UNIVERSIDADE ESTADUAL DE CAMPINAS

INSTITUTO DE ECONOMIA

FERNANDA OLIVEIRA ULTREMARE

The endogeneity of money supply in Brazil: credit money creation after the adoption of the inflation targeting regime

A endogeneidade da oferta de moeda no Brasil: a criação de moeda de crédito após a adoção do regime de metas de inflação

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Prof. Dr. José Carlos de Souza Braga – orientador no Brasil

Prof. Dr. Robert Peter Guttmann – orientador na França

Prof. Dr. Bruno Martarello De Conti – coorientador no Brasil

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Orientador no Brasil

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COMISSÃO JULGADORA

Prof. Dr. JOSÉ CARLOS DE SOUZA BRAGA
Instituto de Economia / UNICAMP

Prof. Dr. CARLOS EDUARDO F. DE CARVALHO
PUC-SP

Prof.ª Dr.ª ELIANE CRISTINA DE ARAÚJO
UEM

Prof.ª Dr.ª SIMONE SILVA DE DEOS
Instituto de Economia / UNICAMP

Prof. Dr. ROBERT PETER GUTTMANN
Université Paris 13

Prof. Dr. CÉDRIC DURAND
Université Paris 13

Prof.ª Dr.ª OLÍVIA MARIA BULLIO MATTOS
FACAMP

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RESUMO

A avaliação da endogeneidade da moeda revela os arranjos complexos que formam uma estrutura bancária e sua capacidade de criar dinheiro por meio do crédito. A este respeito, as principais características da abordagem pós-keynesiana estruturalista da oferta monetária são: (i) o dinheiro é principalmente criado no mercado de crédito; e (ii) as autoridades monetárias impõem alguns limites à criação de crédito, no entanto, não determinam totalmente o seu processo. Aqui, tanto a demanda por moeda como a preferência pela liquidez dos agentes (bancos, empresas e consumidores) são as forças subjacentes que sustentam esses dois atributos. A tese investiga o que tem determinado a oferta de moeda de crédito no Brasil e como a política monetária tem delimitado esse processo desde a adoção do regime de metas de inflação em 1999. Em primeiro lugar, nós delineamos as características intrínsecas da oferta de moeda em uma economia monetária de produção considerando a teoria estruturalista pós-keynesiana sobre o assunto. Em seguida, trazemos o atual pensamento acadêmico dominante que orienta a formulação de políticas monetárias pelos vários Bancos Centrais por quase três décadas, ou seja, o Novo Consenso em Macroeconomia (NCM), e avaliamos suas divergências em relação a abordagem pós-keynesiana. Mesmo que a crise financeira global de 2007-2009 tenha levantado questões sobre o fundamento científico das regras de política do NCM, ela não destruiu a essência de seus elementos teóricos pré-crise, que continuam a afirmar que a regra de Taylor e o uso de uma meta de inflação devem prevalecer, uma vez que qualquer alteração nas variáveis monetárias é, no melhor cenário, efêmera. Embora o Banco Central brasileiro tenha atualizado constantemente seus modelos, seu fundamento está na capacidade última da autoridade monetária de controlar a base monetária. No entanto, encontramos evidências, tanto nas análises empíricas como nos modelos econométricos, de que há outras variáveis que afetam a decisão de oferta de crédito dos bancos no Brasil: as expectativas de longo prazo das taxas de juros, influenciadas pela taxa básica de juros de curto prazo, que altera a curva de rendimentos dos bancos; e a demanda por crédito, que influencia a decisão dos bancos de valorizar sua riqueza e, consequentemente, aumentar ou não a oferta de crédito. Portanto, a oferta de crédito no Brasil é determinada endogenamente - como esperado pela teoria pós-keynesiana - pela preferência pela liquidez dos bancos e pela demanda por fundos, sendo assim delimitada pela política monetária.

ABSTRACT

The evaluation of money endogeneity reveals the complex arrangements that form a banking structure and its ability to create money through credit. In this regard, the key features of the Post-Keynesian structuralist approach of money supply are: (i) money is mostly created in the credit market; and (ii) monetary authorities impose some limits to credit creation, however, they do not entirely determine its process. Hereof, both money demand and liquidity preference of agents (banks, firms and consumers) are the underlying forces that sustain these two attributes. The thesis investigates what has determined credit money supply in Brazil and how monetary policy has bounded this process after the adoption of the Inflation Targeting Regime in 1999. We, first, outline the intrinsic characteristics of money supply in a monetary economy of production by addressing the Post-Keynesian structuralist theory on the subject. Thereafter, we focus on the current dominant academic thinking that guides the formulation of monetary policies for numerous Central Banks by almost three decades, i.e. the New Consensus in Macroeconomics (NCM), and assess its divergences to the Post-Keynesian approach. Even though the global financial crisis of 2007-2009 has raised questions about the scientific foundation of the NCM policy rules, it has not shattered the essence of the pre-crisis theoretical elements, which still claims that the Taylor rule and the use of an inflation target should prevail since any alterations on monetary variables is at the best scenario, ephemeral. Afterwards, even though the Brazilian Central Bank has been constantly updating its models, its background lies on the ultimate ability the monetary authority has to control the monetary base. However, we find evidences, both in empirical analyses and in econometric models, that there are other variables which affect the credit supply decision of banks in Brazil: the long-run expectations of interest rates, influenced by the policy short-term interest rate by the provoked alterations on the yield curve of banks; and credit demand, which influences banks decisions to value their wealth and, in consequence, to increase or not the credit supply. Therefore, credit supply in Brazil is endogenously determined – as expected by the Post-Keynesian theory – by the liquidity preference of banks and the demand for funds, being, thus, bounded by the monetary policy.

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SUMMARY

Introduction

From the perspective of a wide spectrum of economic theories, including some of the mainstream approaches, the money supply is viewed as partially controlled by the monetary authorities. This partial endogeneity of money supply to real private sector economic processes has been highlighted by those who study the actual functioning of banking systems. The inability of monetary authorities to fully control the money supply became most evident in the 1980s, due to a monetarist attempt from some governments to input quantitative limits to the monetary base. Nowadays, however, the practice of monetary policy is explicitly focused on the interest rate targeting [of borrowed reserves]. Despite not unanimously, it is now increasingly accepted by distinguished theoretical approaches that the money supply is an endogenous variable, including, for instance, the post-Keynesian approach, the neoclassical theory of monetary policy, the new classical business cycle theory, and the neo-Keynesian money multiplier model. Nevertheless, the sense through which the endogeneity of money supply is determined varies considerably among these strands of research.

On the one hand, Tobin's Yale School approach to monetary theory identifies endogeneity with the liabilities side of the bank's balance sheet. It is related to the capacity of banks to create deposits on the basis of an exogenous quantity of reserves. The interest rate on bonds is the internal mechanism that ensures the portfolio adjustments by the agents (households, firms, and financial institutions), which enables the existing stock to support a different money supply. However, even though the multiplier applied to these reserves is viewed as endogenous, it is predictable and could be easily factored into money supply targeting. On the other hand, most endogenous money theories relate the money supply to the asset side of banks' balance sheet, placing credit creation and thus deposits at the center of the analysis. In modern, sophisticated baking systems, banks have the innovative ability to stretch their portfolios' constraints and raise potential profit. Additionally, in accordance with Minsky's significant theory of the "lender of last resort", central bank is accessible to supply additional reserves and have no instruments to directly control the volume of money and credit creation. Thus, reserves (as well as the multiplier) are endogenous, and the scope for monetary policy is restricted to the cost of borrowing reserves. Thereby, the focus of these endogenous money theories is on the demand for credit, and on the expectations and expenditure plans which sanctions it.

From a post-Keynesian perspective, the endogeneity of money followed by its non-neutrality are the main characteristics of a monetary economy of production. With the important exception of the horizontalist (also known as accommodationist) view, based mainly on the work of N. Kaldor (1985) and B. Moore (1988a), most of post-Keynesians authors see money supply as only partially endogenous[1] and deeply related to the structure of the financial system. These strands of research actually differ regarding to several aspects, from the time stream (whether it is endogenous in the long-run or the short-run); through the central bank policy objectives and operation techniques; the banking practices; and to the direction of causality between economic activities, demand for credit, bank lending, price level, and money supply. For the latter's, central banking arrangements and the evolving market strategies of banks, aside from credit demand and liquidity preference, determine the volume of credit and thus the creation of money. Given its theoretical and empirical progress, as well as its exploration of the complexities and interdependencies of the nature of money, the *structuralist*[2] view is the strand of research that we consider in this analysis to clarify and form the background for its latter conclusions.

Nonetheless, since the determinants of credit supply differ historically as well as across economies, the degree of endogeneity of a particular monetary-financial system cannot be known without an investigation of its specific institutional features. Besides, unraveling the role of credit supply is an inherently difficult task. This difficulty stems from several factors, from being based on expectations to not been able to unequivocally be calculated in advance to the affects that the demand for credit has on it. Therefore, one of our main objectives is to identify the elements that ascertain the credit supply in the Brazilian economy over the last fifteen years.

We thus follow a path of, firstly, understanding the theoretical factors related to the credit creation, i.e. the importance of banks liquidity preference and the bounds monetary policy can place on it, and, secondly, analyzing the Brazilian specificities related to the monetary policy rules and central bank' instruments, as well as the institutional and historical economic scenario that embedded banks decisions and, finally, providing empirical evidence about the relation between credit creation, liquidity preference, and demand for funds.

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[1] Not fully accommodative.

[2] The term structuralist refers to the post-Keynesian monetary theoretical approach present in Dow (2006) and refers to the fact that the degree of endogeneity of the money supply depends on the institutional structure of the economy.

This work is divided in four chapters. The first chapter focuses on the definition of what is called structural endogeneity and describes the differences between the forms of money and both banking and central bank practices related to the money supply function, i.e. credit money and its possible constraints imposed by the monetary authority. The second chapter, on its turn, is dedicated to understanding the contemporaneous policy rules that directly impact money creation, i.e. interest rate policy rules. After assessing the policies of the New Consensus in Macroeconomics that are followed by most central banks, including the Brazilian Central Bank (BCB), the chapter highlights the Post-Keynesian alternatives for interest rate rules. The third chapter comprises the monetary regime in operation in the Brazilian economy, highlighting the instruments that the Central Bank uses to manage the target short-term interest rate, so as the models it uses in the decision-making process. The fourth chapter provides empirical evidence for the analysis of credit money creation in Brazil, explaining how credit growth is determined in the Brazilian economy after the structural transformations that followed the adoption of the Real Plan and following the adoption of the Inflation Targeting Regime. The chapter presents the estimation of two empirical models – a dynamic panel data and a vector error correction model – that are used to provide empirical evidences about the relationship between the liquidity preference of banks reflected on their portfolios, the demand and monetary policy instruments, and the credit supply. This work concludes with an additional chapter to provide the main conclusions of the thesis, with special regards to the Brazilian country-case.

Chapter 1. The structural endogeneity of money supply

1.1.   Introduction

The evaluation of structural endogeneity reveals the complex arrangements that form a banking structure where banks have the ability to create credit and the credit created as deposits can be used as money. The Post-Keynesian approach, also known as the structuralist approach, addresses the extent to which the Central Bank bounds this process, uncovering the intricate interactions between the agents involved in it, i.e. banks, household, firms, and the Central Bank itself. Therefore, the key features of what we can identify as the structuralist endogeneity view of money supply are: (i) the limited determination of money supply by the monetary authorities; and (ii) the creation of money throughout the credit market, though not exclusively (DOW, 2006). In summary, the underlying forces that sustain these two features are both the money demand and the liquidity preference of banks, which affects a complex range of interest rates (PALLEY, 1988, 1991, 2013b, POLLIN, 1991, 2008).

As argued by Fontana (2004), the supply of liquid funds is strongly determined by its demand, and it is originated inside the economic system in order to finance investment and consumption decisions, and speculative purchases of assets. In one way, the increase in the degree of indebtedness of firms reflects the belief in possible short-term refinancing, as well as expected long-term profitability (MINSKY, 1986). On another, households' willingness for new debt depends on the prospects of growing wages and/or wealth effects[3] (ARESTIS; HOWELLS, 1996; GUTTMANN; PLIHON, 2008). In other words, credit demand depends on the portfolio preferences that reflect expectations about future gains in projected economic environments.

On the other hand, the elasticity of resources generated by the financial system is the result of guarantee margins and expectations about the future behavior of gross aggregate profits. According to Minsky (1986), supplies of credit respond endogenously to demands, and the pattern of response is guided by projections of returns, which is significantly dependent on monetary policy. Banking strategies, for instance, involve the administration of assets and

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[3] The prospect of a financial wealth appreciation makes consumers to increase the propensity to consume on disposable income and, simultaneously, admit extraordinary expenses, supported by an increase in debts. Thus, it is possible to observe expanding debt services on household's current income, even if the relationship between these services and the stock of wealth stagnates or declines.

liability structures by considering different risks, terms and interest rates by valuation expectations. In this process, financial institutions individually may or may not sanction the demand for credit[4], exercising a key role in defining the standard features of financing an economy.

Moreover, the monetary authority can influence credit supply by changing the availability of liquid assets compared to all other classes of assets via monetary policy instruments, i.e. reserve requirements, discount window, and open market operations. Through the management of liquidity in the reserves market, the Central Bank may modify the price of money – the interest rate – and, thereby, provoke adjustments on the portfolio of banks, reordering the comparable disposal of assets. The resulting modification in the yield curve in operation transforms banks propensity to expand credit supply (FONTANA, 2004).

Consequently, money creation depends on the real structural framework in operation and how it affects expectations and the actions of agents. The degree to which money supply is determined by market forces is a function of a complex set of institutional factors, including the forms of money in circulation, banking practices, exchange rate systems, the organization of financial market, and Central Bank's objectives and instruments. Since these factors differ historically as well as across economies, the degree of endogeneity of a particular monetary-financial system cannot be known without an investigation of its specifics institutional characteristics; an abstract monetary theory, which assumes that the money supply is either endogenous or exogenous, cannot be applied mechanically to all economies without being misleading in many cases (NIGGLE, 1991).

This chapter presents the theoretical, institutional arrangements that influence the endogeneity of money supply in an economy and is divided in four more sections besides this introduction. Section 2 describes the importance of the form of money on the matter, i.e. whether it is commodity, fiat or credit money. The third section elucidates the active role of banks and their liquidity preference to sanction the demand for liquid funds. Section 4 examines the Central Bank practices, which affects portfolio' formation of banks, bounding the supply of money. Finally, the last section presents some theoretical partial remarks.

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[4] Financial innovations are associated with the advancement of financial fragility, which results in a higher ratio between debt service of borrowing (interest, amortization) and expected yields. Indeed, the relationship between investment and financial strength during the economic expansion are responsible for a growing instability, which in turn also affects the evolution of monetary policy (MINSKY, 1986).

1.2.   Forms of money

Particular forms of money, i.e. commodity money, fiat money, and bank credit money, combined with various commercial and Central Banking institutions and practices, present different degrees of endogeneity or exogeneity. Each type of money enters the economy or is created differently, and the consideration of the actual behavior of the specific monetary-financial system under analysis is a powerful guide for the best policy practices. For instance, considering an economy with commodity money (gold) or convertible paper currency with rigorous gold rules, and with a relatively underdeveloped banking system, the quantity of money shall be determined outside of the financial and industrial sectors of the economy, i.e. by trade flows, foreign investment, or gold production. The money supply would thus be exogenously determined. Even if the State issued *fiat* money (to cover deficits) or varied the gold backing requirements, the money supply would still be determined exogenously with respect to the private economy by the same factors as in the simpler situation along with the State's fiscal and monetary policies (FONTANA, 2003, 2004; NIGGLE, 1991; PALLEY, 2008, 2013b).

In the opposite side of the spectrum, bank credit money could be created with no legal reserve requirements by the monetary authority, determined both by credit demand and the liquidity preference of banks, with absolute responsibility for preventing financial instability assumed by the Central Bank as the lender of last resort. This relation between the Central Bank and the monetary system would support the idea that the monetary authority is incapable to effectively control the monetary aggregates (FONTANA, 2003)[5].

In a credit money economy, conceded loans create deposits, which are, then, expected to be expended by bank borrowers in real or financial assets. The forward exchanges on portfolio agents provoked by this first expenditure also create deposits, as sellers will be always willing to accept bank deposits as means of payment (as long as they maintain their *moneyness*[6]). In effect, direct exchange by barter of goods and services is transformed in exchange on credit money (deposits). The continuity of this process permits the maintenance

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[5] Moore (1988a, b, 1991), who emerged as leading exponent of the accommodationist theory, defends that Central Banks can affect the monetary aggregates only indirectly, raising or lowering the general level of short-term wholesale interest rates, depending, on its turn, on the extent to which it supply funds to the wholesale markets relative to the wholesale markets' net demand for funds. The Central Bank, as the monopoly issuer of fiat money, is thus able to discretionarily determine the level of short-term market interest rates.

[6] They ability to transform in liquid means of payment with any value loss (KEYNES, 1936).

of the agents' confidence on the system and their willingness to increase holding deposits (PALLEY, 2008, 2013b).

Therefore, in most modern capitalist economies, money is mostly created by credit and its definition comprises very liquid financial assets, most of which can be used directly as means of payment. Money assets are those that have the attributes of money, which allows them to perform money functions, i.e. unit of account, means of payment and store of value. The vastness of money consists mainly of bank deposits and, with banking innovation, the range of deposits performing money functions has increased. Bank deposits come into being primarily as the counterpart to new credit. They can also be created from securities purchasing by banks, government expenditure and from balance of payments surpluses. Once the new deposits are spent, or an overdraft facility exercised, the new deposits circulate within the banking system as money (MADI, 1993)

1.3. The importance of banks

The structuralist view resumes the analytical precedence of credit on deposits in monetary dynamics, focusing on the relationship between money, credit and liquidity preference. In fact, the credit expansion process reflects the combined action of banks and non-banks, lying in the preferences between more liquid or illiquid assets by the non-bank public and in the profit prospects of financial institutions. Therefore, the lending expansion is not completely limited by the volume of existing reserves as financial institutions can develop new sources of funding at the national level or internationally, besides the Central Bank's reserves (CHICK, 1994). Actually, the endogeneity of the money becomes relevant to the extent that financial institutions have the capacity to expand credit, provided it is profitable, in order to meet the demand conditions, despite the restrictions placed by the Central Bank[7]. Consequently, in the process of expansion of loans, banks create deposits, endogenously expanding money and quasi-money and interfering in the state of liquidity in the economy (CHICK; DOW, 2002; MADI, 1993).

In a liability management context, banks may increase the borrowing power of its reserve base creating funding instruments so that the public release liquid funds, accepting in exchange less liquid financial securities. Since the reserve requirement on demand deposits is

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[7] As it will be discussed in the next section, in addition to the reserves requirements and the interest rate policy rules, banking activity is highly regulated, subject to quantitative restrictions such as capital requirements (PALLEY, 2013b).

greater than on those less liquid securities, management of liabilities means that the reserve base can expand endogenously to meet the changes in the net demand for loans in case it is profitable for the financial institution. The expansion of financial intermediation becomes dependent on a positive differential between the funding interest rates and investing funds (GOODHART, CHARLES ALBERT ERIC, 2011).

As far as credit creation is concerned, loan rate of interest is the most relevant one and is determined by banks themselves. These actors tend to move their prime rate at the same speed of the central bank's rate. However, for most lending, particularly marginal ones, there is substantial scope for them to detach from monetary policy. The difference between the marginal cost of liquidity (the wholesale rate) and the actual loan rate charged on loans has two major components: the first one reflects the competitive structure of the banking sector, i.e., the more oligopolistic it is, the larger the mark-up; the second, reflects the banks' perception of lender's risk.

However, lender's risk cannot be objectively calculated and its estimation is subject to great fluctuations. Minsky's (1975, 1986) theory of financial instability results from the fluctuations over the cycle in perception of risk from borrowers and lenders, and the consequent credit cycle. It works in combination with the fluctuations in liquidity preference, which rises at times when confidence in expectations is low (cautionary demand) and when prospects of drops in asset prices are confidently held (speculative demand).

Throughout cycle's ascending movement, expectations in the increasing of asset prices are confidently held, and thus, liquidity preference is low. Banks are more willing to exchange liquid for less liquid assets, as well as to increase their lending activity, changing, in this way the composition and the size of their portfolios. As productive expected returns reach a maximum, activity shifts towards speculative trading, which deepens the financial fragility of the economy. The moment liquidity preference rises, and assets are sold, the economy may move into a downturn, which additionally strengthens liquidity preference, discouraging expenditure and lending (GUTTMANN, 2016; MINSKY, 1986).

When liquidity preference is high, due to, for example, reduced economic perspectives and/or high capital adequacy ratio, banks are less inclined to fulfill the demand for credit of firms and households, choosing to purchase existing securities. In such scenario, banks act as financial intermediaries rather than lenders, redistributing rather than creating liquidity (FONTANA, 2003, 2004). Structuralists also maintain that banks discriminate among potential borrowers by risk category and are likely to have higher liquidity preference, and consequently

to adopt a more prudent lending behavior. This can be the downturn of a long wave in the cycle and stresses the procyclical behavior of banks (GUTTMANN, 2016).

From the structuralist perspective, "the rate of interest (as we call it for short) is, strictly speaking, a monetary phenomenon in the special sense that it is the own rate of interest on money itself" (KEYNES, 1936, p. 223), it equalizes the demand for liquid funds with the available supply of these funds, constituted by current income, by past savings and the purchasing power that banks offer. Putting it differently, the rate of interest ought to modify the money-prices of other capital assets in order to equalize the attraction of holding them and of holding liquid money[8].

For Keynes (KEYNES, 1937a), the demand for liquid funds origins mainly[9] from both the uncertainty about the future (speculative-motive) and the need to finance planned increases of spending. From the first motive perspective, however, Keynes (1937a) argues that the public anxiety to increase their hoards can only affect the amount of hoarding if banks are willing to acquire (or dispose of) additional assets beyond what is required to compensate changes in the active balances. If banks withstand, an increasing propensity to hoard pressures the rate of interest to rise, and thereby, the prices of capital assets other than cash to lower. This process may go until people cease the idea of selling these assets or of abstaining from buying them in order to expand their hoards. The rate of interest is the pecuniary sacrifice that the owner of a hoard thinks worth suffering in preference to other claims and assets with an equal present value.

The latter reason to hold money, in its turn, was added in Keynes' theory of liquidity preference in his articles of 1937, when he emphasized that:

> … an investment decision […] may sometimes involve a temporary demand for money before it is carried out, quite distinct from the demand for active

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[8] Keynes (1937a) stresses that this is not about current saving or new investment. Additional hoards will never be a surplus of current saving over and above what is represented by current investment. The quantity of hoards does not depend on what people do with their savings, and there is no connection between idle balances and the conception of idle savings.

[9] The aggregate demand for money is a composite result of different motives in the General Theory: the Income-motive, meaning the demand for cash to bridge the interval between the receipt of income and its disbursement; the business-motive, where similarly, money is held to fill the interval between the time of incurring business costs and that of the receipt of the sale-proceeds; the precautionary-motive, which mean to have the ways to provide for contingencies requiring sudden expenditure and for unforeseen opportunities of advantageous purchases; and finally, the speculative-motive, which is particularly important in transmitting the effects of a change in the quantity of money to the rates of interest when there are changes in expectation affecting the liquidity function (KEYNES, 1936, p. 124–125).

> balances which will arise as a result of the investment activity whilst it is going on (KEYNES, 1937a, p. 7).

Planned investment may need a financial provision before it takes place. There must be a technique to bridge this gap between the moment in which the investment decision is taken and the time at which the correlated investment and saving actually occur. Keynes (1937a) called this advance provision of cash the *finance* required by the current decisions to invest. The *ex-ante* investment is the search for credit to carry out the investment, and as any other type of expenditure, may increase the demand for money for transactions[10], because the entrepreneur wants to have at his disposal the money before the payment date. If the investment grows in a steady rate, this new demand for money (*finance*) can be supplied by a *revolving fund* of a more or less constant amount, i.e. while some entrepreneurs are having their finance replenished for the purpose of a projected investment, others are exhausting theirs on paying for completed investments. However, if the rate of investment grows, the extra finance involved will constitute an additional demand for money (DAVIDSON, 1965; KEYNES, 1937a; KREGEL, JAN A., 1986; ROCHON; SETTERFIELD, 2011).

Even if the entrepreneur relies on financial provision previously arranged simultaneously with effective expenditure on investment, both by mobilizing installments regarding new market-issues precisely when desired or by arranging bank's overdraft facilities, market's commitments will be in excess of actual saving up to the present time and there is a limit to the extent of the commitments which market will be willing to enter into in advance. Or if he accumulates a cash balance beforehand (which is more likely to occur if he is financing himself by a new market-issue than if he is depending on his bank), then an accumulation of unexecuted or incompletely executed investment-decisions may occasion, for the time being, an extra special demand for cash (MORANDI, 2004; WRAY, 1992).

This *finance* bridge might be filled either by new issues in the market or by money creation by banks. Nevertheless, a pressure to assure more finance than usual may certainly affect the rate of interest through its impact on the demand for money; and unless the banking system is ready to expand the supply of money, scarcity of finance will prove to be an important obstacle to investment decisions. As Keynes (1937b) stresses:

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[10] This is a special case of the finance required by any productive process and has similar characteristics to the demand for money from the transaction motive; nevertheless, it is subject to special fluctuations of its own and thus needs highlight.

> … to the extent that the overdraft system is employed and unused overdraft ignored by the banking system, there is no superimposed pressure resulting from planned activity over and above the pressure resulting from actual activity. In this event the transition from a lower to a higher scale of activity may be accomplished with less pressure on the demand for liquidity and the rate of interest (KEYNES, 1937a, p. 9) .

According to Keynes (1937a, b), it is only the demand for money that satisfies the *finance* motive, i.e. a function of planned increases of spending, which forms part of liquidity preference and places pressure on the interest rate. Spending itself does not enter liquidity preference and plays no role in determining interest rates. The *ex-ante* investment requires *finance* during the time that the investment good is being produced, and the terms of the *finance* supply depend on the present state of liquidity preferences (along with the entrepreneur's forecast to the terms on which his *finance* will be funded when the time comes), in combination with the banking system policy to supply of money.

It is the banking system that takes the decision to provide or not enough *finance* to the planned investment, and if banks refuse to provide more money to satisfy the preference for liquidity, interest rates may increase sufficiently so that money is liberated from inactive balances to enter the active balances of the *finance* motive. The rate of interest, thus, can be determined by the interaction between the public desires to become more or less liquid and those of the banking system to become more or less illiquid. Therefore, the liquidity preference of both banks and public will contribute to determination of asset prices and interest rates. The state of liquidity preference might be directed by the state of expectations, as pessimistic prospects about future may increase the propensity to hoard (DAVIDSON, 1965; KEYNES, 1937a; ROBERTSON; KEYNES, 1938).

Keynes (1937a, p. 210) affirms that it is the credit system that supplies liquidity both to the entrepreneur, in the period before his actual expenditure, and to the recipients of this expenditure, before they have decided the way to employ it. Short-term credit must finance an increase of planned investments, and once the expenditure starts, these credits flow into the *revolving fund* of *finance* and the appropriate level of income, over which an exactly sufficient amount of saving to the new investment will be generated. Therefore, banks, and the whole financial system accordingly, hold the key to economic expansion.

In this regard, under the post-Keynesian structuralist view, *finance* has no correspondence with saving: at the *financial* stage of the events, the investment *ex ante*, no net saving nor its corresponding net investment has taken place on anyone's part (LAVOIE, 2014;

SMITHIN, 2006; WRAY, 1992). *Finance* and commitments to *finance* are mere credit and debit book entries, which sanction entrepreneurs to go forward with pledge.

Structuralists may accept Keynes's argument that a constant amount of spending would place no pressure on interest rates as the "revolving fund of finance" allows a given amount of credit to circulate and finance spending (DAVIDSON, 1965; WRAY, 1992). A growing rate of spending financed by credit creation, however, would involve banks' balance sheets expansion and its consequent reduction of liquidity, by leveraging equities, reserves, and a rage of safe assets. The continuity of this process leads banks to require higher interest rates in order to compensate for greater perceived risk (CHICK; DOW, 2002; DOW, 1996).

Therefore, the incorporation of liquidity preference within banking behavior leads to an upward-sloping money supply curve. Minsky (1975) points that in the short run, for a state of liquidity preference, banks require higher interest rates to be encouraged to expand illiquid positions and satisfy the demand for credit. Nonetheless, continuous innovations and guidelines revisions regarding the appropriate leverage ratios increase money supply potentials, allowing credit expansion with no pressure on interest rates for a while. Eventually, however, leverage ratios and illiquid positions will reach some point beyond which expansion would be considered imprudent and greater compensation for perceived risk will be demanded [11] (MINSKY, 1975).

Optimistic expectations about the future lead both borrowers and lenders to lower their risks' estimations (MINSKY, 1986). This causes the demand price borrowers are willing to pay to purchase investment goods to increase, just as supply prices are lowered as lenders reduce interest rates on loans. The increase reliance of borrowers on external finance raises their risk because default becomes more likely as net worth falls on debt. Lenders take this into consideration by incorporating a premium in the loan rate of interest.

There are other practices taken by bank to mitigate risk as the imposition of collateral requirements, the establishment of closer relations with borrowers, and imposition of quantity constraints on lending. Banks have also developed methods on liability management

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[11] As preference for liquid assets goes up, the entire price structure of financial assets must adjust: prices of less liquid financial assets may fall relative to those of more liquid ones until their yields encourage agents to hold them. Meanwhile, banks and other financial institutions reduce lending and the flow supply of highly liquid assets diminishes expanding. With pessimistic expectations, demand prices of capital assets fall and their supply prices rise, since lenders increases loan rates of interest to compensate for greater lenders' risk. Consequently, planned investment may fall together with the flow demand for money to satisfy the finance motive, which can lead to an interruption of the money supply growth. A rising stock demand for money against a fixed money supply drives rates of interest to even higher levels and prices of illiquid assets to even lower ones (MINSKY, 1975).

to enable them to satisfy credit demand by suitable customers and to permit them tolerate temporary interruptions of income flows when borrowers do not pay off commitments[12]. Even thought, competition for markets and innovations continually expands creditworthy activities and continually creates new financial instruments, acceptable both by banks and their customers and, gradually, experience with defaults will allow rates of interest to rise (WRAY, 1992).

This does not imply, however, that banks will fully accommodate the increasing demand for money even though their expectations are in the same direction as those of borrowers. Banks are not passive lenders; instead, they balance their needs for earnings and liquidity so as to be active agents together with borrowers in the money supply process. They are actually able to choose between creating loans on one hand and buying securities, which also creates deposits, on the other. Through substitution between credit and investments, banks can manipulate the liquidity of their portfolios according to their needs for liquidity and earning. Also, along with their own credit ration due to uncertainty and rises on interest rates with balance sheets increasingly illiquid, restraint by the central bank will also tend to thrust interest rates and reduce banks willingness and ability to increase the supply of money (CHICK; DOW, 2002; DOW, 1996).

Further, structural market diffusion is by no means completed: banks are moving back from the universal banking model, preserving a full range of services inside a holding company, but institutionally separating functions within the company structure. Hence, while a specific banking corporation might be willing to expand credit, this may tend to be applied only to a chosen market segment. The extent which credit creation grows, given the specific monetary policy posture, depends, therefore, on the strategic plans of banks (DOW, 2006).

It is also important to add that as the stock of financial assets is very large compared to the flow of new assets entering the market, the prices of new issues of long-term and short-term debt are influenced by the prices of existing ones. Therefore, the price of new credit instruments must constantly compete with prices of existing assets. Even though secondary markets for many types of loans do not exist and banks (and other financial institutions) are prohibited from entering many financial markets, deregulation and innovation rapidly breaks down such market segmentations and prices of existing assets increase their influence on new financial assets, placing ceilings and floors on interest rates.

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[12] They can, for example, appeal to lines of credit on other banks and nonbank financial institutions; they have also developed other "off-balance sheet" contingencies that enable them to obtain funds as necessary.

However, even being relatively small, new flows of debt may, on the other hand, largely affect the prices of existing assets through expectations, central bank policy rules and large banks actions. In other words, agents operating in secondary markets will devote close attention to wholesale and retail rates announced by the central bank and commercial banks. They will also try to predict the prices that will be announced in the future, devoting their intelligences on anticipating what average opinion expects the average opinion to be (WRAY, 1992).

Money is, though, endogenously determined by a financial system able to innovate and discover techniques that relax the existing constraints imposed by the monetary authority. Through the development of an efficient interbank lending market and liability and asset management methods, this system have been able to create a whole range of different types of papers that can be utilized as money. The understanding of the role of money in modern capitalist economies and the process of its demand and supply is precisely correlated to the nature of market interest rates determination: in the one hand, rises on liquidity preference increases the stock demand for money to hoar in order to satisfy the precautionary and speculative motives of holding money, which thrust forward interest rates[13]; on the other hand, when liquidity preference is low and expectations are high, planned spending and thus planned investment tend to rise, generating a flow demand for finance, which will eventually increase interest rates as lenders' and borrowers' risks rise (CHICK; DOW, 2002).

Financial capitalism is mainly driven by the prospects of future earnings in the way that uncertainty and conventions play a crucial role in decisions of spending and investing. Money is the base institution of the capitalist economy, and its price, the rate of interest, is negotiated by a series of institutional, political, and even cultural factors. This suggests that, given the particulars conventions[14] of capitalism, the determination of the rate of interest is founded by conventional behaviors and relationship between a wild range of sociopolitical

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[13] Unless the money supply is increased by banks, which is extremely improbable as liquidity preference is rising. Indeed, banks will attempt to move into liquid assets (government bonds, cash reserves, liquid paper of the safest firms) at precisely the same time that the public's preferences shift toward safe, liquid assets. This further depresses the price of illiquid assets (financial and real) and increases the price of liquid assets.

[14] As stated by Keynes (1936), the essence of convention lies in assuming that the existing state of affairs will continue indefinitely, except to the extent that agents have specific reasons to expect a change. This does not mean, thought that they really believe that the existing state of affairs will continue indefinitely. For Dequech (2009, 2011), Keynes formulated an "implicit concept", which contained what are considered the essential features of a general concept of convention: social sharing, conformity with the conformity of others, and arbitrariness. This means that convention is an institution or "a socially shared pattern of thought" that could be replaced by a not evidently superior one; and people follow conventions because others also do (at least partially).

actors, subject to monetary authority discretion attempts, at least in the short run, in response to a variety of both economic and political pressures.

1.4.   Central bank practices

The development of a theory of the money supply determination reveals the need to characterize the monetary base formation. In practice, the monetary base has not been directly controlled by monetary policy; the tool of over which the authorities have most direct control is the rate of interest (on the liquidity they are prepared to lend to the banking system). Several factors induce portfolio adjustments by agents, especially the public debt size, the response to open market operations and the elasticity of substitution between domestic and foreign assets. These adjustments occur via variation of relative prices, which has impact on the monetary base and on money supply.

The ability of the monetary authority to quantitatively control the monetary base through open market operations depends, for example, on a perfect prediction regarding the distribution of the monetary base between financial and non-financial agents; also on the forecast of changes in preferences of the public maintaining manual currency; and on the foreseeing of variations in the rediscount operations. The endogeneity of the monetary base refers to the decisions of economic agents under conditions of uncertainty. The rigidity of short-term deficits, the fluctuations in international capital flows in response to changes in the ratio between internal and external interest, and the inelasticity of bank reserves introduce additional elements of uncertainty, strengthening the endogeneity.

Central bank has quantitatively limited control of the monetary base and of the financial intermediation. In an upward period, for instance, banks respond to the demand for credit exceeding the monetary base control attempts through financial innovations and intensification of interbank transactions, even calling upon the international market and/or the rediscount operations with the central bank. This reaction of financial institutions creates, in a growing financial fragility environment, the need for the central bank to act as lender of last resort, making innocuous the strict control over the monetary base (CHICK, 1994; CHICK; DOW, 2002; MADI, 1993).

The recurrent attempt to control the monetary base may, in fact, aggravate the volatility of interest rates in open market operations. The effects of this volatility on interest rates intensify the financial fragility, which leads, ultimately, to an interruption of financing channels, impacting also the evolution of domestic prices and exchange rates.

Accordingly, attention has to be drawn to the asymmetric power of the central bank to regulate bank reserves (open market, discount, compulsory). This is expressed in the fact that while central bank may increase the availability of reserves to financial institutions, it is often unable to reduce them in order to maintain financial stability. In post-Keynesian approach the power of the central bank is limited: pursue a goal as the money supply is therefore a waste of time; if the policy is to be effective, it will be through the interest rate, not the currency (CHICK; DOW, 2002; CROUGH; CHICK, 1979).

As for interest rate policy, we must restore the importance of the administration of the nominal rate of short-term interest rates by the central bank as an instrument through which the monetary authority manages bank reserves. The endogeneity of money does not imply the absence of monetary policy: its main dynamic variable is the short-term interest rate. The importance of the rediscounting compared to open market operations will depend on the institutional characteristics of each economy.

The management of the short-term nominal rate of interest occurs within the limits arising from the combination of endogenous market forces, i.e. liquidity preference, and the reaction of monetary authorities. The discretion of the central bank in determining the short-term interest rates and its influence on long-term rates depend on the characteristics of the institutional framework, in which we highlight the expectations and strategies of financial institutions. Any relationship of long-term interest rates to the balance between savings and investment is incompatible with the existence of uncertainty and the monetary character of the interest rate (PALLEY, 2008).

Generally, in the short run, the demand for reserves of financial institutions is fairly inelastic, and the management of short-term interest rates by the central bank in the money market explicit the supply conditions of liquidity. Moreover, the behavior of the interest rate structure is based on the uncertainty and the existence of multiple valuations, which are expressed in different expectations about the risk and expected profitability in a context of imperfect substitutability between assets (GOODHART, CHARLES ALBERT ERIC, 1988, 2011). The practice of floating interest rates - renegotiated in the short term - is associated with the loss of meaning of a long-term interest rate and, therefore, the growing inability of the monetary authority to influence on the rate structure.

Considering that the behavior of agents in the financial market depends on conventional evaluations subject to abrupt changes and without solid foundation, the central bank seeks, in its daily management, to set limits to such volatility in financial markets,

signaling the behavior of short-term interest rate. However, short-term interest rate, administered by the central bank, should not be confused with the determination of a system anchor, towards the natural rate. This long-term interest rate is determined by the profits on capital, which, in turn, depend on the productivity and the relative abundance of the existing capital (MODENESI *et al.*, 2013).

The central bank is not empowered to, through the management of interest rate, fully control the structure of demand and asset prices, in order to facilitate the stable growth of the system, ensuring a relative pricing structure compatible with the scarcity of assets and with full employment. The active monetary policy refers to the administration of the nominal interest rate and short-term by the central bank. Real interest rates are a result (ex post). However, the ex post real rate may differ from the actual rate ex ante, which is relevant for decision-making. In other words, the monetary interest rate incorporates expectations about the evolution of future prices. Thus, an increase in the monetary interest rate may indicate a rise in inflation forecast. However, the forecast can be frustrated and the actual ex post rate be below the ex-ante real rate (PALLEY, 2008).

In a context of uncertainty, financial market tries to anticipate the decisions of the monetary authority, in order to obtain arbitrage gains. In this movement, although the central bank cannot prevent the sudden change of expectations, manifested in changes in asset prices independently of monetary policy, it can influence the behavior of financial institutions, through interest rate policy and the use of reserves. Monetary policy involves the management of the level of reserves and their price. The influence of the central bank depends on the impact of its short-term interest rate policy, and the policy reserves associated with it, on the expectations of financial institutions (PALLEY, 1993, 2006).

The intricate fragility of the financial system is deeply connected to the understanding and expectations of the market participants. If they believe the monetary authority will easily supply reserves, their financial arrangements will be structured accordingly. If the monetary authority then disappoints expectations, the system will indeed be more vulnerable to turbulence induced by scarcity of reserves. This is the reason why monetary authority announcements of its plans to monetary aggregates targets are notably important. Knowing the rules, participants may or may not increase their safeguard holdings of liquidity, and new markets might be created for recycling liquidity excesses (GOODHART, CHARLES ALBERT ERIC, 1988).

Palley (2013b) reinforces that the monetary authority has a systematic policy reaction function for its availability of finance in a specific rate, so that market actions and outcomes will be affected by their understanding of it. In this regard, there are not only microeconomic financial constraints on individual banking firms, but also macroeconomic constraints, which results from the policy reaction function. Since reserve demand is ultimately driven by lending, increased lending drives up the policy rate, which in turn drives up the loan rate. This means the loan interest rate can also rise because the monetary authority raises the cost of finance since bank lending increases the money supply. Finance affects the real economy, which, in turn, impacts the financial sector through the reaction function.

Structuralists highlights that over a sequence of instants the monetary authority follows its reaction function. Market developments push conditions to a new point and the central bank responds by changing the policy rate to attain its desired position on the reaction function. Anticipations of future monetary policy settings will impact current individual bank decisions and mark-up. However, the essential point is that the supply of reserves by the central bank is not horizontal after the feedback loop between financial markets, the real economy, and policy (FONTANA, 2003).

In an allegorical representation, Palley (2008, 2013b) considers that the monetary authority faces the challenge of fitting a "monetary collar" to the economy that encourages full employment, economic stability, and economic growth. The arrangement of financial regulation and the interest rate policy rule constitute the monetary collar; the economy represents the neck being collared. The two most important challenges are, by one side, the unexpected changes in the neck size; and, by another, that the collar should exert rigidity in response to some forms of disturbance, and elasticity in response to others.

In modern endogenous monetary systems, the collar is far weaker and limited to self-inflicted boundaries on lending derived from banks' assessment of credit plus financing constraints on financial firms. This internal collar is likely to be unreliable and may release pro-cyclically actions for reasons associated with Minsky's (1992) financial instability hypothesis. Similarly, it may stiffen excessively in downturns. According to Palley (2013b, p. 30):

> For policymakers, the challenge is to manage the monetary collar, ensuring it is neither too tight nor too loose. The collar must be elastic so that it accommodates growth and does not hinder recovery from recession, but it must also restrain speculative boom – bust tendencies.

In fact, the central bank is the monopoly supplier of liquidity that needs to protect the national economic system from financial crises. However, it operates under a set of constraints (e.g. the inflation and exchange rate target), which affect its capacity and disposition to practice a full accommodative reserve policy (FONTANA, 2004). Furthermore, the central bank dos not passively reacts to the demand for reserves but, instead, makes active lending decisions giving its state of liquidity preference (ARESTIS; SAWYER, 2002; FONTANA, 2003).

1.5. Partial concluding remarks

The key features of what is identified as the structuralist endogeneity view of money supply show that there is a limited determination of money supply by the monetary authorities, and furthermore that the creation of money occurs mainly in the credit market. In effect, in the particular form that money assumes in modern economies, banks can create it endogenously based on their liquidity preference. Also, the supply of liquid funds is strongly determined by its demand and it is originated inside the economic system in order to finance investment, consumption decisions and speculative purchases of assets. Therefore, the monetary authority has only the ability to influence credit supply by changing the availability of liquid assets compared to all other classes of assets via monetary policy instruments, i.e. reserve requirements, discount window, and open market operations. Through the management of liquidity in the reserves market, the Central Bank may modify the price of money – the interest rate – and, thereby, provoke adjustments on the portfolio of banks, reordering the comparable disposal of assets. Lastly, the resulting modification in the yield curve in operation transforms banks propensity to expand credit supply.

Chapter 2. Monetary policy and the restrictions to credit money creation

2.1. Introduction

The perception that money is a form of wealth, i.e. an asset, gives a more comprehensive meaning to the analysis of the influence of monetary policy on the decision of banks to change portfolio positions, which alters long and short-term interest rates and its propensity to create money as credit. Both changing features impact on investment and demand decisions, since the central bank authority has the power to induce changes in private portfolios, including real assets such as capital goods. Notably, monetary policy impacts the asset market by varying the number of net assets available for accumulation and/or the terms under which these assets can be acquired. Therefore, a change in the availability of money vary the price of other assets, which, in turn, induces changes in the desired composition of wealth, not only financial but also real assets, with all assets having the ordinary function of serving as means to wealth accumulation.

Nonetheless, the current dominant academic thinking, i.e. the New Consensus in Macroeconomics (NCM), guides the formulation of the monetary policy primordially as an interest rate policy rule. Whilst the financial crisis of 2007-2009 has showed a rapidly loss of model effectiveness when interest rates approached zero, the base judgment is still that a central bank should have as a primary focus only the behavior of prices, since its influence on real variables is at most temporary. Even after the great financial crisis, there is still no consensus on the adoption of a more flexible monetary policy and the use of fiscal policies to prevent the recession. The Post-Keynesians, on the contrary, highlight the effects of monetary policy on asset prices and thus the lasting real effects of these policies on real investment and output. In this regard, giving the importance of the NCM policy guide to most central banks and the alternative propositions of the Post-Keynesians to understanding the relations between monetary policy instruments, liquidity preference of banks and credit creation, both streams of formulations are presented in this chapter.

This chapter contributes thus to the understanding of the dominant theoretical arguments that found the monetary regime that operates in many countries (including Brazil), also subside the construction of a broader view of monetary policy by contrasting the NCM and the Post-Keynesians' approaches. Our analysis proceeds by asking three questions: firstly, what are the initial elements of monetary policy for the NCM? Secondly, what are the Post-

Keynesians alternatives? Lastly, did the crisis change the core NCM framework for monetary policies?

The research highlights the effects of monetary policy on asset prices and thus the lasting real effects of these policies on real investment and output. In this regard, we assess the perception that money is a form of wealth, giving a more comprehensive meaning to the analysis of the influence of monetary policy on the decision of banks to change portfolio positions. The transmission of the policy action to bank's decision-making process alters, therefore, long and short run interest rates and its propensity to create money as credit. Consequently, both changing features have a sustainable impact on investment and demand decisions, i.e. private portfolio decisions, which includes real assets such as capital goods.

The chapter is structured in three sections besides this introduction and the partial concluding remarks. The first section investigates the NCM framework for monetary policy, addressing its *core* theoretical foundations, the policy objectives and the Central Bank's reaction function. The second section addresses the Post-Keynesian alternatives to monetary policy, reaffirming the transmission mechanisms to portfolio decisions and the importance of an optimum alignment with fiscal policy. Finally, the third section covers the post-crisis debate among NCM theorists, concluding with the Post-Keynesian interpretation of the facts.

2.2.   The new consensus framework and monetary policy

Over the 1990s, after the collapse of the Grand Neoclassical Synthesis[15], the NCM has emerged and become highly influential in terms of current macroeconomic thinking and macroeconomic policy. Within this framework, the major objective of monetary policy has been converted into the control of inflation to be achieved through the use of monetary (interest rate) policy, rooted in a macroeconomic behavior of inter-temporal general equilibrium (ARESTIS; SAWYER, 2008a). The NCM has found many adherents over the years, mainly because it institutionalizes the sense of "good" monetary policy and imposes discipline on central banks. It advocates that an optimal policy rule that sets a short-term nominal interest-rate operating target as a function of the projected evolution of inflation and the output gap can be achieved. Therefore, monetary policy is converted in a simplistic way into an interest rate policy rule (WOODFORD, 2003).

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[15] See Galí and Gertler (2007) for a summary of the reasons for the collapse of neoclassical Economics.

The origin of the NCM has its core on the combination of monetarist, new-classical, real business cycle and new Keynesian theoretical, empirical and methodological elements. According to Blanchard (1997), the NCM is based on two central prepositions: in the short run, economic activity movements are driven by aggregate demand; and over time, the economy move towards a steady-state growth path. Departing from these two elements, it is possible to characterize the effects of shocks and macroeconomic policy.

> Yet, in my view, there is a set of key principles – a core – of macroeconomics about which there is wide agreement. This core is the outgrowth of the many recent debates about Keynesianism, monetarism, neoclassical growth theory, real-business-cycle theory, and rational expectations. The core is practical in the sense that it is having a beneficial effect on macroeconomic policy, especially monetary policy, and has resulted in improvements in policy (…) (TAYLOR, 1998, p. 1).

De Paula e Saraiva (2016) points to the existence of a theoretical basis that is conventionally accepted as "irrefutable" in the NCM, even after the US financial crises of 2007-2009. This includes the main hypotheses that have not been subject to discussions by any author of the movement: the existence of a natural rate of unemployment, the supposition of rational expectations, dynamic stochastic general equilibrium (DSGE), with the use of the notion of a representative agent, and the classical dichotomy, i.e. the requirement to separate the analysis of nominal and real variables. According to Taylor (2000), Romer (2000) and Mishkin (2011), endorsing Rochon and Setterfield (2007) arguments, we can summarize the key principles that compose the NCM *hard core* (or modern macroeconomics in his terms) in nine inter-related factors:

i)   Inflation is always and everywhere a monetary phenomenon;

ii) Price stability has important benefits;

iii) The long-run real GDP trend, i.e. the potential output, follows the Solow growth model extended to make technology explicitly. This production function acts as a center of gravitation of the economy and determines its capacity;

iv) The tradeoff between inflation and unemployment is null in the long run, i.e. a vertical long-term Phillips curve equates to the potential output. This means that monetary policy (interest rate policy) is neutral in the long-term and so do not affect real variables, and mostly because of temporarily sticky prices and wages, it only affects inflation, e.g. the nominal variables;

v) Short-run deviations from potential output derives from changes in aggregate demand, which can be caused by lending rates diverse from the natural rate, or by fiscal policy;

vi) Inflation and future policy decisions expectations are endogenous and significant. This implies alterations in the output and employment, primarily in consequence of the nominal interest rate realignment by the monetary authority;

vii) In order to mitigate the time-inconsistency problem [16], monetary policy decisions are better set as rules or reaction functions, in which the short run nominal interest rate is adjusted in reaction to economic events. Therefore, there is an exogenous rate of interest set by the central bank in accordance with an estimated equation (the Taylor rule), thus indicating the rejection of the LM curve. Accordingly, money supply is endogenously determined, fine-tuning to the needs of trade;

viii) Productivity and savings set the natural rate of interest, at which the economy is at the natural rate of unemployment, a level below which inflation rises, i.e. the non-accelerating inflation rate of unemployment (NAIRU);

ix) Financial frictions play an important role in business cycles[17].

Indeed, after the Global financial crises of 2007-2009, some reevaluation about the fundamental foundations of the NCM monetary policy approach became required. Its scientific research program (SRP) recognized the prominent role that financial sector plays in the macroeconomic scenario, making it exceptionally nonlinear from time to time. In the event of a financial disruption, this would lead to the abandonment of the linear-quadratic basis and also the representative-agent framework contained on the first forms of the Taylor rule to be followed by the central banks in order to better conduct monetary policy. Actually, the financial crisis has exposed that the relation between the financial sector and the aggregate economy entails the close connection between monetary policy and the financial stability policy. Yet, none of the lessons from the financial crisis in any case weakens or invalidates the nine basic

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[16] For more on the subject and the importance of reputation and institutional designs of central banks, go to Mishkin and Westelius (2008) and Bernanke *et al*. (1998).

[17] This last principle was not explicitly part of models used for policy analysis in central banks before the US financial crises, but was well understood by many, although not all central bankers (MISHKIN, 2011).

principles of monetary policy listed above; it though indicates that the last one about financial frictions is even more important than central bankers previously realized (MISHKIN, 2011, 2012).

Thereby, even though there has been some changes or relaxations applied to exceptional times, the *core* policy content of the NCM remained with two main features that individually carry important macroeconomic implications. One is the interest rate rule as the central bank reaction function: the Taylor rule. The other one is the use of an inflation target (IT)[18]. The two features are interrelated in the sense that the interest rate policy is only an intermediate target, being the price stability (or low inflation) the final or ultimate objective of central bank policy (DE PAULA; SARAIVA, 2016; PALLEY, 2013a; ROCHON; SETTERFIELD, 2007).

Under IT framework[19], the central bank commits to controlling inflation with a public announcement of official quantitative targets (or target boundaries) for the inflation rate over an elected time horizon, explicitly indicating that the monetary policy's primary long-run objective is a low and stable inflation. Consequently, according to the NCM, the transparent communication with the public by the monetary authority is extremely important, in addition to mechanisms capable of strengthening the central bank's accountability for achieving the target (BERNANKE *et al.*, 1998). As Mishkin (2000, p. 10) points out:

> Inflation targeting involves five key elements: 1) public announcement of medium-term numerical targets for inflation; 2) an institutional commitment to price stability as the primary, long-run goal of monetary policy and a commitment to achieve the inflation goal; 3) an information inclusive strategy in which many variables and not just monetary aggregates are used in making decisions about monetary policy; 4) increased transparency of the monetary policy strategy through communication with the public and the markets about the plans and objectives of monetary policymakers; and 5) increased accountability of the central bank for attaining its inflation objectives.

The announced quantitative objectives for inflation developments have specific features and may vary in some extension across countries. Indeed, it shall include ranges of

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[18] Although the NCM support for the IT framework was not undermined by the reflections brought by the financial crisis, they did open a discussion of how flexible IT must be conducted and what flexibility means. Because the financial crisis has shown that the zero-lower-bound, i.e., , can cause serious problems, there is an ongoing debate of whether the optimal level of the inflation rate target would be higher or even if a price level target, instead of a target for inflation, would be a better stabilizer of the economy (BLANCHARD, OLIVIER; DELL'ARICCIA; MAURO, 2010; MISHKIN, 2011).

[19] Mishkin (2012) calls it "flexible inflation targeting", because central banks have had very different approaches to the communication strategy.

distinct sizes, having a precise focus on the range's mid-point or having point targets with moving bands – where a point target is defined within a range, to allow for possible deviations – or even explicit point targets with no range, where a specific rate of inflation is chosen as a target. An IT does not prevent central banks from pursuing other objectives, e.g. they can also go after output stabilization. Yet even when central banks follow other goals, inflation persists as the dominant objective (CASTELNUOVO, E; NICOLETTI-ALTIMARI; RODRIGUEZ-PALENZUELA, 2003; ROCHON; SETTERFIELD, 2007).

Presumably, the choice between point or ranges alternatives for target is an aspect of the credibility/flexibility tradeoff. For instance, a range can provide some flexibility and a determined level of protection from price disturbances that are out of the central bank control. On the other hand, it can be seen as a fragile commitment of the monetary authority to the target, consequently biasing inflation in the direction of the range's superior limit (SCHMIDT-HEBBEL; TAPIA, 2002). Indubitably, however, the advantage of a range, in this respect, would be that it transmits the sense to the public that controlling inflation is an intrinsically imperfect operation and thus it mitigates the belief that monetary policy has the means or might attempt to accurately adjust every price movement (CASTELNUOVO, E; NICOLETTI-ALTIMARI; RODRIGUEZ-PALENZUELA, 2003).

Nevertheless, Bernanke *et al.* (1998) suggest that missing a range, which may unavoidably come about on occasion, will possibly be perceived by the public as a more severe policy failure than missing a point, which inescapably and continuously arises. Additionally, the use of a rage can lead the public's attention to whether the inflation is inside or outside the range limits, instead of its deviations from the mid-point. This has the potential to convert into a problem if the horizon is small enough to increase the pressure on the central bank to act vigorously to maintain inflation within the range, boosting instability and volatility in the real economy. Accordingly, there is also a tradeoff between the width of the range and the length of the horizon in conducting the monetary policy. The dimensions of the range transmit information about the central bank's evaluation of the uncertainty adjacent to its policies' reactions. In this regard, the rationale supporting the choice of a range is analogous and connected to those supporting the choice of a medium-term focus in the operation of the monetary policy.

Apel *et al.*(1999) and Batini and Nelson (2001) have differentiated the concepts of a "control horizon" and an "implicit targeting horizon", i.e. the "optimal policy horizon". The "control horizon" is the time-lag at which monetary policy affects inflation. Thereby, in the

event of an unexpected shock on the expectations of inflation, the "control horizon" determines the delay met by the central bank to bring the inflation back to its target level. The "implicit targeting horizon", on the other hand, is the time span the central bank expects inflation will take to return to its target level after a shock, considering the optimal policy response settled by the central bank's reaction function. Therefore, whereas the "control horizon" responds to the structures of the economy, the "targeting horizon" is an endogenous feature of the central bank's intentions and predilections.

In this respect, an IT officially defined with a time horizon smaller than the "control horizon" is potentially beyond the direct control of monetary authorities. In such case, monetary policy would have to be even more aggressive than it would be in circumstance of an extended horizon, in order to offset its frail short-run effect. However, if a restrictive monetary policy is deemed to be too costly for the economic activity, a more gradual policy stance might be the adopted by central bank, allowing for inflation to reach the target in a softer way, outside the "control horizon". But extending the policy horizon could deteriorate credibility, since the IT mechanism may possibly compromise its function as a solid sign for expectations (SCHMIDT-HEBBEL; TAPIA, 2002). Besides, even operating under annual target rules, the central bank can have a longer time horizon in mind. For that reason, countries tracking low inflation levels frequently implement multi-annual targets, signaling its compromise to carry a progressive route in the direction of a reduced long-run inflation (SCHMIDT-HEBBEL; TAPIA, 2002).

In sum, the NCM advocates that there are three fundamental benefits of the IT policy. The first one is that the adoption of this framework provides a nominal anchor for policy, which is especially important in economies working with floating exchange rate or where central banks adopt the Taylor rule and no longer target the growth of the monetary base. The second is that it may lead to a more transparent environment, as economic actors become better informed about the explicit objectives of the monetary policy. Finally, by reaching the target, central banks earns credibility, which might be deteriorated whenever inflation rises (ROCHON; SETTERFIELD, 2007).

As for the Taylor rule, it was first proposed by Taylor (1993b), where he simulated the economic performance of a number of countries under different monetary police rules. In his approach, the best policy rule was the one able to better achieve price and output stability. Endogenizing expectations using the Lucas' rational expectations framework, the central bank ought to set the short-run nominal interest rate, yet targeting the short-run real interest rate

(TAYLOR, 1993a, b). Following a more neutral form, according to Rochon and Setterfield (2007), the Taylor rule can be simple represented as[20]:

$$r_r = r_r^* + \delta_1(p - p^T) + \delta_2(y - y^*) \tag{1}$$

The term r_r is the short term real rate, defined by the monetary authority; p is the present inflation rate; p^T is the central bank's inflation target; y is present real output; y^* is the term representing the natural rate of output, which corresponds to the nonaccelerating inflation rate of unemployment (NAIRU); and r^* is the Wicksellian natural rate of interest. The equation shows that, in the short run, changes in the real rate will be made by the central bank every time current output deviates from its long-run natural level, or whenever inflation differs from target rate. If the real rate matches the natural real rate, then the monetary policy is compatible with both the inflation and output targets.

Following this first attempts from Taylor – and other important authors as Kerr and King (1996), McCallum and Nelson (1999), and Woodford (2003) for the IS curve and Gordon (1997) for the Phillips curve embodying the accelerationist hypothesis –, NCM view, also based on inter-temporal general equilibrium and the notion of representative economic agent, can be represented in terms of a few key equations (ARESTIS; SAWYER, 2008a, b; MCCALLUM, 2001; WOODFORD, 2003):

$$Y_t^g = a_0 + a_1 Y_{t-1}^g + a_2 E_t(Y_{t+1}^g) - a_3[R_t - E_t(p_{t+1})] + s_1 \tag{2}$$

$$p_t = b_1 Y_t^g + b_2 p_{t-1} + b_3 E_t(p_{t+1}) + s_2 \tag{3}$$

$$R_t = RR^* + E_t(p_{t+1}) + c_1 Y_{t-1}^g + c_2(p_{t-1} - p^T) + c_3 R_{t-1} + s_3 \tag{4}$$

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[20] In Taylor (1993b) the original monetary-policy rule formulation was with $\delta_1 = 1.5$ and $\delta_2 = 0.5$; p^T is 2% and the average short term real interest rate is 2%, so that $r_r^* = 4\%$. δ_1 is required to be greater than one – the "Taylor Principle", for unique equilibrium in sticky-price models.

The first equation represents a forward-looking expectational IS function derived from a dynamic optimization analysis of expected life-time utility restricted by a budget constraint, as explained by Blanchard and Fisher (1989). It corresponds to the demand side of the economy, where the real output gap in the period t, Y_t^g, is determined by past and expected future output gap, $Y_{t-1}^g Y_{t+1}^g$, the short-term nominal interest rate that the central bank uses as its instrument, R_t and the expected rate of inflation for the subsequent period $E_t(p_{t+1})$. The term s_1 comprises the effects of preference shocks and is presumed to be exogenous, as are the costs and policy shocks, represented by s_2 and s_3, respectively in the equations 2 and 3.

The Phillips curve given by the second equation relates the inflation rate, p_t, to the real output gap in the period t, Y_t^g, and past and expected rate of inflation for the subsequent period, p_{t-1} and $E_t(p_{t+1})$. The past inflation term captures the effect of sticky prices, whereas inflation expectations are assumed to be set in accordance with rational expectations as in the first equation (CLARIDA; GALI; GERTLER, 1999; DIXON; KARA, 2006). Indeed, the term $E_t(p_{t+1})$ in the equation can be seen as a reflection of central bank credibility: a credible sign of the intention to achieve and maintain low inflation may lower the expectations of inflation, which can possibly reduce current inflation at a considerable inferior cost in terms of output than alternatively.

The third equation is the policy rule – or the actual Taylor rule – and exhibits how the interest rate, R_t, the monetary policy instrument, relates to expected inflation, $E_t(p_{t+1})$, the output gap, Y_{t-1}^g, the deviation of inflation from its target, i.e., the inflation gap, $(p_{t-1} - p^T)$ and the "equilibrium" real rate of interest, RR^*. The lagged interest rate, R_{t-1}, represents interest rate smooth leveling instrument undertaken by the monetary authorities (WOODFORD, 1999, 2001). In this respect, policy becomes a systematic adjustment to respond to the deviations of both production and price levels from their respective objectives, i.e. full employment and price stability, incorporating a symmetric approach to IT[21]. One important characteristic of this rule is the complete absence of any monetary aggregates comprising any definition of money, e.g. M1 and M2. According to McCallum (2001), because it focuses entirely on the determination of the real interest rate, adding a reference to money

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[21] The equation thus contains a stochastic shock element, so that monetary policy operates with random shocks; however, in some cases, this element is not incorporated in the equation as pointed by McCallum (2001).

would be unnecessary, as it would not have any effect on the behavior of the dependent variable[22]. It can essentially be seen as a replacement for the old LM-curve.

Hence, IT is undoubtedly integrated in the equations, particularly in the third one that entails the important role of the expected inflation. The model comprises thus the possibility of prices rigidity, i.e. the lagged price level, and full price flexibility in the long run: so both lagged adjustment and forward-looking elements are present. For NCM, IT itself and central bank forecasts embed transparency in the system and provides a strong drive to the expectation of inflation. In that sense, according to Svensson (1997) and following this characteristic of the system, inflation forecasting can be seen as a key element of IT and may be even considered as an intermediate target, yet particularly susceptible to errors[23].

Finally, it is important to highlight that the NCM IT framework and its interest rate policy rule is built on the control of a demand based inflation: short-run deviations from potential output derives from changes in aggregate demand, i.e. from the excess of nominal GDP, as mentioned in the composition of NCM *hard core* elements. Cost inflation will either be accommodated, or the supply shocks, which come and go with time, on average will equal to zero and not have effect on the rate of inflation. In this regard, it is strongly implied that inflation can be controlled through the management of the interest rate to cause demand deflation, bearing in mind the existence of an equilibrium rate of interest which is capable of balancing aggregate demand and supply. This may be interpreted as the capacity of the real interest rate to have a price effect on investment and consumer expenditure (CLARIDA; GALI; GERTLER, 1999).

According to Arestis and Sawyer (2002), there can be find six channels by which this price effect occur on NCM view: *the narrow credit channel* and *the broad credit channel*, which are distinct but complementary ways whereby imperfections in financial markets might affect real magnitudes in the economy on the assumption of credit market frictions – the narrow credit channel, or the banking lending channel, refers to the impact of reserve requirements change on the supply of loans, whereas the broad credit channel indicates the financial health of borrowers impacts on the supply of finance and ultimately aggregate demand; *the interest*

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[22] In this respect, Romer (2000) reinforces that the majority of central banks does not focus attention on money supply aggregates while determining policy.

[23] Nevertheless, due to the great margins of error in forecasting inflation, the emphasis on this instrument can be very dangerous for the reputation and credibility of central banks. For instance, shocks on oil prices, exchange rate revolutions, wages and taxes, can be unpredictable and would certainly have a significant impact on inflation, and the central bank would possess a minor control over these factors (ARESTIS; SAWYER, 2008a).

rate channel and *the monetarist channel*, which depend heavily on the assumption made about the degree of substitutability between money and other assets – this can amplify or diminish the speed by which interest rate changes impact the level and pace of economic activity, also affecting the amount change on monetary base needed to set the interest target; *the wealth effect channel*, where consumption function is hypothesized to depend on consumer wealth; and finally, *the exchange rate channel*, operating through import prices and net external demand.

All these channels can effectively alter the variety of economic variables, including credit, and thus, money supply. This can give the impression, even being in a different theoretical scenario than the stressed on the previous section (about the structural endogeneity of money supply), that the transmission of monetary policy depends on the expectations of a wide range of agents and thus suggests that the strength and predictability of monetary policy effects on the economy may be rather loose than precise, as assumed by the first equation above. In the same way that credit availability, asset prices and the exchange rates are changed by the price impact of the interest rate policy, raising questions about whether and in which extent it should focus only on the rate of inflation (ARESTIS; SAWYER, 2003).

Nevertheless, despite the fact that the 2008-2009 financial crisis showed the nonlinearity and the need to rethink the model, the three functions remain the principle guide to most central banks, with, nonetheless, some space to – and considerable discussion on – what NCM authors call "exotic" or nonconventional monetary policy (BLANCHARD, OLIVIER; DELL'ARICCIA; MAURO, 2010; MISHKIN, 2011, 2012). This is especially important when it concerns to the zero lower bond for nominal interest rates and the "lean *versus* clean debate", renewing the dichotomy between monetary policy and financial stability policy. The examination of the controversial arguments on the adoption of a more flexible monetary policy after the crisis and the possible change on the NCM framework is presented in the next section.

2.3.   Post-Keynesian alternatives

Although Both Post-Keynesian and NCM frameworks consider the short run rate of interest as an exogenous variable and the money supply as endogenous, however, the first ones carry fundamental distinct economic perspectives. For Post-Keynesians, the administrative nature of interest rate policy is emphasized when stating that it is independent from market forces, i.e. any compromise to change interest rates is a directorial and political decision taken by central bankers and not the outcome of natural forces. In addition, Post-

Keynesians support that money is *logically* endogenous because it comes from the relationship with debt and credit and the role of the central bank is to supply the required liquidity with the intention of preventing extensive crises. Actually, money supply endogeneity comes from the impossibility, in principle, to control the quantity of money in circulation, not simply difficult in practice, as in NCM. Thereby, under Post-Keynesians perspective, there is no natural rate of interest working as a gravitational center. In other words, there is no unique relationship between the rate of interest and output in the sense that entire NCM notion of achieving a prevailing and resolute inflation target by the use of monetary policy collapses (ROCHON; SETTERFIELD, 2007).

In fact, monetary policy in the Post-Keynesian approach does not affect the economy by exclusively (or even mainly) increasing or decreasing the supply of means of payment, but rather by changing the availability of liquid assets compared to all other classes of assets. Using the short-term interest rate as an instrument, the central bank acts on the financial circulation through open market operations in which bank reserves are exchanged for public securities, in general. Thereby, the first impact of the effort to change the interest rate is that on the portfolio of banks that will be adjusted according to the yield curve in operation, reordering the comparable disposal of assets[24] (CARVALHO, 2005). It is this impact on the portfolio of banks that will (hopefully) reverberate on demand to finally affect inflation.

Consequently, the initial adjustment of banks' portfolio resounds on the financial relationships described by the yield curve: agents are induced to adapt to the new situation by changing their assets' positions, causing asset price movements that reestablishes a new relation between rates. This is because the change on the rate of interest of the very short-run by the central bank alters the offsetting between risk and interest for all the range of assets with different maturities, which leads investors to realign their portfolios by selling and/or buying assets with the new preferred maturity. These operations on the assets' markets, either on the pressure for sale in the case of a policy to increase the basic interest rate or for buying with a

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[24] Commercial banks have in deposit creation their most important passive account, and even term deposits tend to have relatively short maturity when compared to other forms of fundraising. As a consequence, the possibility to held assets with longer maturity can only occur in the existence of organized and activated secondary market where these assets have a stronger liquidity attribute. For instance, loans made by the industry, in particular, must have maturities compatible with the maturities of their liabilities. This implies that, for the monetary policy instrument to have the desired effect on the economy, a sufficiently diversified financial system, both in terms of markets and institutions, must exist so that the induced portfolio adjustments are transmitted to the longer maturity segments – and not entirely translated into the simple replacement of short-term assets. In other words, it is necessary to have a yield curve that defines stable relations between interest rates (and therefore, prices) of securities of different maturities (CARVALHO, 2005).

policy in the opposite direction, would realign all asset prices (and interest rates), shifting the yield curve (CARVALHO *et al.*, 2015).

This process is known as the asset price transmission mechanism and identifies the impacts of this change on asset prices on investment and consumption and, ultimately, on inflation[25]. On the one side, the effects on the level of investments are based on the significant substitutability relation between real and financial capital: given the marginal efficiency of the various types of capital, meaning "the rate of discount which would make the present value of the series of annuities given by the returns expected from the capital-asset during its life just equal to its supply price"[26] (KEYNES, 1936, p. 89), agents ought to choose the assets with the biggest value for that attribute. In this respect, real capital investment is only one possibility in the range of assets and, to compensate for the greater uncertainty, assets must have marginal efficiency at least equal to the basic rate of interest – which, by definition, is the rate that repays the economy's lowest risk bonds. Thus, the higher the basic rate of interest, the greater the share of resources allocated on treasury bonds, and, clearly, the smaller the demand for real assets (SILVA, 2010).

On the other side, there is what is called the "wealth effect", which affects both investment and consumption and is related to the revaluation of the patrimonial wealth of agents. For instance, from a policy intent to increase the rate of interest, the resulting fall on the prices of assets implies on a devaluation of the capital of their owners, what can induce the decrease on spent in investment or consumption. The opposite stands for the case of a policy aiming to lower the interest rate (SILVA, 2010).

In addition, considering the impacts of the monetary policy on the shifting of the yield curve, we can have the exchange rate channel. This transmission mechanism is based on the existence of international capital movements, open financial barriers for these flows and a floating exchange rate regime. Therefore, changes on internal basic rate of interest, that relocates the whole spectrum of interest rates, have the power to attract or to push investments out of the country. This process alters the demand for domestic currency, which in a flexible exchange regime leads to its valuation or devaluation against the currencies of the rest of the

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[25] For some Post-Keynesian authors, such as Evangelista and Sbardellati (2016), Modenesi *et al.* (2013), Fontana and Palacio-Vera (2003) among others, this transmission mechanism is known as the "interest rate channel".

[26] "(…) Meaning by this, not the market-price at which an asset of the type in question can actually be purchased in the market, but the price which would just induce a manufacturer newly to produce an additional unit of such assets, i.e. what is sometimes called its replacement cost." (KEYNES, 1936, p. 89).

world. The outcome is fluctuations on the total of exports, imports and on the balance of payments (CARVALHO *et al.*, 2015).

Lastly, other relevant transmission mechanism refers to the credit channel. Its significance comes from the impact that monetary policy has on the variation of bank lending rates charged by the non-banking public or on the rationing of loans granted by the banking sector. For example, when the monetary authority desires to induce a contraction of loans, it can operate on the open market to elevate the basic interest rate, which will attract banks to buy more bonds and diminish their willingness to create credit, unless its rates also increase. It is worth noting that monetary authority can also affect credit by the use of the rediscount rate or the quantitative rationing of bank reserves[27]: if there is an increase in rediscount rate, even though banks will still have access to the necessary reserves, they will only lend at a higher interest rate; if the case is of a quantitative rationing by the central bank, this will noticeably be reflected in the granting of bank loans. The final consequence will be a change in the volume of aggregate demand elements that are most dependent on credit (CARVALHO *et al.*, 2015; MODENESI; PIRES-ALVES; MARTINS, 2012).

There is also a balance-sheet channel under the credit transmission mechanism, which is related to banks' increase willingness to lend as a response to the improvement of balance sheet of both firms and households, given an easing of monetary policy. The improvement occurs as the lowering on interest rates boosts asset prices (i.e. stocks, real estate) and reduces debt-servicing costs. The importance of this channel is defined by relative importance of bank lending in total credit as sources of funds (CARVALHO *et al.*, 2015).

Following this perspective, Post-Keynesian approaches have emerged in developing alternatives to the NCM policy rules by either amending the Taylor rule with alternative targets or proposing clear substitutes that emphasizes on demoting monetary policy. In this respect, while the first approach shares much with the new consensus model, in the sense that it rests on the use of the short-run rates as an adjustment mechanism; the second rests on the use of the long rate of interest and aims at reducing the dependence on monetary policy, arguing that using NCM framework distorts income distribution and relies on engineering an economic slowdown to regulate the economy. Nonetheless, these alternatives share the reliance on fiscal policy as a credible policy tool and criticizes its downgrade when compared to monetary policy in the last decades (ROCHON; SETTERFIELD, 2011).

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[27] Financial regulations can also have impact on how much banks lend (e.g. Basel's capital requirements).

There is the countercyclical line of policy – or the "activist" approach as named in ROCHON and SETTERFIELD (2007) –, which advocates that, in addition to supporting the use of fiscal policy, central bank can adjust by changes in the short-term rate of interest other economic variables than inflation rate through the regulation of business cycles. The main argument is that focusing solely on IT, monetary policy can generate elevated costs in terms of unemployment and growth. In that way, central banks should substitute the targeting of inflation with a real target, such as GDP, employment, real wage, profits, or even investment, which counts for the use of a more active expansionist fiscal policy (EPSTEIN, 2003; LAVOIE, 2014; PALLEY, 2007).

Under this idea, for instance, Epstein (2003) suggests the use of a real interest rate targeting subject to an inflation constraint, so that the central bank ought to design new tools or reassess old instruments such as asset based reserve requirements or credit allocation instruments in order to achieve the target. The important advantages promoted by this framework is that it highlights the variables that connects most clearly and directly with social welfare, which leads to a more democratic, transparent and accountable central bank policy. Whereas, Palley (2007) develops the microeconomic foundations of the Post-Keynesian monetary policy showing that it does not just affect inflation but also the unemployment and grow rates, and so the real wage and profits: at high unemployment rates, the exclusive cost of an expansionary policy is possible raise of inflation; on the contrary, as the unemployment rate drops, there may be a reciprocity between higher wages and lower unemployment against higher inflation and lower growth. Accordingly, he advocates the targeting of the minimum unemployment rate of inflation (MURI), stating that changes on the price level are only one element of the policy decision and should be presented as such.

In addition, Fontana and Palacio-Vera (2003) argue that the efficiency of the interest rate channel is not certain, indicating a higher impact on investment than on inflation, exposing the distributive effects of interest rate change. Furthermore, an adverse demand shock might produce the zero-bound rate problem that squeezes the monetary policy capacity to elevate aggregate demand through additional nominal interest rate cuts, and an expansive fiscal policy would be necessary to overcome the economic distress. Lastly, they suggest an asymmetric version of the opportunistic approach, as moderate inflation below the long-run inflation target gives the possibility to central bank to exploit the short-run output-inflation trade-off by lowering the interest rates rather than holding them constant. In this respect, there

are important reasons to support a complementation of IT framework with optional fiscal policy.

On the other hand, another group of Post-Keynesian alternatives reinforce the income distribution aspect of the interest rate. Also known as the "parking-it" approaches, they state that IT brings great sacrifices for the economy and, regardless the target chosen, the use of the interest rate as monetary policy for stabilization is not, and in any occasion, recommended. The underlying argument is that the transmission channel does not guarantee that adjustments on the interest rate will have the desired effects on any macroeconomic variable, being that the rate of unemployment, the capacity utilization, output growth or even the inflation. Thus, monetary policy should be downgraded, yielding space to fiscal policy (ROCHON; SETTERFIELD, 2011).

This approaches reinforce the understanding of the interest rate as variable of income distribution and its ultimately determination by the social and political choice of the portion of income that ought to be distributed between rentiers, entrepreneurs and workers – i.e. the balanced selection between the increase of financial wealth and the stimulation of further creation of wealth by production growth:

> The setting of the interest rate then just boils down to a question of power and politics. Money is something that is needed for the capitalist economy to function, and the price of money is 'negotiated' by a series of institutional, political, and even cultural, maneuvers, of which, ironically, economic theory itself is a major element (SMITHIN, 2006, p. 275).

In this respect, the question of which level the interest rate must achieve to consistently reach the desired income distribution arises among these theorists. One first subgroup points that the focus must be on a positive and low real interest rate. According to Smithin (2007), this follows for two reasons: firstly, in order to maintain the socioeconomic system, all financial capital, real business and labor must be rewarded; secondly, because targeting a zero long-run real rate would be too strict, constraining the space for monetary policy to make deviations, especially in moments of recession. Therefore, a reduced more than zero real rate expands financial accumulation but also gives room to production and output to be fostered (SMITHIN, 2003, 2006). However, most of Post-Keynesians theorists use the real rate as equal to zero when modeling for the Smithin rule (ROCHON; SETTERFIELD, 2007, 2011).

Alternatively, according to the Kansas City view[28], the nominal value of the interest rate is the one that must be zero. This is because, in a system built on state money and flexible international capital movements, the government is not financed by tax revenues nor need to pay to be financed on its own emitted currency. In this situation, both taxation and treasury securities sales occur after spending, being the first one responsible to create demand to the state money created; and the second, to administrate interbank reserves and set short-term interest rates. Hence, net reserves increase, as the counterpart of budget deficits, will *naturally* cause overnight interest rates to fall to the rate paid by the central bank on reserves, which is the targeted rate and which have the possibility to be equal to zero. Consequently, with the zero nominal rate policy, deficit spending by the government would not be penalized (MOSLER; FORSTATER, 2005).

Succeeding the studies of Pasinetti (1981, 1993), one last subgroup defends the use of a "fair" rate of interest, which should be set following the adjustments on the productivity growth ratio, so that it:

> […] maintains the purchasing power, in terms of command over labor hours, of funds that are borrowed or lent, and preserves the intertemporal distribution of income between borrowers and lenders. […] With price inflation, the fair rate of interest would be equal to the average rate of wage inflation, i.e., the growth rate of overall productivity plus the rate of price inflation (LAVOIE, 1999, p. 4).

In this regard, trying to avoid a Taylor rule type of policy, Rochon and Setterfield (2007, 2011) model what they call as a "genuine" Post-Keynesian model, which uses an interest rate operating procedure (IROP) consistent with the approaches that recommend the "parking" of monetary policy according to the distributional view. It starts with the description of the inflation-generating process by both a nominal wage and an inflation equation:

$$w = \mu_1(\omega_W - \omega) + \mu_2 p^e + \mu_3 q \tag{5}$$

$$p = \varphi_1(\omega - \omega_F) + \varphi_2(w - q), \tag{6}$$

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[28] The name comes after its main proponents that are professors at the University of Missouri in Kansas City (UMKC).

These equations translate the incomplete power of workers and entrepreneurs to define the wage share or the mark-up respectively, being w the rate of nominal wages expansion; ω_W and ω the targeted and effective labor wage share; p^e the expected inflation; q the productivity growth ratio; p the observed inflation rate; and ω_F the firms targeted wage share. Also, with the coefficients μ_i and φ_i defined as being greater than zero and less than one, we are able to stress the partial capacity of both employers and employees to index wage and price inflation into realized nominal wages and prices growth.

In what follows, the IROP is then defined as:

$$i = \beta_p p + \beta_q q \tag{7}$$

According to each of the distributional approaches, the coefficients on equation ($i = \beta_p p + \beta_q q$ (7), β_p and β_q, can assume different values:

i. For the Smithin rule of zero real rate of interest:

$$i - p = 0$$

$$\rightarrow \beta_p = 1, \beta_q = 0 \tag{8}$$

ii. Referring to the Kansas City Rule:

$$i = 0$$

$$\rightarrow \beta_p = 0, \beta_q = 0 \tag{9}$$

iii. Consistent with the "fair" rate of interest:

$$i - p = q$$

$$\rightarrow \beta_p = \beta_q = 1 \tag{10}$$

We can also endogenize worker's target wage share in function of the output rate of growth, g:

$$\omega_W = f(g), \quad f' > 0 \tag{11}$$

Also adopting the characterization of the economic growth as in a neo-Kaleckian formulation, we can describe g as a function of the rate of capacity utilization, u, the gross rate of profits, c, the debt to capital stock relation, λ, the nominal interest rate, i, and γ, which can indicate an expansionist fiscal policy (ROCHON; SETTERFIELD, 2007, 2011; SETTERFIELD, 2006):

$$g = \gamma + \gamma_u u + \gamma_c(c - i\lambda) \tag{12}$$

Thereby, by the last two relationships of equations (11) and (12) and connecting it to the IROP functions (8), (9) and (10), an increase on the rate of fiscal deficit γ will have a greater impact on the targeted wage share of workers depending on the values assumed by the coefficients β_p and β_q. Accordingly, equations (5) to (12) also enables the set of other targets, e.g. the expansion of nominal wages, rate of profits, capacity utilization, or economic growth, other than inflation, giving more flexibility and less restricting monetary and fiscal policies.

Therefore, monetary policy impacts not only the level of current production, but also investment decisions and, therefore, the real long-term conditions of the economy[29]. Additionally, and most importantly,

> In the approach presented here, the impact of monetary policy (and thus its effectiveness) crucially depends on how the banking sector transfers to the rest of the economy the changes in reserves operated by the monetary authority in its open market operations. In particular, what is usually overlooked by conventional theory, which are the consequences of the eventual allocation of resources by the banking system in the financial

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[29] As a result, two NCM propositions are rejected: the first, concerning the central bank's specialization in pursuing nominal goals, such as inflation targets, is discarded because monetary policy will also impact real variables, and not only in the short-term; and the second, regarding the idea that interest rate fixation must undergo a purely technical analysis, is refused due to the potentially divergent impacts monetary policy has on real investment (and the product) and on the rate of inflation. Thus, the decision to set the interest rate is inherently and inevitably political since it involves the judgement of the favoring of price stability over economic growth.

circulation. The variation in the level of liquidity in the financial circulation has no obvious effect on inflation, since this circuit is not linked to transactions with goods and services…Only part of the central bank-induced reserve variation affects the industrial circulation (CARVALHO, 2005, p. 331, *translated freely*).

2.4. The post-crises debate about monetary policy

The global financial crisis of 2007-2009 has shaken the scientific foundation of NCM framework, since policy rules as interest rates rapidly lost their effectiveness as they approached zero. In this scenario, unconventional monetary and fiscal policies that were enacted to prevent the recession became recurrent and the need to reevaluate the levels at which the public debt could be considered safe appeared imminent. Crisis' disturbances have brought to light the dangers associated with imbalances from the financial sector and exposed the limits of monetary policy, stimulating a broad debate on some of the core principles of its intellectual base (BLANCHARD, OLIVIER; ARICCIA; MAURO, 2013). Despite the NCM theorists have reasserted the policy measures implemented to control the distress in financial markets and the deceleration of economic activity, the essence of the pre-crisis theoretical convergence elements has not shattered and still prevails (MISHKIN, 2012; PATTIPEILOHY *et al.*, 2013).

As argued by Joyce *et al.* (2012), while conventional monetary policy grounded on NCM intellectual and empirical doctrine achieved low and stable inflation, it did not avoid crises from happening, even though there was space in the literature for the controlling of asset market bubbles. For Woodford (2010) and Mishkin (2011), the point is that the policy framework of IT suggested that central banks should not be guided by financial developments, such as a credit-financed booms, as far as such developments did not affect the inflation forecast, or even real activity. It has indeed been clear that bubbles could be identified or handled by monetary policy, but the neglect of regulation for most of the financial system[30] laid on the view that financial crises are simply not predictable enough for trying to *lean* against

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[30] An exception was made for banks, which were seen as special: firstly, because, according to the literature, bank credit was not easily substituted by other types of credit and easily affected by changes on reserves; secondly, the possibility of runs, justified deposit insurance and the lenders of last resort role of central banks. Thus, consequential distortions were enough to justify bank regulation and supervision, while the rest of the financial system was left behind from a macro standpoint (BLANCHARD, OLIVIER; DELL'ARICCIA; MAURO, 2010).

evolving financial-sector risks[31], and monetary policy and prudential regulation was taken separately. There was a belief that monetary authorities had the ways to manage the effects of the bursting bubble, given its response in an adequate time. As a consequence, the general equilibrium modeling at central banks lacked variables to capture financial frictions as an important cause of business cycle fluctuations. According to Blanchard (2010, p. 6):

> With the neglect of financial intermediation as a central macroeconomic feature, financial regulation and supervision focused on individual institutions and markets and largely ignored their macroeconomic implications. Financial regulation targeted the soundness of individual institutions and aimed at correcting market failures stemming from asymmetric information, limited liability, and other imperfections such as implicit or explicit government guarantees. In advanced economies, its systemic and macroeconomic implications were largely ignored. This was less true in some emerging markets, where prudential rules such as limits on currency exposures (and sometimes an outright prohibition against lending to residents in foreign currency) were designed with macro stability in mind.

In this regard, the extreme and *supposed* harmless economic costs related to the 2007-2009 bubble burst brought some important lessons for the monetary policy in the core NCM propositions. The first one – and most visible – was that financial disturbances make the macroeconomy highly nonlinear. The reason is that there is a feedback loop between asset prices and economic activity that can follow a fairly negative path specially when the spiral begins with the decline on asset prices leading to a lowering of the collateral quality and value. Because they count for minimizing adverse selection and moral hazard problems related to the borrowers' propensity to take unmanageable risks, this deterioration causes economic activity to contract. This, in turn, enlarges the probability to have a new fall on asset prices and a newer drop on collateral quality, feeding the loop. The result can be a very high and damaging economic cost that has to be considered in the reformulation of policies (MISHKIN, 2011).

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[31] In the literature before crises, there was an important debate characterized as *leaning* against asset price bubbles versus *cleaning* up after the bubble burst since there was no question that asset price bubbles would have negative effects on the economy: the "lean" versus "clean" debate. On the one side, economists argued that central banks should at times "lean against the wind" by raising interest rates to stop bubbles from getting out of control. The opposing view, often referred to as the "Greenspan doctrine", argued that monetary policy should not try to lean against asset price bubbles, but rather should just clean up after they burst. The arguments of this last position, which strongly influenced the operation of central banks, was that bubbles are hard to detect in advance by central banks and rising interest rates may be ineffective in restraining the bubble or even cause a more severe bubble burst. It also identified that the variety of assets types may reduce the certainty of the impact of the raise of interest rates, as it affects asset prices in general (MISHKIN, 2011).

This process brings the consciousness that financial sector disruptions have a potentially stronger negative effect on economic activity than previously realized, and that it can last for a long period of time. NCN theorist's estimation is that the 2007-2009 financial crisis recession can have a deleveraging process that could take more than one decade to be completed, cumulating in this period extensive output losses and increase on median unemployment rates. Furthermore, it has been made clear that the adverse effects of the financial turmoil on macro economy aggregates could be a lot worse than was anticipated (MISHKIN, 2012; REINHART; REINHART, 2010; REINHART; ROGOFF, 2014).

Furthermore, it is now evident for NCM theorists that price and output stability do not ensure financial stability. Before the crisis, the benign economic environment of low volatility of inflation and output fluctuations[32] may have led to a misperception of risk by the market, which actually drove the financial system to more fragile status. The main consequence of these findings is that monetary policy is not entirely neutral from a financial stability standpoint. Therefore, the pre-crisis common view which monetary policy optimally stabilize inflation and output would also stabilize asset prices diminishing the frequency of asset-price bubbles and the volatility of business cycle fluctuations, is now known as insufficient (ALTUNBAS; GAMBACORTA; MARQUES-IBANEZ, 2014; GAMBACORTA, 2009).

There is indeed indication of a significant connection between a prolonged period of low interest rates prior to the crisis and banks' inclination for risk taking[33]. This can be defined as the "risk-taking channel of monetary policy", i.e. the transmission mechanism of changes in policy rates on both risk sensitivities and risk-tolerance and thus on the portfolio risk level of agents, on the pricing of assets, and on funding conditions. The risk-taking channel may operate thought three different routes: the first one is by the impact of interest rates on valuations and revenues – a decline on interest rates drives to a borrower's net worth augmentation, which reduces the expected default probability and boost debt financed investments, creating a multiplier effect by the consequent rise of asset prices and further increase of net worth and investment; the second relates to the relationship between market and target rates of return where reductions in interest rates can connect with a steady target, expanding risk-tolerance; the last one operates through the central bank reaction function and

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[32] This was special true on the period before the crises, characterized by a volatility decline on output and inflation. The period was known as the Great Moderation (BERNANKE, 2004).

[33] Although there is a debate over this connection, both NCM theoretical and empirical research provides support for monetary policy playing a role in creating credit bubbles (BEAN *et al.*, 2010; BERNANKE, 2010; TAYLOR, 2007).

communication – while transparency can reduce risk premium, the perception that the central bank reaction function is effective in suppressing downside risks entail asymmetric effect on behavior, which can encourage risk-taking, like an insurance effect. Hence, the fact that low interest rates can encourage excessive risk-taking can be put as a forth lesson (BORIO; ZHU, 2012).

Following, it is now clear that the zero lower bound constraint on policy interest rates is more problematic than expected. In fact, conventional expansionary monetary policy becomes incapable of stimulating the economy in case of the emergence of a negative shock strong enough to demand a negative policy rate. To respond to this type of situation, central banks have had to evoke to other kind of police measures, which have been known by NCM theorists as nonconventional policies[34]. It became, thus, evident that contractionary shocks from financial distress can be much higher than formerly anticipated and, in consequence, sufficiently large ones can result in more frequent zero lower bound constraint incidence (MISHKIN, 2012).

In addition, the use of nonconventional policies linked to the financial disruption may sharply increase government indebtedness, which inspire the deduction that financial crises often lead to fiscal crises. In the 2007-2009 financial distress, the high number of bailouts of financial institutions and of fiscal incentive measures was simultaneous to the fall on tax revenue provoked by the severe economic contraction in many countries[35]. Besides the ascending budget deficits, central banks had massive expansions on their balance sheets, arising both from liquidity provision and market purchases of assets. Thus, even though the first one is more likely to be self-liquidating, according to NCM, the second one can expose central bank to interest or credit risk and to loss of independency for irresponsible debt monetization, heading to fiscal disorder (BERNANKE, 2012a; MISHKIN, 2011).

Therefore, much of the contemporaneous discussion carried on by the NCM theorists went in the direction of the challenges to construct a better guide for macroeconomic policy, highlighting that, as to monetary policy, it should be based on more targets and more instruments (BERNANKE, 2010; JOYCE *et al.*, 2012; WOODFORD, 2010). Its criterion

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[34] As we will see bellow on this section, according to NCM view, the nonconventional policies comprise the managing of expectations, by lowering long-term interest rates, lowering risk and term premiums by purchasing securities and lowering the value of the domestic currency in order to stimulate external demand.

[35] United States, for instance, commonly have started achieving budget deficits of over 10% of GDP. Even Ireland and Spain, that had been directing to a reduced fiscal debt, have hit exploding debt-to-GDP ratios, which led to potentially sovereign debt defaults (MISHKIN, 2011).

fluctuates around a more flexible IT, with potential higher levels of inflation, a possible activity and financial stability targeting, and a manner to handle the zero-bound rate and the provision of liquidity. There is no doubt, though, that it may be reformulated in accordance with the review of macroprudential regulation and fiscal policy stabilizers (BERNANKE, 2012b; MISHKIN, 2011).

The more flexible IT brings into question what should be the level of price changes and which economic results should be brought together. Blanchard *et al.* (2010), for instance, suggest that IT must have its target somewhere in-between 2% and 4%, so that the zero lower bound on the policy rate would be less restricting for the manipulation of the nominal interest rate. However, as Mishkin (2011) states, this benefits are only obtained in times of crises, i.e. moments when the zero bound becomes a real constraint, and thus the costs of economic distortion that a superior price level would bring would be greater than its gains for the vast majority of time. Moreover, it has been seen that an inflation rate that reaches the 3% value has a trend to proceed rising, and once it increases above this level, price stability loses its status of a credible objective.

Giving the sharp decline in output and virtually unchanged price level in most advanced countries after crises, there is also evidence of a changing relation between inflation and output. For NCM, the raised credibility on monetary policy over the last decades led to a more stable expectation on inflation, which may now be consistent with bigger variations in the output gap, meaning the emergence of a weaker relation between these two variables. Looking forward, the puzzle is to understand if the relation will be strengthened with the end of the crises or if there is a long-term trend on the weakening. In either case, however, it is more evident that activity targeting would have to be taken to an upper level (BLANCHARD, OLIVIER; ARICCIA; MAURO, 2013).

In addition, two different types of asset-price bubbles have been identified by NCM thought, reinforcing the importance of leaning against it in one particularly dangerous situation: the case of "credit-driven" bubbles. In opposition to a bubble driven by "irrational exuberance", where excessively optimistic expectations brings less risk to the financial system, the bursting of a credit-driven bubble involves high economic costs and are extremely hard to deal. Besides, the fact that they are much easier identifiable as information about underwriting standards and risk premiums are actually accessible to central banks and financial regulators, gives even more support to the lean argument (MISHKIN, 2010).

The questioning, however, is what policies should be redesigned to effectively lean against these bubbles. For NCM, it rests on the possible ability to repair market failure, which effectively is inherent to credit activity and occurs both in the micro and macro level. In effect, it is now more evident that even if regulatory instruments for individual firms are successful to mitigate non-prudential actions, it does not account for the interactions between these agents. In this respect, as Blanchard *et al.* (2013) emphasize, a remodeling of macroprudential regulation is required:

> […] prudential regulation has to add a systemic and macro dimension to its traditional institution-based focus. Regulatory ratios must reflect risk not in isolation but in the context of the interconnections in the financial sector and must also reflect the state of the economy (BLANCHARD, OLIVIER; ARICCIA; MAURO, 2013, p. 18).

Nevertheless, it is important that both macroprudential regulation[36] and monetary policy are taken in line with each other. This is because they are intrinsically connected: by the one hand, "[…] it has long been recognized that monetary policy rates can affect agents' decisions on leverage and on the composition of assets and/or liabilities, by affecting the cost of borrowing, domestic asset prices, and exchange rates" (IMF, 2013, p. 9); by the other hand, "[…] macroprudential policies can affect the level of output and prices [...] by constraining borrowing and hence expenditure in one or more sectors of the economy" (IMF, 2013, p. 11). The exact effect of this interaction, however, will be country- and circumstance-specific.

Well-targeted and calibrated macroprudential policies can contain risks and undesirable effects of monetary policy when taken *ex-ante*, thereby increasing space for action. It can also provide buffers that can be released in times of financial distress, which reduces possible negative externalities of lower policy rates and makes monetary policy looks smoother throughout the cycle. In an overall situation, though, when in imperfectly functioning, one policy ought to provide support for the other: with deficient application of macroprudential policies, monetary policy may still have to control financial instability, "leaning" against a bubble or "cleaning" it; conversely, monetary policy constrictions to respond to a cycle may

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[36] Following the arguments of Blanchard *et al.* (2013), Dell'Ariccia *et al.* (2012), Saito *et al.* (2013), IMF (2011), and BID (2011) after the 2007-2009 crises, macroprudential instruments may comprise three pillars: the pursuit of limiting lenders' risky conducts, such as capital and liquidity requirements; the searching of restricting borrowers' hazardous behavior, such as assets concentration limits, credit growth bounds and loan eligibility criteria, e.g., ceilings on loan-to-value and on debt-to-income ratios; and, although controversial, the attempt to have volatile capital flow management.

require macroprudential policy to manage aggregate demand. In one way or the other, an appropriate institutional framework is required as the dual objective – i.e. price and financial stability – and must be based on credible and transparent structures to be achieved (BLANCHARD; ARICCIA, 2013; IMF, 2013).

After the crisis, the need of a fiscal debt consolidation has brought into discussion the problematic use of an inflationary process rather than a debt restructures. The costly and high limited application of the last method, can make governments to pressure their central banks to bound their borrowing costs – by retarding the end of quantitative easing measures, keeping treasury bonds for a longer period, maintain low interest rates and enable inflation to increase –, fostering fiscal dominance. NCM proposes thus that it is essential that monetary policy decisions resist political interference and that the design of better automatic stabilizers can deliver optimal cyclical fiscal policy responses[37].

In a more general way, giving the vulnerabilities and limits of monetary policy that have been exposed by the crisis, convergences and divergences related to some subjects have appeared among NCM authors. The converging points relate to the transitory status of the unconventional policies and the necessity of monetary incentive. Disagreements, however, come from the way in which economic policy should be operated in the post-crisis period, referring primarily to the connection between macroprudential and monetary policies in addition to the need of a redefinition of the role of fiscal policy (DE PAULA; SARAIVA, 2016). In this regard, in spite of the significant research progress in the last years, the contours of future NCM macroeconomic policy remain vague with the framework for policy rules evolving from a point between two symmetrical situations: the return to flexible IT, with limited use of both fiscal and macroprudential directives; and the adoption of a broad macroeconomic and financial stability mandate, through the use of more vigorous monetary, macroprudential and fiscal policy instruments (BLANCHARD; ARICCIA, 2013).

Nonetheless, in spite of the adoption of certain relaxation in some propositions[38], the core foundations of NCM framework seems to remain the same[39](PALLEY, 2013a). The

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[37] According to Blanchard *et al.* (2013) automatic stabilizes can slower fiscal consolidation and several countries are now adopting structural targets rather than fiscal targets. However, giving the unpredictable movements of output growth because of the crises, better stabilizers may be required, as automatic adjustment of tax or spending policies in case of weaker ones.

[38] Such as the possible change on the short-run Philips curve; the non-neutrality of money in short-run atypical situations; Ricardian equivalence loss in moments of elevated economic distress (DE PAULA; SARAIVA, 2016).

[39] Taylor (2010a, b), on the contrary, states that after crises monetary policy must be carried identically to the one from the before crises period.

major objective of monetary policy is still price stabilization, which continues to be seen essentially as a monetary phenomenon. Other core hypotheses, such as the classical dichotomy, rational expectations and the existence of a natural rate of unemployment, persist in being accepted. So, even though one can say that there have been broader proposals for moments of distress and more targets with more tools, i.e. macroprudential regulation, NCM reassessment comprises only *ex-post* amendments on its supplementary assumptions to justify unprecedented events (DE PAULA; SARAIVA, 2016).

From the Post-Keynesian standpoint, on its turn, the interpretation of the 2007-2009 crisis is grounded on Minsky's financial instability hypothesis (MINSKY, 1982, 1986, 1992), which stem from a debt based monetary view of capitalism. The central idea is that the periods on the time stream is linked to each other by financial relations, building a cyclical past. In this scenario, marked by fundamental uncertainty,

> […] over a period in which the economy does well, views about acceptable debt structure change. In the deal-making that goes on between banks, investment bankers, and businessmen, the acceptable amount of debt to use in financing various types of activity and positions increases. This increase in the weight of debt financing raises the market price of capital assets and increases investment. As this continues the economy is transformed into a boom economy (MINSKY, 1982, p. 66).

This "euphoric expectation" leads to a situation where the boom gives place to failure: as leverage ratios rise, hedge financial positions transform into speculative ones, and speculative into Ponzi; at any moment, a sudden distress can take place, Ponzi finance positions increases even more, interest rates raises and a recessionary adjustment starts. As Guttmann (2016) points out, close to the cycle peak there is a "dynamic squeeze" of debtors, who see themselves with lower rates of income, greater costs of debt, and restricted access to loanable funds, leading the economy to a state of financial fragility. "(…) [S]uch incidents become a financial crisis when there are a lot of such overextended debtors in Ponzi finance positions so that the entire system has become fragile" (GUTTMANN, 2016, p. 36).

This was the exact case of the 2007-2009 subprime crisis, which experienced a high and unsustainable increase in debt of households and the proliferation of securitized assets. It was the result of a number of financial innovations prompted by the continuous effort of authorities to restrain financial system fragility, that led to the expansion of off-balance operations and the boom of high-risk mortgage lending (GUTTMANN, 2016; GUTTMANN;

PLIHON, 2010)[40]. The downturn of the "Minsky Super-Cycle" and the meltdown of this system happened in 2007, after the housing bubble burst that occurred in the year before, the subsequent downgrading of subprime loans securities, the enhancement of market disorder and the final inability of BNP Parribas to price securitized loans (GUTTMANN, 2011, 2015; JARSULIC, 2013; MINSKY, 1964).

In any cycle end for Minsky (1986), and of the 2007-2009 global crisis for Post-Keynesians – e.g. Kregel (2008), Wray (2011) , Keen (2015), Guttmann (2016), Mehrling (2011) – system rehabilitation can be achieved in a faster pace or even the deep downturn postponed from happening by a combined action of a "Big Bank" and a "Big Government". From one side, a strong central bank provides ultimate liquidity to the system so as to provide price asset stabilization, assuming its lender of last resort profile. From the other side, the enlargement of public deficits can counteract private sector contraction, compounding a bound to income and profits decreases. As Guttmann (2016) points out:

> [Minsky] considered those two channels of economic policy particularly indispensable in stopping a possibly self-feeding spiral of forced asset sales, debt liquidations, losses, and cutbacks that may easily get out of control and throw the economy into depression – the famous debt-deflation spiral […] (GUTTMANN, 2016, p. 38).

Monetary policy thus must follow an alternative route to the NCM propositions, departing from the endogeneity characteristic of money creation and the reliance on fiscal policy to promote growth. There is no ultimate solution for crises, whatsoever, being the capitalism intrinsically instable, which does not mean that policy should abstain from trying to prevent downturns on the cycle – which will not stop "attempts at regulation-evading innovation" (GUTTMANN, 2016, p. 127). Therefore, it is evident on the basis of the finance-driven accumulation regime [41] that a globally synchronized response is required from governments to manage boosting and depressing forces with the perspective of best attaining politically and economically elected objectives.

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[40] From an endogenous money standpoint, the spread of securitization in a "shadow banking system" reflected the creation of portfolio assets that seemed to take the money characteristics as a reliable and liquid store of wealth. For more on shadow banks, see GUTTMANN (2016).

[41] Known as finance-led capitalism or financialized capitalism (BRAGA, 1997, 2000).

2.5.   Partial concluding remarks

This chapter addressed the understanding of the dominant monetary policy regime that operates in many countries, including Brazil and which is grounded on the theoretical arguments of NCM. In order, also to subside the construction of a broader view of monetary policy by contrasting the NCM and the Post-Keynesians' approaches our analysis proceeded, first, by exhibiting the main elements of the monetary policy by the NCM, i.e. the interest rate rule as the central bank reaction function and the use of an inflation target, then by presenting the Post-Keynesians alternatives, and, lastly, how crises changed the core NCM framework for monetary policies.

In fact, the global financial crisis of 2007-2009 has raised questions about the scientific foundation of NCM framework and its policy rules, considering that interest rates rapidly lost their effectiveness when they approached zero. Crisis' turbulences have exposed the risks associated with disturbances from the financial sector and uncovered the limits of monetary policy, stimulating an extensive debate on some of the core principles of its intellectual basis and what could be learnt from the dramatic situation. In this regard, convergences and divergences have appeared among NCM authors. The converging points correspond to the transitory status of the unconventional policies and the need of monetary incentives. Disagreements, on the other hand, relate to the way monetary policy ought to be performed, and what should be its connection with both macroprudential and fiscal policy. Despite NCM theorists have reasserted the policy measures implemented to control the distress in financial markets and the deceleration of economic activity, they have not shattered the essence of the pre-crisis theoretical convergence elements, which still claims that the Taylor rule and the use of an inflation target should prevail.

The Post-Keynesian interpretation of the 2007-2009 crisis, however, is grounded on Minsky's financial instability hypothesis, in which consecutive periods of time are connected to each other by financial relations, building a cyclical past. This process, marked by fundamental uncertainty, brings the consciousness that financial sector disruptions have a potentially strong negative effect on economic activity and it can last for a long period of time. Thereby, the downturn of a "Minsky Super-Cycle" and the meltdown of the system, as it happened in 2007, can only be recovered by a combined action of a "Big Bank" and a "Big Government". The strong central bank provides ultimate liquidity to the system in order to

foster price asset stabilization, while the enlargement of public deficits counteract private sector contraction, compounding a bound to income and profits decrease.

Being, thus, the economy inherently unstable, monetary policy should follow objectives that entirely comprises the functioning of a monetary production system, where deliberated changes on the short-term interest rate acts on the financial circulation firstly impacting bank's yield curve in operation and, then, investment decisions. Following this perspective, Post-Keynesian alternative approaches share the understanding of the interest rate as variable of income distribution and the reliance on fiscal policy as a credible policy tool. Therefore, even though there is no ultimate solution for crises, policy ought to continuously try to prevent downturns on the cycle.

Chapter 3: Monetary policy in Brazil: Instruments under the Inflation Targeting Regime

3.1. Introduction

There are some similarities in Central Banks' functioning across the world whether one considers the objectives of monetary policy. Generally, Central Banks have shown three main goals: i) to preserve price stability under a monetary regime in operation; ii) to control financial volatility; and iii) to support the state's financing. Unsurprisingly, the balance between these three objectives has moved over time from the predominance of state financing during times of war to the alter dominance of price and financial stability (GOODHART, CHARLES ALBERT ERIC, 2011)[42]. After the great crisis of 2007-2009, nevertheless, the search for additional macro-prudential instruments, to be associated with controlled variations in systemic liquidity and in the Central Banks' balance sheets, took advantage, and monetary policy have (barely) gained new objectives and instruments.

The adoption of the inflation target regime a few years after the implementation of the Real Plan can be understood as the submission of the entire economy to a well-defined objective, which is seen as a needed anchoring point to maintain price stability and enable economic growth. According to the decree 3,088 of June 1999, it is the responsibility of the Central Bank of Brazil (BCB)[43] to design the proper monetary policy to achieve the stipulated target – the inflation target fixed by the National Monetary Council (CMN), upon a proposal of the Minister of Finance[44]. Under the Regime, monetary policy is conducted to influence the

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[42] Goodhart (2011) makes an effort to illustrate the changing role of central banks over time. The author analysis three stable eras: the Victorian epoch, from 1840's to 1914; the decades of government control, from 1930's to 1960's; and the triumph of the markets, from 1980's to 2007. The final epoch was concluded with a crisis, when it became evident that financial stability was not guaranteed by macroeconomic stability, the Great Moderation, and efficient markets and macro-prudential (counter-cyclical) instruments were needed.

[43] The main functions of the BCB, according to the 10,214 law of the National Monetary Council (CMN), are: defining which settlement systems are systemically important; it is allowed multilateral netting of obligations in a clearing and settlement system; in multilateral netting systems considered systemically important, its entities operators must act as central counterparty and adopt mechanisms and safeguards that ensure certainty of settlement of the operations; assets pledged as collateral in connection with clearing and settlement systems are unseizable; and civil insolvency regimes, concordat, bankruptcy or extrajudicial liquidation, to be submitted any participant does not affect the due performance of its obligations under a clearing and settlement system, which will be finalized and settled according to the regulations of this system.

[44] The targets are represented by annual variations of the National Extended Consumer Price Index (IPCA) and it is considered that it was achieved when the cumulative inflation variation – measured by the chosen price index, for the period from January to December of each calendar year – is inside the range of its respective tolerance intervals. Along with its intervals, the target must be fixed until the month of June of the previous year (only for the years of 1999, 2000 and 2001 the targets and intervals were set by June 30 of 1999). If the target is not met,

level of the short-term interest rate by adjustments in the supply of bank reserves. In this regard, it manipulates three importantly different instruments: i) *the reserve requirements*; ii) *the liquidity discount window*; and iii) *the open market operations*. Although the policy may not be understood as having the sole purpose of fixing the interest rate, this objective constitutes an important operational goal, turning it possible to achieve the final goal of price stability.

The chapter has four sections besides this introduction. The second section introduces the current characteristics of the distinguished instruments used by the Brazilian monetary authority. The third section presents the formal process that the BCB follows to determine the target rate, which comprises both forecasting estimation of macro e microeconomic models, and evaluation among council members. Lastly, the fourth section summarizes the key elements of the monetary policy in the country in order to both highlight the instruments that interfere in the process of credit creation by banks.

3.2.   The tripod of monetary policy instruments

Hence, BCB conducts monetary policy by choosing a target for the interest rate for the overnight interbank loans collateralized by domestic federal securities registered with and traded on the "*Sistema Especial de Liquidação e Custódia*" (SELIC)[45]. More specifically, the Central Bank sets the target for the Selic rate, which is defined as the "adjusted average rate of daily financings determined in the SELIC for federal securities" (BCB, 2017d). It includes, consequently, all exchange operations of reserves for a day between financial institutions – the secondary/interbank market – and between these and the Central Bank in its calculation – the primary market [46] (ARAÚJO, 2002).

SELIC is, therefore, part of the bank reserves market (or the federal securities market), i.e. the institutional arrangement dedicated for the negotiation of bank reserves. If exchange reserves are not collateralized in public securities, they will be made and registered at the "*Central de Custódia e de Liquidação Financeira de Títulos Privados*" (CETIP)[47], currently "Organized Markets", and will then be remunerated by a DI-Cetip rate (Interbank

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the President of the BCB will publicly disclose the reasons for the noncompliance, by means of an open letter to the Minister of Finance. The BCB is also responsible to disclose, until the last day of each quarter, the Inflation Report addressing the performance of the inflation targeting regime, the results of past monetary policy decisions and the prospective inflation assessment (Decree, 3.088).

[45] Special System for Settlement and Custody.

[46] For more on Selic legislation and norms, go to http://www.bcb.gov.br/htms/demab/circular3587-english.pdf

[47] Custody and Financial Settlement Center for Private Securities.

Deposit). These transactions stand for changes on the reserve account of banks, which is the cash deposit account that all banks maintain on the Central Bank balance sheet in order to meet the reserve requirements and to settle the clearing of payments and receipts with other banks (interbank transactions) (BCB, 2016e).

In this sense, reserve requirements are deposits made in cash (bank reserves) or in securities that each bank is legally obliged to maintain at the Central Bank and are calculated as a percentage of deposits – demand deposits, time and saving deposits and additional requirements[48]. Reserve requirements were extremely high at the beginning of the Real Plan, in order to contain a possible surplus demand from the initial success of price stabilization, and in accordance with the BCB intent to control the monetary base. Although, the rates of requirement have decreased over the years, being followed by the shift towards the interest rate management policy (see Table 1). As Graph 1 shows, there have also been a relative loss of importance of demand deposits reserves, which are not remunerated, in comparison to interest-bearing deposits reserves (time deposits and savings) in terms of the amounts collected by the BCB.

Table 1. Current reserve requirements rates, deductions and remuneration in Brazil

Type	Rate	Deductions	Remuneration
Demand deposits	45%	There is an initial deduction of R $ 70 million that benefits all instutions equally	No
Time deposits	25%	There is an initial deduction of R $ 30 million that benefits all institutions equally (in addition to reductions due to Reference Equity)	Selic rate
Savings accounts	15.5% (rural) 24.5% (housing)	Financial institutions with reference equity lower than R $ 5 billion, deduct R $ 200 million until 2016 and R $ 100 million until 2017	Linked savings: Referential Rate (TR) + 3% p.a. Others: If the Selic rate target is higher than 8.5% p.a. .: TR + 6.17% p.a. If the Selic rate target is less than or equal to 8.5% p.a .: TR + 70% of the target Selic p.a.
Additional	Time Resources - 11% Savings - 5.5%	Reductions due to Reference Equity	Selic rate

Source: own elaboration based on BCB (2016a).

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[48] The additional requirements applies to savings, demand deposits and time deposits (BCB, 2016a).

Graph 1. Reserve Requirements by type (1995-2016)
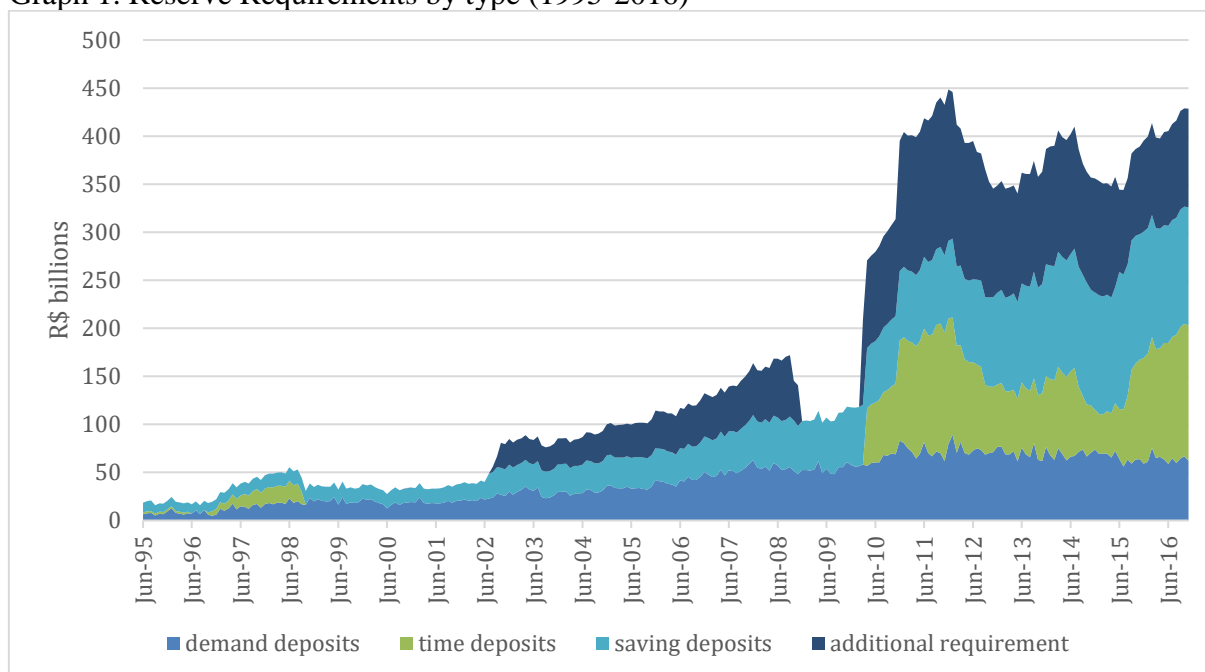
Source: own elaboration based on BCB (2017e)

The total amount of reserve requirements (RR) is calculated by applying a ratio (the reserve requirements rate) to a defined reserve base (RB) ascertained during a period of time called the "calculation period"(CAVALCANTI; VONBUN, 2013):

$$RR = RB \ x \ ratio \tag{13}$$

The RB, thus, accounts for the values subject to requirements (VSR), i.e. the set of specific accounting and non-accounting items for each type of reserve, and the deductions to be made:

$$RB = \left({\sum VSR}/{calculation \ period} \right) - deductions \tag{14}$$

The payment obligation is fulfilled through the deposit of the RR in cash at the Central Bank in case of demand deposits and saving deposits and by public securities for time deposits. The collection occurs over a period of time called the "movement period" that starts after the end of the calculation period, with a one-day lag[49]. And, all the information used to

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[49] To the comply of requirements, the daily balance held in the bank reserve account and the average of the funds registered on the cash account of the balance sheet are considered. Also, it is allowed the compliance of at least 80% of the requirements on one or more days, provided that the final average corresponds to 100%. This

calculate RR is provided by the financial institutions for each business day of the calculation periods, within the time limits established by the Central Bank, being the failure to comply with the requirements subject to penalty[50] (CARVALHO *et al.*, 2015; CAVALCANTI; VONBUN, 2013).

Consequently, in order to meet its required reserve balance – i.e., the net sum of the BCB reserve requirements and the economy' daily transactions –, banks can either lend directly from the BCB at the discount rate or go the interbank market, where the lower bond rate for borrowed reserves is the interest rate BCB pays on some types of reserve requirements[51]. In this regard, we can graphically represent banks' demand for these reserve balances as a negative sigmoid curve with the market interest rate on the vertical axis and the sum of bank reserves in the horizontal axis.

Figure 1. Demand for reserve balances
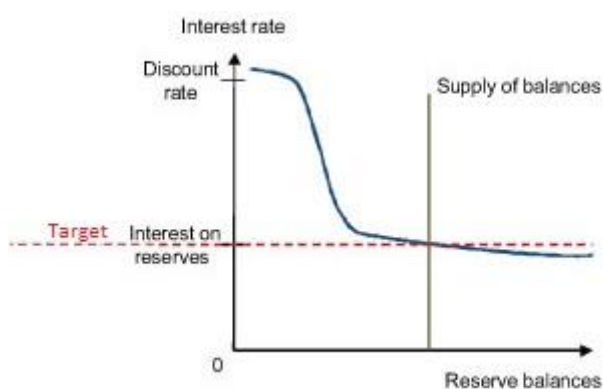
Source: Keister (2012)

Borrows of reserves from the BCB are, then, negotiated at the liquidity discount window, which forms another instrument of monetary policy to control the short-term interest rate. These loans are priced at the discount rate and helps to diminish liquidity problems for banks, also fetching some stability to financial markets. The present BCB operational model, however, gives transactions at the discount window a limited and discouraging nature. This is

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prerogative reduces, in practice, extreme fluctuations in daily banking liquidity, caused by the need to maintain daily reserves requirements. Besides, with the objective of facilitating market solutions, the institutions were divided into two groups, "A" and "B", whose periods of calculation are separated by a week.

[50] For more details on the BCB reserve requirements, go to http://www.bcb.gov.br/htms/novaPaginaSPB/Resumo_das_normas_dos_compuls%C3%B3rios.pdf

[51] The liquidations of these operations are processed through the entries in the accounts maintained by the participants in the Central Bank and occur through the Reserve Transfer System (STR), which is the heart of the National Financial System (NFS). For more on the STR, go to http://www.bcb.gov.br/htms/novaPaginaSPB/str.asp?IDPAI=STR.

part of a *floor system*[52] where the interest rates charged, the discount rate, are extremely high and, as can be seen on Graph 2, the interest-on-reserves rate (the market rate) is equal (or very close) to the target rate (BCB, 2016b).

Graph 2. Selic target, Selic rate and CDI rate

Source: own elaboration based on BCB (2017e)

The access to liquidity assistance operations in Brazil is restricted to financial institutions holding bank reserve accounts and the operations can be settled by the use of reverse repurchase commitments, which are revolving loans against guarantes up to the borrower's withdrawal limit set by the BCB, or by the actual rediscount of eligible securities. Moreover, charges over these transactions can be either fixed, being more or less favorable depending on the behavior of the reserve market interest rate, or anchored to the Selic rate but with an additional rate, which maintains a constant differential. BCB is, thus, able to limit the access of financial institutions to these liquid funds, operating a balance between its function as a lender of last resort and a guarantor of the payment system fluidity.

As can be summarized in Box 1, the mechanisms prescribed for the liquidity assistance operations can cover the resolution of issues in the very short-term or in longer terms.

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[52] As in opposition to the corridor system employed until 1999 with the Basic Interest Rate (TBC) working as floor and the Financial Assistance Rate (TBAN), as a ceiling (TORRES, 1999).

As for the first case, there are the *Standing Facilities* operations, which include intraday or one-day operations. These operations are a feature of the Brazilian Payment System (BPS), designed to guarantee the flow of payments in the new context inaugurated by the 2002 reform, when it was prohibited for financial institutions to present negative balances on the bank reserves account ("overdrafts") against BCB. The second mechanism, known as normal condition rediscount, is aimed to amend specific situations of a particular institution, even when there is no threat to the systemic liquidity. These operations are discretionary in the sense that they depend on prior consent from the BCB and the presentation by the institution of a detailed projection of its daily cash flow, demonstrating the expected funds needs for the period of the operation. We can verify, however, the prevalence of Standing Facilities operations, the BCB having no record of normal condition rediscount over the last years[53] (BCB, 2016b).

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[53] With the great Crises of 2007-2009, however, a third liquidity financial assistance mechanism: The special condition rediscount. Due to its systemic bias, this framework allowed BCB to use special criteria and conditions for the evaluation and acceptance of assets, as well as temporarily extinguish some fiscal regularity requirements. Besides, this new type of rediscount, predicted a maximum period of 359 calendar days. For more on this type of rediscount operation go to http://www.bcb.gov.br/pre/normativos/busca/downloadNormativo.asp?arquivo=/Lists/Normativos/Attachments/47808/Res_3622_v6_P.pdf

Box 1. Rediscount operation instruments

Operation		Attributes	Cost
Standing Facilities	**Intraday**	Repurchase agreements with federal government securities, intended to meet liquidity needs throughout the day. Institutions that require reserves and possess federal public securities in its custody account at SELIC can sell them to the BCB with the commitment to repurchase on the same day of the hiring, at the same price of sale, until the closing of the Reserves Transfer System (STR). This is an operation with no financial cost for the contracting institution and are carried out in automated systems based on request and payment messages. However, the rediscount regulation allows the intraday operations pending liquidation at the end of the STR's operating hours to automatically be converted into one-day operations at the rate composed of the Selic rate + 1% p. a. for the same securities of the intraday concession.	No cost or Selic rate + 1% p. a. if converted into one-day operation
	One-day	Repurchase agreements executed only with federal public securities, for financial institutions with liquidity needs resulting from very short-term mismatches in the financial institution's cash flow	Selic + 1% p.a.
Normal Condition Rediscount	**up to 15 business days operations**	Repurchase or rediscount transactions and may be renewed up to a limit of 45 business days. They depend on the previous signature of a contract and are used in the hypothesis of short-term mismatch in the cash flow, not characterized as a problem of structural imbalance.	Selic + 2% p.a.
	up to 90 calendar days	Repurchase or rediscount operations that can be renewed provided that the total term does not exceed 180 calendar days, in order to allow the adjustment of the financial institution with a structural imbalance. These operations depend on the prior signature of the contract and approval by the BCB Board of Directors, both for the contracting and the re-contracting. The financial institution must present a reasoned claim, accompanied by a statement of cash flows projections for the operation period and the restructuring program whether capitalization or share control sale.	Selic + 2% p.a.
Special Condition Rediscount	**up to 360 calendar days**	Rediscount operations in national currency and in guarantee of foreign currency loan operations. The term of the operation, including any renewals, must be less than 360 calendar days. The rediscount operations in national currency will be carried out in the form of the purchase of assets with the BCB's resale commitment, in conjunction with the repurchase agreement of the financial institution.	Selic + fixed percentage, depending on the market conditions. The financial charges for foreign currency loan operations will correspond to the Libor + percentage rate set by the BCB

Source: own elaboration based on BCB (2016b)

The system, therefore, requires a more active role of open market operations in liquidity management. In other words, the rediscount operations act only as an auxiliary

instrument in reserve management by the Central Bank, which provides banks with a liquidity assistance line that helps to solve individual cash problems that may occur at the end of the day or at the end of the period of movement of the compulsory collection, avoiding the existence of overdrafts in the bank reserves account (FIGUEIREDO; FACHADA; GOLDENSTEIN, 2002).

As previously noted, in order to guarantee the level and the desired behavior of the short-term interest rate, BCB works to estimate the liquidity need of the interbank market. With that estimation, it operates the volume of reserves, adding or withdrawing money on/of the system. Thus, changes in reserves are a result of both BCB's actions to manage liquidity and autonomous variations in the Central Bank balance sheet accounts of net external assets[54], loans to Government, paper money in circulation and deposits in the Treasury account[55]. In this sense, liquidity forecasting is the initial stage towards the implementation of monetary policy; it is the baseline for the decisions on the volume, frequency and maturity of operations designed to balance the reserve market (FIGUEIREDO; FACHADA; GOLDENSTEIN, 2002).

In this regard, the authority estimates can point either to a generalized deficiency in the reserve market or to a widespread excess of bank reserves in the market. In the first case, we can say that the Central Bank is oversold and the volume of bank reserves available in the market is lower than the stock of public securities issued and held in banks' portfolios – i.e. the outflow of resources from the reserve account of all institutions is larger than the inflow. In the second, we can say that the Central Bank is undersold and the inflow of resources into the bank reserves account is greater than the outflow. Hence, if the Central Bank does not want greater fluctuations in the market interest rate, it must act accordingly, or providing the necessary funds to banks or purchasing excess reserves (CARVALHO *et al.*, 2015).

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[54] The changes in the net external assets account result both from the balance between exports and imports and from financial operations. In Brazil, the Central Bank operates in the foreign exchange market, buying or selling foreign currency (to banks) through auctions, in order to maintain the quotation at the considered appropriate level, and these operations can directly sensitize the bank reserves account. These auctions are of two types: spot market or swap. In 2002, the BCB and the Treasury began to carry out foreign exchange swap operations in conjunction with primary offers of LFT - Treasury Financial Letters. The use of this instrument enables the market itself, more than the Central Bank, to offer foreign exchange hedge to companies. The new system also made it possible to reduce the issue of securities indexed to the exchange rate. The swap and LFT auctions are executed on the same day, with swap offer occurring first. The acquisition of the swap for each financial institution is limited to the financial volume of the proposals accepted in its LFT offer. In the calculation of the public offerings of both LFT and swap, the single price criterion is used, with the minimum quotations accepted in each event applied to all winning proposals. In these operations, financial institutions purchase variable flows (the CDI - Interbank Deposit Certificate) and offer, in return, fixed flows (dollars) to the Central Bank. The purchase of the LFT induces the matching between the swap flow the Treasury security flow, thus reducing the possibility of losses and, thus, the premium on the swap transaction (CARVALHO, FERNANDO J. CARDIM DE *et al.*, 2015).

[55] The Treasury on BCB is called "Conta Única" and it keeps all government spending and collection information, such as tax collection, public bond auctions, and server payment.

Therefore, according to its strategy, the monetary authority may adopt reactive/defensive interventions, when in an attempt to compensate for imbalances identified in the banking reserve market, or active interventions, when the intention is to establish a certain degree of liquidity in the reserves market. These compensatory adjustments are, however, mainly made through open market operations, given their greater versatility in accommodating daily variations on market liquidity.

From this perspective, BCB may also choose between definitive operations or repurchase agreement operations. On the one hand, outright operations usually are chosen in the case that the central bank intends to make a lasting withdrawal from the reserves market or when it wishes to intervene at the level of the prevailing interest rate over a medium or long-term horizon. Thus, this way of acting is usually associated with active intervention type by the monetary authority. On the other hand, repurchase operations are the main option when the need is of managing short-term or very short-term conditions in the bank reserve market. These operations, also known as *repo* or *reverse repo*[56], are related to the fine-tuning of liquidity conditions they permit the neutralization of unwanted changes in the level of bank reserves, whether resulting from an unexpected behavior of the agents, as sudden reversal on expectations, or from seasonal occurrences. For this reason, they are regularly preferable when dealing with defensive interventions (ALMEIDA, 2014).

On repos and reverse repos operations the interest rate established may vary according to prevailing market conditions on an everyday basis and has no relation to the interest rate embedded in the security – what is being negotiated in a repurchase agreement are reserves in which the borrower delivers securities as collateral but does not lose the right to receive the interest tied to it as it possessor. The predominant selection of these transactions balances the fact that the Central Bank not always has in its portfolio securities with adequate maturities to neutralize the lack or excess of liquidity in the reserves market. Therefore, performing a definitive operation can indirectly promote additional imbalances at a future date. Besides, as repurchase agreements have predefined short-term interest rates, the possibility of misinterpretation about the monetary authority's intentions by the market is greatly reduced, as

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[56] As mentioned above, repurchase agreements may also be conducted under the liquidity or rediscount assistance and consist in the purchase and sale of securities in which the seller undertakes to repurchase the security at an agreed price on a specified date. When central banks perform this operation as temporary buyers of these government bonds, they are injecting liquidity into the economy, thus operating what we call *repos*. When, on the contrary, they temporarily give up the securities they hold in the portfolio, they are withdrawing liquidity from the economy, doing what we call *reverse repos*.

it is the impact of operations on securities' prices. Finally, although the repurchase operations ultimately stimulate the liquidity of public securities, they do not require the pre-existence of a liquid market for them (MACEDO E SILVA, 2016b).

In Brazil, the increasing use of repurchase agreement has been specially associated, though, with the rise of international reserves balances by the Central Bank in the period between 2006 and 2009, and to net redemptions of securities by the National Treasury after 2010, as we can see on Graph 3.

Graph 3. Volume of reverse repos, international reserves and net cumulated redemptions of federal securities (1999-2016)
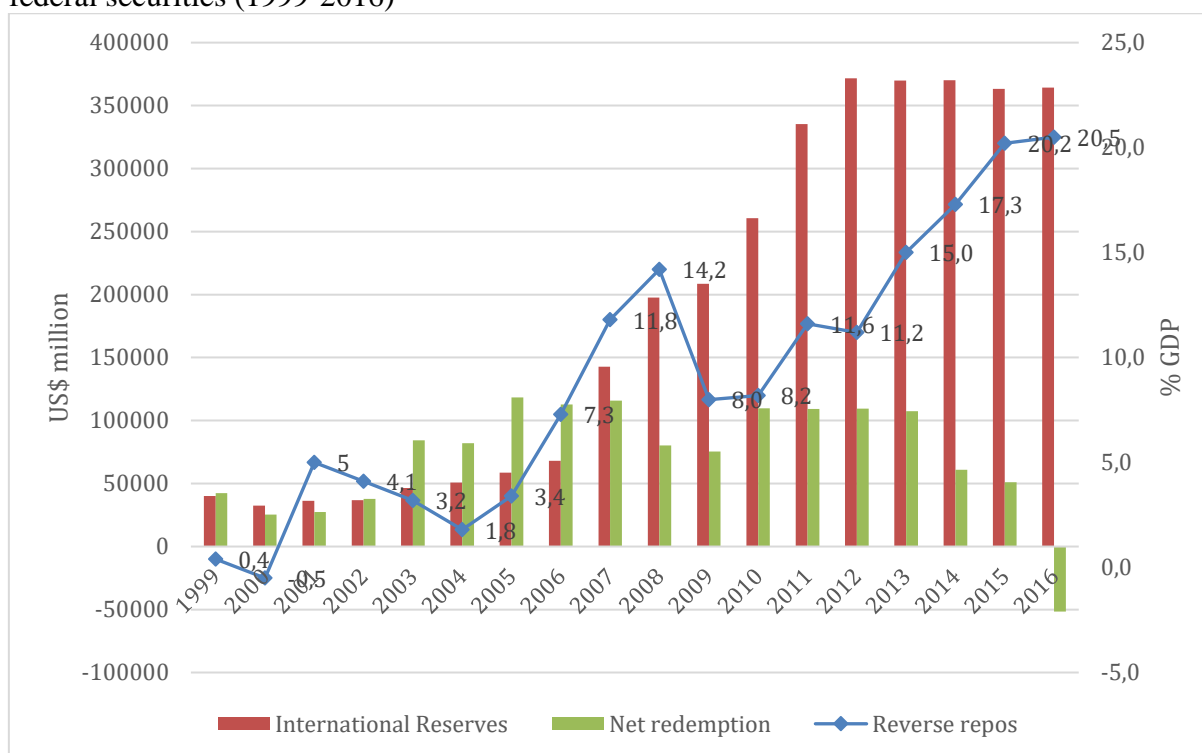
Source: own elaboration based on BCB (2017b) and Tesouro (2017).

With regard to the international reserves, the BCB – as well as Central Banks's on many others developing countries (PRATES; CUNHA; LÉLIS, 2011) – took advantage of the context of abundance of international liquidity to constitute a strategic reserve buffer that would guarantee some security against international financial markets volatility and also be used in eventual moments of intervention in the foreign exchange market. These assets have been purchased by the Central Bank with net resources in *Reals*, which thus increases deposits and, consequently, bank reserves. The liquidity generated in this process triggered by the BCB have

been sterilized by reverse repos operations with the intention of maintaining the interest rate at the level defined by the Selic target (DE CONTI, 2016; MACEDO E SILVA, 2016a).

In addition to that[57], since 2006, the Treasury has established a strategy to change the profile of public debt, with the aim of reducing exchange-linked or floating-rate securities, increasing the importance of those pre-fixed or indexed in price indices. Thus, in order to lengthen the maturities of these securities, there was an effort to roll over the debt with securities with different indexes or to redeem large volumes of securities[58], which, without the counterpart of new issuances, resulted in excess liquidity in the system. This process also resulted in the use of reverse repos by the BCB.

Graph 4. Federal Public Debt composition (2002-2015)
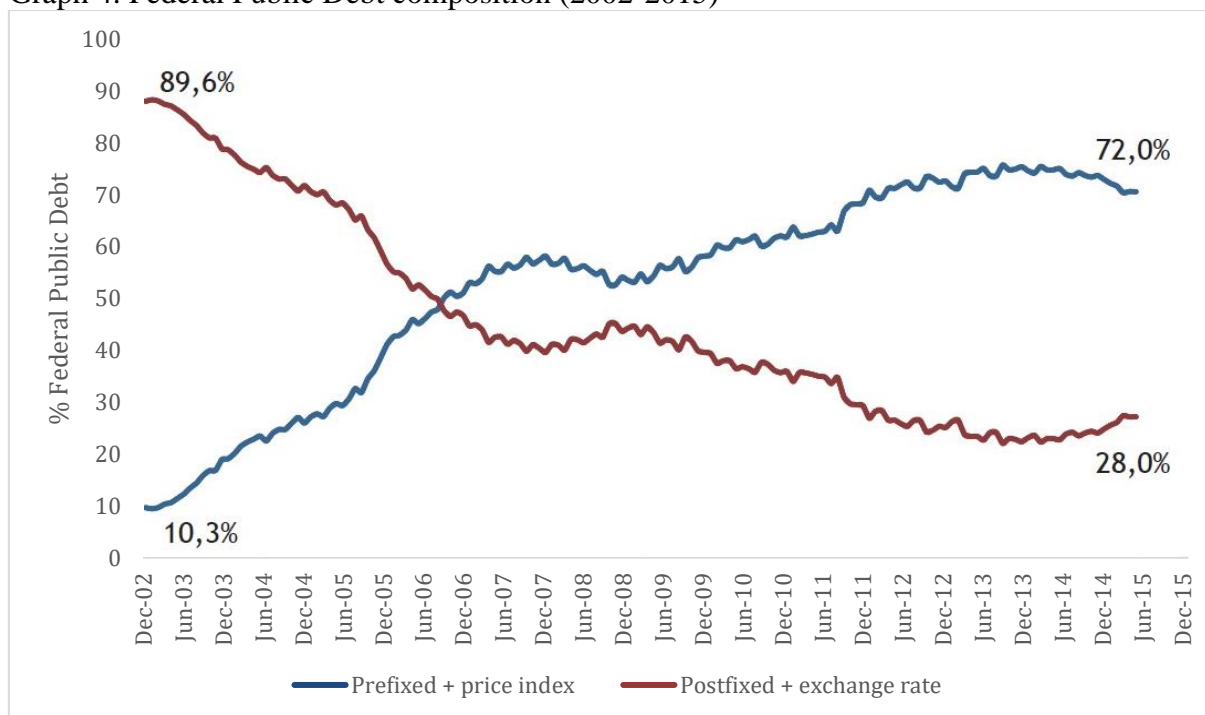
Source: own elaboration adapted from Tesouro (2016).

In this regard, both definite and repo operations can be executed based on public price offers known as "informal auctions" or "go-arounds", which takes place by way of the Informal Currency and Securities Auction (LEINF) electronic system. In this regard, while the

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[57] We must highlight that, in response to the outbreak of the great crisis, the BCB has undertaken anti-cyclical policies, such as compulsory reduction policies, in an attempt to stimulate the economy. These policies, however, partially ended in the need of sterilization in order to maintain the interest rate level (CAVALCANTI; VONBUN, 2013).

[58] There is an extensive discussion of how this process may actually be contaminating the federal debt profile. Because this is the BCB's current liquidity management benchmark, these short-term Selic-rate operations may be moving in the opposite direction to the Treasury's targets (DE CONTI, 2016; MACEDO E SILVA, 2016a).

so-called go-arounds of money correspond to currency auctions and occur through repo operations of one day (overnight) or with relatively short terms; the go-arounds of securities refer to the definitive purchases or sales of securities from the Central Bank's portfolio. Also, these types of auctions do not require public notices, being its occurrence directly communicated to licensed organizations in the Department of Open Market Operations (DEMAB) – dealers. The result of the operation is, finally, determined based on the proposals collected, the expected liquidity conditions and the defined operational target (ALMEIDA, 2014; FIGUEIREDO; FACHADA; GOLDENSTEIN, 2002).

Lastly, since 2009, auctions of long repurchase agreements with maturities of three months or more, previously made through the LEINF, has been made through the BCB module of Electronic Formal Public Offering (OFPUB). Typically, these auctions are based on Treasury securities[59], which, although not expressly issued for monetary policy purposes, affect money market liquidity. Besides, they have short maturity of usually a year, and entitle the owner of an interest coupon, i.e. they provide an interest payment in fixed installments defined in the issuance, in addition to capital gain and coupon reinvestment gain[60]. Differently from the previous system, the formal auctions allow the participation of non-dealers and are disclosed through a formal communication from the Central Bank one day before the event. The result is defined by the BCB based on the negotiated rates in the future interest rate market, the rates negotiated on the secondary market for government securities and the consensus rates reported by financial institutions to the DEMAB table of operations (ALMEIDA, 2014; CARVALHO, *et al.*, 2015).

These formal primary auctions may be discriminatory/multi-price auctions or uniform price auctions. In the first case, also known as English auctions, each participant may submit more than one proposal for the securities' purchase, with the specific quantity demanded and the respective purchase price. The calculation is done in descending order of price, and the proposal with the highest price has all its demand met. If the total amount demanded from the first to the last considered proposal is less than the supply of papers, then BCB has the choice to sell the remaining securities by the immediately preceding price and divide the quantity among the lasting proponents. In the second case, the proposals are also ranked in descending

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[59] In Brazil, until 2001, the Central Bank was authorized to issue securities to be used in formal auctions. As of the edition of the Fiscal Responsibility Law (Complementary Law 101/2000), the BCB lost his authorization, and the National Treasury has the prerogative of issuing federal public bonds. As a result, the monetary authority lost some of the discretion in the use of this instrument for monetary policy purposes.

[60] Which occurs when the coupon not redeemed on the maturity date is automatically reinvested.

order of price, but all participants pay the same price, which is equal to the price of the last winning bid in the calculation – the "cut price". Those institutions that offered a higher price have their demands in terms of quantity fully satisfied, while those whose offered price is equal to the winning price, have their demands partially met, in a scheme of division similar to that prevailing in the multi-price auctions (BCB, 2016e).

Under this system, thus, changes on the interest rate will respond to the market's ability to absorb securities. Accordingly, conducting the auction on days of oversold may increase the liquidity premium required by the participants or even decrease the demand for papers; both tending to rise the interest rate. On its turn, in moments when expectations and liquidity are more stable, and the total amount of securities issued is lower than the quantity maturing, there is no pressure on the interest rate. Conversely, in times of great volatility in expectations, the Central Bank has a major difficulty in defining the cut price for securities, taking the risk of sending misleading signals about the direction of the interest rate. So in summary, this process ultimately depends on the monetary flow defined in the liquidity management, and on the balance between securities to be issued and the ones on the date of maturity (CARVALHO *et al.*, 2015).

3.3.   The BCB Taylor rule

Considering these instruments for the monetary policy under the Inflation Target regime, BCB chooses the target for the interest rate for the overnight interbank loans – the Selic rate target – by the use of a set of tools that go from small-scale structural models of the transmission mechanism of monetary policy and short-term inflation forecasting models to surveys of market expectations of inflation and economic growth (BOGDANSKI; TOMBINI; WERLANG, 2000). In fact, given the temporal lag between the monetary authority action and its effect on macroeconomic variables and on prices, the Central Bank takes monetary policy decisions in accordance with the movements in the expected inflation (forward looking) in an attempt to anticipate future price pressures and volatility on GDP. One of the main features of the monetary policy adopted in Brazil based on inflation targets is, therefore, to look at the future inflation to decide the interest rate in the present (LIMA; SILVA, 2011).

According to the latest essay on the Inflation Target regime in Brazil by the BCB – Dez Anos de Metas para a Inflação no Brasil: 1999-2009 (BCB, 2011) – and in view of the BCB working paper series opening article on the same subject – Implementing Inflation

Targeting in Brazil (BOGDANSKI; TOMBINI; WERLANG, 2000) – the system of equations BCB estimates (and calibrates) in order to identify the mechanism of monetary policy transmission is, thus, a combination of an IS type equation, a Phillips curve, an exchange rate passthrough specification, and a Taylor rule. The models currently in use for this system can, therefore, be divided into the following five categories: i) antecedent indicators and core inflation indexes; ii) vector autoregressive models (VAR) for inflation trajectory projection; iii) small-scale semi-structural models for inflation forecast; iv) medium semi-structural models for the analysis of alternative economic scenarios (PAGODE); and v) a micro model of medium size (SAMBA) – whose structure is similar to that of general equilibrium stochastic models (DSGE models) (DSGE models) (BCB, 2011; BOGDANSKI; TOMBINI; WERLANG, 2000; LIMA; ARAUJO; SILVA, 2011).

The first model category composed by antecedent indicators and core inflation indexes has the important feature of identification of unobservable components. On the one hand, the estimation of models of antecedent indicators is based on the selection of variables that anticipate inflation, such as indicators of demand in the basic industry, retail orders and demand for packaging. Being particularly interesting for predicting inflections in the inflation trajectory, an unobservable component common to the chosen variables is obtained by a system of equations anchored on the Kalman filter and indicates the behavior of inflation in future periods. On the other hand, the core inflation indexes identify the common component to the processes of price change and, with that, the share of inflation that affects the economy. Among its methodologies, two are highlighted: *the nucleus by exclusion*, in which naturally volatile prices such as food and energy are excluded from the final result; and *the supported average*, where items with price variation at the ends of the distribution are initially eliminated and then the core inflation is computed using the remaining items multiplied by a scale factor as weights to ensure that their sum equals unity. Thus, the main use of such models is in the evaluation of shocks – e.g. during periods of extreme shocks there is a tendency for persistent deviations between the inflation and its core, in contrast to periods of greater calmness (LIMA; ARAUJO; SILVA, 2011).

VAR models have the short-term projections of inflation as its prime focus and divided into two groups by the BCB: i) economic based VAR models; and ii) purely statistical VAR models. The first group includes two subgroups: traditional VAR models and BVAR models. These models generate forecasts for market prices inflation that, combined with projections of administered prices inflation, compose forecasts of full inflation measured by the

Broad Consumer Price Index (IPCA). The review of these two subgroups of models in 2012 meant a reduction from fourteen to six models, which can be seen on Table 2. Four traditional VAR models with monthly frequency (VAR I to VAR IV), a monthly BVAR model and a quarterly BVAR model. In addition to having substituted/included endogenous variables and the number of lags changed, the new models incorporate the expectations of economic agents, being the choice of two Bayesian models an illustration of the diversity of estimation methods. According to BCB (2012c), the review had the intention to obtain a parsimonious number of heterogeneous models capable of capturing a large number of transmission mechanisms

Table 2. Economic based VAR models

Model	Endogenous Variables	Seasonal Adjustment	Lags	Deflator	Exogenous Variables
VAR I	Market prices, administered prices, foreign exchange, real interest rate	No	2	ex-post (IGP-M)	-
VAR II	Market prices, M4/B, exchange rate, real interest rate	Yes	1	ex-post (IPCA)	-
VAR III	Market prices, industrial production, real interest rate	Yes	3	ex-post (IGP-M)	-
VAR IV	Market prices, M1, real interest rate	No	1	ex-post (IGP-M)	-
BVAR I	Market prices, exchange rate, real interest rate	Yes	13	ex-post (IGP-M)	-
BVAR II (quarterly)	Market prices, GDP, nominal interest rate	Yes	5	ex-post (IGP-M)	One Dummy

Source: Adapted from BCB (2012c).

Using the Principal Components Analysis (PCA) technique, statistical VAR models combine the use of major components with traditional VAR modeling. In this sense, in a first step, a broad base of time series is "summarized" in some (few) major components. In a second step, these main components are used in VAR models without structural restriction in order to have the market prices inflation predicted. The variables used in the statistical VAR models come from six groups of indicators[61], and the models are divided into two classes and are estimated with monthly data. Subsequently, the medians of the two classes are combined with the predictions of the economic based VAR model to form an aggregate forecast of IPCA. Figure 2 illustrates the overall aggregation process with the respective weights. The aggregate forecast of market prices inflation is then combined with the independently-constructed administered prices inflation forecasts[62] to project the path of full inflation (BCB, 2013b).

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[61] Economic activity, External, Financial, Prices, Monetary and Shocks.

[62] The set of administered prices is modeled using two approaches: the "econometric approach" models are estimated for the aggregate of administered prices; and the "hybrid approach", which divides administered into two groups. The first group, composed of 12 items – pharmaceuticals, health plan, urban bus, fixed telephone, water and sewage rate, license, gambling, road toll, gas, subway, fines and mail –, which represent about 14% of the IPCA, according to the weights of April 2012, is modeled "on-balance", according to the respective adjustment rules. The prices of the second group of the hybrid modeling – representing about of 10% of the IPCA – are modeled econometrically in aggregate form (BCB, 2012b).

Figure 2. Vector autoregressive models
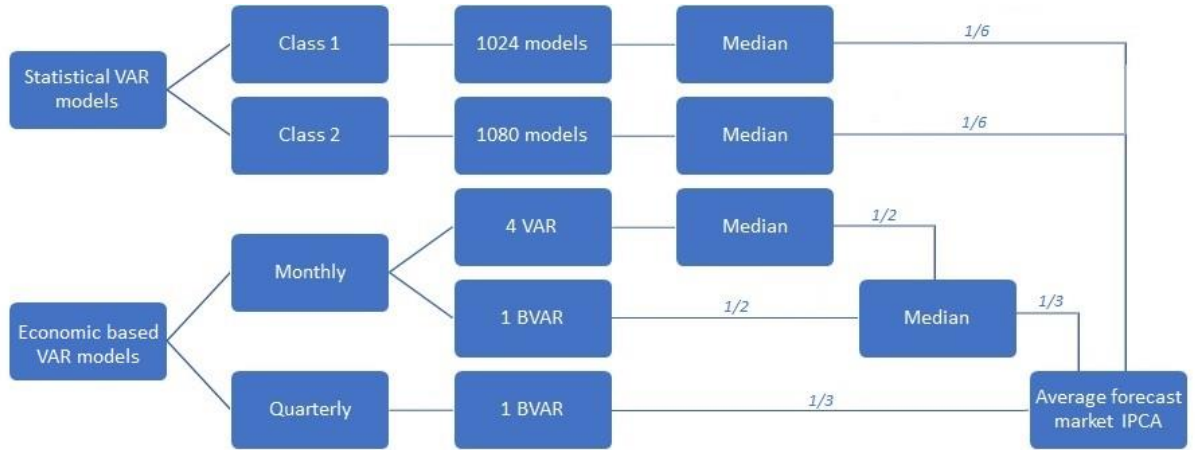
Small-scale semi-structural models for inflation forecast have been one of the BCB's main tools for monetary policy decision-making. With the intention of always improving the quality of the forecasts and following the progress in the availability of time series that explore the use of large databases, in 2015 the BCB revised the specifications of three classes of small semi-structural models: that of aggregate model; the model of disaggregated prices for the segments of services, food at home and industrial products; and the "CNC" model for prices of tradable and non-tradable goods (BCB, 2013a, 2014, 2015b).

In the basic structure of these models, the supply side of the economy consists of Phillips curves, while the demand side consists of an IS curve that describes the output gap dynamics. The slope of the term structure of the interest rate is described by an equation that relates the policy interest rate (Selic) to the long-term interest rate (360-day pre-DI swap). In this regard, for the aggregate model, we have:

$$\pi_t^L = \sum_{i>0}\alpha_{1i}E_t\pi_{t+i} + \sum_{j>0}\alpha_{2j}\pi_{t-j} + \sum_{k\geq0}\alpha_{3k}\pi_{t-k}^* + \sum_{l>0}\alpha_{4l}h_{t-l} + \sum_{m\geq0}\sum_n\alpha_{5m}^n Z_{t-m}^{\pi,n} + \varepsilon_t, \tag{15}$$

for the Phillips curve, in which π_t^L is the IPCA market price inflation, $E_t\pi_{t+1}$ is the current expectation about inflation in i quarters ahead, π_t is the full inflation measured by the IPCA variation, π_t^* is the external inflation measured by the variation of the Commodity Research

Bureau (CRB) index expressed in Reais, h_t is a measure of the output gap, $Z_t^{\pi,n}$ is the control variable, and ε_t is an error term. Control variables are proxies for supply shocks, such as innovations in the international oil price and the mismatch between wholesale and retail prices. Also, the estimated parameters satisfy the vertical constraint of the Phillips curve in the long term: $\sum_{i>0}\alpha_{1i} + \sum_{j>0}\alpha_{2j} + \sum_{k\geq0}\alpha_{3k} = 1$.

$$h_t = \beta_0 + \sum_{i>0}\beta_{1i}h_{t-i} + \sum_{j>0}\beta_{2j}r_{t-j} + \sum_{k>0}\beta_{3k}\Delta sup_{t-k} + \sum_{l\geq0}\beta_{4l}\Delta\bar{y}_{t-l}^* + \sum_{m\geq0}\beta_{5m}\Delta h_{t-m}^* + u_t \qquad (16)$$

stands for the IS curve, where r_t is the real interest rate, measured by the 360-day pre-DI nominal swap interest rate deflated by the expectation of inflation for the swap contract period, Δsup is the variation of the primary surplus, $\Delta\bar{y}_t^*$ the growth rate of the world's potential output, Δh_t^* is the variation of the world output gap and u_t is an error term.

Finally,

$$Swp_t - S_t = \gamma_0 + \sum_{i>0}\gamma_{1i}\left(Swp_{t-i} - S_{t-i}\right) + \gamma_2\Delta E_t\pi_{t+3}^4 + \sum_{k>0}\gamma_{3k}\Delta h_{t-k} + \sum_{m\geq0}\sum_n\gamma_{4m}^n Z_{t-m}^{Swp,n} + v_t \qquad (17)$$

is for the interest rate equation, which defines the spread between the long-term rate (Swp_t) and the Selic rate (S_t) as a function of its lags, the expected inflation variation ($\Delta E_t\pi_{t+3}^4$), the output gap dynamics (Δh_t), and control variables ($Z_t^{swp,n}$).

For the disaggregated prices model, there are three additional Phillips curves that describe the inflation of each of the sectors, i.e. services (π_t^S), food at home (π_t^{FH}), and industrial products (π_t^{IP}), so that, $\pi_t^L = \pi_t^S\omega_t^S + \pi_t^{FH}\omega_t^{FH} + \pi_t^{IP}\omega_t^{IP}$. $\omega_t^S, \omega_t^{FH}, \omega_t^{IP}$ are the weights of the respective sectoral inflation in the market prices inflation, such that $\omega_t^S + \omega_t^{FH} + \omega_t^{IP} = 1$.

The same occurs for the CNC model, where the two additional Phillips curves describe the inflation of each of the two sectors, tradable (π_t^T) and non-tradable (π_t^{NT}). In this case, $\pi_t^L = \pi_t^{NT}\omega_t^{NT} + \pi_t^T(1 - \omega_t^{NT})$, ω_t^{NT} being the weight of non-tradable goods inflation in the market prices inflation.

It is worth noting that this model also offers BCB tolls regarding the time length and the mechanism through which a change on the short-term interest rate affects inflation.

According to the BCB inflation report of 2012 in small-scale models, the transmission of monetary policy to prices occurs in several stages, through different transmission mechanisms (interest rate or demand, exchange rate, expectations, and credit). An increase in the short-term interest rate (Selic), for example, raises the longer-term rates, which are the relevant variable for consumption and investment decisions. This process causes households and firms to face, respectively, a higher cost to finance consumption and investment and thus contributes to contain the expansion of aggregate demand. This leads to a moderation of activity and the factor market, i.e. to an opening of the output gap, which contains price increases. The time taken by this process has increased over years, taking currently three to five quarters, with a maximum effect in about two years. The report also suggests that the power of monetary policy in Brazil has increased in recent years, reflecting, among other factors, the expansion of credit relative to GDP, as well as its maturation, which gives greater importance to the credit channel[63]; lower concentration of public debt in Selic rate bonds; and an increase in the average maturity of public debt securities (BCB, 2012a).

The medium semi-structural model, on its turn, is an *ad-hoc* model elaborated by applying the same aggregate restrictions over the small models and consists of over thirty equations. Under its composition, the supply side, characterized by the potential output, is derived from a Cobb-Douglas production function, and the demand is divided into its national accounts components, i.e. consumption, investment (specifically in machinery and construction), government spending and net exports. These models, however, have had their importance reduced since several unsupported assumptions about the economic behavior lead to inconsistencies that, in some cases, result in highly improbable projections. In any case, they are considered as an intermediate step in the development of medium-sized micro-based models (DSGE) (LIMA; SILVA, 2011).

Lastly, the SAMBA model is defined, according to Castro *et al.* (2011), as a small open economy model that combines the building blocks of standard DSGE models, such as price rigidities and adjustment costs, with five special characteristics attributed to the Brazilian economy. These five features are: i) a primary surplus targeted by the fiscal authority; ii) the existence of administered prices in the composition of the consumer prices; iii) high external

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[63] According to the BCB article on Implementing Inflation Targeting in Brazil and the previous inflation reports, the credit mechanism has not operated in the Brazilian economy and its importance in terms of channeling interest rate impacts on inflation has been negligible, though in possible growth movement (BCB, 2007, 2009; BOGDANSKI; TOMBINI; WERLANG, 2000).

vulnerability in response to the external financing of imports; iv) the broad use of imported inputs on the internal production chain; and v) the existence of both optimizing households, who owns the capital stock and firms shares, and financially constrained households. Agents in this model are thus considered to be households, domestic producers, importing firms, and government (represented by fiscal and monetary authorities). The model is, finally, estimated by Bayesian techniques and follows a nonlinear structure with Phillips curves in recursive terms and a steady state analytically built to facilitate the parameters estimation. In the fiscal block, taxation is an adjustment variable to achieve the dynamic balance of public accounts, making the government spending component exogenous[64].

The SAMBA model has been used for scenario simulations since 2011 and has been used to generate specific forecasts for prices and macroeconomic aggregates since the beginning of 2012. It has been constantly updated, being the last one made in 2015[65]. The model evaluation is based on impulse response functions and its projections of inflation and macroeconomic aggregates seek, as far as possible, to reconcile the scenarios normally used by other models, meaning that the hypotheses adopted in the small-scale semi-structural models are also assumed to design scenarios with SAMBA, as long as they do not prevent its convergence back to the steady state (BCB, 2015a).

To sum up, according to this model simulations, a change in the basic interest rate affects inflation and output basically through the channel of interest rate or domestic demand, the exchange rate channel, and the expectations channel. The effect on inflation is immediate, and maximum, in the sixth quarter. This is because the marginal cost of firms (which moves with the output gap) affects inflation contemporaneously on the SAMBA Phillips curve and also, differently from what occurs in small models, the output gap reacts faster to the interest rate (BCB, 2012a).

Most importantly, all these five categories of models are used by the monetary authority to determine the interest rate and, thus, the instruments to be employed on the reserves market. Their construction and presentation of results are, therefore, part of a three-stage

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[64] For all the restrictions and constraints in the model and the derived equilibrium conditions, see Castro *et al.* (2011)

[65] Since the beginning of its operation, the Samba model has undergone two parameter updates, based on more recent samples, without substantial modifications in the structure or set of observed variables. In this last update of 2015, the sample was also updated and the model began to include data from the National Survey by Continuous Household Sample (PNAD Continuous) to characterize the labor market dynamics; a new series for the world GDP, using the global GDP gap calculated by the Hodrick-Prescott (HP) filter; and components of domestic demand calculated by their average growth rate minus the average GDP growth (BCB, 2015a).

decision making process, composed by a two-day meeting of the Monetary Policy Committee (Copom)[66]. In the first session, BCB's department heads and the executive manager present an analysis of the domestic environment covering observed inflation and its short-term trends, among other variables such as the level of activity, evolution of monetary and credit market aggregates, public finances, reserves and international flows, among others. The presentation has the intention to give Copom the ability to identify trends and inflection points in the consumer inflation behavior and anticipate eventual imbalances between aggregate demand and supply expansion (LIMA; ARAUJO; SILVA, 2011).

In the second session, the head of the Department of Studies and Research (Depep) presents an evaluation of the most recent economic events and the prospective assessment of inflation, with central projections obtained by the macroeconomic models described above. In addition to the central projections, at time, alternative scenarios are examined incorporating shocks to variables under greater uncertainty. After that, the directors of Monetary Policy and Economic Policy present alternatives to the short-term interest rate target and make recommendations about monetary policy. After the consideration and presentation of possible alternative proposals by the other Copom members, the proposals shall be voted on: this is the last stage of the process. The final decision – the target for Selic Rate and bias, if any – is immediately disclosed to the press at the same time as it is issued through the Central Bank Information System (Sisbacen) (BCB, 2017c; LIMA; ARAUJO; SILVA, 2011).

3.4. Partial concluding remarks

This analysis introduces the current features of the instruments used by the Brazilian monetary authority as well as the formal process that the BCB follows in order to address the key elements that interfere in the process of credit creation by banks. Thereby, we have, firstly, detailed the monetary policy apparatuses to manipulate the supply of bank reserves, which is the variable that the Central Bank manages to control the level of the short-term interest rate. In this regard, this chapter discusses the employment of three importantly different instruments by the Central Bank. First, the reserve requirements rate, which have decreased over the years, and is nowadays on 45% of the demand deposits, 25% of time deposits, and 15,5% and 24,5% of rural and housing saving deposits, respectively. Second, the

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[66] The Copom is composed of the members of the Board of Directors of the Central Bank of Brazil, its president and directors, being the decisions taken by a majority of votes and, in case of a tie, by a quality vote of the president.

liquidity discount window that works with penalty rates in a floor system. Third, the open market operations, where the BCB operates the volume of reserves, adding or withdrawing money on/of the system in order to maintain the liquidity of the interbank market in accordance with the desired level of short-term interest rate.

We, thereby, follow with a description of the formal process that the BCB uses to determine the target rate, which comprises both forecasting estimation of macro and microeconomic models, and a deliberation among the monetary council members. In fact, the system of equations that the BCB estimates (and calibrates) in order to identify the mechanism of monetary policy transmission is a combination of an IS type equation, a Phillips curve, an exchange rate passthrough specification, and a Taylor rule. However, the decision about the target rate is straightforward, occurring in two stages: in the first moment, an analysis of the domestic economic environment covering observed inflation and its short-term trends is presented to Copom; and in the second moment, the most recent economic events, along with the prospective assessment of inflation with central projections obtained by the macroeconomic models, and the alternative scenarios are examined incorporating shocks to variables under greater uncertainty. Finally, the directors of the department of Monetary Policy and Economic Policy present alternatives to the short-term interest rate target and make recommendations about monetary policy, which are followed by a vote process in order to have a final decision.

Finally, considering all the instruments and proceedings used by the monetary authority in Brazil, which are under the NCM foundations of the Inflation Targeting Regime, we can assert that the intention to control liquidity by the BCB is based on the limited view of money as, primordially, a mean of payment and, ultimately, of monetary policy as a simple regulator of monetary base. Therefore, yet with some efforts to prove enhancement with improved models and space for deliberation between the Council members, the real impact of monetary policy in money supply, and consequently in credit growth, is, at the best scenario, ephemeral.

Chapter 4: Credit money creation in Brazil: institutional peculiarities and empirical evidences

4.1. Introduction

Unraveling the role of credit supply is an inherently difficult task that stems from several factors. Firstly, since credit supply depends on expectations, it's not unequivocally calculated in advance (and completely determined by monetary policy), i.e. we can only see the actual credit outcomes after they have happened. Secondly, there are some factors that also affect the demand for credit, which can or cannot be fulfilled. Hence, the econometric identification of factors determining credit creation is not straightforward, even though some progress in this area has been recently achieved through the use of matched bank-firm lending datasets and macroeconomic variables.

Essentially, thus, giving the notorious amount of information about financial institutions over the last years, most of the effort in explaining credit determination uses panel data models, where a large number of banks specific information, such as the total liquid and illiquid assets, profitability and leverage, and macroeconomic variables, e.g. interest rates, GDP and capital requirements are related to credit supply (AWDEH, 2016; EVERAERT *et al.*, 2015; IANAZE, 2011; LIMA, 2016; MENDONÇA; SACHSIDA, 2013; STEPANYAN; GUO, 2011; VINHADO, 2014; VINHADO; BELÉM, 2013). There are, however, many studies where structural vector autoregression and, especially vector error correction models, analyses the impulse and response of macroeconomic variables endogenously determined in the system, in which aggregate information of credit is included (BUSCH; SCHARNAGL; SCHEITHAUER, 2010; DIB, 2010; GAMBETTI; MUSSO, 2016; GOODHART, CHARLES; HOFMANN, 2008; HOFMANN, 2004; HRISTOV; HULSEWIG; WOLLMERSHAUSER, 2012; KOLLMANN; ENDERS; MÜLLER, 2011; MUMTAZ; PINTER; THEODORIDIS, 2015; TAMÁSI; VILÁGI, 2011). Nevertheless, all of these methods must be integrated to a concise theoretical view, in order to better define the simulations and comprehend the results.

This chapter provides some empirical evidence for the analysis of credit money creation in Brazil, seeking to explain how credit growth is determined in the Brazilian economy after some structural transformations on the Brazilian banking system that followed the adoption of the Real Plan, and, after that, the Inflation Targeting Regime. It is stressed that the National Financial System has experienced a deep process of restructuring over the years, with

the currency stabilization, forcing a voluntary structural change by banks that resulted not only in a shift of focus concerning profitable activities, but also in a new design of the market. It has meant a deep restructuring process that accompanied the inflation stabilization process, loss of inflationary revenues by banks, and the transformation of the system into a complex structure, highly internationalized, concentrated and with the presence of large instruments-of-economic-stabilization-policy public banks. This way, it is important to highlight that the overall relations between the econometric variables are embedded in an institutional and historical economic scenario, which shall (have had to) be consider in order to analyze the idiosyncratic case of Brazilian credit money creation.

Given the relevance of both the liquidity preference of banks reflected on their portfolios and the macroeconomic relations between credit, demand, and monetary policy instruments, we have used two complementary approaches to analyze credit supply. On the one hand, we have estimated a dynamic panel data model with the aim of examining the role of expectations on banks' balance sheet and its implications on credit supply. On the other hand, a time series approach has emphasized the responses of credit supply to variations on a set of macroeconomic variables. This second analysis was based on a vector error correction model (VECM) and it aims to find empirical evidences to distinguish and to compare both NCM and Post-Keynesians interpretations of credit money creation.

Our findings suggest that changes on the basic interest rate have the power to affect the supply of credit by banks, changing the composition of their yield curve and the degree of liquidity preference. We were, thus, able to capture the relationship between these movements mirrored in the portfolio position of banks and credit creation by model estimations based on indicators of leverage and flexibility. Accordingly, while leverage indicators were positively correlated to credit supply, flexibility indicators followed the opposite direction. This means that when there is a lowering on the liquidity preference of banks, banks are more likely to increase their degree of financial leverage, which indicates a search for riskier passive positions in order to subsidize larger gains in riskier asset positions, such as credit. Additionally, in such situations, the willingness of more flexible portfolio condition is surpassed by the desire of more illiquid and profitable stance. Moreover, and not least important, in line with the Post-Keynesian theory, demand for credit played an important role on the offer of funds by banks in Brazil.

The chapter has five sections. After this introduction, in the next section, some stylized facts are presented to show the changes in the financial environment after the

achievement of price stabilization, and more specifically the reorientation of banks activities. Section 3 discusses the Brazilian credit cycle that started some years after the adoption of the Inflation Targeting Regime, considering the importance of some institutional changes on the demand side of credit, and also on the macroeconomic policy to stimulate the economy after the crisis. Section 4 addresses the econometric appraisal for the credit money supply function. This section highlights the importance of bank financial and ownership variables for the dynamics of credit growth, so as its responses to macroeconomic variables. Finally, the last section presents a systematization of this discussion.

4.2. The structural transformations on the Brazilian banking system after the Real Plan

The analysis of the determinants and constraints of credit creation in the Brazilian economy must be connected to its institutional particularities. For instance, changes in the National Financial System (NFS) until mid-90's were mainly motivated by the need to cope with high inflation rates, as spreads were compressed and gains with loan activity were made less attractive, thus shaping the technological progress to increase the processing speed of financial transactions. In the following decade, with the reform conducted by the BCB[67], the focus was redirected to risk management, real-time settlements of interbank funds transfer were enabled and credit operations grew. The Real Plan comes, therefore, as a turning point to banks and other financial institutions in terms of market formation and willingness to lend, which must be characterized in order to understand the contemporaneous credit supply function of the Brazilian economy.

Since the launching of the Real plan in 1994, the NFS has experienced a deep process of restructuring. Financial environment has changed significantly with the currency stabilization, forcing a voluntary structural change by banks that resulted not only in a shift of focus concerning profitable activities, but also in a new design of the market. Therefore, it is possible to say that over the past decade and a half, Brazil has had two very different financial systems. The system in place before 1994 had a strong presence of public banks, both in the federal and in the state governments sphere, a restricted number of foreign banks, a major importance of directed credit, narrow competition, and a substantial reliance of banks' profits

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[67] In the scope of the reform of 2001 and 2002, the BCB implemented the Reserves Transfer System (STR), enabling real-time settlement of interbank funds transfer, irrevocably and unconditionally. ARRUMAR

on revenues correlated with high inflation. In contrast, the second system in place currently has a smaller (but important[68]) number of public banks, a larger presence of foreign banks, a generally free allocation of credit, and banks independent on inflationary earnings, with a solid capital structure. The translation from the first to the second system has taken place over the 1990s in the event of a marked change to a more open economy in terms of both trade and capital flows. It has meant a deep restructuring process that accompanied the inflation stabilization process, and recently renewed efforts to improve regulations as well as procedures to strengthen the financial system (GOLDFAJN; HENNINGS; MORI, 2003; HERMANN, 2010; PUGA, 1999).

The inflationary environment preceding the Real Plan stimulated banks to compete for deposits in view of the profits earned with the investment of the resources in inflation-protected securities. The so-called "inflationary revenue" originated in unpaid obligations of funds (deposits and values in transit, due to transfers, collection of securities and tax payments) that, excluding the portion collected compulsorily without remuneration to BCB, could be applied by banks in credit or bonds at expected inflation comprised interest rates. Inflationary revenues resulted, therefore, from the loss of real value of funds deposited in the banking system, and such loss being appropriated by banks.[69] It transmuted into profitable and viable investments that, otherwise, in a low inflation scenario would be characterized as unviable (BRAGA; PRATES, 1999; CARVALHO, CARLOS EDUARDO, 2003). These inflationary revenues motivated banks to expand, offering unpaid services and developing a pronounced technological progress on increasing the speed of processing financial operations.

Remarkably, even though high inflation engendered an unstable macroeconomic scenario, it opened possibilities of exceptional gains for banks[70], together with the financial

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[68] In Brazil, some important public banks that managed to pass through the structural transformations of the 1990's are in the group of the biggest financial corporations in terms of assets.

[69] Furthermore, it is assumed that inflationary revenue could be broken into two items: the inflation arbitrage and the float. Inflation arbitrage would thus be obtained by banks when they did not pay to the holders of deposits a return to compensate the corrosion of these values by inflation, but included such a compensation in the borrower's rate charged on these resources, appropriating the difference (gains from the so-called spread). Float gains, in turn, were obtained by the additional income generated by interest bearing deposits to be invested in various asset transactions in the banking system. For the years of high inflation, it attaches itself something in between 80% and 90% of inflationary revenues to arbitrage; and 10% to 20% to float gains (CARVALHO, 2003; PASIANOTTO, 2001).

[70] Also, big capital enterprises experienced a maintenance in their profitability. The companies with the highest financial strength and ability to mark prices retreated credit system, reducing its debts, and used in the limit the opportunities offered by the government to counteract the currency risk of foreign currency loans contracted in the past (deposits by Resolution 432) and to extend their non-operating income by the financial working of their internal liquidity. This collaborated to enhance, at the macroeconomic level, the recessionary and inflationary

policy carried out by the Treasury and the central bank (ALMEIDA, JÚLIO SÉRGIO GOMES DE; BELLUZZO, 2002). According to MORRIS (1990) and CARVALHO (2003, 2005), between the years of 1981 and 1987, the average profitability of the Brazilian banking system measured by the return on average equity was 62.3%, while 16.5% for Latin America. The net income as a percentage of net equity index for financial institutions was on average 11.5%, reaching 20.5% in 1981 and 15.4% in 1989. The Brazilian financial system has acted markedly as an extension of the monetary authorities in the implementation of monetary policy and in managing the domestic debt of the public sector. This reallocation of functions allowed not only the sector's maintenance, but also contributed to exceptional results.

The main policy instrument was the generalization of short-term investments (overnight) in federal bonds, with interest permanently monitored by the BCB in order to signal real gains for investors. Banks acquired government bonds, with terms of weeks or months, and resold to the public for one day, through the repurchase price set at the time. To minimize the risk that the daily cost of financing could overcome the bond yields, the BCB insured banks daily financing ("*zeragem automática*") and the eventual repurchase of the securities and their replacement, if the interest expectations altered unexpectedly. There was thus established a partnership between the government and financial system to provide money substitutes, with what was avoided the currency substitution phenomenon[71] and the degeneration of "mega inflation" in open hyperinflation. One of the main items of this strategy was the signal by BCB of high and predictable real interest, which subordinated all monetary policy over the years and kept for banks profitable and safe alternative to concentrate on securities intermediation of public debt (ALMEIDA, JÚLIO SÉRGIO GOMES DE; BELLUZZO, 2002).

The good and paradoxical performance of banks, given the significant reduction in lending function, is explained by a profound reorientation of activities. The unusual growth of overnight operations with high real interest rates, allowed daily applications of funds raised in the form of deposits of various natures and of their own reserves, ensuring in this way permanent positive spreads. This activity generated cash balances whose returns were appropriated by the institutions. The reduction in credit function also minimized the risks

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trends in the economy, but at the micro level ensured a healthy capital structure and preserved, in full recession, margins and profits of the big capital (ALMEIDA, JÚLIO SÉRGIO GOMES DE; BELLUZZO, 2002).

[71] The commitment of economic policy throughout the period was decisive to discourage the outflow of capital and the dollarization of domestic transactions, keeping non-monetary financial assets denominated in national currency attractive. Since access to indexed public securities was given through the banking system, dollarization was avoided and banks did not lose their share of financial transactions, as it happened in most of Latin America countries (CARVALHO, FERNANDO J. CARDIM DE; SOUZA, 2011).

inherent to normal credit operations, especially in times of crisis so frequent in the 1980s (Graph 5). Investment deadlines had been reduced, while remained or rise real interest rates, which in a way reflected an ideal world for financial operators (CARVALHO, CARLOS EDUARDO, 2005; MORRIS, 1990).

Graph 5. Percentage of income from financial liquidity applications and from loan on total income in Brazil (1989-2016)
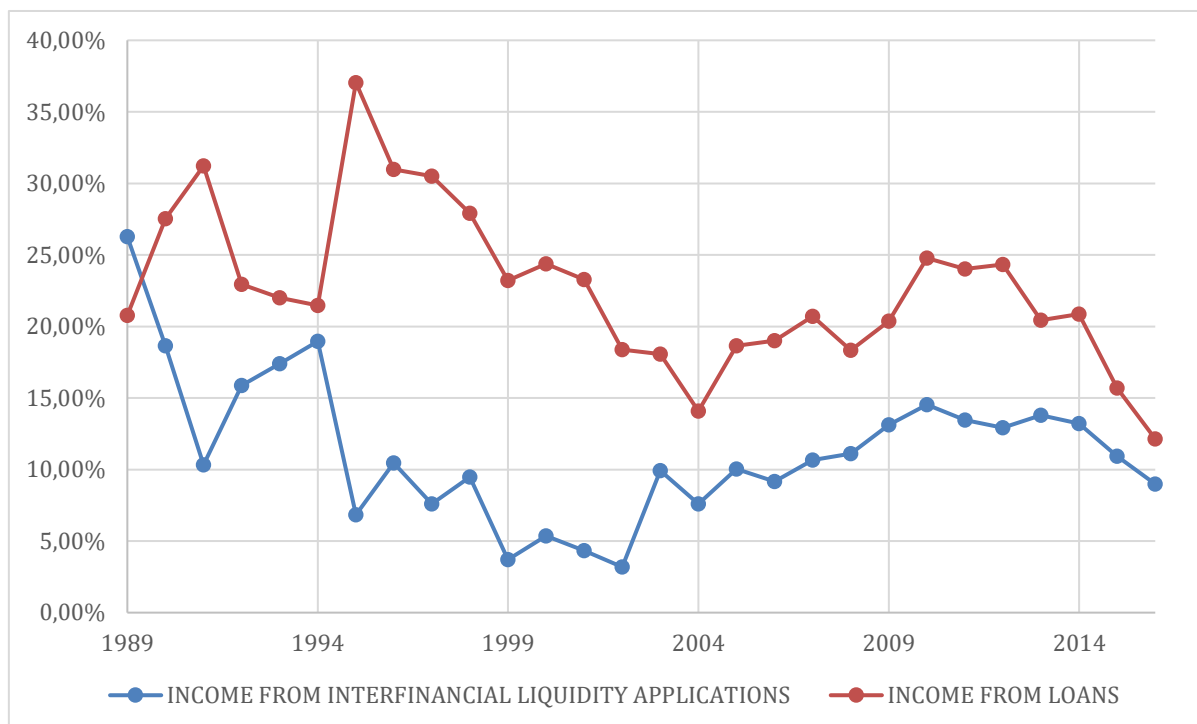
Source: own elaboration based on BCB (2017a).

The overturn induced by the Real Plan and the new consensus' inspired policies forced banks to find alternative sources of profits, consolidating their operations and renovating their administration bodies. Only the most competitive and solid banks survived through this period. With the end of inflationary income, banks found themselves with a very heavy and low efficiency structure. In the year following the introduction of the Real Plan, banks also had to adapt rapidly to rising defaults, which reached record high levels. There was deterioration in the quality of credit assets, and the impairment of equity with problematic loans have already reached 18.2% in 1995, compared to a historical average volume of 5.5% (PASIANOTTO,

2001). Despite the fact that some institutions were able to maintain its margins of profits[72], the vulnerability of the financial system has continued to increase and a climate of apprehension were reinforced with the concentration of liquidity within the largest banks (CORAZZA, 2001).

Graph 6. Number of banks in the Brazilian NFS (1989-2016)
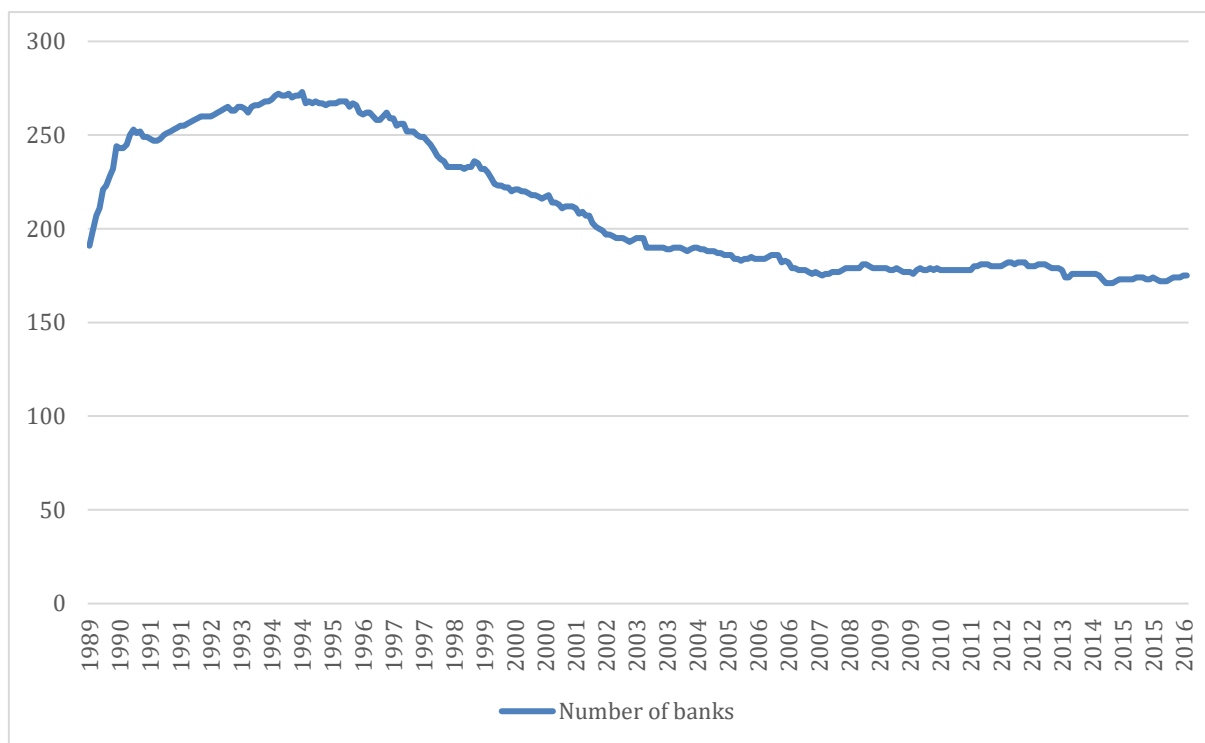
Source: own elaboration based on BCB (2017a).

This was the context on that important official bank restructuring programs were released. Until then, there was no institutional framework to prevent the system from the risk of a financial crisis. The role of the central bank to bail out institutions was only on an emergency basis, using resources from the monetary reserve. In August 1994, in accordance with the Basel Accord, the central bank edited resolution 2,099, establishing minimum capital ratios for the establishment of a bank, as well as additional limits that would vary according to the risk level of assets. But it was only in 1995 that more ambitious measures were taken, given the decline in the economic growth rate resulting from the adoption of a highly restrictive monetary and credit policy because of the Mexican crisis, making inevitable the restructuring in banks (CARVALHO, FERNANDO J. CARDIM DE; SOUZA, 2011; MAIA, 1999).

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[72] Credit to the private sector increased by almost 60% in the first year of the Real Plan in response to the loss of inflationary revenue. The running for the increase in credit the expense of greater risk contributed to the weakening of the system (CALIARI; OLIVEIRA, 2008).

Initially, in November 1995, the Program of Incentives for Restructuring and Strengthening the National Financial System (Programa de Estímulo à Reestruturação e ao Fortalecimento do Sistema Financeiro Nacional – PROER) was launched[73] with the objective to facilitate and organize the processes of mergers and acquisitions necessary to ensure the stability of the banking system. In addition to providing a special line of liquidity support and the release of funds from the compulsory reserves on demand deposits, the program included the flexibilization of the applicable operating limits on financial institutions as well as the computation as capital gain of the difference between the amount paid in the acquisition of an organization in distress and the patrimonial price of the shareholding as capital gain. Along these lines, the monetary authority sought to speed the banking system restructuring process, preserving its solvency and providing resources for solid financial institutions to acquire a controlling stake in troubled banks (OLIVEIRA, 2009; PAULA, 2011).

Also, the restructuring and privatization of banks owned by Brazil's state governments were stimulated by the Program of Incentives for the Reduction of the State Role in Banking Activity (Programa de Incentivo à Redução do Setor Público Estadual na Atividade Bancária – PROES)[74] with the end of the inflation tax and implicit government guarantee. The program would provide the instruments to finance the liquidation and the adjustments required to privatize or change the status of the state bank in a non-bank or development agency. Nonetheless, if the state government decided to maintain control over the state bank, the federal government would meet only 50% of the costs of the restructuring program. Lastly, although the launch of PROES occurred under the impulse of the assistance program to private banks, given their impact on the banking system, it had essentially fiscal reasons, and in this respect, it is distinct from PROER[75].

The Program for the Strengthening of the Federal Financial Institutions (Programa de Fortalecimento das Instituições Financeiras Federais – PROEF), launched by the Provisional Measure 2,196/2001, was responsible for a very rigorous supervision by the BCB over four

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[73] The program was announced on 04.11.1995 and promulgated by the Provisional Measure 1,179 (after Law 9,710/98) and CMN Resolution 2,208, with retroactive date of 03.11.1995. On the same day (04.11.1995) the National Bank was settled, already under Proer legislation. The Banco Econômico had been settled in the previous August, but it was later sold under the PROER regime in April 1996 (CARVALHO, CARLOS EDUARDO; STUDART; ALVES JR, 2002).

[74] central bank Circular 2,742 of 1997.

[75] The PROES comprise a comprehensive process of state fiscal adjustment and debt restructuring. The fiscal adjustment program object was to generate primary surpluses so that states would able to service their debt, while debt is reduced to sustainable levels through restructuring, which involved forgiveness of (securitized) debt and an (implicit) interest rate subsidy on (total) restructured debt (MAIA, 1999).

federal banks – Banco do Brasil (BB), Caixa Econômica Federal (CEF) and two development banks – Banco do Nordeste and Banco da Amazônia. Its main objective was the adjustment of capital adequacy of these institutions in order to make these banks more transparent, competitive and efficient. The PROEF framework involved three lines of action: firstly, the transfer to the Treasury or a Special Purpose Company (Emgea) of credit risks; secondly, the exchange of low liquidity and low interest rates assets for more liquid instruments remunerated by market interest rates; and thirdly, a capital increase. As a result, these federal banks started to observe capital requirements stricter than those recommended in the Basle Accord (CAMARGO, 2009; GOLDFAJN; HENNINGS; MORI, 2003).

The restructuring programs were followed by the creation of the Credit Guarantee Fund (FGC)[76], a compulsory and privately funded deposit insurance system. It is part of an important initiative to prevent financial crisis, ensuring funds deposited by customers in banks in cases of insolvency or special arrangements. The guarantee concerns demand, time and savings deposits, bills of exchange, real estate and mortgage. The funds derive from the financial system itself, with a monthly contribution of a specific percentage of the amount of the balances of insurance accounts. The instrument aims to guarantee the state of confidence in the system responsible for the coordination and facilitation of credit and debit relations of the economy (OLIVEIRA, 2009; PUGA, 1999).

These programs have defined major institutional instruments for the restructuring of the Brazilian financial system and have made viable an entire policy to attract large foreign banks to the country. From the removal of the requirement that the minimum capital of a foreign bank would be twice that required for a national bank (CMN Resolution 2,112/1995) and the support by the Real Plan that was national interest the entry of foreign banks in the country (Article 52 of the federal constitution), the opening of the banking market in Brazil has been conducted since the second half of 1995. At the beginning, some small banks were sold to institutions wishing to operate in the wholesale market - for example, the Deutsch-Südamerikanische Bank, which bought the Banco Grande Rio in 1996, a small institution in liquidation since 1991. After that, through the same route of entry, was the time of the "foreign giants" - for instance, HSBC, which bought Bamerindus and Santander, which bought Noroeste. Thereby, the purchase of failed banks under intervention or settled by the BCB was

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[76] CMN Resolutions 2,197/1995; 2,211/195; 3,024/2002; 3,251/2004; 3,400/2006; 4,087/2012; e 4,222/2013 (BCB, 2016c).

the mechanism by which the great wave of inflow of foreign capital in the domestic baking system has been initiated (BRAGA; PRATES, 1999; CARVALHO, CARLOS EDUARDO; STUDART; ALVES JR, 2002; OLIVEIRA, 2009).

Nonetheless, the changes in the regulatory structure of the SFN have not been restricted to emergency procedures. Brazilian government has also implemented a number of measures in order to improve its supervision and regulatory framework, in the event of the new requirements for controlling and monitoring the financial and capitals markets, in connection with the more general movement experienced by regulation and supervision in the world (MENDONÇA, ANA ROSA RIBEIRO DE, 2010).

In 1997, the BCB introduced the Global Consolidated Inspection Program (GCI) in order to improve supervisory operations, renovate competences of supervisors, and develop a planned path for the forthcoming of the financial system. By a regular flow of information provided by the institutions to the BCB[77], it became possible by the program to examine the financial and non-financial activities on a consolidated basis; to assess controlled subsidiaries and affiliates, both local and foreign; and to inspect branches abroad. The framework to determine the risk conditions at a global and consolidated level for a given group was well-established (GOLDFAJN; HENNINGS; MORI, 2003).

Moreover, it took the necessary steps to fetch the regulations and supervisory practices in accordance with the Basel Core Principles. The adoption of the Basel Agreement in 1994 became a benchmark, changing the focus of the regulation to the asset positions of banks. Domestic banks had four years to adapt to the new rules, which established minimum capital coefficients to be calculated with respect to their assets weighted by risk – at least 8%, a rate that was later increased to 11%. It was also set a minimum capital requirement so that the bank could operate within the system, varying according to the type of institution. Further rules have subsequently been issued[78][79], especially in terms of risk evaluation, but also in the sense

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[77] Financial institutions have the obligation to regularly provide information to the BCB, in accordance with the Accounting Plan of the Institutions of the National Financial System (Cosif). The system was created in 1987, with the objective of unifying the numerous accounting plans existing at the time, and of systematizing the procedures for the recording and preparation of financial statements (MENDONÇA, ANA ROSA RIBEIRO DE, 2010).

[78] For all the rules referent to updated prudential regulations in Brazil see BCB website on: http://www.bcb.gov.br/?REGPRUDENCIAL.

[79] With respect to the securities markets, until recently, Brazilian regulation had not been targeted at containing systemic risks, but rather at creating rules and procedures to protect the integrity of these markets. After a long a period of high risks and contraction resulted from high inflation, the main goal of regulators has been to attract new investors, particularly to private securities markets. The pathway found was to open the segment to foreign investors in the mid-1990s along with the privatization process. In this regard, new measures and arrangements

of guaranteeing a greater and enhanced access to information, a regulation of the entry and continuance of institutions in the system, and the responsibility of officers and shareholders (CARVALHO, FERNANDO J. CARDIM DE; SOUZA, 2011; MENDONÇA, ANA ROSA RIBEIRO DE, 2010).

In 2002, the authorities put in place a new payment system which would prevent the possibility of overdrafts at any time: a new real-time gross settlement (RTGS), also known as the Reserves Transfer System (STR). In June 2004, the Basel Committee posted general lines of a new Accord, which had been in negotiation for a few years. The BCB rapidly adhered to the new rules, issuing a communiqué (12,746, of December/2004) and scheduling a chronogram for the converting of prudential rules to the Basle II model (GOLDFAJN; HENNINGS; MORI, 2003).

Under the specificities carried out for the Brazilian market, it was decided that the standardized approach to the calculation of credit risks would not be based, as proposed by Basel Committee, on ratings set by specialized agencies. Given the fact that coverage of loans by rating agencies in the country is very limited, the BCB decided to issue itself a new table of risk weights. In sum, it has created two additional risk levels and different risk levels for real estate loans and retail transactions, in view of the benefits arising from the diversification of risks in such widespread portfolios. Moreover, the rules proposed in the notice take into account

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had to be adopted to attend the demands of more perceptive investors: rules were created to guarantee the right of minority investors and to improve corporate governance, in addition to the creation of the New Market, at the São Paulo Stock Exchange, the central stock exchange in the country (CARVALHO; SOUZA, 2011). Amongst the most important regulatory reforms was the Corporate Law of 2001 (Law 10,303/01), which secured rights of minority shareholders by ensuring them no losses in merging and acquisition process; it also guaranteed the representation of minority shareholders in management boards. Law 6,385/76 provides on the market securities and creates the Brazilian Securities Commission (CVM), its text contains all changes made so far. It is available at
http://legislacao.planalto.gov.br/legisla/legislacao.nsf/viw_identificacao/lei%206.385-1976?opendocument.
Regulators also made an effort to restraint market volatility by implementing devices such as the use of circuit breakers in stock exchanges – which determines the suspension of trading after big falls on Bovespa Index –, and by supervising concentrate positions in the market.
Debt markets similarly benefited from some of the regulatory framework mentioned above. The development of a private debt securities market, nevertheless, remained trapped by the substantial market for public papers. In addition to abnormal high interest rates and practically no liquidity risk, public debt securities have expressed robust protection against interest rate volatility and exchange rate fluctuations. Thus, regulations for this market were improved to observe governance and manipulation prevention aspects.
As for the securitization, although still very incipient, it was developed mostly in the form of mutual funds – the FIDC (CMN Resolution 2,907), which raise money by issuing senior quotas for qualified investors, and subordinated quotas, usually bought by the company that originated the receivables. This is the case of banks that securitize their loans in order to make they viable. The BCB, through circular 3,360, 2007 and CMN resolution 3,533 of 2008, has adopted a restrictive approach to the calculation of required capital, replacing the implicit risk of the subordinated quotas for the maintenance in their assets of the securitized loans. Meaning in practice that banks do not benefit from the securitization transaction in relation to regulatory capital (PINHEIRO; SAVOIA, 2009).

the effects of risk mitigation factors, e.g. guarantees, pledges, other instruments of personal guarantee, co-obligations in credit assignments, assignment in trust of securities, credit derivatives, as well as deposits in cash, gold and federal bonds, inter alia. Thus, in conformity with Basel II, these instruments would determine the risk-weighing factor (MENDONÇA, ANA ROSA RIBEIRO DE, 2010).

The process of adaptation to Basel II was expected to be complete by 2011. Around half way in the process, however, the international financial crisis demanded a new regulatory framework. The Basel Committee began in 2009 to work on comprehensive changes to Basel II, a process basically completed in 2010 with a new set of proposals, which is known as Basel III (CARVALHO; SOUZA, 2011). On 01/03/2013, the CMN issued a set of four resolutions and on 04/03/2013, the central bank published 15 circulars, which are part of the present standards for deployment in Brazil of the Basel III recommendations on capital structure for financial institutions with the aim of improving the ability of banks to absorb shocks and face possible financial crisis (BCB, 2016c).

The new regulatory framework provides a reformulation of the capital structure of financial institutions by improving the calculation of risk-weighted assets, the expansion of capital requirements and the redefinition of the regulatory capital and its levels. It also introduces the concept of liquidity ratios and of leverage ratio. All measures of the new agreement applicable to the Brazilian economy are scheduled to come into operation gradually until 2022 (ANBIMA, 2016).

Therefore, after the achievement of price stability and the overcoming of severe banking crisis through reorganization measures, as well as the privatization of the financial sector, the SFN advanced, from the late 1990s – to a complex structure, highly internationalized and concentrated. The new scenario is of a more solid financial structure, converging with international standards of prudential regulation by the improvement of its monitoring configuration, controls and mitigation of risks (PRATES; BIANCARELI, 2009; PRATES; FERREIRA; GORAYEB, 2015).

4.3. Brazilian credit cycles and banks' balance sheet transformation over the last fifteen years

The new competitive environment brought by the adoption of the Real Plan has provoked important changes on the Brazilian banking sector, which resulted in both an increase

in the strength and the degree of sophistication of institutions as also in the complexity and concentration of the system. Nonetheless, contrasting with the optimistic expectations by the government, as can be seen on Graph 7[80], credit to GDP ratio fell from 36% in 1995 to 22% in 2002, and spreads, despite the sharp drop from 120% per year in 1994 to 60% in 1999, stabilized in 40% by the year of 2000 (Graph 8). In fact, with the prominence of highly liquid applications, such as government indexed securities, credit expansion only gained impulse in the beginning of 2003 in the balance sheets of these institutions. The cycle expansion, though, last until 2015, when Brazilian economy felt into depression (DE PAULA; OREIRO; BASILIO, 2013; PRATES; FERREIRA; GORAYEB, 2015).

Graph 7. Credit to GDP ratio and total credit stock
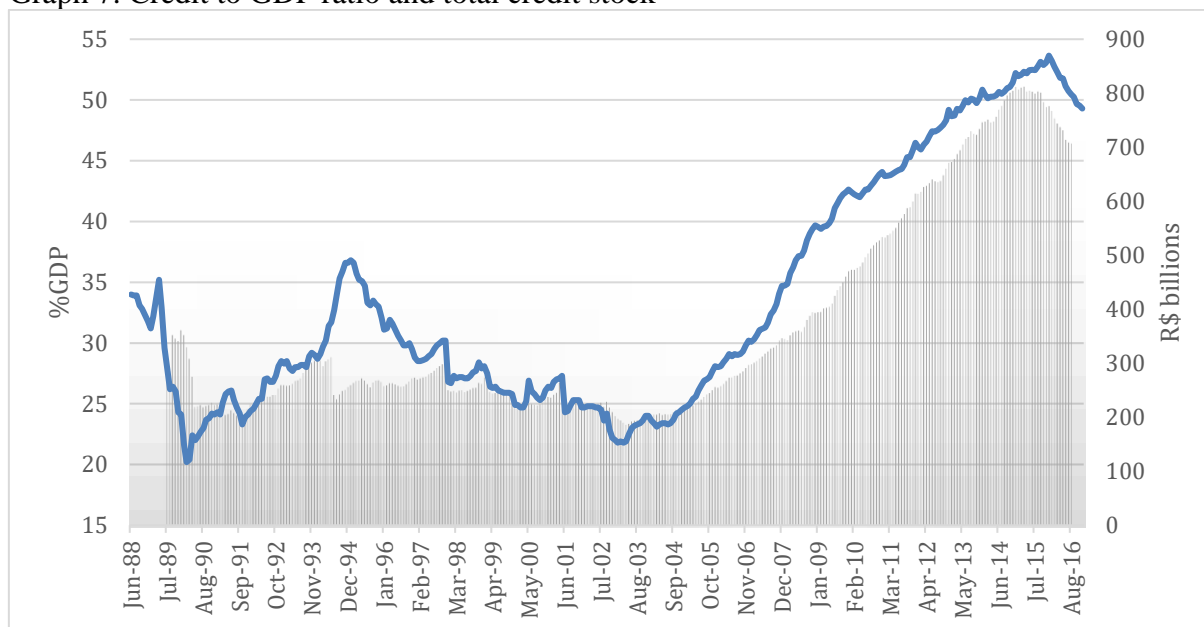
Source: own elaboration based on BCB (2017e).

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[80] Total stock of loans and financing granted by the institutions that are part of the National Financial System in relation to the monthly nominal GDP informed by the Central Bank.

Graph 8. Average Spreads (1994-2016)
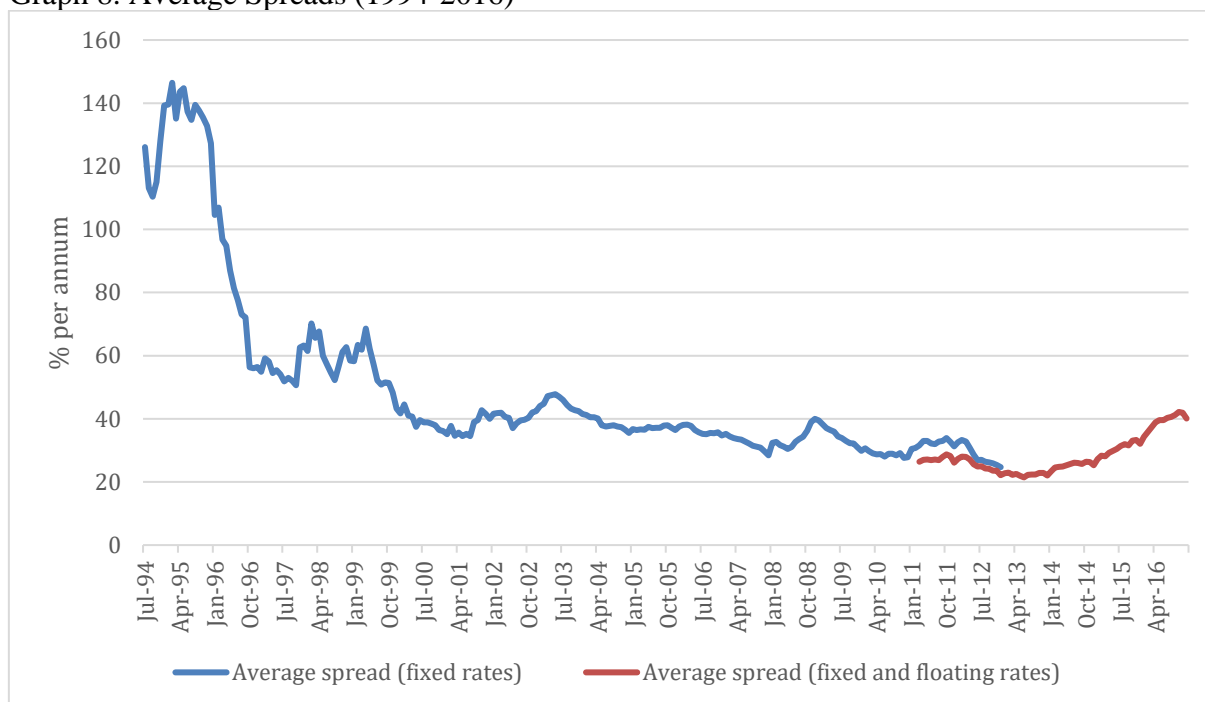
Source: own elaboration based on BCB (2017e).

Between the years of 1997 to 2002, banks have intensified their balance sheet adjustments initiated after the Real Plan adoption due to the negative effects imported from the crises in Asia and Russia, and even the Brazilian crises in 1999[81]. The contraction trend in credit operations that started between the years of 1995 and 1996 in response to restrictive monetary policy pursued by the Central Bank was reinforced by the continuous increase in investments in securities assets by banks, especially public bonds, which stepped forward to structurally occupy a prominent position in the banks' total assets and revenues. Also, as can be seen on Graph 9, following a movement that initiated in the beginning of the 1990s, banks were equally successful in maintaining their profitability levels by exploiting service revenues even in moments when credit operations declined. This process confirmed the acting profile of Brazilian banks and expressed the risk aversion of these institutions and the need to reconcile their active and passive structures: loans have been concentrated in the short-run and the financial leverage has decreased in times of more uncertainty. Therefore, even after the descending period of credit cycle, revenues from open market operations have gained the

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[81] For more on the Brazilian crises, see Almeida and Belluzzo (2002).

greatest importance in the income of banks (CALIARI; OLIVEIRA, 2008; PRATES; BIANCARELI, 2009).

Graph 9. Open market operations revenue, credit revenue and service revenue as a percentage of operational income
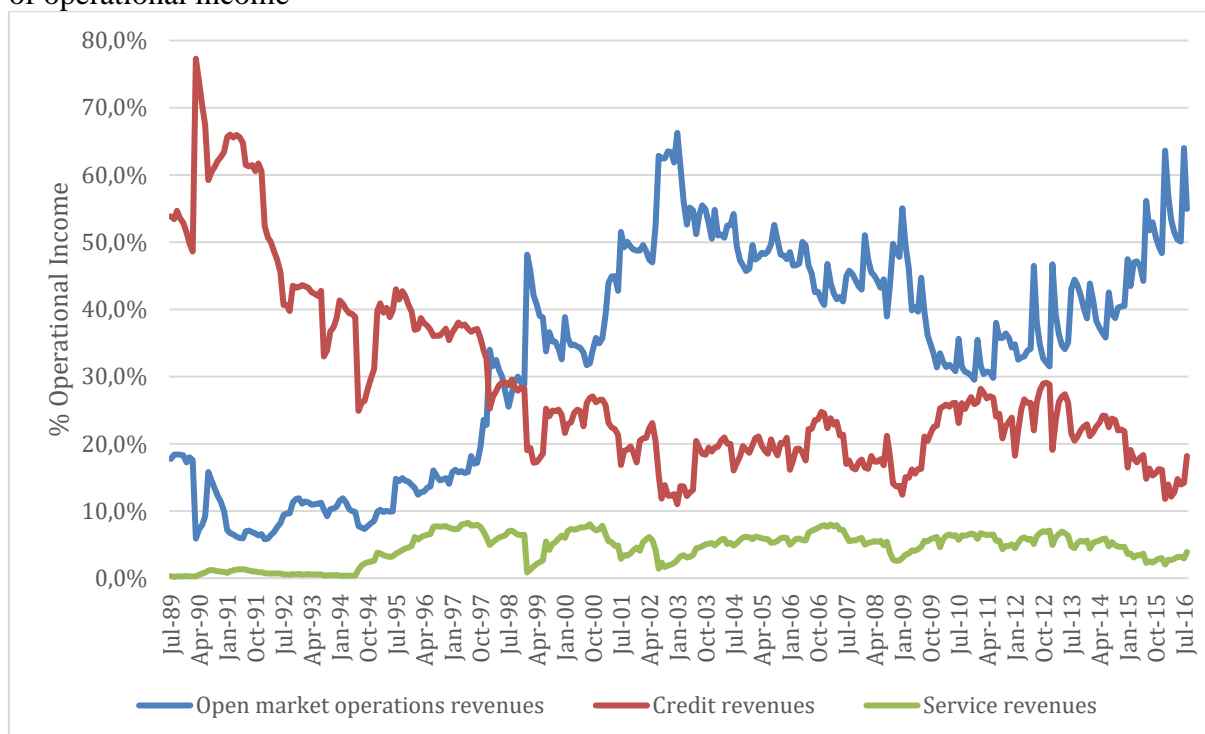
Source: own elaboration based on BCB (2017a).

It was only after the first months of 2003 that the credit started to expand in response to both the confirmation by the new government that there would be no change in the economic policy, i.e. the NCM policy framework, and most importantly, due to the improvement of the macroeconomic environment. The reason is that, although the inflation-targeting regime has been adopted back in 1999, it was with the decline in the macroeconomic volatility that the credibility along with the financial sector finally came. The beginning of the new cycle ascending path has thus responded to the recovery of a set of variables that reacted to the significant improvement in the external accounts. The downward trend of the average expectations for the exchange rate, inflation, and interest rates was supported by a new boom of capital flows to emerging markets, a low risk aversion of global investors, an upward trend of commodity prices, and the Chinese commodity appetite growth. Together, the expansion of the balance of trade, the liquidity cycle towards the peripheral countries and the consequent expectations of a reduction in the short-term interest rates by the monetary authority induced banks to redefine their operational strategies, prioritizing credit expansion in the intent to

expand their market share and margins of profit margins (FREITAS, 2009; PRATES; BIANCARELI, 2009).

According to Prates *et al.* (2015), in developing economies like Brazil, the high level of external fragility gives the exchange rate behavior an important role in persuading banks to change their degree of liquidity preference. In one hand, it directly affects the costs of external funding. On another, it enabled both inflation and interest rate to decrease. Therefore, in the Brazilian credit boom of 2003, the first direct effect only gained importance after 2007 with financial innovations launched by banks to broader use of external liabilities, but the second was of utmost importance to speed the credit offer from the beginning of the process. As for the determination of the inflation rate, the exchange rate was one of the main sources of a descending trend by its influence on the price of tradables. Regarding the interest rate, the threat of a sudden increase in response to an exchange rate overshoot had been progressively dispelled by the [self-fulfilled] expectations of a sustainable movement of currency appreciation given the still high Selic rate and the external's account improvement. Thereby, the conditions for a decrease in banks' liquidity preference were set and, as can be seen on Graph 10, a trend to a portfolio composition with riskier credit operations was encouraged.

Graph 10. Credit operations percentage by risk[82]
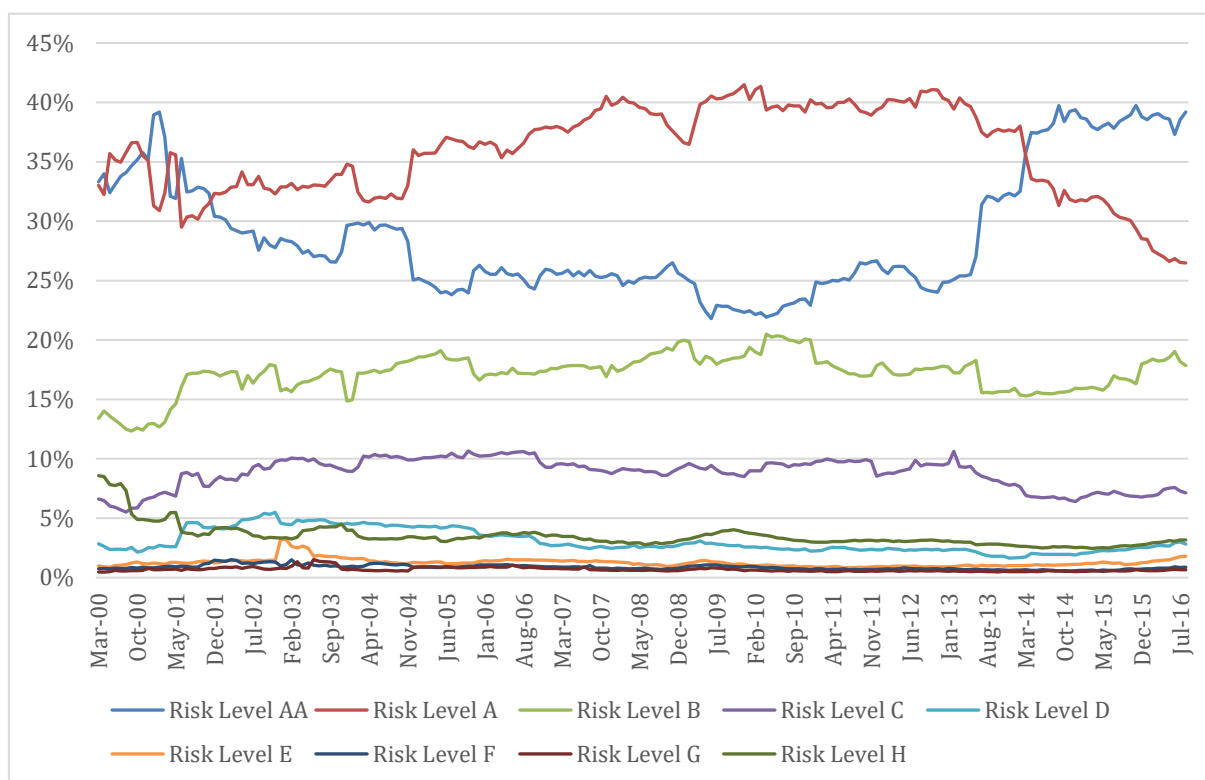
Source: own elaboration based on BCB (2017a).

In the context of optimistic expectations for both employment and income recovery and the outlook of a policy rate reduction – and the corresponding decline in the revenues from overnight Selic rate treasury securities –, private banks started to see household credit, particularly personal and for goods purchasing, as a profitable asset. Besides, it was this same improvement in the macroeconomic environment that enabled the public debt composition change by the government, which could opt to diminish exchange and Selic indexed bonds emissions, arising the offer of fixed interest and inflation-indexed papers. Consequently, demand and supply of Selic treasury securities were discouraged, contributing to the change in banks portfolio and their predisposition to create credit (BIANCARELI, 2011; PRATES; FERREIRA; GORAYEB, 2015).

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[82] Refers to the balance of loans, financing, advances and leases granted by the national financial system. By means of Resolution 2,682, the classification of the credits of responsibility of a financial institution must take into account, among others, the economic and financial situation, the level of indebtedness, the economic activity sector, the credit limit, the nature of the credit operation, the nature of the guarantees and amount of credit, as well as income, equity and registration with regard to households. The corresponding risk level is classified as follows regarding late payment: between 15 and 30 days, level of risk B; between 31 and 60 days, level of risk C; between 61 and 90 days, level of risk D; between 91 and 120 days, level of risk E; between 121 and 150 days, level of risk F; between 151 and 180 days, level of risk G; and above 180 days, level of risk H (BCB, 2017e).

Some critical institutional changes were also important to boost the cycle and gave the existent restrained demand for credit the possibility to be fulfilled. This was the case of the payroll-deducted credit for workers and pensioners[83] and the fiduciary alienation for vehicles. In the first case, with the authorization to discount loans directly from the salary or from the social security benefit, the risk of default has been drastically reduced, which, in turn, contributed to an interest-rate's decline and an increase in the number of takers. In the other, the promulgation of the fiduciary law has led to an efficiency growth in the execution of guarantees by banks. This process supported an expansion of vehicles acquisition loans, which also led to terms extension and interest rate's decline. Thus, the reforms of financing institutional conditions[84] enabled credit expansion even before the first signs of recovery of consumer purchasing power in 2004 (FREITAS, 2009; LIMA, DANIEL GUILHERME DE, 2016).

As can be seen on Graph 11, it was the household credit that led the begging of the cycle boom, with the corporate sector – mainly industry and other services, such as infrastructure – assuming the forefront of the expansion only in 2008. Therefore, the household share grew from about 36% of the total in 2003 to 47% in 2008, while the share of corporate credit fell from 64% to 53.7%. Although the household credit has led the credit expansion for most of the ascending period of the cycle, it was lower in the period after the global financial crisis in comparison with the previous period (CINTRA, 2006; PRATES; FERREIRA; GORAYEB, 2015).

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[83] Introduced by Provisory Measure 130 on September 7, 2003 and converted into Law 10,820, on December 17, 2003.

[84] Under this reforms, we can also highlight the importance of bankruptcy law and Credit Information System of the Central Bank (SCR in Portuguese) (LIMA, DANIEL GUILHERME DE, 2016).

Graph 11. Total credit balance to companies and households as a percentage to GDP[85]
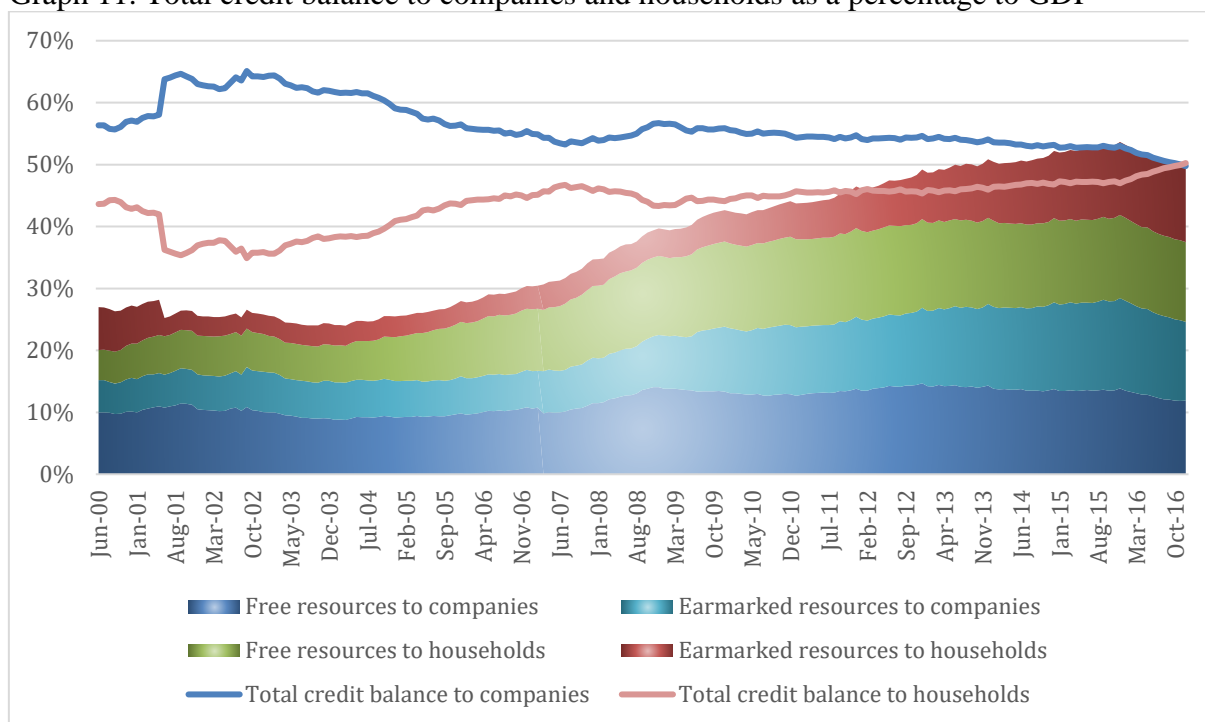
Source: own elaboration based on BCB (2017e).

The willingness of households to increase indebtedness was also stimulated by the strategy of large retail chains, which soon associated with banks, to extend debt terms of consumer credit operations. This lengthening, by significantly reducing the amount of the financing monthly payment, contributed to a reduction in delinquency, especially in a scenario of higher income for the population and, to a lesser extent, a rise in employment. The average maturity of transactions with individuals increased from 308 days in January 2004 to 488 days in December 2008. Therefore, this relative lengthening of the maturities enabled credit expansion even in a scenario of [still] extremely high average interest rates (FREITAS, 2009; OLIVEIRA, 2007).

In the dispute for mass consumption credit, large private banks extended their operations to the acquisition of small financial institutions and banks focused on consumer credit; and also to the operation of credit assignment contracts with small and medium-sized institutions. In one hand, the smaller banks that have made the partnerships became enabled to sustain active operations and serve a greater number of clients[86]. On the other hand, the larger

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[85] The graph comprises two series for every item, one for the period from June 2000 to February 2007, and the other for the rest of the period. The series from the beginning period were discontinued (BCB, 2017e).

[86] This expansion of credit operations and then restrained by the parameters established in the Basel Accord, which meant less possibility to generate loans for small banks outside this movement of partnership with larger banks.

banks that established partnerships or acquisitions of institutions, or simply leased the credit portfolios of banks that operated in the consumer finance niche, boosted the growth of their credit portfolios with a new business generation capacity, i.e. a platform of closer relationship with the targeted borrower. In short, this strategy has allowed banks to increase their credit portfolios in a small period of time and at much lower costs than would be incurred in an organic type of expansion (OLIVEIRA, 2007).

Credit operations in the corporate segment started to grow at more expressive rates in the second half of 2007, responding to the acceleration the Brazilian economy growth - anchored in the domestic market and the expansion of investments, which stimulated production and expansion of capacity. In addition, several Brazilian and multinational companies that had other sources of financing started to use the domestic credit market due to the continued deepening of the international financial crisis. The crisis meant for large banks and companies a significant worsening in contract terms, such as costs and terms, of borrows in the international market. Moreover, the strong asset deflation that marked the deteriorating financial conditions in developed countries also caused the lower dynamism of the Brazilian capital market, with special retraction of the primary stock market. These processes resulted in an increase in the contracting of loans, especially working capital, in the domestic market by large companies (PRATES; BIANCARELI, 2009; PRATES; FREITAS, 2013).

However, in order to reduce inflationary pressures, in 2008, two economic policy measures were taken that ended up undermining the domestic capital market's dynamism. The first of these was the requirement of compulsory deposits on leasing companies, which raised funds for their bank controllers by issuing debentures. The second was the increase in the Selic rate, which, by increasing the profitability of federal public securities, triggered the reallocation of financial investment portfolios away from private debt securities. Consequently, the cost of borrowing for companies and banks, especially those of medium and small size, increased. For smaller companies, indeed, raising funds by private bonds issues became even more difficult with the deterioration of the international financial conditions, given that, with the lack of external credit, large companies started to compete in the Brazilian market for financial resources (FREITAS, 2009).

In this context of greater expansion of the Brazilian economy, associated to the growth of the domestic market, in which bank credit is fundamental to make investment

decisions feasible, a financial innovation87 has given a second impulse to credit expansion by offering companies financing contracts linked to foreign exchange derivative operations, which guaranteed a reduction in the cost of credit while the real trajectory was appreciated 88 (MARTINS; FERRAZ, 2006; SANT'ANNA; BORÇA JUNIOR; ARAÚJO, 2009b). In this regard, the result of underestimation of risks and banking competition dynamics, where financial innovations associated with the management of liabilities (time deposits with daily liquidity) and assets (loans to companies linked to foreign exchange derivatives operations) have been introduced in the system, has resulted in more fragile financial environment, and amplified the potential contagion effect of the financial crises to the Brazilian economy. Nonetheless, this extremely risky mechanism contributed to preserve the credit-to-GDP growth ratio in the first eight months of 2008 by reducing the cost of credit even in a context of a higher basic rate (PRATES; BIANCARELI, 2009). The peak on the foreign exchange portfolio and in the derivative operations after 2007 can be seen on Graph 12.

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[87] Introduced in the country by foreign banks in 2007 and quickly mimicked by the national private banks.

[88] Although they had varied forms, the contracts always resulted in guarantees of greater profits to the companies when compared to the conventional contracts, as long as the Real continued to value; Or, in the case of a depreciation, more specifically, if its price exceeded the exercise price of the option sold by the company or the forward exchange rate, the losses would double. For banks, the credit risk increased, since they performed mirror operations to neutralize exchange rate risk.

Graph 12. Total foreign exchange portfolio and derivative operations[89] in the Brazilian bank system
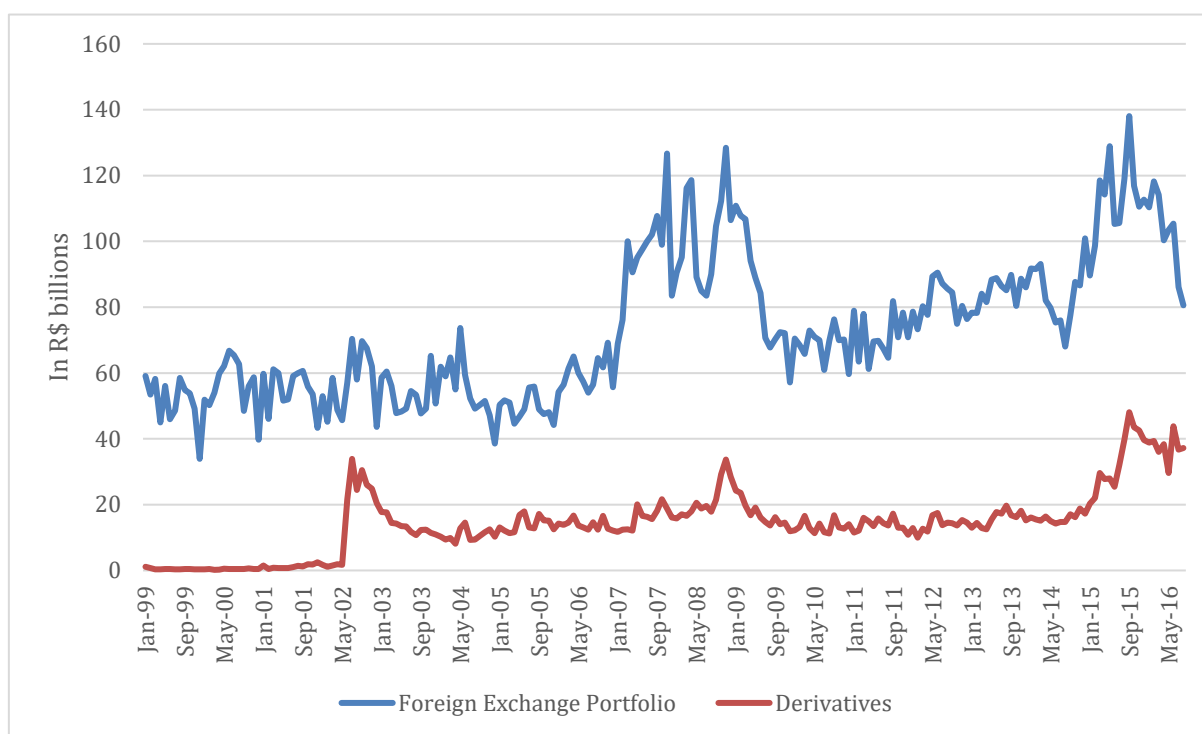
Source: own elaboration based on BCB (2017e).

Throughout 2008, however, banks have faced increasing difficulties in renewing their external credit lines that supported the transfer of resources and foreign exchange derivatives operations. The bankruptcy of Lehman Brothers, ultimately, led to the interruption of external financial flow to support credit in the domestic market (which affected the financing of Brazilian foreign trade). Also, the need to cover the high losses in the subprime mortgage markets implied the transferring of funds by foreign banks to the parent company, which meant the liquidation of financial investments, and, consequently, the retraction of the participation of these institutions in the Brazilian private financial system. In the reversal of expectations, thus, banks reacted with caution and sharply tightened interbank credit, that made it difficult to solve liquidity problems by some banks, especially the smaller ones[90](PRATES; FREITAS, 2013; SANT'ANNA; BORÇA JUNIOR; ARAÚJO, 2009a, b).

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[89] the derivatives account is under the securities and derivative financial instruments portfolio, which also comprises free securities and subject to repo commitments, to the BCB, to the acquisition of state companies, to collateral.

[90] Small and medium-sized banks were the most affected by the liquidity pooling, as they lacked a broad base of depositors and relied on fund raising in the interbank market and on credit assignment to continue their active operations. The situation of these institutions was further aggravated by the sale of papers by companies that

The growing rumors about losses of companies and banks with foreign exchange derivatives operations triggered a movement of absolute risk aversion and liquidity preference by banks. The obscurity about the degree of exposure of the other agents led banks to withdrew credit both for companies and individuals and for other banks, prompting companies to revise production and investment plans. The portfolio reallocation movement, characteristic of banks' active management of balance sheets, was facilitated by both the Treasury securities indexed to the attractive increase of the Selic rate and their relatively short-term credits profile. The result was the rapid deceleration of economic activity in the last quarter of the year (MORA, 2015).

In response to the international crisis, however, the federal government took a sequence of unprecedented measures: contrary to what happened during the international crises of the 1980s and 1990s, in 2008-2009 Brazilian authorities were able, giving the use of the favorable external conditions of the previous years, to adopt countercyclical policies[91] with the utmost objective to prevent the international crisis from contaminating the Brazilian financial system and, at the same time, to recover the level of economic. Among these measures there were the reductions in the compulsory rate, the reduction in the additional chargeability on demand, time deposits and savings deposits and the subsequent increase in deductions associated with the acquisition of assets of financial institutions – which had the purpose of stimulating portfolio purchases of these institutions by larger banks activity. The most important one, however, was the growth of loans with earmarked funds (BARBOSA; SOUZA, 2010).

More specifically, in early 2009, the Union granted a credit line of 3.3% of GDP to BNDES, which in turn offered a set of special short-term credit lines to the productive sector. In addition to this action, Banco do Brasil and CEF were also offered financial incentives in the form of interest rate equalization in order to augment credit lines such as working capital to agriculture, construction, production of basic inputs and the production and sale of durable

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needed resources to honor commitments with the exchange rate derivatives, as well as by large applicators (companies, investment funds, pension funds) that redeemed their applications in these banks and transferred them to bigger private or state-owned banks (PRATES; BIANCARELI, 2009).

[91] Countercyclical monetary policy finally included a substantial cut in the Selic rate, but it was only taken after the BC's fears about the inflationary impact of the depreciation of the Real were surpassed by the generalized concern of the government with the abrupt drop in the level of economic activity. However, the delay of the conservative monetary policy in stimulating the economic recovery was offset by the implementation of a series of temporary tax reliefs to stimulate sales and consumption, such as the reduction of IPI to the automotive sector and the extended exemptions for the durable consumer goods sector, building materials, capital goods, motorcycles, furniture and some food items in 2009 (BARBOSA; SOUZA, 2010).

consumer goods, known as having sectors the worst liquidity problems. An extensive housing program was, also, implemented as a structural measure, i.e. the "Minha Casa, Minha Vida", aiming at building a million new houses. The program included the direct construction of residences by the government, the expansion of the subsidized real estate financing by CEF, the reduction of indirect taxes on the construction of popular houses and the creation of a special line of credit to encourage the adoption of modern techniques to increase productivity by BNDES (BARBOSA; SOUZA, 2010; PAIM, 2013).

Thus, considering the most critical phase of the crisis, between September 2008 and July 2009, public banks increased their credit supply by 33%, while national private institutions grew by 4% and foreign institutions by 1.5%. As can be seen on Graph 13, the earmarked credit grew from to. Therefore, the impulse of the public financial institutions – BNDES, Banco do Brasil and CEF – in the earmarked credit system has broadened the scope of the Brazilian government in managing the contagion effect of the international crisis on the credit evolution, compensating, in part, the deceleration of the segment of free resources (PAIM, 2013).

Graph 13. Balances of credit operations of financial institutions under public, private, national private, and foreign private control (%)
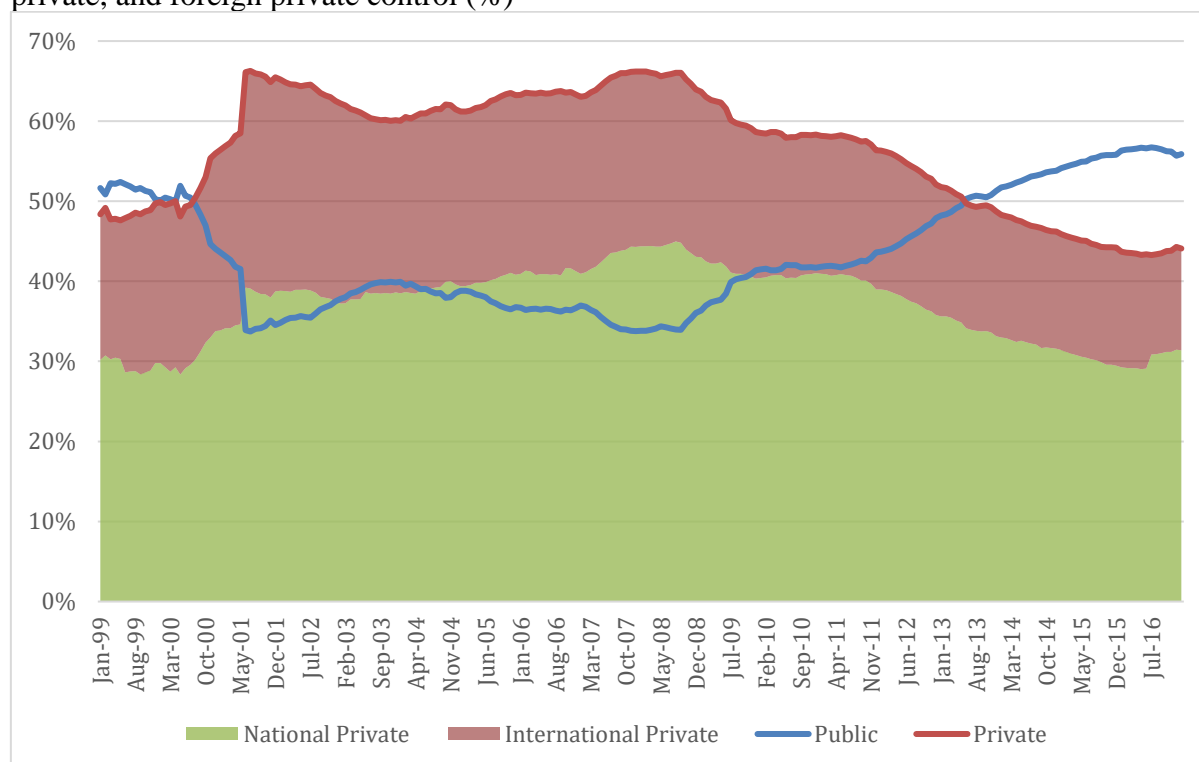
Source: own elaboration based on BCB (2017e).

Once more, the expansion of the Chinese economy and its increasing demand for primary and processed agricultural goods produced in Brazil reinforced the counter cyclical policies. However, the attained result of a 7.5 percent GDP growth rate registered by the Brazilian economy in 2010 was confined to only that year. In the aftermath, with the loss of steam in China and the consequent worsening in the Brazilian trade balance, there was an avalanche of corruption accusations in the federal government and government controlled firms[92], which culminated in the adoption of fiscal and monetary austerity policies[93], presented to the population as the only way to recover control of budgetary situation of the state. By 2015, the GDP growth rate persistent decline gave way to an open recession (CARVALHO, 2017; PAULANI, 2015).

Graph 14. Total Reverse Repos Operations and Degree of Financial Leverage on the aggregate of the financial system.
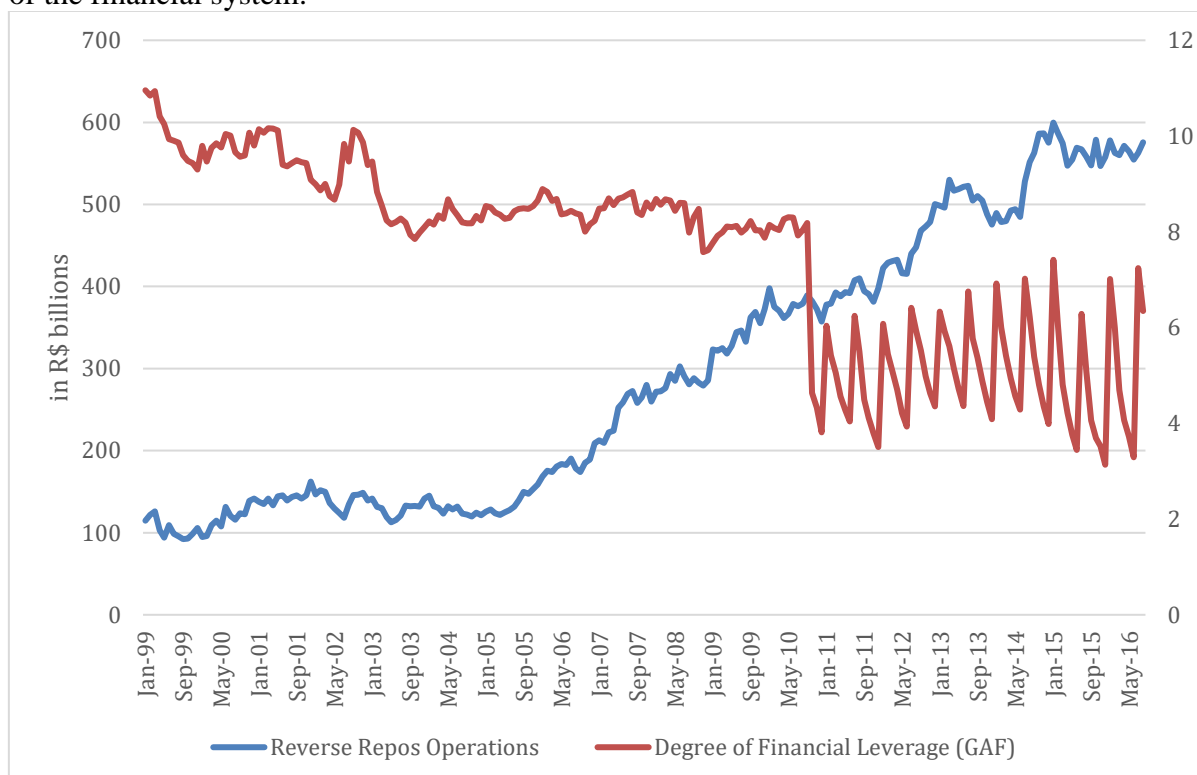
Source: own elaboration based on BCB (2017e).

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[92] Even the credit policies designed to strengthen some large firms in the external competitive scenario, i.e. the so called national champions, deepened the perception that the first government economic objective was to pay lobbies (CARDIM DE CARVALHO, 2016; CARVALHO, FERNANDO J. CARDIM DE, 2016).

[93] According to Carvalho (2017), the difficulties experienced by the manufacturing sector due to the high external concurrence provoked by the long period of Real's over appreciation was an important factor to explain Brazil's economic downturn. Besides, despite the fact that in the first moment the government was still politically able to offer financial and fiscal subsides to domestic firms to reduce their costs and increase their profits, these policies performed poorly in terms of reactivating the economic growth.

This was the context of a sharp cut by public financial institutions in credit subsidies and the consequent drop on earmarked loans. Besides, in the intent to maintain the inflation above the official target, BCB forced a rise on the Selic rate, increasing the interest rates in the interbank reserves market. The uncertainty on how the crisis was to be solved bolstered and a vicious circle was established: the decline in the level of economic activity deteriorated the fiscal situation, fostering the expectation of further austerity measures, which, on its turn, deepened contractionary pressures, and so on. Under these circumstances, once more, banks have managed their portfolios according to the respective liquidity preference, lowering their exposure to indebted borrowers and investing in BCB reverse repos as can be seen on Graph 14 (CARVALHO, 2016, 2017).

4.4.   Credit money supply function: an econometric appraisal

From the post-Keynesian interpretation on the credit supply in a business economy, in which the balance sheet composition of the banks is guided by the degree of liquidity preference assumed by these institutions at a given moment, we analyze the determinants of credit growth by using a large cross-section bank-level panel dataset. In this regard, data from the BCB on credit and bank financial variables were matched with time-varying information on bank ownership. The sample included 50 banks[94] with activities in the country and covers the period from 1999 to 2016, i.e. from the year of the inflation targeting regime' adoption to the last data available. These quarterly data were, finally, combined with macroeconomic variables also from the BCB dataset.

The estimation strategy was to use the GMM estimator, based on the Arellano and Bond (1991) and Holtz-Eakin *et.al.* (1988), which counts on the persistence over time of both autocorrelation, given the presence of lagged variables, and individual effects that controls for the heterogeneity between entities. For these estimators, additional instruments are created by the differences among lagged variables and disturbances. Therefore, we can estimate the coefficients for the credit supply function with the generated regressors as instruments.

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[94] BCB (2017b) provides information of the balance sheet of the entire NFS, covering data from banks and their conglomerates. In this thesis, we have opted to work with bank data in an intent to capture more specific balance sheet composition changes. Also, in order to build the panel data sample with the less possible missing data as well as with a sufficient large number of information (giving the fact that some institutions have merged or stopped activities over time), we have taken as base the fifty largest banks in activity in the year of 2016. In addition, monthly data for these banks were transformed in average quarterly data to diminish extreme variation on errors in the model.

The basic regression uses the following specification, where credit in bank i, at time t, is given by:

$$credit_{i,t} = c_i + \alpha \cdot credit_{i,t-1} + \beta \cdot macro_t + \gamma \cdot bank_{i,t} + \varepsilon_{i,t} \qquad (18)$$

Bank-specific fixed effects, c_i, the, credit in the previous period, $credit_{i,t-1}$, macroeconomic variables at time t, $macro_t$, and bank-specific balance sheet variables at time t, $bank_{i,t}$. Hence, according to the literature on bank credit in the Post-Keynesian perspective, a set of typical variables are included to control for the macroeconomic conditions and, most importantly, some bank indicators were created in order to capture banks specific portfolio arrangements that affects their decision to lend. The following box gives the summary of the variables characteristics and the expected sign.

Box 2. Description of input variables and expected signals

Domestic macroeconomic variables	
Real domestic demand (+)	Reflects the demand intensity and is expected to have a positive impact on credit supply. The domestic demand was used instead of GDP because it was a critical driver of the financial credit cycle in Brazil from 2004 to 2015. From the perspective of an individual bank, contemporaneous domestic demand growth is assumed to be an exogenous variable, and not to depend on the banks' own credit supply. Hence, no lags are used for this variable.
Selic (-)	Apprehends the impact of the monetary policy intrument on credit supply. Selic changes alter the yield curve of banks that respond to it with balance sheets adjustments. The sign is expected to be negative as liquid assets become relatively more attractive than credit.
Average inflation (-)	Captures expactations on macroeconomic balance. The sign is expected to be negative as lack of price stability deters financial transactions and inflation erodes bank capital.
Bank's balance sheet variables	
Previous credit supply (+)	It reflects the preceding expectations and the anteception of demand growth; both having a positive impact on future credit supply.
Speculative position (-)	It reflects how much the result of bank's normal operations is used to pay interest and other principal obligations. The expected sign of this indicator is negative because the lower the ratio between operating revenues and operating expenses, the lower the degree of liquidity preference, i.e. the more risk taker is the bank and, therefore, the greater the supply of credit.
Leverage (+)	Ratio between third-party resources and equity and measures the aggressiveness of banks. The higher the indicator, the higher the bank's speculative grade, the greater the credit supply.
Assets flexibility (-)	At times of declining liquidity preference, banks tend to increase their positions in assets whose monetary return is high and whose liquidity premium is low, such as credit operations, thereby reducing the ratio of more liquid assets, such as short-term public and private securities, to total assets.
Liabilities flexibility (+)	Ratio between the sum of resources with no incidence of reserves requirements and the total current and long term liabilities. The more the bank is able to raise non-reserve requirements, the greater the ability to offer credit.
Risk exposure (-)	Ratio between the lowest risk credit portfolio (A and AA) and the total credit portfolio. The lower this ratio, the more prone to risky operations is the bank, therefore, with a tendency to increase the supply of credit.
Foreign currency exposure (+)	Ratio between obligations and rights in foreign currency. The higher the indicator, the greater the risk assumed, the greater the funds for credit.
Financial Independence (+)	Ratio between shareholders 'equity and adjusted total assets (total assets less shareholders' equity). The higher, the higher the bank's independence degree to third-party capital, the greater the ability to offer credit.
Return on Equity (+)	Quotient between net income and shareholders' equity, indicating bank profitability. More profitable banks are expected to be in a better position to extend credit.

Source: own elaboration based on BCB (2017e), Oliveira (2009) and Everaert *et al.* (2015).

The domestic demand was included among the macroeconomic variables in order to capture the prominent impact of demand for funds on credit supply. The reason is that, as stated in the first chapter, credit demand, aside from liquidity preference, determines the volume of credit. Besides, it was chosen instead of GDP because of its critical role as a growth driver

in the Brazilian last credit cycle. Finally, from the perspective of an individual bank, contemporaneous domestic demand growth is assumed to be an exogenous variable, i.e. not to depend on the banks' own credit supply, and to have a positive impact on credit supply (EVERAERT *et al.*, 2015).

Moreover, the Selic rate and the inflation rate apprehend the generalized expectations of macroeconomic stability manipulated by the monetary authority. Additionally, while a rise in the Selic rate can indicate the possibility of more gains in concurrent and more liquid assets then credit, a higher inflation rate erodes the reserve of value function of money and augments the economic environment instability. Therefore, the sign of the coefficients of both variables have been expected to be negative.

Nevertheless, in addition to the macroeconomic variables[95], we have incorporated several balances of payments indicators in the model. The inclusion of these indicators is related to the Post-Keynesian view highlighted from the beginning of this thesis, based on Minsky's seminal analytical contributions that banks, like all other agents, have a preference for liquidity and expectations regarding the future that guide the strategies they draw in their incessant search for valuation, which may or may not deter the supply of credit, and then the decisions of production (MINSKY, 1975). Accordingly, apart from a strictly accounting approach, the composition of a bank's balance sheet expresses its degree of liquidity preference at a given moment, confined to a context where forecasts based on probability calculations are not sufficient to ensure that the expected scenario will be effectively verified (OLIVEIRA, 2009). Consequently, the indicators based on these balance sheets reflect the institutions' perception of the economic prospective scenario, that is, it captures the constant changes in the yield curves of these agents, including those caused by monetary policy.

In effect, these institutions decide not only to allocate their resources among the different classes of assets available at a given moment and context of expectations, but also to have less or more flexibility in relation to the amount of resources they will be willing to lend. Banks thus decide simultaneously the magnitude and how to allocate their resources, i.e. how much flexibility and leverage their balance sheets will present. Hence, we have created most of the indicators based on the literature that connects balance sheets' positions and credit creation, being the last three on the above box extracted from Oliveira (2009).

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[95] The vast majority of GMM models that seek to identify factors that alter the supply of credit use these three macroeconomic variables: demand, inflation and interest rates. See for instance Everaert et al. (2015),

The first measure of speculative position of banks, i.e. the ratio between operational revenue and expenses, has been expected to be negative. This reflects the fact that banks hedge financial positions tend to transform into speculative ones, and the speculative into Ponzi in the upward of a cycle. Therefore, the more speculative the position, the lower this indicator will be and the greater the credit expansion. For the same reasons, the contrary sign has been projected for the leverage indicator, which represents the ratio between third-party resources and equity, and measures the aggressiveness of banks. Consequently, the higher the indicator, the higher the bank's speculative grade and the greater the credit supply.

The next two indicators are based on the need of banks to maintain flexible positions both in the assets and in liabilities side of their balance sheets. As stated by Oliveira (2009), the flexibility provided by liquidity is a fundamental condition for the balance sheet decisions of banks, being favored the greater the perception of uncertainty, the bigger the degree of liquidity preference. In moments of high macroeconomic instability, for instance, the option for a portfolio of more liquid assets provides the possibility of near-instant equity adjustments, necessary both to protect wealth and to benefit from opportunities to expand it. Even more, flexibility is also related to speculative movements in relation to the expected changes in interest rates (money demand speculation), as well as unforeseen opportunities gains with several assets on the market, being, therefore, the ratio between liquid assets to total assets – the assets flexibility indicator – negatively related to credit expansion.

On the other hand, the liabilities flexibility indicator stands for the quotient between the sum of resources that does not implicate in reserves requirements and short and long-term liabilities. Banks have before them a multiplicity of possibilities for raising funds, rather than just deposits. Thus, their needs of reserves, resulting from bold positions taking in the management of assets, can be compensated by either the use of instruments capable of influencing depositors' preferences or the fundraise from different sources, different markets or from arbitration. In addition to the use of conventional liability management techniques, banks are constantly working on financial innovations that are not subject to regulatory restrictions, consolidating different operational strategy. Banks are, therefore, active players in what comprises the administration of their liabilities in the search for the appreciation of their wealth. In this way, the greater the liabilities flexibility indicator, the greater the possibilities of offering credit (HASTINGS, 2006; TUFANO, 2003).

The next indicator is the risk exposure indicator, i.e. the ration between the lowest risk credit portfolio (A and AA) and the total credit portfolio, which refers to the inherent risk

of credit supply given non-payment possibility by the borrower. Even though they may minimize this source of risk through a policy of customer diversification, loan ceilings, guarantees, or securitization of assets, futures markets operations, options or swaps, in business expansion phases, banks tend to reduce their safety margins, entering the region of increasing risks (GENNAIOLI; SHLEIFER; VISHNY, 2012; SANTOMERO; TRESTER, 1998). In this sense, Kregel (1997) points that banks generally do not realize that their safety margins are being reduced since, on the one hand, the very expansion of business tends to increase the conviction of bankers that potential borrowers have sufficient financial conditions of payment; and, on the other hand, the optimistic state positively influences the borrower's risk record, which in other circumstances would inevitably have his claims rejected. Thus, the greater the risk exposure indicator, the greater the credit supply.

We then have an indicator that is related to bank leverage in external resources: the foreign currency exposure. This is the ratio between obligations and rights in foreign currency and stands for the risk the risk of exchange rate variation. According to Saunders (2000), banks can mitigate this type of through in- and out-of-balance hedging strategies. Among the strategies on the balance sheet are the attempts to match maturities and values of assets and liabilities in foreign currency and the diversification of portfolio positions in different currencies, since the correlations between exchange rates and interest rates are not perfect between markets. Out of the balance sheet, the author points to the use of derivative transactions such as forward and futures contracts, swap transactions and options. Nonetheless, in the case of expansion prospects of the economy, these institutions tend to minimize the risks of currency mismatching on the balance sheet and increase the proportion of liabilities in foreign currency when compared to the volume of assets denominated in the same currency. In this way, the higher the indicator, the greater the risk assumed the greater the supply of credit (DAVANZO, 2004; HASTINGS, 2006).

Finally, we have included three more bank specific variables, which are: i) the credit supply in the previous period; ii) the financial independence variable; and iii) the return on equity indicator. As for the first one, the greater lagged credit supply indicates both preceding optimistic expectations of banks and a reliable anticipation of future demand growth. The financial independence indicator, on its hand, which is based on the quotient between shareholders' equity and adjusted total assets (total assets less shareholders' equity), reflects how much the banks can expand their lending operations based on its own resources. Lastly, the return on equity indicates bank's profitability and stands for the fact that the more profitable

the bank is, the more likely it is to expand credit supply. In summary, the bigger these indicators, the greater the volume of credit; that is, they have been expected to present positive signs in their coefficients. Thereby, taking all these variables into account, we can see the estimation output for the first model in Table 3.

Table 3. Dynamic Panel Data Model 1

Dependent Variable: Credit
Method: Panel Generalized Method of Moments
Transformation: First Differences
Sample (adjusted): 2000Q1 2016Q2
Periods included: 66
Cross-sections included: 35
Total panel (unbalanced) observations: 1180
White period instrument weighting matrix
White period standard errors & covariance (d.f. corrected)
Instrument specification: @DYN(LNCREDIT,-2,-3) AD SELIC INFLATION SPECULATIVEPOSITION LEVERAGE ASSETSFLEXIBILITY LIABILITIESFLEXIBILITY RISKEXPOSURE FINANCIALINDEPENDENCE FOREIGNCURRENCYEXPOSURE RETURNONEQUITY @LEV(INFLATION)
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Credit(-1)	0.1177	0.0452	2.6028	0.0094
DomesticDemand	0.1747	0.1239	1.4100	0.1588
Selic	-0.0064	0.0023	-2.8374	0.0046
Inflation	0.0009	0.0010	0.9019	0.3673
SpeculativePosition	-0.1877	0.0690	-2.7200	0.0066
Leverage	1.0619	0.0918	11.5652	0.0000
AssetsFlexibility	-0.4546	0.0576	-7.8951	0.0000
LiabilitiesFlexibility	0.0454	0.0185	-2.4589	0.0141
RiskExposure	0.0090	0.0059	1.5361	0.1248
ForeignCurrencyExposure	0.0447	0.0257	1.7367	0.0827
FinancialIndependence	0.5446	0.0607	8.9779	0.0000
ReturnOnEquity	-0.0188	0.0066	-2.8632	0.0043

Effects Specification
Cross-section fixed (first differences)

Mean dependent var	0.0174	S.D. dependent var	0.1889
S.E. of regression	0.2282	Sum squared resid	60.8348
J-statistic	27.0498	Instrument rank	36
Prob(J-statistic)	0.3021		

Source: own elaboration based on Eviews 9.0 estimation output.

One may see that roughly every variable presented coefficients with the expected sign, except for inflation, which didn't exhibit a good significance level (less than 10%), the risk exposure and the return on equity. In Brazil, both last, though, can be partially explained by the existence of flexible instruments with overnight gain to protect revenue and those compete with credit as profitable assets, such as the Treasury reverse repos. The opposite sign on the risk exposure can also be explained by the outstanding characteristic of banks in the country of presenting a great majority of lower risk graded credits in their portfolios, a possibility made possible by the institutional changes in the credit market presented in the previous section, i.e. the payroll-deducted credit for workers and pensioners. As for the opposite sign of the return on equity, it can also be related to the fact that among the leading banks of the expansion phase of the last credit cycle there was large public banks, such as Banco do Brasil and Caixa Econômica Federal, which started to perform credit expansionary policies after the crises in 2007.

The Selic rate, as expected, presented a negative sign on its coefficient, meaning that policy rate has a negative effect on credit supply, whereas a up change on the short-term rate of interest stimulate gains in concurrent and more liquid assets then credit, which, as could be seen on the second chapter, alters the yield curves of these institutions. Banks in Brazil are, thus, effectively bounded by the monetary policy.

As for the other variables, there is enough evidence that banks in Brazil respond in a very typical way to both liquidity preference and demand, i.e. as the more optimistic expectations about the future, the lower the urge for flexibility positions, the greater the propensity to leverage positions and, thus, the greater the volume of credit. In this regard, speculative position of banks, i.e. the ratio between operational revenue and expenses, exhibited a negative sign, while the coefficient for leverage – the ratio between third-party resources and equity – was positive. Also, assets flexibility and liability flexibility presented the expected signs, being banks in Brazil more likely to lend at times of declining liquidity preference, both increasing their positions in assets whose monetary return is high and whose liquidity premium is low, thereby reducing the ratio of more liquid assets, and augmenting the proportional sum of resources with no incidence of reserves requirements.

The foreign currency exposure indicator presented positive sign on its coefficient, capturing thus the appetite for balance sheet riskier positions in times of lower liquidity preference. This means that banks in Brazil, for the period under analyses, were able to fund themselves in external currency and increase international obligations, compared to their rights.

This was associated to the growth of the domestic market and the financial innovation that, before the international financial crises, has given a second impulse to credit expansion with the internal offer of contracts linked to foreign exchange derivative operations, which guaranteed a reduction in the cost of credit while the Real trajectory was appreciated. With the crises, the obscurity about the degree of exposure of the other agents led banks to withdrew credit and revise their portfolio positions. The indicator was, therefore, positively correlated with the supply of credit.

Lastly, there is the financial independence ratio, which captures bank's independence degree to third-party capital. Given the fact that all the indicators are in percentage form of the same unit variables, we can highlight the relative importance of this indicator in explaining the credit supply. In Brazil, thus, banks ought to provide bigger amounts of funds to firms and households based on their notorious ability to fund themselves; a characteristic of a concentrated and exceptionally cautious system. Accordingly, the indicator coefficient was presented positive, meaning the higher the bank's independence, the greater its ability to offer credit.

Furthermore, in addition to the complete model 1, we have further estimated two other models in order to better capture the dataset relationship. In the first case (Table 4), the intent was to double-check the response of credit to the aggregate demand, which a high probability (15%) of being equal to zero in the first model. As for the second case (Table 5), it wanted to investigate the response of credit to only bank's balance sheet variables.

Table 4. Dynamic Panel Data Model 2

Dependent Variable: Credit

Method: Panel Generalized Method of Moments

Transformation: First Differences

Sample (adjusted): 2000Q1 2016Q2

Periods included: 66

Cross-sections included: 49

Total panel (unbalanced) observations: 2508

White period instrument weighting matrix

White period standard errors & covariance (d.f. corrected)

Instrument specification: @DYN(LNCREDIT,-2) AD SELIC INFLATION SPECULATIVEPOSITION LEVERAGE RISKEXPOSURE @LEV(INFLATION)

Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Credit(-1)	0.8237	0.0024	349.2725	0.0000
DomesticDemand	0.2473	0.0139	17.7650	0.0000
Selic	-0.0102	0.0006	-17.3895	0.0000
Inflation	0.0002	0.0003	0.6548	0.5127
SpeculativePosition	-0.0001	0.0000	-4.9904	0.0000
Leverage	0.0001	0.0000	15.3797	0.0000
RiskExposure	0.0023	0.0001	40.3127	0.0000

Effects Specification
Cross-section fixed (first differences)

Mean dependent var	0.0234	S.D. dependent var	0.3822
S.E. of regression	0.5621	Sum squared resid	790.1157
J-statistic	45.8536	Instrument rank	50
Prob(J-statistic)	0.3547		

Source: own elaboration based on Eviews 9.0 estimation output.

Table 5. Dynamic Panel Data Model 3

Dependent Variable: Credit
Method: Panel Generalized Method of Moments
Transformation: First Differences
Sample (adjusted): 2000Q1 2016Q2
Periods included: 66
Cross-sections included: 35
Total panel (unbalanced) observations: 1021
White period instrument weighting matrix
White period standard errors & covariance (d.f. corrected)
Instrument specification: @DYN(LNCREDIT,-2,-3) SPECULATIVEPOSITION LEVERAGE
ASSETSFLEXIBILITY LIABILITIESFLEXIBILITY RISKEXPOSURE FINANCIALINDEPENDENCE
FOREIGNCURRENCYEXPOSURE RETURNONEQUITY
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Credit(-1)	0.2970	0.0232	12.8262	0.0000
SpeculativePosition	-0.1119	0.0406	-2.7598	0.0059
Leverage	0.9795	0.0643	15.2391	0.0000
AssetsFlexibility	-0.4232	0.0487	-8.6913	0.0000
LiabilitiesFlexibility	0.0749	0.0120	-6.2604	0.0000
RiskExposure	0.0101	0.0058	1.7387	0.0824
ForeignCurrencyExposure	0.0543	0.0224	2.4289	0.0153
FinancialIndependence	0.4747	0.0471	10.0791	0.0000
ReturnOnEquity	-0.0251	0.0069	-3.6679	0.0003

Effects Specification
Cross-section fixed (first differences)

Mean dependent var	0.0150	S.D. dependent var	0.1847
S.E. of regression	0.2421	Sum squared resid	59.2477
J-statistic	28.8956	Instrument rank	35
Prob(J-statistic)	0.2683		

Source: own elaboration based on Eviews 9.0 estimation output.

As a result, model 2 and 3 presented the same signs to the indicators as model 1, being the coefficient of domestic demand positively related and with a significance level of less than 1% to credit supply. The inflation rate coefficient persisted in not being significant and the indicators of risk exposure and foreign currency exposure enhanced their levels of significance.

Beyond that, in order to better understand the credit supply in a macro standpoint and, then, be able to compare the interpretation of both NCM and Post-Keynesians theorists about credit response to macroeconomic variables, we performed a second analysis based on a vector error correction model (VECM). This model was chosen because in a VAR model, all

the variables in the system are endogenous, with each one of them expressed as a linear function of its own lagged values and the lagged values of all the other variables considered. The manipulation, thereby, of this system produces a vector error correction equation in which differenced vector terms are explained as lagged differenced vector variables plus lagged levels terms that represents the error correction phenomenon.

To compose the system, therefore, in addition to quarterly data of credit, domestic demand, Selic rate, and an inflation rate index (Broad Consumer Price Index – IPCA), we used a short term and long-term expectations variables, the Basel Index and the average reserves requirement rates for the period from 2001[96] to 2016 from the BCB dataset[97]. The description of the variables is on box 3:

Box 3. Description of VEC-M input variables

Macroeconomic variables	
Credit Supply	It is the time series of the aggregate credit supply from the biggest banks in the NFS
Real domestic demand	The same variable used on the GMM model
Selic	The same variable used on the GMM model
Average inflation	The same variable used on the GMM model
Short Term Expectations	Reference rate for fixed-rate DI swaps (BM & F) - 90-day period (average for the period) -%p.y.
Long Term Expectations	Reference rate for fixed-rate DI swaps (BM & F) - 360-day period (average for the period) -%p.y.
Basel Index	This indicator measures the capital adequacy of the institutions of the banking system and is based on the Basel Capital Accord definitions. It is calculated by dividing the reference equity by risk-weighted assets (RWA).
Reserves Rate	It is the average reserve requirement rates on demand deposits

Source: own elaboration based on BCB (2017e), Oliveira (2009) and Mishkin.

With the intention to detect whether the variables follow a stationary process, we performed the augmented Dickey-Fuller test (ADF) and the Phillips-Perron (PP) test at level

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[96] Differently from the GMM Model, here we have the sample starting from 2001 due to the availability of data for the Basel index.

[97] Both credit supply and domestic demand were taken in their logarithmic form.

and first differences as can be seen on Table 6 and Table 7. For the variables in level, the null hypothesis of a unit root (nonstationary) was rejected for LongTermExpectations, BaselIndex and ReservesRate. As for the variables at first differences, the null hypothesis was rejected for all of them (at 1% significance level for the majority and 10% and 5% for the DomesticDemand and ShortTermExpectations respectively). Therefore, Credit, DomesticDemand, Selic, Inflation and ShortTermExpectations are I (1) and LongTermExpectations, BaselIndex and ReservesRate are I (0).

Table 6. Augmented Dickey-Fuller test: Level and first difference

Variable	t-statistics	Critical value		
		1%	5%	10%
Credit	-1.965910	-4.098741	-3.476275	-3.166190
DomesticDemand	-2.354039	-4.098741	-3.476275	-3.166190
Selic	-1.709024	-4.098741	-3.476275	-3.166190
Inflation	-2.273032	-4.098741	-3.476275	-3.166190
ShortTermExpectations	-1.214643	-4.098741	-3.476275	-3.166190
LongTermExpectations	-3.617256	-4.098741	-3.476275	-3.166190
BaselIndex	-3.366874	-4.098741	-3.476275	-3.166190
ReservesRate	-4.654732	-4.098741	-3.476275	-3.166190
DCredit	-5.535619	-4.098741	-3.476275	-3.166190
DDomesticDemand	-2.724627	-3.536587	-2.907660	-2.591396
DSelic	-8.676684	-4.098741	-3.476275	-3.166190
DInflation	-5.197143	-4.098741	-3.476275	-3.166190
ShortTermExpectations	-7.405396	-4.098741	-3.476275	-3.166190
LongTermExpectations	-8.309143	-4.098741	-3.476275	-3.166190
BaselIndex	-7.141496	-4.098741	-3.476275	-3.166190
ReservesRate	-5.383652	-4.098741	-3.476275	-3.166190

Source: own elaboration based on Eviews 9.0 test output.
Note: ADF test with trend and intercept for all variables, except Inflation.

Table 7. Phillip-Perron test: Level and first difference

Variable	t-statistics	Critical value		
		1%	5%	10%
Credit	-2.967756	-4.098741	-3.476275	-3.166190
DomesticDemand	-2.599815	-4.098741	-3.476275	-3.166190
Selic	-4.780753	-4.098741	-3.476275	-3.166190
Inflation	-0.596445	-4.098741	-3.476275	-3.166190
ShortTermExpectations	-2.089416	-4.098741	-3.476275	-3.166190
LongTermExpectations	-2.346381	-4.098741	-3.476275	-3.166190
BaselIndex	-2.845454	-4.098741	-3.476275	-3.166190
ReservesRate	-3.489861	-4.098741	-3.476275	-3.166190
DCredit	-5.607105	-4.098741	-3.476275	-3.166190
DDomesticDemand	-14.110370	-3.536587	-2.907660	-2.591396
DSelic	-6.835057	-4.098741	-3.476275	-3.166190
DInflation	-4.819309	-3.530030	-2.904848	-2.589907
ShortTermExpectations	-4.095392	-4.098741	-3.476275	-3.166190
LongTermExpectations	-7.295394	-4.098741	-3.476275	-3.166190
BaselIndex	-7.146982	-4.098741	-3.476275	-3.166190
ReservesRate	-5.952204	-4.098741	-3.476275	-3.166190

Source: own elaboration based on Eviews 9.0 test output.
Note: PP test with trend and intercept for all variables, except Inflation.

Having determined the integration order of the series, we have performed two cointegration tests that can be seen on Table 8. First, the unrestricted cointegration rank test (Trace), and second, the maximum eigenvalue statistics. The null hypothesis of no cointegration relationship has, though, been rejected at the 5% significance level for the Trace test, while the Max-eigenvalue test have indicated 3 cointegrating equations at the 0.05 level of significance. We thus have had enough evidence to estimate a VECM with the variables in level, as it transforms the terms in differences, with the error correction component measured in levels.

Table 8. Cointegration tests

	Trace statistics			Maximun-Eigen statistics		
	Eigenvalue	Critical value	Probability 5%	Eigenvalue	Critical value	Probability 5%
None	346.0606	187.4701	0.0000	101.0298	56.7052	0.0000
At most 1	245.0307	150.5585	0.0000	70.4481	50.5999	0.0002
At most 2	174.5826	117.7082	0.0018	58.5866	44.4972	0.0454
At most 3	115.9961	88.8038	0.0454	37.3405	38.3310	0.1923

Source: own elaboration based on Eviews 9.0 test output.

Furthermore, the VECM estimation is developed in two steps: the first one is a VAR model estimation with a sufficient lag structure on all the explanatory variables; and the second one is the manipulation of the VAR with the inclusion of the error correction term, considering the number of cointegrating vectors and the tested number of lags to be included. Therefore, after performing the VAR, we have executed five different, but usual, tests to determine the lag number of lags to be added in the model, i.e. the likelihood ratio criterion (LR); the final prediction error (FPE); the Akaike information criterion (AIC); the Schwarz (SC), and the Hannan-Quinn (HQ).

The results of the tests are presented in Table 9 and suggest, by the SC criteria, the inclusion of one lag; by the LR criteria, 4 lags; and by FPE, AIC and HQ, 5 lags. Nonetheless, the decision of lags length structure ought to be set such that the VAR residuals are free of autocorrelation, even if this implies longer lags than suggested by the information criteria. Therefore, we have performed the Lagrange Multiplier (LM) autocorrelation test (Table 10).

Table 9. Lag order selection criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-347.6093	NA	3.62e-05	12.47752	12.76426	12.58896
1	206.9147	933.9350	1.24e-12	-4.733848	-2.153152*	-3.730901
2	284.6940	109.1640	8.70e-13	-5.217335	-0.342686	-3.322880
3	357.3029	81.52573	9.22e-13	-5.519400	1.649201	-2.733437
4	526.1603	142.1957*	5.18e-14	-9.198606	0.263948	-5.521135
5	656.2011	73.00541	2.74e-14*	-11.51583*	0.240676	-6.946851*

Source: own elaboration based on Eviews 9.0 test output.

Table 10. Residual serial correlation LM test

Lags	LM-Stat	Prob
1	139.6839	0.0000
2	79.68198	0.0894
3	51.39742	0.8722
4	69.09633	0.3094
5	45.79519	0.9584
6	58.51239	0.6701
7	76.68423	0.1329
8	75.24387	0.1589
9	52.44208	0.8486
10	40.49752	0.9905
11	61.20229	0.5760
12	79.13185	0.0964

Source: own elaboration based on Eviews 9.0 test output.

Thereby, considering the results from the lag length criteria tests, the LM test, which suggests no evidence to reject the null hypothesis (non-existence of serial autocorrelation) after the inclusion of the second lag in the model, and the robustness model checks[98], we have decided to include 2 lags on the VECM estimation. Figure 3 bellow shows the response of credit to a shock (of a standard deviation and according to the Cholesky decomposition) in Domestic Demand, Selic, Inflation, Short Term Expectations, Long Term Expectations, Basel Index and Reserves Rate.

Figure 3. Response of Credit to Cholesky One S.D. Innovations on Domestic Demand, Selic, Inflation, Short Term Expectations, Long Term Expectations, Basel Index and Reserves Rate
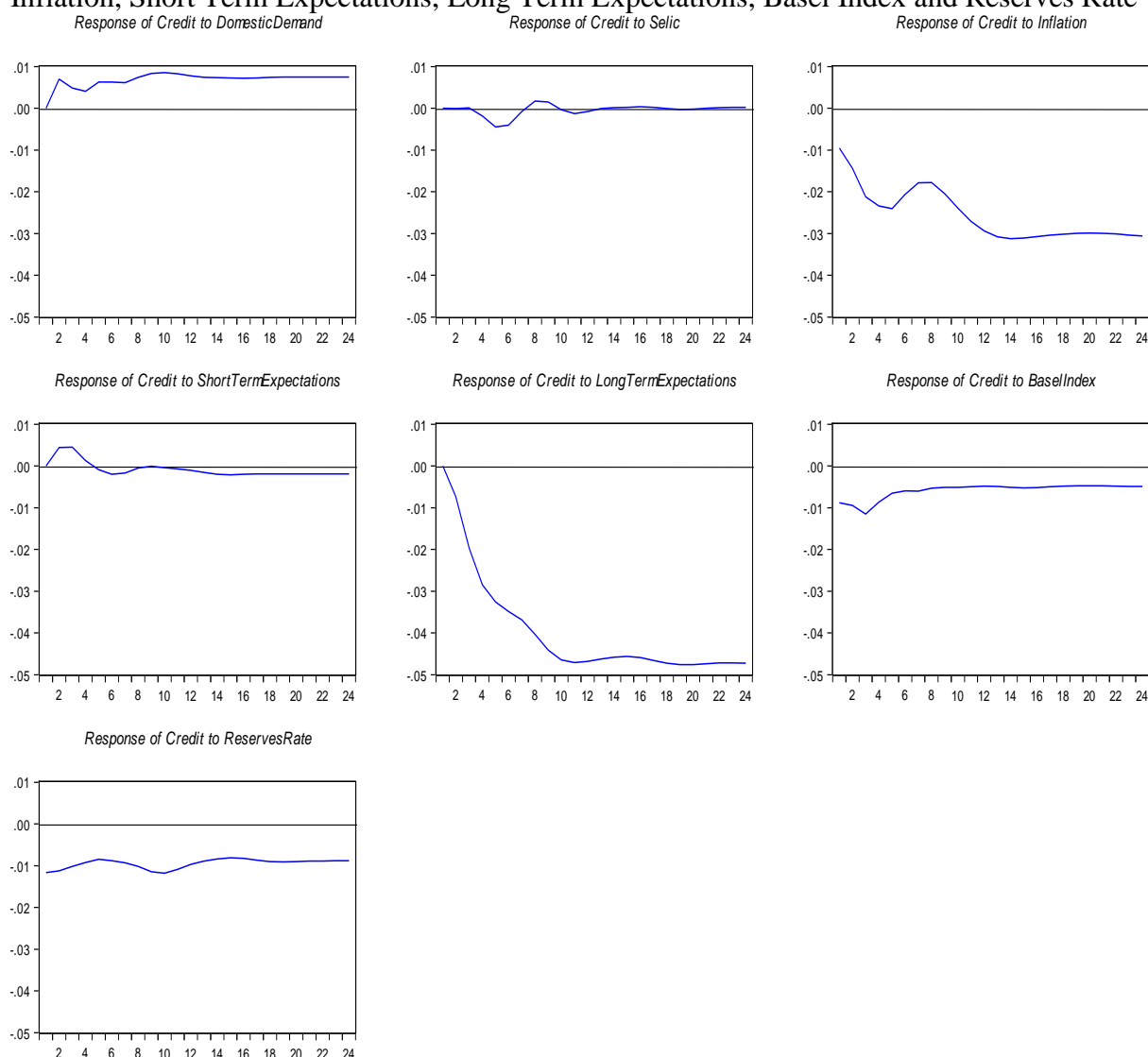
Source: Eviews 9.0 estimation output.

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[98] In Annex 2, we present the residual heteroskedasticity test (joint test) for the VECM model, which indicates that there is enough evidence against the rejection of the null hypothesis that residuals are homoscedastic, i.e. heteroscedasticity to be non-existent, and estimation output, which shows the significance level of the coefficients for the credit equation and the Jarque-Bera normality test.

Initially, while we can observe that credit supply responds positively to demand growth, it reacts fairly negatively to long term expectations, both supporting the Post-Keynesian argument that credit supply expands endogenously to meet the changes in the net demand for loans in case it is profitable for the financial institution, i.e. in case its expectations about future earnings from credit operations encompasses gains from other investment positions. The long-term expectations variable is based on the reference rate for fixed-rate DI swaps[99] registered on the Brazilian stock exchange market and stands for the fluctuating price of swaps operations that considers the expectations of agents about the future path of interest rates. Therefore, the bigger these references rates, the higher the anticipated value of future interest rates, the more the expected vulnerability in the economy, the lower the stimulus to expand credit.

The Selic rate, on the other hand, only provoked disturbances on credit after the third quarter, contradicting finds of NCM theorists, such as, whereby the monetary policy short-term interest rate has a sharp impact on credit. In fact, nonetheless, for the structuralist theory of money endogeneity, the policy rate impacts credit mostly by its effects on agents' expectations: the short-term expectations variable and the long-term expectations, seen above. As for the variable for short-term expectations – the reference rate for fixed-rate DI swaps for one quarter period –, more connected to the contemporaneous Selic rate than the long-term expectations variable, it assumed, in the first year, a positive impact on credit, and a negative effect only after that. From a Post-Keynesian standpoint, this first movement contradicts the expected variation on credit, as the expectations of a rise on interest rates should diminish the appetite to expand credit operations. It can, though, be related to an inertial movement of short-term credit demand with a rise on the cost of credit to borrowers.

Additionally, the inflation rate and the reserves rate variables produced the expected variations on credit according to both Post-Keynesian and NCM, although not in an exclusively way in case of inflation in the latter's theory of credit supply[100]. The inflation rate captures expectations on macroeconomic balance and the negative effect shows how lack of price

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[99] Swap contracts are traded in over-the-counter markets, and carry out the exchange of cash flow, based on the comparison of the profitability between two indexers. In this way, the agent assumes the two positions, i.e. bought in one indexer and sold in another. The return of the participant occurs when the indexer in which it assumed the long position is higher than the return of the short position. BM & FBOVESPA makes available the registration of swaps in all its modalities, including the one referenced to the DI rate.
[100] As seen in Cecchetti; Schoenholtz (2011), Mishkin (2013), Burton; Brown (2015), Currie; Nobay; Peel (2016) for the multiplier model and the evolution of the money multiplier.

stability deters credit by its adverse impact on financial future prospects and on the erosion of bank capital. As for the reserves requirement, even though for Post-Keynesians banks can still manage their portfolios in order to deviate from the need of idle funds, it restrains the credit supply. Hence, both variables negatively impact credit expansion by banks.

Still on Figure 3, we can see the impacts of change on the Basel on credit supply. The introduction on this model of Basel index is related to the fact that the literature on the agreement[101] has recently pointed out that the adaptation to the new requirements can be either by adjustments in the capital volume, in assets (such as credit), or both. Moreover, there seems to be a consensus that that the adjustment occurs predominantly through changes in assets, especially as one expects to be costlier to rise capital than to reduce assets. Indeed, for the Brazilian economy, changes on capital requirements show a negative impact on credit (ALENCAR, 2011; CECCHETTI; SCHOENHOLTZ, 2011).

In order to better capture the effects of the key monetary policy instrument in Brazil, and to analyze more than only the effect of a raise in the basic interest rate on credit supply, we show on Figure 4 the response of all the other variables to a shock on the Selic rate.

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[101] For more on that see: Barajas; Chami; Cosimano (2005), Berrospide; Edge (2010), Cecchetti; Schoenholtz (2011), Pinheiro; Savóia; Securato (2015).

Figure 4. Response of Credit, Domestic Demand, Inflation, Short Term Expectations, Long Term Expectations and Basel Index to Cholesky One S.D. Innovations on Selic[102]
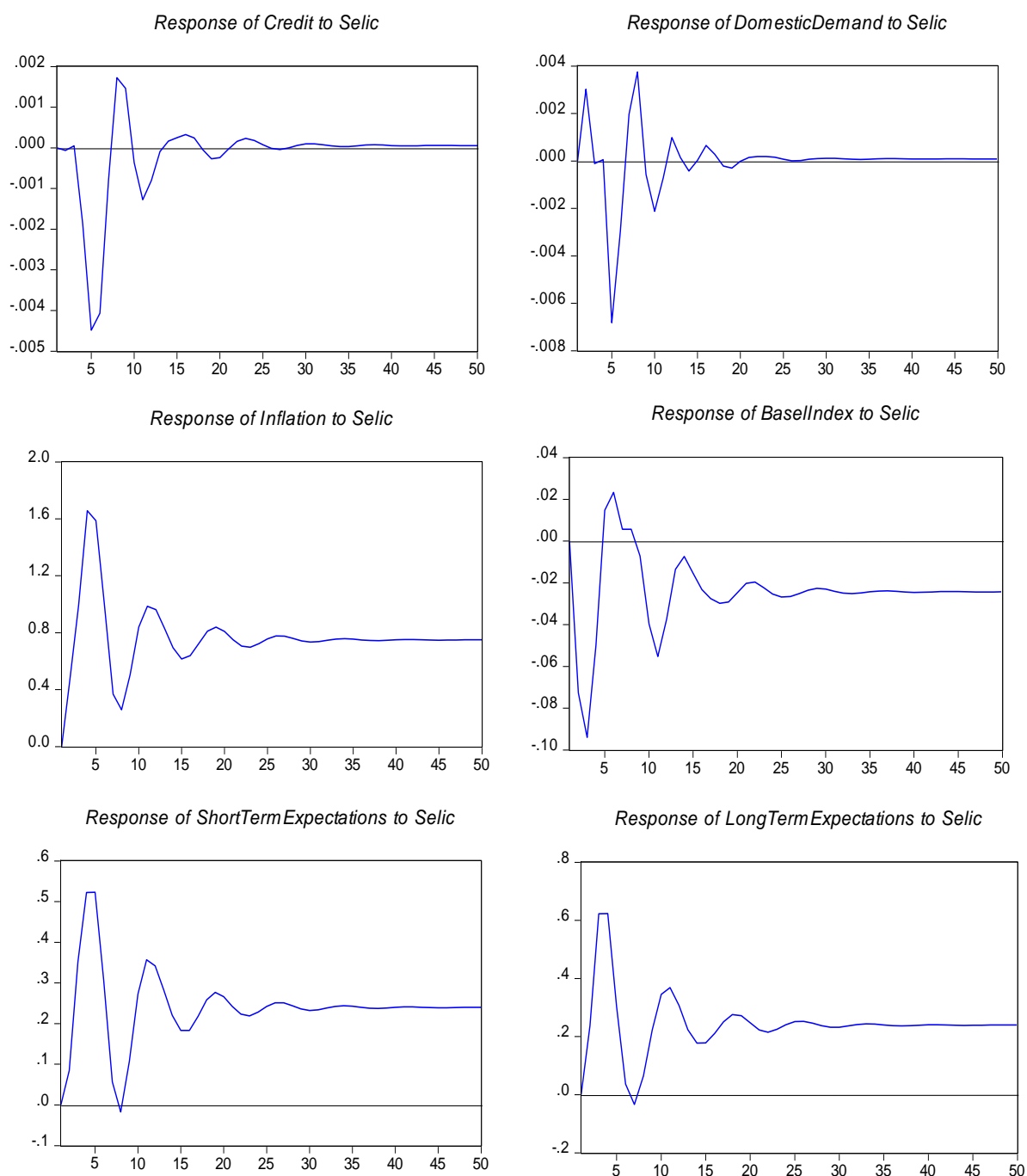
Source: Eviews 9.0 estimation output.

All the variables have presented a very erratic response to changes on the Selic for a long period before it stabilized (after around 30 quarters for most of the series). The reaction

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[102] As the reserves rate is also a policy instrument, we think that it responses to the base interest rate does not show meaning.

of credit did not show changes in the first three quarters, though; after which, it sharply declined, peaking a variation of -0.4% in the beginning of the second year. However, the adaptation of spreads and the expectations of future gains on credit operations led to moments of credit increase followed by credit decrease until the steadiness. Domestic demand, on the other hand, presented a positive variation in the first quarters, which peaked out 2% after the first nine month. It thus moved in the same direction of credit, showing the possible presence of a credit transmission mechanism in the Brazilian economy[103] – what has been neglected by the monetary authority on its policy models seen on chapter 3. Thereby, the response of both variables demonstrates that, in accordance with the Post-Keynesian interpretation, the use of the Selic rate as the unique instrument of monetary policy brings a high degree of instability in the finance of production and consumption decisions, and in the overall domestic demand. It does not corroborate with the NCM theory of only decline consequences on these variables.

When we look to the response of inflation, we have a positive movement on the price level to contractionary monetary policy shocks. This is known by the name of *price puzzle*, where empirical VAR models contradict the conventional NCM view that suggests inflation should react negatively to such a monetary policy movement (GIORDANI, 2004; SIMS, 1992). In this regard, a growing body of the empirical literature backed in both NCM and Post-Keynesians theories has supported the relevance of a "cost channel" in determining inflation (CASTELNUOVO, EFREM, 2007; MODENESI; PIRES-ALVES; MARTINS, 2012; PIMENTEL; LUPORINI; MODENESI, 2016). The idea is that funds-constrained firms borrows from financial institutions to meet their needs of working capital, and thus the interest rate paid on credit is a cost element for these agents. Consequently, the process creates a direct and positive connection between monetary policy moves, oscillations in costs and fluctuations in prices charged. Although in some studies such as Sims (1992), we can find attempts to show that the positive impact on prices dissipates over time or manners to fix the model in order to mitigate the price puzzle. Following, we can see on the Figure 4 that it stabilizes in approximately 80% after 30 quarters in the Brazilian economy[104].

As for the Basel index, the relation is the one that is transmitted from the connection between the Selic rate and the value of the reference equity, and the risk-weighted assets. With a rise on the basic rate, though, the price of equity declines in a faster pace than of the assets,

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[103] A very good work on this subject can be seen on Evangelista (2016) and Evangelista; Sbardellati (2016).

[104] Similar finds can be seen on Modenesi; Araújo (2013).

which can, in fact, increase from Selic driven alternative investments. Thereby, the index showed negative oscillations, peaking 9% decline in the second quarter.

Finally, it is also possible to see that the short-term and the long-term expectations presented similar responses to the policy rate movement. The second variable, however, showed a higher peak of plus 60% on the fourth quarter, while the short-term expectations variable went to a positive 50% change given the 1% rise on the Selic rate. Nevertheless, after the first year, the variations declined reaching a small negative number in the eighth quarter. Subsequently, they started to rise again, reaching stabilization between 2% and 3%. The positive oscillation on these series from the beginning corresponds to asset pricing variation registered on the Brazilian stock exchange market, which systematically absorb future expectations about the Selic rate, which tends to be higher in the beginning of the period.

To sum up, the evidences here found related to the management of reserves, even considering the key variables for the NCM where the Central Bank controls credit supply from attempt to control the monetary base, show that there are other variables that also affect the credit supply decision of banks: the long run expectations of interest rates, influenced by the policy short-term interest rate by the provoked alterations on the yield curve of banks, and credit demand, which determine banks decisions (as capitalists' agents) to value their wealth and, in consequence, to increase or not the credit supply. In this sense, the analysis goes beyond the variables that would ascertain for changes in the offer of credit (i.e. the Selic rate, the reserves requirement, and the Basel recommendations for capital), considering explicitly the demand growth, the inflation rate, and, most importantly, the expectations of economic agents.

4.5. Partial concluding remarks

This chapter provides empirical evidence for the endogeneity money supply in the Brazilian economy, throughout credit creation by banks. We have followed a path of describing how credit have grown in the country after the structural transformations in the economy and in the banking system with the adoption of the Real Plan, and, following with the adoption of the Inflation Targeting Regime, which is maintained as the policy regime in operation until today. It was important to highlight some of the institutional and time peculiarities that marked the credit creation mechanism in the Brazilian economy, so that we could also have enough information to estimate an econometric model that genuinely captured the process of credit money creation.

Therefore, connected to the main framework of the Post-Keynesian approach for the relation between credit supply and balance sheet composition of banks, aside with other macroeconomic variable, our findings suggest that changes in the liquidity preference of banks, reflected on their portfolio adjustments throughout movements on flexibility and leverage indicators, have significant relation with credit supply. For instance, when there is a lowering on the liquidity preference of banks, banks are more likely to increase their degree of financial leverage, which indicates a search for riskier passive positions in order to subsidize larger gains in riskier asset positions, such as credit. Additionally, in such situations, the willingness of more flexible portfolio condition is surpassed by the desire of more illiquid and profitable stance. Besides, not least important, in line with the Post-Keynesian theory, demand for credit plays an important role on the determination of funds to be offered by banks in Brazil. In conclusion, it is possible to say that banks in Brazil are effectively bounded by the monetary policy, but not entirely determined by it, once, differently from the multiplier theory of NCM, changes in the basic short-term interest rate alters banks' yield curves and their liquidity preference, modifying their willingness to expand credit supply.

Concluding Remarks

The key features we have identified as the structuralist endogeneity view of money supply are that there is a limited determination of money supply by the monetary authorities; and that the creation of money occurs mainly in the credit market. In effect, in the particular form money assumes in modern economies, banks can create it endogenously based on their liquidity preference. Also, the supply of liquid funds is strongly determined by its demand and is originated inside the economic system in order to finance investment and consumption decisions and speculative purchases of assets. Therefore, the monetary authority has only the ability to influence credit supply by changing the availability of liquid assets compared to all other classes of assets via monetary policy instruments, i.e. reserve requirements, discount window and open market operations. Through the management of liquidity in the reserves market, the Central Bank may modify the price of money – the interest rate – and, thereby, provoke adjustments on the portfolio of banks, reordering the comparable disposal of assets. The resulting modification in the yield curve in operation transforms banks propensity to expand credit supply.

However, even though, the global financial crisis of 2007-2009 has raised questions about the scientific foundation of the policy rules fallowed by many Central Banks, the still dominant academic thinking, i.e. the New Consensus in macroeconomics (NCM), guides the formulation of the monetary policy based on the judgment that a Central Bank should have as a primary focus only the behavior of prices, since its influence on real variables is at most temporary. However, being the economy inherently unstable, monetary policy should follow objectives that entirely comprises the functioning of a monetary production system, where deliberated changes on the short-term interest rate acts on the financial circulation firstly impacting bank's yield curve in operation and, then, investment decisions. Following this perspective, Post-Keynesian alternative approaches share the understanding of the interest rate as variable of income distribution and the reliance on fiscal policy as a credible policy tool. Therefore, even though there is no ultimate solution for crises, policy ought to continuously try to prevent downturns on the cycle

For the Brazilian economy, given its peculiarities and the institutional context generated by three decades of high inflation followed by a decade and a half of external vulnerability, the real impacts of monetary policy on investment decisions and the role of financial circulation in this process are far evident. Nonetheless, BCB has been using the

Inflation Targeting Regime framework since 1999, constructing and updating models bared in the same theoretical foundations, which has a limited view of money as, primordially, a means of payment and, accordingly, of monetary policy as a simple regulator of the quantity of money in circulation.

Besides, the long period of high inflation and the conditions under which the financial market was developed, i.e. with a price stability anchored to public bonds of short maturity with exceptionally high interest rates, made it impossible to create a yield curve that would extend beyond the short-term. The abbreviation of time horizons caused, firstly, by inflationary uncertainty, and then by the uncertainties regarding the future behavior of interest rates, still affects all the choices of all kinds of assets, financial and real. The power of monetary policy to follow its objectives is, moreover, lessened by the capacity financial circulation has to permanently absorb the stimulated variations on reserves.

The credit cycle that started in 2003 was a response of banks to the restructuring path that the National Financial System followed after the adoption of the Real Plan, transformed into a complex structure, highly internationalized and concentrated. It was also very important the confirmation by the new government of the maintenance of the same theoretical foundations of the economic policy (the NCM), the improvement of the macroeconomic environment and, some critical institutional changes, such as the creation of the payroll-deducted credit for workers and pensioners and the fiduciary alienation transformation rules. Therefore, credit expanded both as result of a decline in the liquidity preference of banks and the new arrangements that fostered demand fulfillment.

With the financial crises of 2007-2009 though, there was a reversal of expectations, where banks reacted with caution and sharply tightened interbank credit. The growing rumors about losses of companies and banks with foreign exchange derivatives operations triggered a movement of absolute risk aversion and liquidity preference by banks. The obscurity about the degree of exposure of the other agents led banks to withdrew credit both for companies and individuals and for other banks, prompting companies to revise production and investment plans. The portfolio reallocation movement, characteristic of banks' active management of balance sheets, was facilitated by both the Treasury securities indexed to the attractive increase of the Selic rate and their relatively short-term credits profile. The result was the rapid deceleration of economic activity in the last quarter of the year.

However, in response to the international crisis, the federal government took a sequence of unprecedented measures. The favorable external conditions of the previous years

enabled Brazilian authorities to adopt countercyclical policies with the utmost objective to prevent the international crisis from contaminating the Brazilian financial system and, at the same time, to recover the level of economic activity. This meant an impulse on the participation of large public banks – BNDES, Banco do Brasil and CEF – in the earmarked credit system, used as instruments of polices of stabilization and growth.

Nonetheless, the ultimate decline on exports, the consequent worsening in the Brazilian trade balance and the avalanche of corruption accusations in the federal government and government controlled firms, culminated in the adoption of fiscal and monetary austerity policies, presented to the population as the only way to recover control of budgetary situation of the state. By 2015, the GDP growth rate persistent decline gave way to an open recession. This was the context of a sharp cut by public financial institutions in credit subsidies and a consequent drop on earmarked loans and the end of the credit cycle boom.

The estimation of the credit supply function for the Brazilian economy have, thus, comprised all these institutional and historical facts. The evidences here found are that, even considering the key variables for the NCM where the Central Bank controls credit supply from an attempt to indirectly control the monetary base, there are other variables that also affect the credit supply decision of banks: the long-run expectations of interest rates, influenced by the policy short-term interest rate by the provoked alterations on the yield curve of banks; and credit demand, which influence banks decisions to value their wealth and, in consequence, to increase or not the credit supply.

Finally, connected to the main framework of the Post-Keynesian approach for the relation between credit supply and balance sheet composition of banks, aside with other macroeconomic variable, our findings suggest that changes in the liquidity preference of banks, reflected on their portfolio adjustments throughout movements on flexibility and leverage indicators, have significant relation with credit supply. For instance, when there is a lowering on the liquidity preference of banks, banks are more likely to increase their degree of financial leverage, which indicates a search for riskier passive positions in order to subsidize larger gains in riskier asset positions, such as credit. Additionally, in such situations, the willingness of more flexible portfolio condition is surpassed by the desire of more illiquid and profitable stance. Therefore, credit supply in Brazil is endogenously determined – as expected by the Post-Keynesian theory – by the liquidity preference of banks and the demand for funds, being, thus, bounded by the monetary policy.

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Annexes

Annex 1. Reserve requirements rates

Period		Demand deposits	Time deposits	Savings accounts Housing	Rural	Foreign exchange short position	Interf. Deposits Leasing companies	Additional Demand deposits	Time deposits	Savings deposits
Before Real Plan		50%	-	15%	15%	-	-	-	-	-
1994	Jul	100% [1]	20%	20%	20%	-	-	-	-	-
	Aug	" [1]	30%	30%	30%	-	-	-	-	-
	Oct	" [1]	"	"	"	-	-	-	-	-
	Dec	90% [1]	27%	"	"	-	-	-	-	-
1995	Apr	" [1]	30%	"	"	-	-	-	-	-
	May	" [1]	"	"	"	-	-	-	-	-
	Jul	83%	"	"	"	-	-	-	-	-
	Aug	"	20%	15%	15%	-	-	-	-	-
1996	Aug	82%	"	"	"	-	-	-	-	-
	Sep	81%	"	"	"	-	-	-	-	-
	Oct	80%	"	"	"	-	-	-	-	-
	Nov	79%	"	"	"	-	-	-	-	-
	Dec	78%	"	"	"	-	-	-	-	-
1997	Jan	75%	"	"	"	-	-	-	-	-
1999	Mar	"	30%	"	"	-	-	-	-	-
	May	"	25%	"	"	-	-	-	-	-
	Jul	"	20%	"	"	-	-	-	-	-
	Sep	"	10%	"	"	-	-	-	-	-
	Oct	65%	0%	"	"	-	-	-	-	-
2000	Mar	55%	"	"	"	-	-	-	-	-
	Jun	45%	"	"	"	-	-	-	-	-
2001	Sep	"	10%	"	"	-	-	-	-	-
2002	Jun	"	15%	"	"	-	-	-	-	-
	Jul	"	"	20%	20%	-	-	-	-	-
	Aug	"	"	"	"	-	-	3%	3%	5%
	Oct	"	"	"	"	-	-	8%	8%	10%
2003	Feb	60%	"	"	"	-	-	"	"	"
	Aug	45%	"	"	"	-	-	"	"	"
2008	May	"	"	"	"	-	5% [2]	"	"	"
	Jul	"	"	"	"	-	10% [2]	"	"	"
	Sep	"	"	"	"	-	15% [2]	"	"	"
	Oct	42%	"	"	"	-	"	5%	5%	"
	Nov	"	"	"	15%	-	"	"	"	"
2009	Jan	"	"	"	"	-	0% [3]	"	4%	"
	Sep	"	13,5%	"	"	-	"	"	"	"
2010	Mar	"	15%	"	"	-	"	8%	8%	"
	Jun	43%	"	"	16%	-	"	"	"	"
	Dec	"	20%	"	"	-	"	12%	12%	"
2011	Apr	"	"	"	"	60% [4]	"	"	"	"
	Jun	"	"	"	17%	"	"	"	"	"
	Jul	"	"	"	"	60% [5]	"	"	"	"
2012	Jul	44%	"	"	"	" [5]	"	6%	"	"
	Sep	"	"	"	"	" [5]	"	0%	"	"
	Oct	"	"	"	"	" [5]	"	"	11%	"
	Dec	"	"	"	"	" [6]	"	"	"	"
2013	Jul	"	"	"	18%	0% [6]	"	"	"	"
2014	Jul	45%	"	"	19%	0% [6]	"	"	"	"
	Out	"	"	"	13%	"	"	"	"	"
2015	Jun	"	"	24,5%	15.5%	"	"	"	"	5,5%
	Ago	"	25%[7]	"	"	"	"	"	"	"

1. Reserve requirements were equal to the sum of the following components:

    I - Reserve requirements calculated according to the regulations effective on June 30, 1994 (50%) applicable in the following calculation periods:

        a - group "A" institutions: from 23 to June 29, 1994, denominated "base period";

        b - group "B" institutions: from 27 to June 30, 1994, denominated "base period".

    II - 100% of the increase in the average value in the calculation period as compared to the average value in the "base period".

2. It also included 100% of the variation, if positive, of the calculation base defined on January 31, 2008.

3. Interfinancial Deposits issued by leasing companies were included in the calculation base of time deposits' reserve requirements.

4. Rates applied over the sum of short positions (daily average) minus the sum of long positions deducted from the smaller value between US$3 billion and Level I Reference Net Worth.

5. Rates applied over the sum of short positions (moving average of five consecutive days) minus the sum of long positions deducted from the smaller value between R$1billion and Level I Reference Net Worth.

6. Rates applied over the sum of short positions (moving average of five consecutive days) minus the sum of long positions deducted by US$3 billion.

7. As of the calculation period of August 31,2015 to September 4, 2015.

Source: BCB (2016a).

Annex 2. Estimations output

VEC Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares)

Chi-sq	df	Prob.
1376.841	1368	0.4280

Source: own elaboration based on Eviews 9.0 estimation output.

Eviews VEC-M estimation output

Dependent Variable: D(LNCREDIT)

Method: Least Squares (Gauss-Newton / Marquardt steps)

Sample (adjusted): 2001Q4 2016Q2

Included observations: 59 after adjustments

D(LNCREDIT) = C(61)*(INFLATION(-1) + 10.6011915227*LNCREDIT(-1) + 11.9893583195*LNDD(-1) - 3.66018346456*LONGTERMEXPECTATIONS(-1) + 11.9285171053*SHORTTERMEXPECTATIONS(-1) - 10.8299646842*SELIC(-1) - 4.22965225311*@TREND(99Q1) - 17751343) + C(62)*(RESERVESRATE(-1) - 0.869607597476   *LNCREDIT(-1) + 0.513405625822*LNDD(-1) + 0.0760613105994 *LONGTERMEXPECTATIONS(-1) + 0.118764641491   *SHORTTERMEXPECTATIONS(-1) - 0.192800615296*SELIC(-1) +   0.021809003514*@TREND(99Q1) + 3.56542514084) + C(63)*(BASELINDEX(-1) + 16.7536104657*LNCREDIT(-1) - 0.748907752099 *LNDD(-1) - 2.4623070825*LONGTERMEXPECTATIONS(-1) +   7.98884528818*SHORTTERMEXPECTATIONS(-1) - 5.15640629759   *SELIC(-1) - 0.367509576187*@TREND(99Q1) - 218.727544629) + C(64)*D(INFLATION(-1)) + C(65)*D(INFLATION(-2)) + C(66) *D(RESERVESRATE(-1)) + C(67)*D(RESERVESRATE(-2)) + C(68) *D(BASELINDEX(-1)) + C(69)*D(BASELINDEX(-2)) + C(70) *D(LNCREDIT(-1)) + C(71)*D(LNCREDIT(-2)) + C(72)*D(LNDD(-1)) + C(73)*D(LNDD(-2)) + C(74)*D(LONGTERMEXPECTATIONS(-1)) +   C(75)*D(LONGTERMEXPECTATIONS(-2)) + C(76) *D(SHORTTERMEXPECTATIONS(-1)) + C(77)*D(SHORTTERMEXPECTATIONS(-2)) + C(78)*D(SELIC(-1)) + C(79)*D(SELIC(-2)) + C(80)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C(61)	0.0001	0.0010	0.0665	0.9474
C(62)	-0.1125	0.0857	-1.3127	0.1969
C(63)	-0.0035	0.0025	-1.3826	0.1747
C(64)	-0.0018	0.0016	-1.1255	0.2672
C(65)	-0.0015	0.0018	-0.8305	0.4113
C(66)	-0.0085	0.2399	-0.0354	0.9720
C(67)	0.2200	0.2215	0.9936	0.3265
C(68)	-0.0052	0.0078	-0.6660	0.5094
C(69)	-0.0095	0.0076	-1.2404	0.2222
C(70)	-0.0810	0.1796	-0.4510	0.6545
C(71)	0.0148	0.1847	0.0800	0.9366
C(72)	0.2216	0.1013	2.1879	0.0347
C(73)	0.0968	0.0899	1.0758	0.2886
C(74)	-0.0207	0.0090	-2.3134	0.0261
C(75)	-0.0070	0.0091	-0.7626	0.4503
C(76)	0.0633	0.0232	2.7229	0.0096
C(77)	0.0255	0.0175	1.4576	0.1530
C(78)	-0.0394	0.0182	-2.1644	0.0366
C(79)	-0.0131	0.0109	-1.1977	0.2383
C(80)	0.0312	0.0117	2.6745	0.0109
R-squared	0.6259	Mean dependent var		0.0176
Adjusted R-squared	0.4437	S.D. dependent var		0.0338
S.E. of regression	0.0252	Akaike info criterion		-4.2615
Sum squared resid	0.0247	Schwarz criterion		-3.5573
Log likelihood	145.7152	Hannan-Quinn criter.		-3.9866
F-statistic	3.4343	Durbin-Watson stat		2.0099
Prob(F-statistic)	0.0005			