peculiar leverage or multiplier effect of injections of base money on bank assets and deposits and, correspondingly, on specific asset and liability items of the public’s balance sheets”

Brunner, K., “The report of the commission on money and credit” (1961), page 612

In a 1964 contribution to the Journal of Finance called *“Some further investigations of demand and supply functions for money”* (The Journal of Finance, vol. 19, No. 2, page 245), the two authors described in detail what they called *“the built-in leverage of the system’s response to prevailing surplus reserves”*, also expressed as $\frac{1}{\lambda - \mu}$. The λ is the average loss-coefficient of the banks in the system, and μ denotes the average spillover of deposits in the system from expanding banks to other banks. These explanations are in many ways consistent to the Deposit Multiplier model.

Jumping a few years forward we find the work of Paul Smith, who in his article *“Concepts of money and commercial banks”* (published in the Journal of Finance 21 from 1966, pages 635-648), developed a model that tried to illustrate the economic repercussions of different individuals deciding about how to proceed with their savings. A key assumption in his model was that each bank new loan initiated a chain of transactions; this and the addition of reserve requirements make his model work in a way that could very well be compared to the DM model.

The final authors we will present in this subsection are Guttentag and Lindsay. In a contribution they made to the Journal of Political Economy in 1968 (pages 994-995) they analyzed the credit-generating capacity of banks. One of the essential ratios they used was the reserve ratio, which when altered had notable effects on the evolution of total credit. The functioning of the model resembled very much that of a fractional reserve system. Moreover, a few pages later they again put some distance between them and Gurley and Shaw when they say:

“The greater credit expansion of banks, it will be recalled, occurs because banks do not suffer significant leakages of reserves when they extend credit. This is turn stems from the willingness of non-bank intermediaries to hold their reserves in the form of claims against banks. And this they do because banks create money”

Guttentag, J.M., Lindsay, R., *“The uniqueness of commercial banks”* (1968),
pages 1012-1013

3.4.5 Contemporary authors supporting the DM model

A last big leap brings us to the 90s. The models from Samuelson and Brunner had by then been for four decades some of the most important explanations found in economic textbooks describing the money creation process by commercial banks. Even in the 90s there were authors that not only agreed with the ideas proposed by their older colleagues, but built on the theories that had been elaborated decades before. A good example of this are Michelle Garfinkel and Daniel Thornton, two economists who wrote a paper analysing Brunner and Meltzer’s 1964 article, reaching the following conclusion:

“That the multiplier is affected by policy actions suggests that money stock control using the multiplier model would be enhanced by taking the effect of policy actions on the multiplier into account”

Garfinkel, M., Thornton, D., *“The Multiplier approach to the money supply process: a precautionary note”* (1990), page 62

With that it is explicit that the two authors agree on the basic premise of the money multiplier model developed some decades before them, and that they believe the method can be polished to predict the effects of monetary policy in an even more accurate way than their predecessors did.

The next two samples displayed in this section are from the middle of the 2000s. In 2005 Shelagh Heffernan, a Canadian economist who specialized in analysis of banks and banking markets, wrote her book *“Modern Banking”*. There is a chapter in it discussing monetary control and price stability, where the Professor cites reserve ratios as an example of a traditional method for controlling the money supply. She also wrote, for example:

“Banks play an important role in creating money, but so does the central bank”

“... in some countries, banks are required to hold a certain fraction of deposits as cash reserves, and the central bank can influence the money supply. If the reserve ratio is raised, it means banks have to reduce their lending, so the money supply is reduced”

“This method was standard procedure until the 1980s... in 1981, the (UK) government abandoned its use as a means of controlling the growth of credit. It was replaced by a cash ratio”

Heffernan, S., *“Modern Banking”* (2005), page 30

Her description of the reserve ratio traditional method matches very well the functioning of the Deposit Multiplier philosophy. The last abstract is especially interesting, because there

we can appreciate how despite Professor Heffernan mentioning how this method of controlling the money supply lost popularity, at no point in her book did she argue against this as a correct way of controlling the money supply.

We reach the end of the subchapter with Joseph Stiglitz, a well-known American economist and Professor who was awarded the Nobel Prize in Economic Sciences in 2001. Belonging to the New Keynesian economics school, he was strongly influenced by Robert Solow, his doctoral advisor during his studies.

Stiglitz wrote many books and papers during his career, but now the work in question is a collaboration he did with Carl E. Walsh. In their book *“Economics”* from 2006 (4th Edition) they dedicated a big section to the money supply and the bank’s balance sheet, and at some point they started describing the fractional reserve system:

“... the level of reserves required by the Fed is designed primarily with an eye not to maximizing their profit but to controlling the money supply and thereby the level of economic activity... This system of banking, in which banks hold a fraction of the amount on deposit in reserves, is called a fractional reserve system”

“When there are many banks, individual banks may not even be aware of the role they play in this process of expanding the money supply. All they see is that their deposits have increased and therefore they are able to make more loans”

Stiglitz, J., Walsh, C., “Economics” (2006), pages 622-624

In this part of their book there is an emphasis in the role of commercial banks as a group, not just as single entities, in the role of creating money by means of the money multiplier. A few pages later the authors started describing different ways how the Fed, the American Central Bank, can affect the money supply with its decisions. This is what they wrote regarding reserve requirements:

“... the Fed establishes how much banks must hold as reserves... If the Fed increases reserve requirements, banks must set aside a larger fraction of their deposits as reserves and thus can lend out less. A rise in the reserve requirement reduces the money multiplier and reduces the impact that a change in the level of reserves has on the money supply”

Stiglitz, J., Walsh, C., “Economics” (2006), page 630

This was our last evidence showing how present the Deposit Multiplier model still is in nowadays’ literature. Before concluding this part of the chapter, let us express that the fractional reserves theory is not famous for its clarity. Describing the way the financial system increases the total volume of broad money while the banks’ power remains limited has been a challenging task for the economists writing on banking theory and, as we will see in the next page, there are reasons why this will never get easier.

3.5 Critiques to the DM model of banking

Let's put one thing straight: the Deposit Multiplier model does not describe well how the real world works. The way banks function is much closer to the FMC view than to the fractional reserve theory. Commercial banks seek customers with good creditworthiness and loan funds to them, from which they can make profit. These loans are independent from the reserve positions the bank has. The banks will seek funds to ensure they comply with the required reserve minimum in a given accounting period, but these lending decisions are not originated as the fractional reserve theory claims.

Many introductory economic textbooks supporting the fractional reserve theory give too much power to the Central Bank when they claim it has direct control over the total money supply. The authors defending this theory believe that a Central Bank wishing to vary the money supply could do so by lowering/increasing the legal reserve requirement minimum for commercial banks. By doing that, banks would have more/less reserves available for lending, which would translate in more/less aggregate deposits, or broad money, in the economy. This explanation is utterly wrong.

Central banks set target prices, and accommodate the supply and remuneration of reserves by using their chosen policy rates. A Central Bank can control the price of money in the system through its policy settings, but it is unable to control the volumes of money as the Deposit Multiplier model assures, making it an imperfect formulation. It is the money supply which drives the monetary base, and not vice versa. The demand for base money is a consequence, not a cause, of banks granting loans and creating deposits. It is the loans that banks grant independently of their reserve positions what will determine the reserves at any point in time. Whenever a creditworthy customer enters a bank willing to ask for a loan the entity will always lend if the terms are in its favour, regardless of the current position of its reserves.

It is true that private banks have the option to borrow and lend to each other through the interbank market, but these horizontal transactions will only help a single entity to achieve its requirement target if the system is not short of reserves. If there are not enough reserves in the system, the bank can still sell bonds back to the Central Bank, or in the worst case eligible institutions can ask for a loan directly through the so called "discount window". This is the least preferred alternative for them because the interest rate charged on such loans (the repo rate) is usually around a percentage point above the interbank rates, so commercial banks only take advantage of this option during emergencies.

It would be wrong to say that the price of reserves does not play a role at the individual bank level – it obviously affects their decisions when they have to approve loans – but the reserve position per se does not matter. An individual bank will lend to a borrower provided that there is a sufficient difference between the return of the loan and the repo rate, because any balance sheet expansion that leaves the bank in a position with lower reserves than required might force it to access the discount window, with the corresponding price penalty.

The Deposit Multiplier notion affirming that the system needs an initial injection of high-powered reserves to initiate balance sheet expansion through rising excess reserves also does not apply in the real world. A commercial bank's capacity to expand its balance sheet is

neither limited by its amount of reserves nor by fractional reserve requirements. A bank will expand its balance sheet via lending in this fashion: first a loan is granted, then at the same time a matching deposit is created, and after that reserves back the deposits. The reserve position of the bank is completely unconnected to the mechanism of creating new bank liabilities through credit extension.

Another fact that is ignored by this theory of banking is that reserves from the Central Bank cannot be lent to non-bank agents. That cash is only withdrawn against deposits that have been previously created through lending, not lent directly to people. This clearly works against the effects of open market operations described in the previous pages: in reality those operations have no impact on lending.

The DM theory also asserts that the Central Bank increases and decreases the money supply through open market operations. To prove this is wrong, imagine the case where an increase in the money supply is desired. This would start as in our example exposed in section 3, where the purchase of securities in the market led banks to lend out excess reserves. The problem is that this extra lending will cause competition in the overnight market to drive the interest rate down, forcing the central bank to intervene again. How can the CB maintain control over the overnight market? By draining reserves through the sale of bonds in open market. It is then clear to us that the method does not work, because in order to regain control the CB has to undo the action that caused the loss of control in the first place.

Another unrealistic element of the theory is that during the process of money creation, whenever there are excess reserves they are used to fund a loan. The money is shown to leave the bank immediately, and the excess cash balance is drawn down because it is assumed the borrower has received the money paid out in cash. The truth is that banks normally do not extend loans to customers who previously don't have an account with the entity, and certainly it is not common that the money is given in cash. Hence, by simply dropping this unrealistic assumption that loans are paid out in cash, the models explaining the fractional reserve theory (like Samuelson's) become quite like the ones explaining the credit creation theory because the step of the cash deposit can be omitted.

The final flaw of the DM theory is the contradiction shown in some of the models describing it. Samuelson, for example, shows the deposits on the balance sheet of the bank; this means they are not off-balance sheet items, and therefore these deposits are property of the bank, not of the customers. Bank deposits are just a record of the loan from the saver agent to the bank. This implies that the customer deposits or reserves are not constraining bank lending because since deposits are a record of the debt owed to customers, the bank can extend a loan and record further debts to customers, very much in the fashion as the FMC theory suggests.

Some of these flaws and contradictions might be the reasons why the Deposit Multiplier model started to lose popularity about a decade ago, as nowadays' textbooks mainly discuss either the ILF or the FMC models. Although the ILF presents nearly as many deficiencies as the DM model, we have to acknowledge some progress has been made when a theory with such wrong basic premises and approach finally gets discarded from literature. We can only hope that the same will gradually happen to the ILF view.

Chapter 4

ILF vs. FMC: an empirical test of DSGE models reacting to shocks

As the reader has already seen, despite seemingly being an old-fashioned way of describing how money production by banks works, the ILF view of banking has attracted an important stream of thinkers during the last century. With the different opinions and examples showed in previous chapters, the reader now should be familiar with the functioning of the ILF and the FMC theories – that is, in a microeconomic level. But focusing on that would mean we are barely scratching the surface of what the researchers try to prove: that choosing the wrong model to describe how the system works ultimately leads to very inaccurate predictions for the real economy as a whole.

Some of the contemporary authors who more devotedly try to oppose the ILF as an established way of banks doing business, like for example Jakab and Kumhof, want to see how a series of shocks affect economies modelled in a DSGE manner. Those economies are only different in the assumptions behind bank lending and borrowing, keeping all other things equal. In this chapter we will discuss some of the broader outcomes from these experiments.

In their 2015 paper *“Banks are not intermediaries of loanable funds — and why this matters”* Jakab and Kumhof first lay the basis of their DSGE experiment, where they try to simulate two pairs of models in which the individuals try to maximize their utilities in the same ways. The real steady states of all four models are identical, and in order to maintain the symmetry the only difference in the setting of the models is the set of agents dealing with banks.

The authors constantly emphasize that, although they tried to calibrate their model according to US historical data and DSGE literature, their main goal is not to represent a full econometric exercise but to illustrate the large differences between ILF and FMC models for non-financial shocks. One of the shocks is designed to affect the economy’s fundamentals, and the other tries to represent an autonomous change in an agent’s sentiment. That said, before getting into the shocks, let’s have a look at the model the authors built in order to replicate what they considered “real life” conditions.

4.1 The agents in Jakab-Kumhof's universe

4.1.1 The Government

One of the most important entities that appears in this model, the government finances public expenditure by means of taxation. Like in the real world, there is a serious concern that the general prices of goods and services might increase or decrease beyond undesired thresholds; therefore, another important role of the Government is to set nominal interest rates at levels that are consistent with their macroeconomic objectives, based in future inflation expectations.

It is known that forecast-based rules are prone to indeterminacy, especially the standard ones with a finite horizon (*"Inflation forecast-based-rules and indeterminacy"*, Levine et al, 2006). This real indeterminacy appears when, like in this paper, a shock displaces the economy from its equilibrium, creating sunspot equilibria that can become welfare reducing and potentially quite large. Although it is true that a discounted sum of current and all future rates of inflation would solve the problem, Jakab and Kumhof opted for a setup where the government aims for an interest rate that stabilizes the discounted future inflation for 4 periods. This is only a medium-term prediction, but suffices to show the vastly different effects of certain shocks in either ILF or FMC scenarios.

Returning to the function of public spending, this expenditure equals a fixed percentage of the steady state output (the authors chose 18% of GDP, consistent with their historical data) and it is exclusively financed with the lump-sum taxes obtained from the households' net income streams - for simplicity, these lump-sum taxes are solely obtained from households, and not from companies. If we further assume that the initial government debt equals zero, this way of financing translates into a zero-level government debt at all times.

The last thing the Government does in this world is to issue Government bonds, the only alternative along with wholesale loans for banks to finance themselves. As we will see in the upcoming subsection, these bonds can be acquired with deposit money created by retail deposit banks and are perfect substitutes with wholesale loans. The real interest rates on government debt are r_t , and later we will see how important these are when we later talk about profits of retail deposit banks.

4.1.2 Banking sector

The Banking sector in Jakab and Kumhof's model has several roles in the system, among which we can list retail deposit, wholesale and retail lending functions. For that, the authors decided to divide this sector into three subsectors with these separate tasks, namely: Retail deposit banks, Retail lending banks and Wholesale banks. Let's take a deeper look at each of them.

Retail deposit banks

The role of retail deposit banks in this universe is to create deposit money. Depositors come to the bank to leave their deposit money for an agreed amount of time, while retail deposit

banks operate with it. In exchange, depositors will receive an interest rate $r_{d,t}$ from the bank.

The universe is set up in a way such that deposit money allows you two possible options: one can either purchase wholesale loans or acquire government bonds. These different products are perfect substitutes of each other, so whenever retail deposit banks lend to wholesale banks, they do it at the policy rate.

Retail deposit banks earn profit by exploiting the discrepancy between the lower deposit rates $r_{d,t}$, payable to the depositors who left their money at the bank, and the aforementioned real interest rates they receive from having acquired government debt, r_t . So for any given period t their profits will depend on the difference between these rates times the amount of deposit money d_{t-1} created in the previous period:

$$\Pi_t^R = (r_t - r_{d,t}) * d_{t-1} \quad (4.1)$$

Retail lending banks

Retail lending banks are, according to Jakab and Kumhof, the financial institutions that grant loans and determine the terms of the loan contracts with the borrower households. Particularities like the nominal loan amount and the gross nominal retail rate of interest are specifically chosen to fit the borrower's category of everyone who comes over asking for a loan.

These banks generate profit from the interest $r_{l,t}$ on the loans they grant, and then use it to repay the wholesale interest charges to the wholesale banks, explained in next section. What makes everything tricky is the fact that not every borrower will repay; in fact, there is going to be a percentage of the people receiving a loan who, affected by the shocks implemented in the setup of the model, will draw a return from their investment lower than the interest rate agreed with the bank. In such cases the borrowers cannot repay, and the implications for the bank are various: they can't recover the full value of the pledged assets, they need to apply monitoring costs to ensure that all bankrupt cases are indeed bankrupt...

Retail lending banks have an ex-ante zero profit condition, which means that although realized ex-post profits might differ from zero, the expected payoff they receive from their lending activity (with all outcomes taken into consideration) must equal the wholesale interest rate they must pay back to wholesale banks. Those entities are the next stop in our journey.

Wholesale banks

The last type of banks that one can find in Jakab-Kumhof's universe are Wholesale banks. These have a clearing function in the system, and at the same time make sure that the other banks are complying with governmental macroprudential regulations. Their balance sheet is composed of a loan stock on the one side, while on the other one can find the deposit stocks and their net worth: $l_t(j) = d_t(j) + n_t^b(j)$.

In a given period banks can either be well capitalized or fall short of capital requirements. Unless they are compliant with capital adequacy ratios, their net worth will fall. This forces

banks to include capital adequate with the regulations whenever they calculate their optimal capital choice.

Similar to the case of retail lending banks, wholesale banks will also suffer a shock at time $t+1$. This will affect the bank's loan book, and if as a result the net worth of that bank is less than a certain percentage of that bank's value of assets, they must pay a penalty that further reduces their net worth. Thus, Wholesale banks maximize their pre-dividend net worth like this:

$$\max_{l_t(j)} E_t \left[r_{l,t+1} l_t(j) \omega_{t+1}^b - r_{t+1} d_t(j) + \Pi_{t+1}^R(j)x - \Lambda_{t+1}^l(j)x - \chi l_t(j) F^b(\omega_{t+1}^b) \right]$$

Which basically says that a bank will choose a number of loans that will maximize:

1. The gross return on loans, $r_{l,t+1} l_t(j) \omega_{t+1}^b$, where ω is the aforementioned shock
2. Minus the gross cost of deposits, $r_{t+1} d_t(j)$
3. Plus profits on retail deposit operations, $\Pi_{t+1}^R(j)x$. The x here represents the constant positive technology growth of the closed economy, dependent on the growth of the labour augmenting technology
4. Minus net losses on retail lending operations $\Lambda_{t+1}^l(j)x$
5. Minus penalties on those banks that fall below the regulatory minimum $\chi l_t(j) F^b(\omega_{t+1}^b)$, where χ represents the penalty payable as a percentage of the loans

4.1.3 Manufacturers and Unions

The products created in this world are crafted by combining two different sorts of agents: manufacturers and unions. The first produce and sell goods, while the second can be viewed as syndicates of workers that offer workforce to the manufacturers.

Manufacturers

These are the agents in the economy that create the goods and sell them to the households. Different manufacturers differ only in the variety of the products they create. Manufacturers purchase labour h_t from unions at a price V_t , which denotes the union-specific wage rate. At the same time they will need to employ physical capital k_{t-1} , obtained from either households or entrepreneurs (depending on the model variant) at the nominal rental rate R_t^k .

Once they have produced the output $y_t(j)$ they sell it at a price $p_t(j)$ for many different purposes: consumption, saving, investment... In the end, we can express manufacturer profits as $\Pi_t^M = y_t p_t - (h_t V_t + k_{t-1} R_t^k)$, where the parenthesis indicates the costs payable to the unions and to the households, in this order.

Unions

These are entities that “sell” labour to the manufacturers. Each one of these unions groups people together with similar skills, and the only difference between individual unions is the variety of labour they provide. Unions purchase homogeneous labour services from households,

at the household nominal wage rate W_t , and sell differentiated labour varieties to manufacturers, at the union-specific producer wage V_t . Union profits are therefore derived from the difference between the wage rates V_t and W_t , achieved via the intermediation between the households and the manufacturers, and multiplied by the amount of labour they intermediate for in a given period, h_t .

4.1.4 Households

In all the model variants, households represent the population of the universe. Households are utterly important because they sell their time to the Unions, produce the output of the economy y_t by using the physical capital provided by the manufacturers, and then buy this output to either consume it, save it or invest it - pretty much what the human beings would do in the real world. At the same time, depending on the type of household they are, they will interact with the different types of banks in several ways. Ultimately, all of them will pay taxes to the Government, deducted from their net income stream.

What all households have in common is that all of them provide work to the unions, and that each one of them consumes an amount c_t . What differentiates them is the fact that some of them have preference to save, while others borrow. This way, deposit money for consumption and investment are held exclusively by saver households who deposit it in Retail deposit banks in exchange for a rate $r_{d,t}$, while borrower households will be the ones entering loan contracts with Retail lending banks.

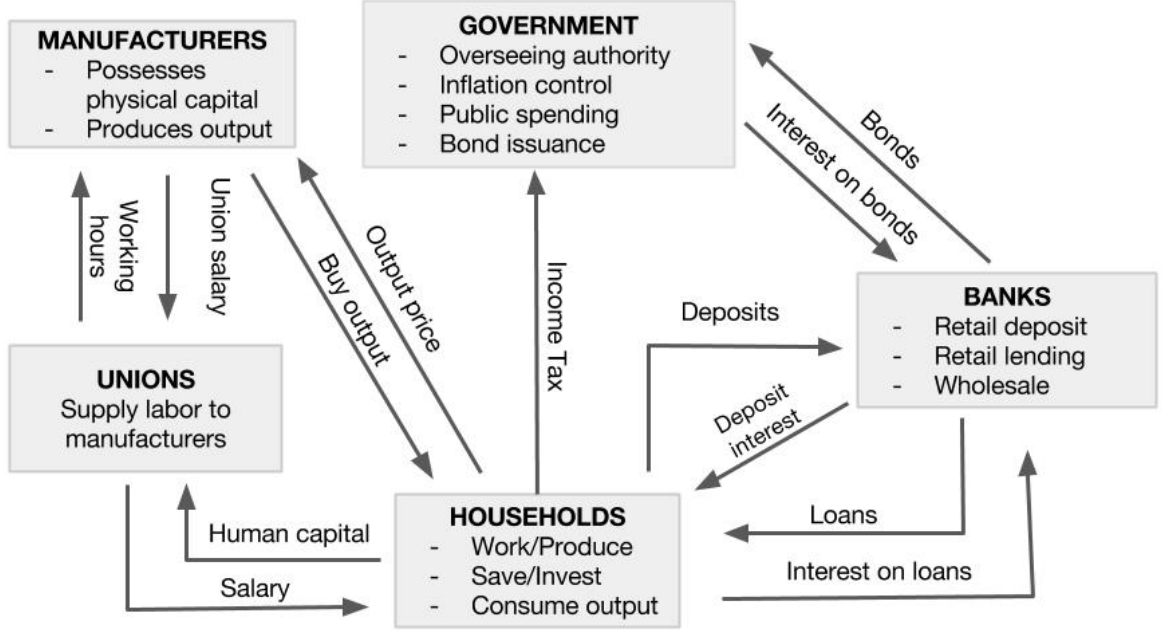
We could say that the budget constraint of Borrower households is

$$q_t k_t - l_t = q_{t-1} k_{t-1} - r_{l,t} l_{t-1} + W_t h_t^b - c_t^b + \Omega_t$$

which means that in period t they will be able to spend the returns from capital from period $t - 1$, minus the rate $r_{l,t}$ payable to the Retail lending banks for loans obtained in period $t - 1$, plus the wage W_t received from the Union for their working hours, minus the amount they consume in the period, plus the share of the aggregate lump-sum net income stream Ω_t corresponding to the population share of borrowers. This income stream is obtained after adding entrepreneur dividends (in case the household has become an entrepreneur), plus profits of the manufacturer (if they have actively engaged in the production of goods), plus payments related to adjustment costs, minus lump-sum taxes payable to the government.

For saver households the budget constraint is basically the same, with the only difference being that instead of having to return the lending rate to Retail deposit banks, they will receive a payment $r_{d,t}$ from Retail deposit banks as an interest on the deposits left in the vaults in $t - 1$, and that they will be able to consume c_t^s instead of the c_t^b consumed by the borrower. The main difference is that, keep everything else equal, if the saver had accumulated savings during previous periods he should be able to consume a higher amount of the production good than the borrower. To that, we also need to add the returns on investment from previous periods.

4.1.5 Diagram of the agents



4.2 The shocks

In probably the most important part of their paper, the authors developed two different types of shocks that are implemented to check how the agents in the DSGE model readapt themselves after the exposure. More importantly, they aim to verify their hypothesis: that under identical shocks, the interactions between the agents in FMC settings lead to much stronger effects in the banks' balance sheets and the real economy than those interactions in ILF settings. This will indeed be the case, but before jumping to the conclusion we will further define the shocks a little bit more in detail.

4.2.1 Borrower Riskiness shock

The first of the two shocks is meant to be a technological disruption to the economic fundamentals. It will affect the whole banking scheme, as it is introduced into the clearing subsector, the Wholesale banks. Every bank will react to it in a rational adaptive way.

In a simplified manner, we could say that the shock affects how banks perceive the riskiness of the agents to whom they could potentially lend. If a bank had a return on its loan book of $r_{l,t+1}$ before suffering the shock by the very beginning of period $t + 1$, then right after $t + 1$ begins they will be victims of a disruption ω_{t+1}^b which will alter their returns, making each individual wholesale bank's effective return on its loan book become $r_{l,t+1}\omega_{t+1}^b$.

Since the overseeing authority, the government, enforces regulations that require penalties from banks who do not fulfill minimum adequacy ratios: whenever the net worth of a bank is less than a certain percentage of that bank's value of assets, they must pay a penalty that further reduces their net worth. This forces the entities to include borrower riskiness in their optimal pre-dividend net worth. Taking all that into account, in the event of for instance a perceived improvement in borrower's riskiness (they behave more responsibly, so riskiness decreases) banks will be willing to lend more easily to borrowers, in its turn affecting the loan volumes as well as the consumption, output levels, inflation and GDP of the economy. A more detailed explanation of the magnitude of the effects follows in the next section.

4.2.2 Willingness-to-Lend shock

The second type of shock is conceived to provide an alternative to the previous, which affected the economic fundamentals. This one, in turn, is not a function of other economic fundamentals but an autonomous change in banks' sentiment: it will distort the fraction of the value of the capital stock against which banks are willing to lend, and it will have repercussions starting from the Retail Lending banks and the borrowers (capital owners) until they reach the whole of the economy.

The people in this world who are catalogued as borrowers mostly borrow money from Retail lending banks for investing purposes. That is, they will use the money from the loans to purchase physical capital, and provide it to manufacturers for various production processes, becoming entrepreneurs in the process. The physical capital gives a return $ret_{k,t}$ which takes into account both the depreciation rate and the rental price of capital $r_{k,t}$. But this is not all: after having bought the asset, each borrower suffers a shock ω_{t+1}^k during the period $t+1$, making its effective return from capital become $ret_{k,t}\omega_{t+1}^k$. Borrowers who draw ω_{t+1}^k below a cutoff level cannot pay the interest rate on their nominal loan amount and declare bankruptcy.

As we saw before, Retail lending banks' ex-ante zero profit condition will take these shocks into account. This means that once they realize the shock they will adapt accordingly, changing the amount of granted loans and, e.g. in case of a decrease in the share of the value of assets against which banks are willing to lend, being stricter with the contracts they sign with potential borrowers from that moment on for as long as the shock lasts. Such changes will result in variations in investment, consumption, output, inflation and GDP, which we will see in the next section.

4.2.3 Magnitude of the shocks

Jakab and Kumhof considered it reasonable to test the behaviour of the agents differentiating the responses between credit booms and credit crashes. To do so, they modelled the following scenarios:

- For the positive economic stimuli originating Credit Booms, the authors set up cases where over a period of six quarters each of the shocks varies by 30%. This implies a 30% decrease in the standard deviation of the borrower riskiness and, in the case of the

Willingness-to-lend shock, a 30 p.p. increase on the share of the value of capital against which banks are willing to lend for also a six-quarter period.

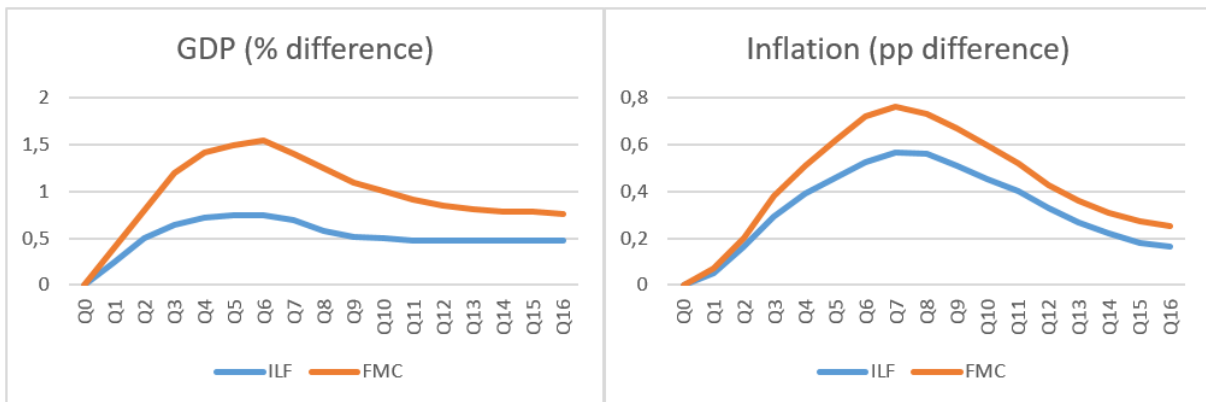
- To test negative economic stimuli inducing Credit Crashes, Jakab and Kumhof imagined a world where the shocks negatively affected variables by 15% for a single quarter. This translates into an increase of 15% in the standard deviation of the borrower riskiness, and in a 15 p.p. decrease in the share of value of assets against which banks are willing to lend.

In case the reader now wonders why credit crashes occur within one quarter as opposed to booms which accumulate over time, there is broad consensus in the literature in establishing asymmetries between credit booms and credit crashes. *Claessens, Kose and Terrones (2011a,b)* determined that gradual prolonged booms in lending translated into gradual positive economic effects, while credit crashes occur more sharply, and their consequences are large sudden negative shocks, especially affecting the output.

4.3 The shock consequences under ILF vs FMC scenarios

4.3.1 The effects of the Borrower Riskiness shock

Credit Boom due to lower Borrower Riskiness



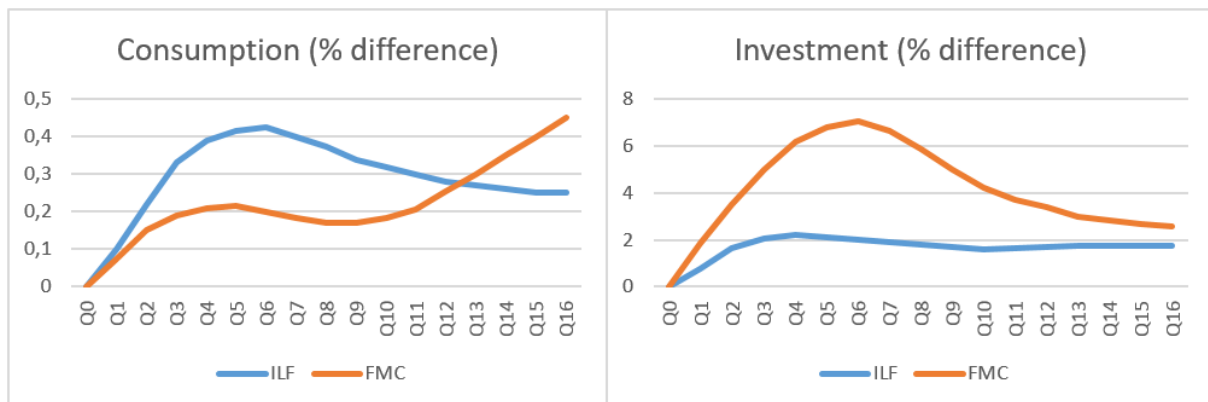
As it can be appreciated in the graph, the effects of a 30% drop in borrower riskiness will lead to a much greater increase in the GDP in FMC settings than under ILF restrictions. If we check for instance the 6th quarter, which is the moment when the shock is active for the last time, the difference is especially big: after one and a half years the GDP levels for the FMC model have increased 1,5% (compared to the initial level), which is almost double than the increase suffered by the ILF model subject to the same disruption.

Why do we see such a substantial difference in the GDP? Well, this is because although some components (e.g. inflation) have a similar development between the two models, at the same time several important financial components of the GDP present variations of considerable size. Without going any further, in the next page we can see how the evolution paths of the Consumption and the Investment, two of the most important components of the gross

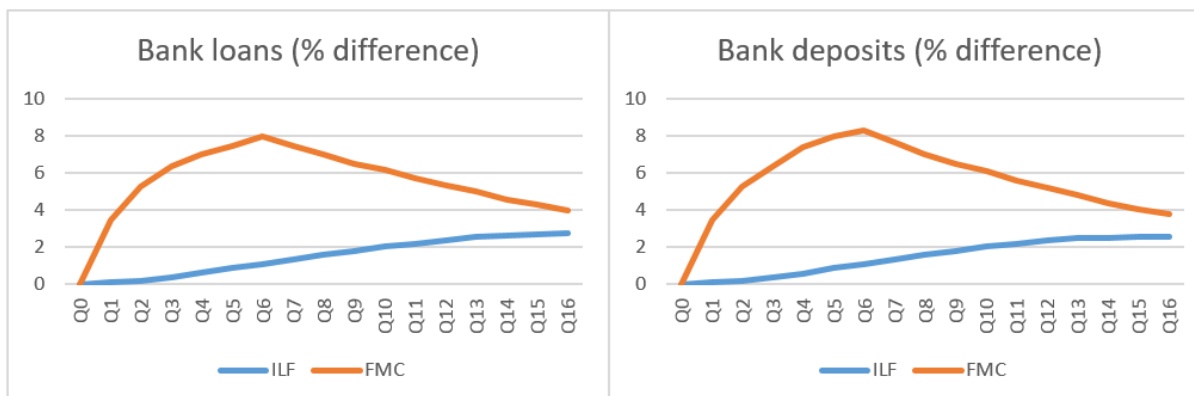
domestic product, differ greatly between the ILF and the FMC settings. The cause for such differences is that ILF banks cannot change their lending volumes until they have first received sufficient deposits from saver households, which gives them much less manoeuvre space and makes the money creation process slower, since households will only reduce their consumption gradually to start saving. They even might be willing to increase their working hours in order to get a higher wage, but that also will not happen from one day to the other because of nominal rigidities.

On the other hand, in the FMC world the banks face fewer constraints: they don't need to wait for depositors to bring their money, which accelerates the lending process, thus allowing households to increase consumption and investment with more flexibility. As we can distinguish from the graphs, these increases translate not only into higher investment, banks loans and bank deposits, but also into augmented inflation and GDP levels.

About the right part of the graph, the reason why the inflation increased at slightly more than 0.7 percentage points by the end of the second year (8th quarter) is very likely derived from an increase in aggregate demand.



Regarding the effects on the real economy, once we look at the investment levels we can appreciate how by the end of the 6th quarter investment has increased about 7% in the FMC case, while it only increases by a modest 2% in the ILF case for the same period. The cause for that might very well be the new purchasing power created by the bank's lending activity, which facilitates and reduces the cost of trading with investment technology. Therefore, the "effective" price of investment experiences a much steeper decrease in the FMC scenario. At the same time, consumption also experiences an increase derived from positive wealth effects from higher lending volumes and lower lending spreads.

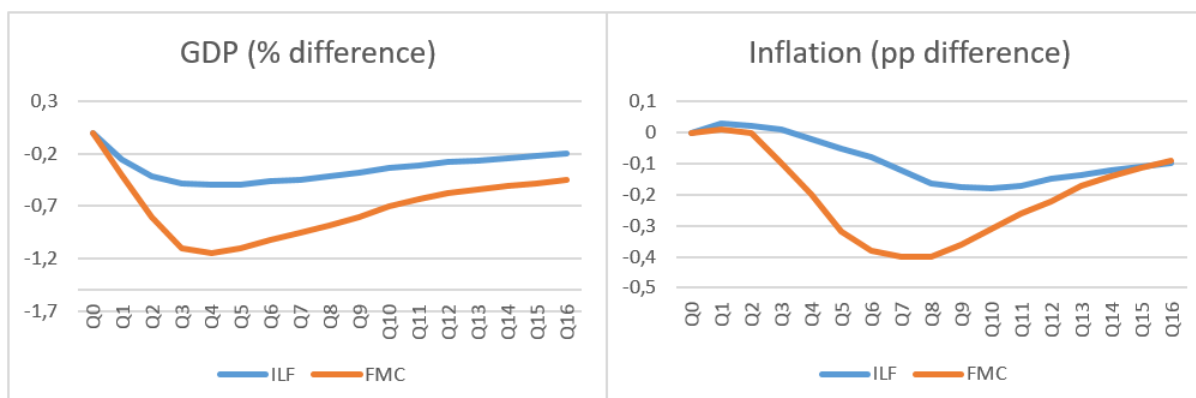


The aforementioned improvement in borrower riskiness positively affects the banks, since now less people will default and they will have increased profitability. The balance sheet is going to be better off, and in both ILF and FMC cases the levels of loans and deposits will clearly rise for the 6 quarters where the shock lasts, and even continue growing for the ILF case.

For these two variables, the critical difference we can extract from the graphs is that both loans and deposits are much more easily adjustable in the case of a FMC world than in an ILF one. This is proved by the fact that ILF loans and deposits keep growing even after the shock is over in period Q6, denoting how predetermined loans and deposits are when banks cannot create their own funds.

It is remarkable to see how both graphs evolve in an almost identical way. This is indeed a consequence of the way how banks fund additional lending: by creating deposits on the other side of the balance sheet. With this method, the net worth of the banks is going to suffer little changes, but given that in both the ILF and the FMC case the lending risk will increase since we have a bigger amount of loans, the lending spreads of the banks (the difference between the borrowing and lending rates in the banking system) should suffer a reduction, which will no doubt be worse in the case of ILF.

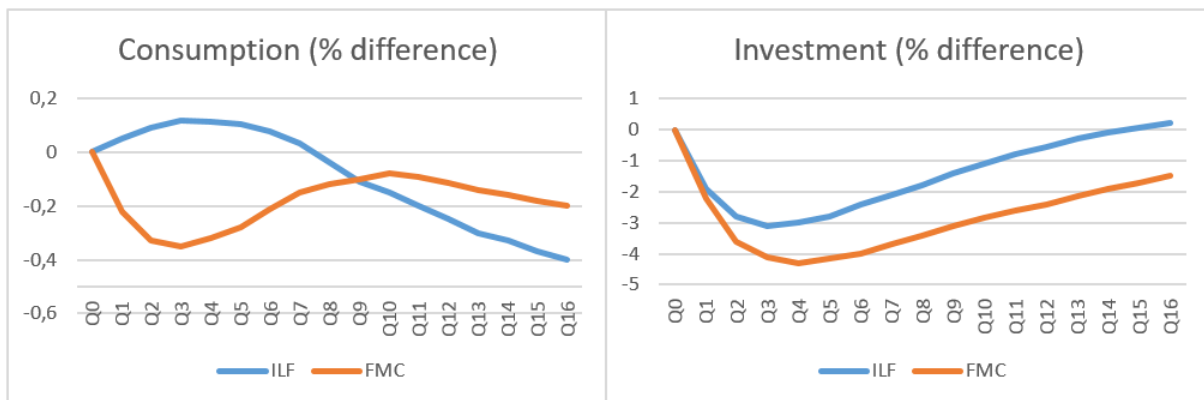
Credit Crash due to higher Borrower Riskiness



Opposed to the case we have seen before, now we are in front of a scenario where the borrower riskiness worsens (increases) 15% in a single quarter. Such a shock will have a clearly bigger impact on the GDP with a DSGE model following the FMC rules, than on one replicating a ILF scenario. Although the shock only lasts for a quarter the repercussions can be felt until the 4th quarter, where both GDP levels start to pick up. The biggest difference is found precisely then, at a point when the DSGE model predicts a decrease of 1.2% in the GDP of the FMC world, while the reduction amounts to “only” 0.5% in the ILF setting.

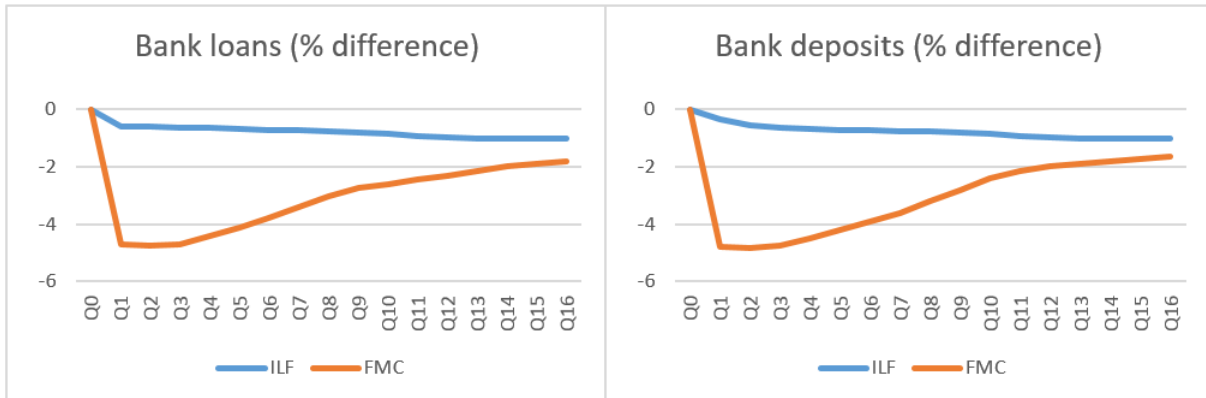
These contractions in GDP are occasioned by lower levels of lending, caused by a higher unwillingness from the banks to lend to the borrowers, which reduce the means for investing. And in a closed economy like this one, investment is one of the main driving forces of the gross domestic product. A lasting cut in lending will raise the “effective” price of investing, and this translates into lower purchasing power for the whole economy.

From the graph on the right side the conclusions that can be extracted are that the inflation falls much faster and about 20-25 basis points lower under the FMC constraints compared to the ILF ones. Although they later converge after a period of 3 years, this difference is caused by the way how transaction balances are supplied in the different settings; obviously the contractions in the FMC world have a stronger disinflationary role than those in the ILF case.



We already explained the cause for the contraction in investment. Let’s deal with the Consumption: why does it increase on ILF? It is probably due to a combination of effects which pull in different directions. During the first 4 quarters it increases, indicating that the stronger effect pulling upwards might be the monetary transaction costs. These are caused because while investment is contracted by the shock, the ILF setting does not allow bank savings (deposits) to drop as fast as in the FMC case, so the supply of transactions is less affected. There is going to be an amount of transaction balances “free of use”, forcing the consumption price to drop and leading to an increase in the consumption for the first year.

In the FMC model the supply of bank deposits can rapidly fall already in the first period, that is why the transaction costs will increase, leading to higher consumption prices and also eventually an increase in the volumes of consumption and investment.



If the shock from before positively affected banks, now an increase in borrower riskiness will have negative impacts for them. The implications will be worse balance sheet structures and profitability for banks, since now more people will default. In both ILF and FMC cases the level of loans and deposits will jump downwards at the first period, although the jumps in the ILF scenario are only about 10% the magnitude of the those in the FMC scenario, which decreases 5% in a single quarter.

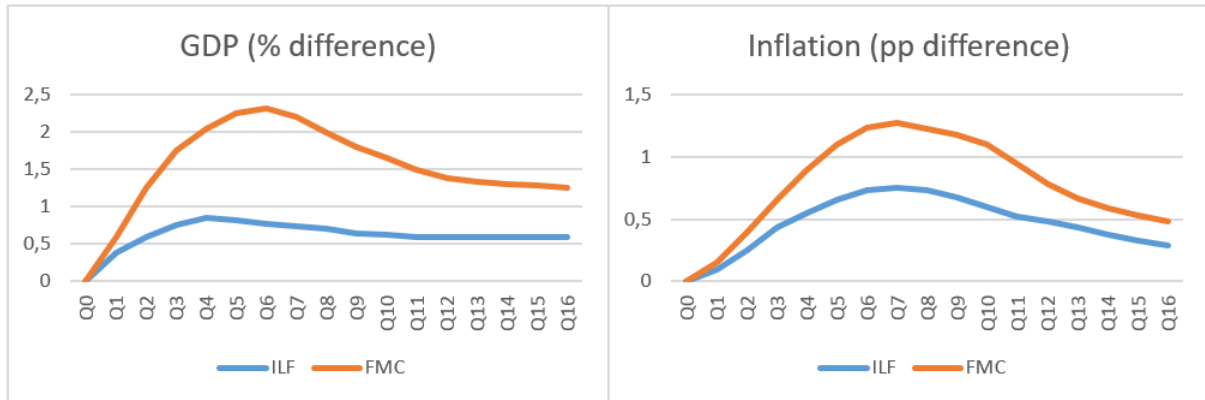
The banks will want to resist the shock by lending less, but ILF banks have again the same problem as in the Credit Boom: they cannot change the lending volumes as fast as the FMC banks. Savings (deposits) are predetermined, and loans depend on them; households will try to start consuming more and/or working less, but the process is slow and gradual and it means that banks will face the problem of lending money to potentially defaulting borrowers with increased riskiness. The only good news for them is that the increased riskiness allows them to increase their lending spreads to try to compensate for the losses of the defaulting agents.

This is not a problem that FMC banks have to face. They can reduce their loan volumes easily, that is why the magnitude of the jumps regarding loan and deposit volume is so much bigger for FMC scenarios than for the ILF case. Deposits and loans will decrease at the same time, hand by hand, like in the credit boom. After the initial shock the levels will slowly go back to normality, but even by the end of the 4th year after the shock the effects can be felt – the loan and deposit volumes will still be lower than they were before the shock took place.

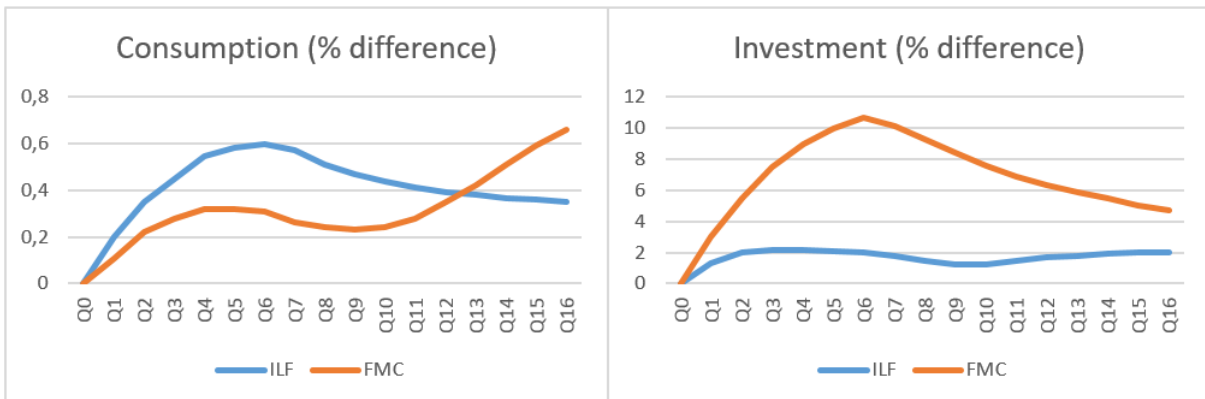
4.3.2 The effects of the Willingness-to-Lend shock

Credit Boom due to higher Willingness to Lend

This sequence of graphs shows us the effect of a 30 p.p. improvement (increase) in the share of the value of capital against which banks are willing to lend over a period of six quarters. At a first glance we can already highlight how similar these responses are to those from the drop in borrower riskiness, at least in shape if not in measure. Quantitatively speaking, they appear to be larger for the willingness to lend shock, but the structure of the sequences is qualitatively the same.

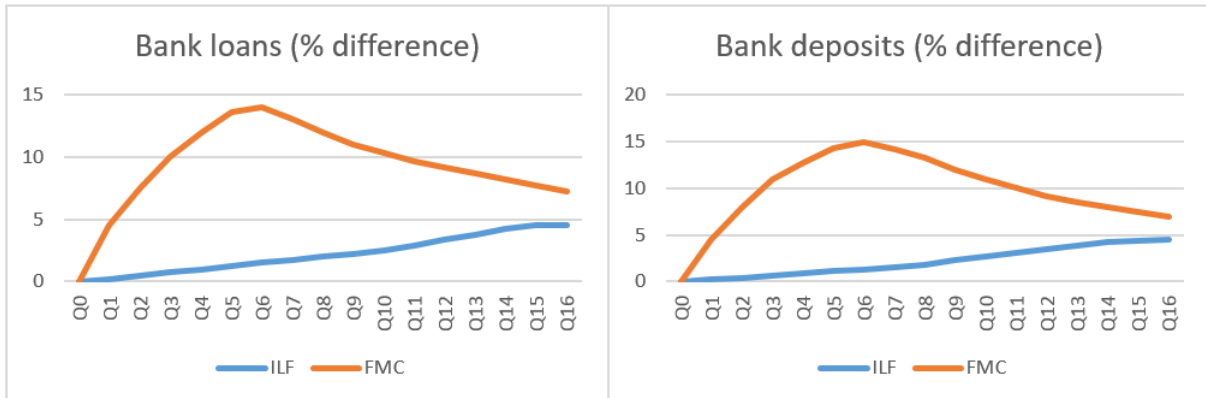


As we described in previous sections, now the driving force is an autonomous change in the bank's sentiment, while the fundamentals of the borrowers' business stay unaltered. For the evolution of the GDP levels the differences in the ILF are not huge, but for FMC now we see even stronger growth in both GDP and inflation than what we saw with the other shock: in q6, the moment when the shock achieves its biggest accumulated distortion, the effects of the Willingness-to-Lend shock are 0.8 p.p. bigger than with the former shock, and the inflation levels now reach a maximum of 1.25 p.p., a premium of 0.5 over the previous case.



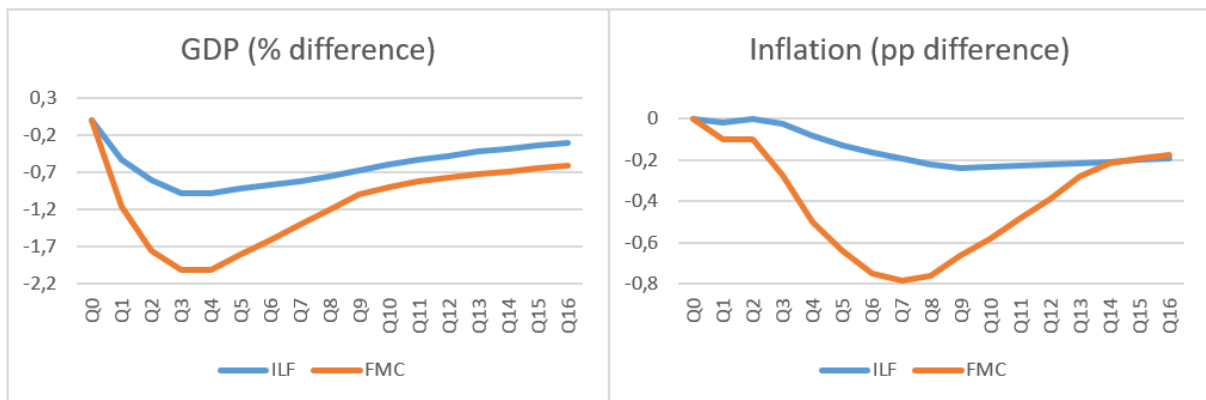
The real economy will behave similarly under this shock to the way it did with the previous one: again we see a much bigger FMC investment increase than in the ILF case. With the credit creation settings the investment levels surpass the 10% increase mark after 6 quarters, while the ILF barely reaches a 2% threshold, much like in the case of the borrower riskiness shock. Again, the explanation for such stronger movements is a more active retail lending sector which provides the means for investing with more ease than with the ILF setting, resulting into stronger and faster decreases in the “effective” price of investment for the FMC case.

Exactly as one could rationally expect from an increase in willingness-to-lend, both the levels of bank loans and bank deposits will increase for either FMC and ILF cases. The increase in the volume of loans reaches 14% for the FMC in the 6th quarter, a very steep development which shows how banks adapt to the shock more with quantity changes rather than price.



Even though now banks have more availability from collateral (remember, the share of the value against which the bank is willing to lend increased) per dollar of loans, they also have an increased default risk from borrowers which proves to be even bigger, resulting in an increase in loan levels. For the ILF model we don't see such big jumps in volumes for the reasons already commented (lack of flexibility due to the cumulative requirements) so in that case banks will have to adapt to the shock by dropping spreads instead of increasing volumes.

Credit Crash due to lower Willingness to Lend

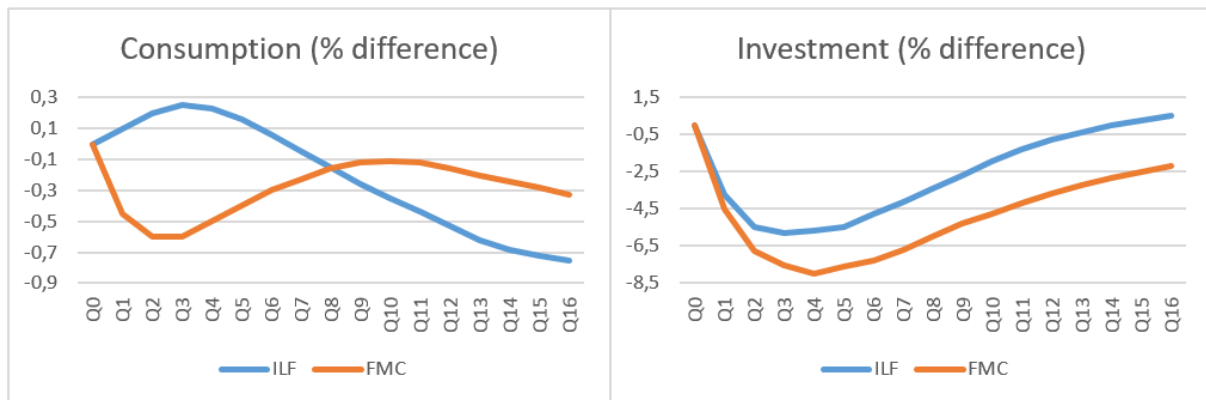


These graphs represent a situation where the share of the value of assets against which banks are willing to lend decreases by 15 p.p. in a single quarter. Despite the fact that the shock only lasts for one quarter, the tendency for decrease lasts for 4 quarters for the GDP and for as much as two years for the inflation levels, before they start picking up again. For the gross domestic product the biggest difference in the levels between the two cases can be seen by the end of the first year, when the decrease is twice as big for the FMC compared to the ILF setting.

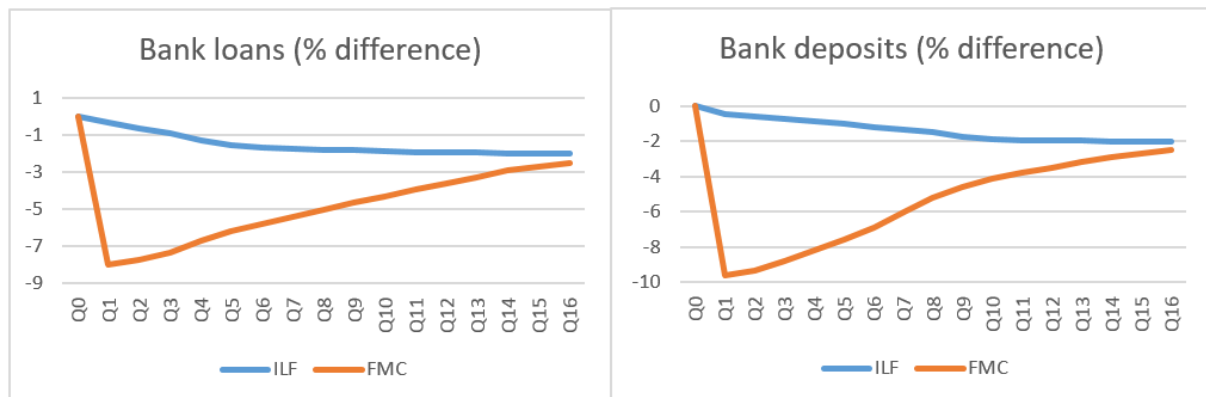
The reason for the recession in both cases is that, like with the other shock, banks will readapt to the new conditions by granting less loans and impeding the investment in levels that foster GDP growth. Retail lending banks will start being more picky with potential borrowers, and will lend only to those that pledge a higher-than-before level of collateral. This will in turn

decrease the whole purchasing power in the world, but the level is always going to be higher for the FMC case given the ease they have to change lending volumes without having got deposits first.

For the inflation rate we can observe a much bigger and steeper fall in the FMC case, which starts to drop severely after q2 and reaching levels of -0.8 p.p. by the end of the second year, which is about 4 times bigger than the drop in the ILF case. Again, the shock will cause deflationary contractions at a bigger level in the FMC than in the ILF setting.



Consumption and investment strongly follow the same paths as in the borrower riskiness shock causing crashes, but like in every other variable here the magnitude of the increases and decreases is bigger. For both consumption and investment levels now we reach degrees that are 200% bigger than with the previous shock. The cause for this even bigger repercussions could be that, unlike the previous one, this shock is forward-looking: banks know what they want to sign and accept, while in the previous one they were committed already when the shock first strikes. This helps them mitigate the effects on their net worth by strongly reducing the amount of offered loans, which reduces the other variables in the ways we have described in previous sections.



To finish with the analysis, there is only left to say that bank loans and deposits will obviously be negatively impacted by the new stricter criteria for picking “good” borrowers. Because of

the forward-looking capacity of banks to combat this shock, now the loans will reduce 8% in a single quarter, accompanied by an almost 10% reduction in the bank deposits during the same period. ILF banks will face the same constraints as always: they cannot sharply reduce deposits and loans since balance sheet items are predetermined and need to be accumulated, that is why the reductions will always be reaching a level of -2% after 4 years, which is the time it takes to FMC to catch up with ILF level of loans and deposits.

4.4 Final words regarding the Jakab-Kumhof paper

Thanks to the paper from Jakab and Kumhof we now know that under identical shocks and similar conditions, FMC models forecast much larger reactions to shocks in the balance sheets of the banks in the economy than those predicted under ILF models. This will in turn have greater impact on the real economy because the adjustment process is much more flexible and less dependent on the slow and continuous characteristics that define the ILF deposit accumulation mechanism. With a two-sided expansion of their balance sheets, banks in the FMC achieve money creation in a much quicker and discontinuous manner.

It is worth noting that this doesn't mean banks in FMC settings are not subject to constraints; they will still have to correctly evaluate the solvency and profitability of the lending opportunities they are offered. But at least other disturbing factors, like the availability of central bank reserves, are gone from the equation.

In terms of balance sheets the experiment proved that the FMC theory describes banks as institutions with zero net but non-zero gross financial transactions, as opposed to the ILF theory which imagines banks as recording non-zero net non-financial transactions with goods. It is precisely this creation of gross positions with zero net principal value but a positive new interest flow over time what the authors describe as the main reason for existence of banks.

To finalize, the authors believe that in the real world there are no entities that operate in the ILF way, which is why they suggest to use FMC models for research in macroprudential policies. According to them, these models should be much more consistent with real data and provide much more accurate prediction results than the those obtained with methods present in existing literature.

Conclusions

Unraveling the mysteries of commercial banking and the money creation role of banks in the society is clearly of the greatest importance at this point in time. During the elaboration of this master thesis we were able to contextualize and follow the development of each of the three dominant deposit creation theories, reaching in the process remarkable conclusions that undoubtedly have the potential to improve existing literature and macroprudential policy models.

In the opening section of this paper we dealt with the Intermediation of Loanable Funds (ILF) theory, currently the most widely used explanation of how banks create money, and therefore present in most literature and models. It is a view of banking subject to many constraints, the most important of which is that the banks need to have the resources prior to being able to lend them, making lending a consequence of saving. The most important papers used in this chapter probably were Tobin's "*Commercial banks as creators of "money"*", together with Gurley and Shaw's "*Financial aspects of economic development*". After checking the details of monetary and non-monetary transactions under these restrictions, we (same as some authors before) reached the conclusion that this way of transferring resources within the system does not result in an increase of the aggregate deposits in the economy, and hence fails to achieve what it claims: money creation. ILF-type institutions do not seem to exist in the real world.

The next step in the journey was reproducing the procedure, this time for the Financing through Money Creation (FMC) theory. Dating back to the 1860s, this is the oldest of the three mainstream methods; as such, one would expect it to be more archaic and less accurate than the more modern ones, but in fact this turned to be the best explanation of all: commercial banks are able to create money in the form of extra aggregate deposits by simply matching a borrower's loan with an equal-sized deposit under the same name, therefore creating money "out of the air" or from a "fountain pen". As we find in important textbooks as for instance Schumpeter's "*The theory of economic development*" (1912), banks are here monetary institutions whose main restriction is not possessing the resources in advance, but their own profitability: they will only borrow to creditworthy borrowers (under their own standards). The process is also illustrated with an example where the reader can see how banks are the only Financial Intermediaries able to reclassify liabilities, an essential element in the money creation process, thanks to their activity of regularly maintaining and being in charge of customer deposits. Regulation is, after all, applied differently for them because of precisely that role, which allows them to mix the client deposits with other liabilities towards other clients instead of keeping them off-balance.

Eventually we reached the Deposit Multiplier (DM) model, also known as fractional-reserve banking. At first sight it proposed ideas similar to those claimed by the ILF theory, but in this setting banks act as a collective entity rather than individual profit-seeking units. And all that while they are scrutinized and heavily controlled by a Central Bank that has almost almighty capabilities. Leading economists like Paul Samuelson, who accurately described this process in his 1948 book *“Economics”*, were convinced that the Deposit Multiplier was more reliable than the ILF and FMC methods. The third view of banking would succeed in explaining money (deposit) creation if its assumptions were right, but unfortunately some of them are utterly incorrect. For instance, the Central Bank is not able to control the volumes of money in the economy because it does not target volumes but the price of the money through its policy settings. Moreover, it assumes that commercial banks can lend Central Bank reserves to non-bank agents, when in reality they are only able to borrow such high-powered money to each other. All in all, this theory has too many failing components in it to be depicted as a truthful explanation.

A final chapter is dedicated to a detailed description of an empirical experiment created by Zoltan Jakab and Michael Kumhof with the intention of testing the reactions to shocks under ILF and FMC scenarios. The results support our hypotheses: subject to identical shocks, a model where banks function under a Financing through Money Creation setup predicts reactions of the agents in the economy that are much faster and larger than those predicted by the ILF model. The variables in the real economy are therefore much more swiftly and heavily impacted in the case of the FMC setting, and the volume of the reactions in that case is definitely more in line with historical data than the responses obtained from the application of the same shocks under a scenario where banks had to collect the deposits before being able to lend any.

4.5 Possible applications

A big percentage of nowadays literature still considers the ILF version of commercial banking as the way to go. Only recently some authors started a stream of opposition against the intermediation theory, and favor the Financing through Money Creation instead. During the course of our analysis we have succeeded at identifying the FMC view as a more accurate explanation of how banks really work, and at the same time we have been able to demonstrate the different repercussions that applying one theory or the other can have in a DSGE model conceived to replicate reality.

After having been exposed to the effects of particular shocks, the ILF scenarios evolved much less rapidly than their FMC counterparts. In some of the settings, the magnitude of the changes in economic variables like the inflation, the GDP, consumption and investment was three times smaller when banks had to accumulate deposits before lending than in the cases where they could lend “out of thin air”. Not only the magnitudes were very different, but the speed at which the agents were able to react to the changes was much slower, a trait rarely found in the real world. Finally, for all depicted shocks we could observe how the variables in the FMC scenario changed with more flexibility for as long as the shock had its effect, but in the ILF scenario the adaptation process continued long after the shock was inactive.

We firmly believe that all these traits of inefficiency and lack of adaptation, features that are rarely found (and definitely not at this degree) in the real world, make economic models based on the ILF view of banking deficient attempts of something that could have been better if the FMC way would have been applied. Better how? Better in forecasting the pace of the reactions of the agents, better at representing the magnitudes of both positive or negative unanticipated shocks and, in essence, better for any prediction exercises.

A good example of potential applications of our findings is the paper from two modern authors, Salomon Faure and Hans Gersbach, who started studying in 2014 the impact of monetary policy and capital regulation on the money creation role of private banks, which in its turn affects the economy as a whole. To do so, they developed a general equilibrium model which is noteworthy for our topic because it is only one of the few actual exercises where the setting is completely FMC, and not ILF. Some of their insights are very interesting: they argue that appropriate Central Bank policy can restore socially efficient money creation in cases where, for instance, due to price rigidities, money creation collapses or explodes. Joint measures combining capital adequation and monetary policy can restore equilibria with socially efficient money creation and lending. And most importantly: all the model works under FMC assumptions.

4.6 Other factors affecting money creation

Constraints imposed by the behavior of non-bank agents

No matter if we find ourselves in a ILF or an FMC setting, the behaviour of private households and other non-bank agents in the economy in relation to the newly created deposits is something that will always determine the ultimate impact of commercial banks' credit creation. Tobin already discussed that once new deposits are generated, two scenarios may arise: either the people use the money to repay outstanding loans, or they use it for consumption and investment purposes. The first option, known as "reflux theory", would take place whenever a borrower would use the money to repay a pre-existing loan. In this situation we can say that the newly created money has been "destroyed", and if all the agents in the economy were to follow that borrower then the volume of aggregate deposits in the economy would return to the levels before any loans were made.

The second option for the borrower would be to spend it on goods and services. This typically happens when the money ends up with an agent without outstanding loans or companies with positive holdings or financial assets. Now that the agent has more money than desired, the normal course of action would be reducing this "excess" of money by investing it in whatever asset they wish. In an extreme case, the money could be passed on and on between households and companies, augmenting the spending every time. This effect is called "hot potato" and could potentially see the money supply increase way more than predicted by the authorities and banks, leading to undesired inflationary pressure.

Quantitative Easing

In economies where commercial banks are creating too little money by means of lending, the Government or monetary authority may deem convenient to take measures in order to reach a certain desired inflation threshold. As we saw just before the global financial crisis from 2007-08, a usual measure to foster lending (and money creation) is to reduce the policy rate. But this method has a clear limitation: once the rate at which reserves are remunerated has reached an effective lower bound, the monetary authority has to turn to Quantitative Easing.

What is exactly Quantitative Easing? This method of stimulating the economy involves strategical assets purchases with the aim to stimulate the economy. The monetary authority will shift its objective to the quantity of money rather than the price. They will target asset quantities from chosen sellers, who after the transaction will deposit the money in their usual commercial banks. Banks act here as intermediaries between the Central Bank and the asset sellers, and after the sale has been effective the commercial bank will see its balance sheet increased: more assets in form of more reserves, and more liabilities in form of accounts that accompany the aforementioned reserves, for instance a pension fund deposit. This is just an overview of the process; deeper scrutiny would deserve a paper on its own.

4.7 Final words

Although the findings of this master thesis are conclusive, we can't help but to reflect upon the fact that the two less correct views of commercial banking have managed not only to survive this long, but in many occasions to become subject of books and relevant literature. So, what if they were not wrong? Sure, after having spent some time with the topic there seems to be little debate about the FMC being a better explanation of the way how commercial banks function. But we still think that it is important to rescue the many positive contributions from the ILF and DM views that we were able to unravel during our research.

We realize that borrowing and lending of abstract concepts can be difficult to fully comprehend. It is precisely in there where the success of the ILF theory lies: common sense tells us that real goods have to be created and accumulated before they can be passed and transferred. What's more, many of the options which are traded on any stock exchange are linked to underlying goods that are real, existing and palpable; they can be counted, stored and transported. At the same time, the Central Bank might not have such a big role as the Deposit Multiplier theory says, but as we have just seen in the Quantitative Easing explanation, it is still a powerful enough agent to be taken into account while modeling.

It is our intention that every reader of this thesis learns about the different models of commercial banking as much as we did during our research. All three theories had their share of popularity because of some reason, and learning about them will be an enriching experience in any case - as it has been for us. This topic is of utter importance nowadays and if we managed to shed some light on the reader's doubts and maybe even spark some interest for future research, the time and effort employed for this thesis will have been worth it.

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Appendix

In this section the reader can find a brief guide to the formulas and notation used in this master thesis, most notably in Chapter 4. For convenience, they are listed in order of appearance.

- r_t : real interest rates on government debt
- $r_{d,t}$: interest payable by retail deposit banks to depositors who leave their deposits in the bank
- $\Pi_t^R = (r_t - r_{d,t}) * d_{t-1}$: this equation represents the profits of retail deposit banks in period t . It is originated from the difference between the two rates, times the amount of deposit money d_{t-1} created in the previous period
- $r_{l,t}$: interest payable by the borrowers to the retail lending banks
- $l_t(j) = d_t(j) + n_t^b(j)$: balance sheet of wholesale banks. On the left side of the equation we find the loan stock, and on the right side we have the deposits stocks and the net worth of the bank
- $\max_{l_t(j)} E_t [r_{l,t+1} l_t(j) \omega_{t+1}^b - r_{t+1} d_t(j) + \Pi_{t+1}^R(j)x - \Lambda_{t+1}^l(j)x - \chi l_t(j) F^b(\omega_{t+1}^b)]$: this is how wholesale banks maximize their pre-dividend net worth. Each of the elements, in more detail, represents:
 1. $r_{l,t+1} l_t(j) \omega_{t+1}^b$ is the gross return on loans, where ω is a shock that affects the loan book
 2. $r_{t+1} d_t(j)$ is the gross cost of deposits
 3. $\Pi_{t+1}^R(j)x$ are the profits on retail deposit operations,. The x here represents the constant positive technology growth of the closed economy, dependent on the growth of the labour augmenting technology
 4. $\Lambda_{t+1}^l(j)x$ here are the net losses on retail lending operations
 5. $\chi l_t(j) F^b(\omega_{t+1}^b)$ stand for penalties on those banks that fall below the regulatory minimum. Here χ represents the penalty payable as a percentage of the loans

- h_t : labor purchased from the Unions by the Manufacturer
- V_t : union-specific wage rate, paid by the Manufacturer to the Union in exchange of labour
- k_{t-1} : physical capital. It is what is "left" from the previous period. It is employed by the Manufacturers
- R_t^k : nominal rental rate of the physical capital. It is paid by the Manufacturers to the households or entrepreneurs who own it
- $y_t(j)$: output produces by the Manufacturers after having combined all the input factors
- $p_t(j)$: price of the output $y_t(j)$
- $\Pi_t^M = y_t p_t - (h_t V_t + k_{t-1} R_t^k)$: these are the manufacturer profits. It is derived from the income received after selling the output $y_t(j)$ at the price $P_t(j)$, minus the costs payable to the unions and to the households
- W_t : nominal wage rate paid to households by the Unions
- c_t : consumption level of a household
- $q_t k_t - l_t = q_{t-1} k_{t-1} - r_{l,t} l_{t-1} + W_t h_t^b - c_t^b + \Omega_t$: this is the budget constraint of the borrower households
- Ω_t : this is the aggregate lump-sum net income stream corresponding to the population share of borrowers. It is obtained after adding entrepreneur dividends, plus profits of the manufacturer, plus payments related to adjustment costs, minus lump-sum taxes payable to the government
- $r_{l,t+1}$: return on the loan book of a bank before suffering any shock in period $t + 1$
- ω_{t+1}^b : a shock, suffered by the banks at the beginning of period $t + 1$. It will alter the bank's returns, making each individual wholesale bank's effective return on its loan book become $r_{l,t+1} \omega_{t+1}^b$
- $ret_{k,t}$: return given by the physical capital. It takes into account both the depreciation rate and the rental price of capital $r_{k,t}$
- ω_{t+1}^k : shock suffered by the borrowers during period $t + 1$. It will make each borrower's effective return from capital become $ret_{k,t} \omega_{t+1}^k$. Additionally, if ω_{t+1}^k is drawn below a cutoff level, the borrower cannot pay the interest rate on his nominal loan amount and declares bankruptcy

Zusammenfassung

In dieser Arbeit werden drei etablierten Theorien methodisch untersucht, die seit ihrer Einführung bis heute, die Rolle von Geschäftsbanken bei der Geldschöpfung versuchen zu erklären. Eines der Modelle beschreibt die Banken als Vermittler/Mediatoren zwischen Sparern und Darlehensnehmern, in einem Prozess, der voraussetzt, dass vor der Darlehensgewährung ausreichend Reserven vorhanden sind. Die Theorie von der Kreditschöpfung besagt, dass Banken bei jeder Kreditgewährung Einlagen bilden, dieses ist nur an ihre Wirtschaftlichkeit gebunden. Das dritte Theorem sagt aus, dass das gesamte Bankennetz als ein Kollektiv funktioniert, und dass durch den Gelschöpfungsmultiplikator die Entscheidungen der Zentralbank direkten Einfluss auf die umlaufende Geldmenge haben. Aus bereits vorhandenen empirischen Modellen und ihren Resultaten, kamen wir zu dem Ergebnis, dass durch eine Reihe von unerwarteten Schocks unter den Modellannahmen von der Kreditschöpfung, kommt es zu größeren Auswirkungen sichtbar in makroökonomischen Variablen, in Größe und Geschwindigkeit, als mit dem anderen zwei Theorien. Dieses entspricht auch mehr den historischen Daten, als die Ergebnisse, der anderen zwei Alternativen. Als Konsequenz daraus, schließen wir, dass die Auswahl der Theorie in ein makroökonomisches Modell einen wesentlichen Einfluss auf die Qualität der Prognose hat.

Schlüsselwörter: Geschäftsbanken, Geldschöpfung, Vermittlung von Darlehensfonds, Finanzierung durch Geldschöpfung, Einzahlungsmultiplikator, makroprudenzielle Politik, Kapitalregulierung.