Bank capital and endogenous money:

Liquidity preference and capital constraints as determinants of credit rationing

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ABSTRACT

The negative impact of capital constraints on bank lending has focused much of the policy discussions about the depth of the crisis as well as the inability of credit to help economies overcome the 'spectre of stagnation'. This paper puts forward a Post Keynesian explanation of why banks ration credit to creditworthy borrowers as a result of the capital constraints they face during recessions. It does this by using the theory of liquidity preference in three distinct ways: First, it argues that banks' liability structure is underpinned by a 'liquidity hierarchy' in which banks' ability to have their deposits accepted as substitutes for money depends on the amount of equity capital that is available to them. Second, banks' demand for capital increases during recession because they lose confidence in their previous abilities to calculate risk. Third, given these constraints, I argue that credit rationing can emerge from the inability of banks to raise sufficient capital during recessions. This occurs because an increase in the liquidity preferences of investors leads them to restrict the supply of equity capital. The inability of banks to raise sufficient capital to continue extending loans will in turn lead them to ration credit to creditworthy borrowers.

Key words: Post-Keynesian economics, endogenous money, credit rationing, bank capital

JEL codes:

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1. Introduction

There is widespread evidence that the supply of bank credit is constrained by capital availability during recessions. Banks' senior loan officers reported concerns about capital availability during the so-called Great Recession in the lending surveys carried out by the ECB and the Federal Reserve (ECB, 2015; FRB, 2015) just as the supply of credit to the economy was contracting. There are also numerous empirical studies estimating the negative impact of capital constraints on bank lending (Basett and Covas, 2014; Rocholl et al. 2010; Thakor, 1996; Kopecky and VanHoose, 2004; Jacques; 2008). It is therefore unsurprising that in the context of the new Basel III capital rules the debate about the pro-cyclical nature of higher regulatory capital requirements has also re-surfaced (Repullo and Suarez; 2013, Admati and Hellwig; 2013). Post Keynesians, however, have had remarkably little to say about why and how capital constraints affect the ability of banks to extend credit. 'Horizontalist', argue that banks create their own sources of funding in the process of creating credit money but do not regard the distribution of these funds between equity and debt to be a relevant question influencing banks' lending decisions. 'Structuralist' have traditionally paid more attention to supply-side constraints on bank lending. But they have never provided a coherent monetary explanation of the function that capital plays in bank's liability structure and its role in producing credit rationing by limiting the risk-taking capacity of banks.

The aim of this paper is to provide a Post Keynesian explanation of why the banking systems' inability to access equity capital during recessions leads it to ration credit to solvent or creditworthy borrowers. My starting point is that money creation is a credit driven endogenous process and that this theory is compatible with the view that banks face capital constraints that limit their ability to extend credit. Within this framework, Keynes' theory of liquidity preference is used in three distinct ways: Firstly, to provide an institutional explanation of why in a monetary economy banks need to have liabilities representative of equity capital as part of their overall liability structure in order to extend credit. The concept of a 'liquidity hierarchy' or 'hierarchy of money' will be developed to this end; Secondly, to explain why it is that banks' *demand* for capital increases during recessions just as they lose confidence in their own ability to assess risk, and; Thirdly, to explain why during recessions investors' refuse to *supply* banks with the additional capital that they demand.

The paper argues that if the amount of capital that banks can access during recessions is limited by a rise in the liquidity preferences of equity investors, then banks will be forced to *ration credit.* The definition of 'credit rationing' that I use is fundamentally different to the one commonly employed in the Post Keynesian literature. In the latter, it refers to a situation where borrowers that do not meet the shifting credit standards of banks are unable to access credit. By contrast, in this paper it is defined as a situation where even borrowers *that do meet the credit standards* of banks are unable to have access to as much credit as they demand even if they are willing to pay a higher price for it. The previous Post Keynesian literature had not been able to explain this type of credit rationing because it did not incorporate a theory relating changes in banks' risk-taking capacity to the availability of capital. If

capital limits the amount of exposure that banks can have to borrowers that are identical in terms of the risk that they will default (as assessed by the bank), then this means that they will only be able to satisfy the demand for loans coming from borrowers of the same credit-worthiness up to a certain limit. This will produce a result akin to that of the New Keynesian definition of *credit rationing,* where not all borrowers can satisfy their demand for loans even when they are observationally equivalent to the bank in terms of the probability that they will default. The mechanism that produces this outcome will, however, be completely different to the adverse selection mechanism discussed by New Keynesians.

The paper combines insights provided by the corporate finance literature on banking with Keynes theory of liquidity preference to explain both the role that capital plays in banks' liability structure and the factors that affect banks' demand for capital. This is done in the following way:

First, the corporate finance literature justifies the existence of capital with banks' need to protect non-equity liability holders (debt holders) from losses. But, unlike Post Keynesian monetary theory, it does not take into account the fact that some of the non-equity liabilities of banks (i.e. deposits) can act as substitutes for money and that these are created through the very process by which banks extend loans. Once we recognize that this is the fundamental characteristic that distinguishes banks from any other ordinary corporation, an alternative theory can be used to justify the role of equity capital in banks' liability structure. This paper uses the theory of 'liquidity preference' to argue that bank capital can constrain lending because there is an institutionally determined 'liquidity hierarchy' (also referred to as a 'hierarchy of money') that underpins banks' liability structure. This means that banks' ability to have their deposits accepted as substitutes for money depends on the amount of equity capital that is available to them. The reason for this is that the 'liquidity' of the specific bank liabilities that occupy the top positions within this 'liquidity hierarchy' (e.g. deposits) depends on the relative 'illiquidity' of those at the bottom (e.g. equity). It is clear that only institutions (e.g. regulators and supervisors) external to the market mechanism can provide and enforce the basic legal and regulatory framework that defines which liabilities occupy what specific place in this hierarchy. But within these institutionally defined limits or basic standards the exact amount of capital that banks require at any point in time in order to support the monetary value of their other liabilities will also depend on the changing liquidity preferences of the public. If the public's liquidity preferences are low, then banks will require lower capital to asset ratios in order to have their liabilities accepted as money and will be able to increase their leverage. But if the publics' liquidity preferences are high then banks' ability to increase leverage and increase lending will be constrained.

Second, the corporate finance literature recognizes that banks generate profits by *taking risks* and that both the *cost* and *availability* of capital limits their risk-taking capacity. Because banks need capital to absorb 'unexpected' losses and capital is scarce and costly, capital determines the *economic cost* of risk-taking. Before banks decide to extend credit and assume the risk of default, they assess the profits

they expect to attain in the future against the amount and cost of capital that they need to provide themselves with in order to support their desired level of exposure to this risk. There is, however, an important limitation with this vision of banking: Even though it recognizes that the capital with which banks measure the economic cost of risk-taking can *only* be measured *in terms of money*, it does not draw all the implications that Keynes' theory of money would allow from this apparently superficial observation. For Keynes money acts as a 'barometer' that measures the level of 'confidence' that economic agents have in their probabilistic calculations about a future that is 'fundamentally uncertain'. The only reason why money can play this role is because it is also the only asset that can provide economic agents with protection against 'uncertainty'. Which is what explains why economic agents have 'liquidity preferences'. The concept of 'liquidity preference' is therefore closely interrelated with those of 'uncertainty' and 'confidence' in a way that is radically different to neoclassical, New Keynesian and portfolio choice theories (Davidson, 2006). While the latter assume that all possible future outcomes of present day economic decisions can already be 'priced' in transactions agreed in the present, for Keynes the future is something that is 'fundamentally uncertain'. The actual behaviour of economic agents reflects their awareness of the fact that their probabilistic risk calculations cannot be relied on to 'price' all possible future outcomes. In an environment where 'uncertainty' plays a role, economic agents *must* therefore also rely on their 'confidence' to guide their behaviour. The less confident agents are about the ability of their probabilistic calculations to predict the future, the higher will their 'liquidity preferences' be. How can these ideas be related to an explanation of the factors that determine banks' demand for capital? Post Keynesians equipped with the understanding of 'liquidity preference' that I have just outlined, will immediately recognize that if banks hold capital as protection against future 'unexpected losses', the monetary value of the capital that they decide to hold must also reflect the level of confidence that they have in their own probabilistic calculations about risk. This 'confidence' can only be measured in terms of money precisely because money is the only thing that can act as a 'barometer' of the degree of uncertainty about the future. Keynes' theory can be used in this way to explain why a rise in banks' liquidity preferences will lead them to demand more capital when their confidence in their own ability to calculate risk declines during recessions.

The third and last endeavour of this paper is to use Keynes' theory of liquidity preference to explain why investors will refuse to supply banks with all the capital they demand during recessions. For Keynes, interest rates were a 'monetary' and not a 'real' phenomenon because it was liquidity preferences that determined the level of interest rates. Furthermore, the level of return of all other assets had to adapt to the standard set by the level of interest rates on money. It was liquidity preferences and not the interaction between the relative quantities demanded and supplied of different assets that determined the equilibrium level of return on those assets. Following this framework, the paper argues that the return on equity does not act as a 'price' that adjusts endogenously in response

to the relative quantities of equity capital demanded by banks and that supplied by investors. The rate of return on bank equity that investors require will be determined 'exogenously' by their liquidity preferences. As discussed above, the quantity of capital demanded by banks will depend on their own 'confidence' and liquidity preferences. Neither an 'excess' quantity of equity demanded by banks nor a 'deficient' supply of equity capital on the part of investors can cause the return on equity to adjust upwards to clear the market. In this situation, the 'equilibrium' rate of return on bank equity required by investors to satisfy the additional demand for capital coming from banks could be set at a level above the one that 'clears' the market for bank equity.

The existence of credit rationing has major macroeconomic implications. The supply of credit money is not 'neutral' with respect to output and the available supply of bank credit cannot be simply explained away by the available quantity of solvent demand. This means that credit rationing will by itself deepen recessions. By preventing solvent firms from financing production, it will cause the default rate on bank loans to increase beyond what can be explained by the initial contraction in effective demand. This generates a vicious loop whereby a rise in loan defaults causes a shortage in bank capital and banks' inability to raise new capital in turn causes them to ration credit further.

This paper is structured in six sections. Following this introduction, the second section provides a brief literature review that highlights the distinct contribution made by this paper. The third puts forward a Post Keynesian interpretation of the role of capital in banking. The fourth provides an explanation of how an increase in the liquidity preferences of investors in bank equity can prevent banks from raising the additional capital they demand during recessions. The fifth argues that the resulting capital constraints can force banks to restrict the supply of loans to lenders of equal creditworthiness. The last section concludes.

2. Post Keynesian theories of money, credit and banks

The existing literature on credit rationing and capital constraints is dominated by a New Keynesian framework that has its roots in the economics of information and implicit contract theory of the 1970s (Akelrof, 1970). It relies on so-called 'market imperfections' like asymmetric information, adverse selection and moral hazard to explain rationing (Stiglitz and Weiss, 1981; Jaffee and Stiglitz, 1990; Greenwald and Stiglitz, 2003; Freixas and Rochet, 2008). The main weakness of this literature is that it ignores the role of banks as creators of money within a monetary economy and reduces them to the role of specialized intermediaries between savers and borrowers in a loanable funds market characterised by imperfect information. Money as such plays no distinct role within this framework as its principles apply whether 'credit' takes the form of 'real goods' that are transferred by savers to borrowers through banks or of 'money'. Money is just a medium of exchange and the quantity of it available must ultimately reflect the desire of savers to save and 'impatient' borrowers to consume.

The impact of bank credit on output has nothing to do with the ability of banks to create money but with the ability of banks to act as effective intermediaries for savings.

Much of the original Post Keynesian literature that developed in reaction to New Keynesian 'rationing' theories was built on the basis of counterpoising a theory of 'asymmetric expectations', based on Keynes' principle of 'fundamental uncertainty' and the distinction he drew between a 'lenders' and 'borrowers' risk, to 'asymmetric' and 'imperfect information' based theories. This paper, however, focuses on applying Post Keynesian views of liquidity preference and endogenous money to developing a monetary theory of how capital constraints can lead to credit rationing by banks. The reader should therefore bear in mind that this is the objective that informs the choice of references that is covered in this selective review of the Post Keynesian literature.

Post Keynesian economics distinguishes itself from New Keynesian explanations of credit rationing in that the former explicitly links credit with an endogenous money creation process led by banks. This is commonly referred to as 'endogenous money theory'. The idea that the main driver of the money supply is the creation of monetary liabilities (e.g. deposits) by banks, through their decision to extend credit, remains central to the perspective advocated in this paper. However, while all Post Keynesians share this common view there are important differences amongst them about: 1) the exact role of supply-side constraints in limiting the ability of banks to extend credit and; 2) the compatibility of Keynes' liquidity preference theory of interest rates with endogenous money. In order to help situate the contribution of this paper I will briefly review what these differences consist of:

Members of the so-called 'horizontalist' school (Moore, 1988) have argued that endogenous money theory implies that the banking system can always fully accommodate any demand for loans from 'credit-worthy' or 'solvent' borrowers because there are no funding constraints preventing it from doing so. The supply of bank credit is therefore fully demand-determined. There are no independent supply and demand schedules for bank loans but only a single downward sloping demand-schedule for 'credit-worthy' borrowers.

The qualification that lending decisions depend on banks' judgement of what constitutes a 'credit-worthy' borrower has allowed many 'horizontalist' to assign a role to bank behaviour and develop a particular theory of 'credit-rationing'. Wolfson (1996), for example, labelled the demand from 'credit-worthy' borrowers the 'effective' loan demand schedule and distinguished it from a 'notional' schedule which reflects the demand for loans from *all* willing borrowers. He then characterised the difference between the two loan demand curves as 'credit rationing'. This concept of 'credit rationing' is, however, fundamentally different from the one used in New Keynesian theories. For the later rationing refers to situations where for a given set of borrowers of the same credit standing some can access credit while others cannot, or none of them can completely satisfy their demand for loans (Stiglitz and Weiss, 1981). These Post Keynesian authors on the other hand refer to rationing as the

inability of borrowers with a lower credit standing, relative to that which is acceptable to banks, to access credit (Wolfson, 1996, Lavoie; 2014). These Post Keynesians have also argued that the gap between this 'notional' and 'effective' demand curves for credit depends on the changing credit standards of banks, their state of confidence and their appetite for risk (Wolfson, 1996; Lavoie, 2014). Banks' attitudes toward risks is sometimes also characterised as banks' own 'liquidity preferences' (Lavoie, 2014).

A number of leading 'horizontalist' (Kaldor, 1985; Moore; 1988) have, however, insisted that endogenous money is fundamentally incompatible with Keynes' theory of liquidity preference. Their main contention is that liquidity preference is a theory that assumes that the money stock is an exogenous variable whose supply is under the control of the central bank and that the interest rate is endogenous. This, in their view, is inconsistent with a theory where money creation is credit-driven and demand-led and where interest rates are exogenously determined. Indeed, for 'horizontalists' the monetary policy interest rate is set exogenously by the central bank independently of the amount of reserves that it supplies and long-run rates largely depend on expectations about the future path of interest rates. Commercial banks set an interest rate 'mark-up' above the central bank rate which is related to the risk premium, but even then this 'mark-up' is 'exogenously' determined because it does not depend on the quantity of loan demand but on 'conventions' and changing preferences towards risk. Over the years, some authors have gradually abandoned this rigid view and have tried to link the term premium of interest rates or the credit risk premium to changes in investors' and banks' 'liquidity preferences' (Lavoie, 2014).

The contribution of this paper is much more closely tied to the work of the so-called 'structuralist' Post Keynesians. 'Structuralists' have consistently argued that endogenous money is compatible with liquidity preference theory and with the view that banks' ability to extend credit is constrained by the cost, quantity and structure of funding that banks can access in the market (Minsky, 2008; Pollin, 1991; Palley, 2013; Dow, 2006). They emphasize that banks can only lend profitably when they are able to transform liquid liabilities (e.g. cash deposits or short-term securities) into relatively illiquid assets such as loans to households and corporations (Minsky, 2008). Liquidity preference and credit creation interact with each other because the capacity of banks to create credit depends on their ability to have their liabilities accepted as 'money' (Dow, 2006). This acceptance is contingent on the liquidity preferences of the public that holds such liabilities and on the institutional structures that validate the banking systems' liabilities as money. The confidence with which the public is willing to hold bank liabilities as valid substitutes for 'money' is also related to how fragile banks' balance sheets are perceived to be by the public (Palley, 2013). The evolution of banks' liability structures reflects their efforts to accommodate as well as overcome the constraints that both the publics' liquidity preferences, and the prevailing institutional framework, impose on their capacity to create

credit. Banks are therefore engaged in a continuous process of financial innovation to increase the liquidity premium of their liabilities (Minsky, 2008).

Some 'structuralists' (Palley, 2013) have applied the idea that the 'publics' liquidity preferences can constrain bank lending by interpreting Keynes' theory of liquidity preference in terms of Tobin's portfolio choice theory (Tobin, 1958). They have used this interpretation to defend the existence of a downward sloping money demand curve against 'horizontalists' and to justify the endogeneity of interest rates (Palley, 2013). This paper relies on changes in the liquidity preference of investors in bank equity to explain why banks cannot access as much capital as they demand during crisis and become constrained in their ability to lend. It argues, however, that Tobin's interpretation represents a neoclassical distortion of Keynes ideas. In contrast to Palley (2013), this paper applies a concept of the theory of liquidity preference that is more in line with the one originally put forward by Keynes' where money has completely different properties to that of ordinary commodities and interest rates are therefore not endogenously determined by the intersection of an alleged supply and demand functions for money (Keynes, 1936).

A number of 'structuralists' have used Keynes' theory of liquidity preference to explain credit rationing on the basis of changes in banks'*own* liquidity preferences (Dow, 1996; Le Heron, 2008). Le Heron (2008), for example, builds a stock-flow-consistent model in which changes in the leverage ratio of borrowers trigger changes in banks' liquidity preferences and lead them to ration credit. Dow (1996) argues that changes in banks' liquidity preferences are expressed through changes in the *confidence* that banks have in their own predictions. Her main objective is to show that adverse changes in risk assessment can produce 'systemic rationing' during downturns in the business cycle.

Structuralists have addressed the issue of capital as a constraint on bank lending before. However, in the past this has mostly been restricted to analysing: how regulators impose capital adequacy ratios to control the expansion of bank credit (Minsky, 2008); how banks innovate to circumvent these capital constraints (Dow 2006; Minsky, 2008), or; how loan losses cause banks to cut lending in order to comply with their previous regulatory capital ratios (Dow, 1996; Le Heron 2008). As far as this author is aware, however, there has never been an attempt to integrate the corporate finance view that, independently of regulatory capital ratios, banks use capital to measure the economic cost of risk-taking, and hence to guide their lending behaviour, into a Post Keynesian monetary framework. This paper does this by arguing that the demand for capital by banks reflects changes in the confidence that they have in their own risk assessment. This confidence is necessarily measured in monetary terms, because lending is conducted by banks on the basis of expectations of obtaining a future monetary profit which is 'fundamentally uncertain' in the Keynesian sense. The idea that changes in bank's own liquidity preferences are related to fluctuations in the confidence they have in their own risk assessment has been employed before (Dow, 1996 and 2006; Lavoie, 2014; Le Heron., 2008). But this has never been specifically linked to the role of bank capital in the way outlined above.

This paper also argues that a rise in the liquidity preferences of investors in bank equity prevents banks from satisfying their increased demand for capital during crisis. Some 'structuralist' authors have also made this link before and have related the resulting capital constraints to the rationing of credit by banks (Dow, 1996). There are, however, a number of important differences between Dow (1996) and this paper: First, this paper specifies a concrete mechanism through which a change in investors' liquidity preferences can prevent banks from raising additional capital and distinguishes it from a portfolio type investment choice *a la* Tobin (1958). Second, Dow (1996) does not provide an explanation of the exact role of capital in banking beyond pointing to the fact that it is an external regulatory constraint. Third, Dow (1996) builds her fundamental argument for credit rationing on the basis of changes in the subjective confidence of banks, but it is not clear how this can be related to regulatory capital constraints which depend on the appreciations about risk of external regulators rather than bank's own views. Fourth, while this paper tries to explain the emergence of 'credit rationing' as defined in the New Keynesian literature, Dow (1996) appears to be referring to 'rationing' as a situation where both 'credit-worthy' and 'non credit-worthy' borrowers can be refused credit. She also argues that it is not important to specify what exact kind of credit rationing does her model result in (Dow, 1996).

Finally, this paper makes use of the idea introduced by Keynes (1936) and developed by Minsky (2008) that what is 'money' cannot be identified independently of specific institutional usages and that institutions establish a 'hierarchy of monies' that determines how different financial liabilities have a varying degree of acceptance as 'money' or a different 'liquidity premium'. The paper uses this idea to argue that banks' liability structure is also underpinned by a 'hierarchy of money' in which the liabilities representative of capital are necessary to have deposit liabilities accepted as money. Capital provides depositors with a necessary 'margin of safety' giving them confidence that in the event of loan defaults bank losses will be absorbed by the holders of capital liabilities and not them. This is another way in which the paper assigns a concrete role to bank capital and explains how it can constrain banks' capacity to extend credit.

To sum up, the existing Post Keynesian literature does not provide a distinct monetary explanation of what is the role of capital in influencing bank behaviour and why it can constrain the ability of banks to lend and lead to the rationing of credit to 'credit-worthy' borrowers. This is the main objective of this paper.

3. The role of capital in banking

The mainstream corporate finance literature provides a theory of the role of capital in banking that can explain why and how capital can constrain lending. This standard 'micro' vision of banking is, however, limited by its own inability to integrate banking behaviour within a broader monetary theory of how a market economy works such as the one originally put forward by Keynes (1936). That is, an

economy in which *money* acts as the fundamental force that explains both the motivations and decisions of entrepreneurs in general, and banks in particular. The purpose of this section is to show that these two theories can be combined in a coherent way to produce a better explanation of the role of capital in banking.

There are two key concepts in the corporate finance literature which I wish to relate to a Post Keynesian approach to money: Firstly, there is the idea that the 'loss absorbing' role of bank capital is an institutionally dependent variable. There is a specific institutional framework, the 'capital structure' of banks, which is designed to ensure the reliability of the payment commitments represented by different kinds of bank liabilities. However, the fact that certain bank liabilities also play the role of money does not alter in any fundamental way our understanding of how this institutional framework works as compared to that of non-bank corporations. Second, capital influences bank behaviour because it is used by them to measure and value the economic cost of risk-taking involved in the business of banking. In this role, the amount of capital available to a bank constrains its 'risk-taking capacity'. However, nothing much is made of the fact that capital and the economic costs of risk are valued in terms of money beyond making the superficial observation that money provides a 'useful means' of adding up and comparing different kinds of risks.

As regards the first concept, the thrust of my argument can be summarised as follows: What distinguishes banks from ordinary corporations is that the capital structure of the former also serves to support certain bank-specific liabilities, like deposits, that perform the role of money. This implies that the hierarchy of payment obligations embodied in the liability structure of banks is simultaneously underpinned by a 'hierarchy of money' that uniquely allows certain bank liabilities to be accepted as substitutes for money. Therefore, in addition to the non-market institutional framework on which the capital structure of any corporation is anchored, banks rely on specific monetary institutions to ensure that their liabilities are accepted as money. The presence of liabilities representative of equity capital in a bank's liability structure is a pre-requisite for non-equity liabilities at the top of this 'hierarchy of money' to be validated as money. Since banks can only extend loans by endogenously creating money in the process, this explains why 'insufficient' capital can constrain their ability to extend credit.

As regards the second concept, the substance of my argument is as follows: Corporate finance argues that banks' risk-taking capacity is limited by the amount of capital at their disposal. The reason is that banks use capital to measure the economic cost of risk. Since lending involves risk-taking for the purpose of profit-making, banks will only engage in lending that is profitable once the economic cost of the risk implied by such activity is taken into account. In banking, the economic cost of risk-taking is measured in monetary terms (in the form of capital) and the valuation of this cost is based on the confidence that banks attach to their own probabilistic calculations of expected losses. The lower the confidence banks have in their own calculations, the more capital they will demand to cover for

unexpected losses. From a Keynesian point of view this makes perfect sense. Money must be the only way of valuing risk because in market economies the pursuit of a monetary profit through risk-taking is the main objective of enterprise. Moreover, precisely due to the fact that risk can only be valued in monetary terms, the value attached to money will itself affect the ability and willingness to take risk. Changes in banks' confidence will therefore inevitably affect the amount of money that banks have available in the form of capital to put at risk. A fall in bank's confidence will make their existing stock of capital 'scarce' with respect to the amount of risk previously on their balance sheet. It will lead to an increase in banks' demand for capital, but if the willingness of outside investors to supply banks with more capital is also limited by a rise in their liquidity preferences, then the only choice open to banks is to reduce the amount of risk on their balance sheets by rationing credit.

3.1 The institutional underpinnings: Bank capital as a specific institutional use of money

The corporate finance literature explains that 'capital' constitutes one amongst several possible funding instruments for a bank. The liabilities that are representative of capital, however, have clearly defined institutional characteristics that distinguish them from other bank liabilities like deposits or debt securities. Capital instruments give their holders exclusive rights over any profits that accrue to the bank after all interest payments on debt have been made. Contrary to deposits and debt, they are 'illiquid' in the sense that the bank has no obligation to redeem the original funds provided by those that invested in them. This characteristic allows bank capital to act as a 'buffer' for absorbing 'unexpected losses' arising from the bank's assets (Choudhry, 2012). Amongst the different capital instruments, 'equity capital' is considered to be the 'highest quality' form of capital. In accounting-terms, it represents the difference between the value of a bank's assets and its liabilities. This implies that the absorption of any unexpected losses arising from a reduced value of the bank's assets takes place by writing down the value of equity. As the main mechanism for absorbing a bank's unexpected losses, the purpose of equity capital is two-fold: First, to allow the bank to continue to operate as a 'going concern', and; Second, to protect holders of the other bank liabilities from insolvency by ensuring that they are still able to recover their funds when these losses arise. The various types of liabilities that form part of the bank's overall liability structure are thus organized hierarchically according to the order of priority in which each of them will sequentially absorb the bank's losses in case the bank's equity is not sufficient to absorb them all and the bank becomes insolvent. This hierarchy is known as the bank's 'capital structure'.

There is one crucial feature that remains implicit throughout the above standard discussion on the capital structure of banks: It relies entirely on an institutional framework external to the market mechanism to define, enforce and validate it. Without laws and regulations to define and distinguish between the features of different bank liabilities, to define regulatory capital ratios and to enforce

bankruptcy proceedings, bank capital can play no role whatsoever in influencing bank behaviour. This institutional framework makes its presence felt as a force 'exogenous' to the market.

The mainstream corporate finance literature, however, overlooks the fact that banks are actually *not* like any other corporation. Part of their liabilities (i.e. deposits) act as substitutes for money in the economic system. Their ability to do so relies on a unique non-market institutional framework that ties together an economy's banking and monetary systems. The role of this framework is two-fold: First, to regulate banks as institutions that extend credit and thereby expose themselves to potential losses, and; Second, to validate the liabilities that banks create endogenously, as money. This means that the loss-absorbing 'capital structure' of banks is simultaneously underpinned by a so-called 'hierarchy of money' in which the relative 'illiquidity' of banks' equity liabilities serve to support the ability of bank deposits to act as a valid substitute for money. Money as a means of payment cannot exist if it is vulnerable to default (Goodhart et al, 2013). This same money, however, is supplied by banks when they extend credit, which is an activity that by its very nature is *based* on the possibility of default. These two seemingly contradictory aspects of banking are reconciled through the existence of a hierarchical bank liability structure where deposits are protected from default by other liabilities like equity which *can* absorb losses from loan defaults. Another way to put it is that, the pre-condition for certain bank liabilities to be 'freed' from the risk of default in order to perform a monetary role, depends on the possibility that other liabilities (like equity) are vulnerable to a loss of their original monetary value.

The term 'hierarchy of money' is taken from Minsky (2008) who used it to argue that money cannot be identified independently of its institutional usages and that there is a 'hierarchy of monies' where different types of money are used for different purposes:

> *'Both the monetarist and standard Keynesian approaches assume that money can be identified quite independently of institutional usages. But in truth, what is money is determined by the workings of the economy, and usually there is a* ***hierarchy of monies****, with special money instruments for different purposes. Money not only arises in the process of financing, but an economy has a number of different types of money: everyone can create money; the problem is to get it accepted.'(Minsky, 2008)*

Minsky (2008) used the term inter-changeably with that of a 'hierarchy of liquid assets'. He did so, however, mainly to refer to the drive by the market to constantly create different kinds of new 'liquid' financial instruments that *'offer a good measure of the protection offered by money holdings'* to finance positions in 'illiquid' assets, and to describe how this created a chain of interdependent financial commitments. Although he did not use the term directly to refer to the ability of non-market institutions to validate the relative 'liquidity' of different financial liabilities, this idea is implicit in various ways throughout his work. For example, in the way he described the lender of last resort responsibility of central banks as one whose function was to 'validate threatened financial usages'

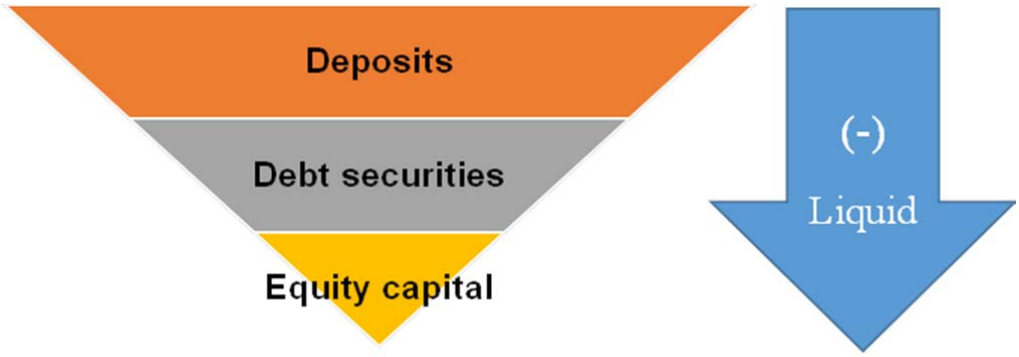
(Minsky, 2008, p. 280). By contrast, the use I wish to make of the term 'hierarchy of money' refers specifically to the inter-dependent 'liquidity hierarchy' that underpins banks' capital structure and to explain how it relies on non-market institutions.

The general idea, however, originates with Keynes (1936), who defined the 'liquidity premium' of any asset as the security bestowed to its holder that he could convert it back into money at his convenience. He believed that every asset always embodies a certain 'liquidity premium' because what constitutes 'money' in its role as a *store of value* cannot be unambiguously demarcated from 'non-money'. In a monetary economy there is therefore a spectrum of assets/liabilities which possess different degrees of 'liquidity' or 'moneyness':

> *'There is, clearly, no absolute standard of 'liquidity' but merely a scale of liquidity—a varying premium of which account has to be taken, in addition to the yield of use and the carrying-costs, in estimating the comparative attractions of holding different forms of wealth.* ***The conception of what contributes to 'liquidity' is a partly vague one, changing from time to time and depending on social practices and institutions. The order of preference in the minds of owners of wealth in which at any given time they express their feelings about liquidity is, however, definite*** *and is all we require for our analysis of the behaviour of the economic system.'(Keynes, 1936, p.151)*

Different bank liabilities carry different *liquidity premiums* and are structured into a 'hierarchy of money' according to the degree to which they can act as substitutes for the most liquid liability. But, as 'liquidity' is a relative concept, the degree of liquidity of each liability cannot be defined in isolation from the rest of the elements within this hierarchy but only on the basis of the lower liquidity of those liabilities occupying a lower position within it. There is therefore an 'interdependence' between the different layers of the 'money hierarchy' where the liquidity of its more senior layers depends on the relative 'illiquidity' of the more junior ones.

Figure 1: The 'hierarchy of money' underpinning banks' liability structure



Banks' liability structures are also underpinned by a 'hierarchy of money' (Figure 1). The securities representative of bank equity (e.g. shares), are a specific type of financial liability that stand at the bottom of this hierarchy. As such, their role is to provide holders of bank liabilities that occupy a

higher position in the hierarchy (e.g. deposits or debt securities) with a certain 'margin of security' that they are relatively more likely to be able to convert these liabilities into money than what is the case for the holders of equity instruments. The relative 'illiquidity' of bank equity is therefore a necessary pre-condition for preserving the relative 'liquidity' of bank debt and deposits. The terms 'illiquidity' and 'liquidity' should not be simply understood in the market sense that one can 'buy' or 'sell' some assets more easily than others. But in the sense that in the event of bank losses the pre-condition for debt holders to be able to recover their money is the inability of equity holders to recover theirs. This does not exclude 'liquidity' understood as easiness with which one can 'buy' or 'sell' assets, since it is clear that the transaction market for equity instruments might indeed be very liquid in this sense during normal times. But even so, it is clear that when banks' post losses equity holders who are first in line to share in these losses, will only be able to sell their securities in the market at a heavy discount. What was a 'liquid' transactions market when banks' posted no losses can suddenly become a very 'illiquid' one when these losses surface on their balance sheets.

What ultimately allows bank liabilities to pass as substitutes for money are non-market institutions such as governments and central banks. The role of these institutions is to exogenously validate bank liabilities as money. This task is carried out either 'explicitly' during crisis (e.g. lender of last resort function of central banks) or 'implicitly' in normal times. The 'hierarchy of money' that stands behind the liability structure of banks' also depends on the norms and conventions enforced by these external non-market institutions. Governments, for example, usually guarantee certain bank deposits. But these guarantees are not limit-less and in the event that a bank is unable to honour all of its liabilities (i.e. bankruptcy) the government will always first ensure that the equity holders bear the bank's losses in full before paying for its guarantees over bank deposits. Bank deposits that are not covered by these guarantees will also bear losses only after equity holders have. The point is that the validity of the specific 'hierarchy of money' that underlies banks' liability structure (i.e. the relation between bank equity and deposits) does not emerge from a 'natural' market mechanism, it depends on the ability and willingness of non-market institutions to enforce it.

If banks need equity in order to attract depositors and have their deposit liabilities accepted as money, then they are also constrained in their ability to extend loans by the willingness of the public to hold their equity. A bank that is perceived to be 'undercapitalised' is one where the margins of safety offered to its depositors are too 'thin' to guarantee that in case of losses these will not also be imposed on depositors. Such bank deposits will stop being regarded 'as good as money'.

3.2 The demand for bank capital: 'economic' capital, risk-taking and confidence

Before we develop a Keynesian interpretation of the relationship between capital and risk in banking in the next section, we will first need to briefly review what the existing corporate banking literature has to say on the subject. This literature recognizes from the start that banks are profit driven

institutions that make their profits by taking on entrepreneurial risks. This dependence of profit-making on risk-taking means that the profitability of any banking venture cannot be meaningfully assessed on its own, but must always take into account the relative cost of the risk that it involves. The relation between profit-making and risk-taking and the need to quantify the economic cost of risk-taking in order to guide bank's lending behaviour is what creates an economic role for capital:

> *'Capital management is first and foremost driven by risk. Indeed, because risk can trigger losses that deplete their capital, banks must carefully consider the potential, unexpected losses that are associated with each individual activity. Value maximization requires financing only businesses that are sufficiently profitable once their capital consumption is taken into account' (Baer et al., 2011, p1.)*

Risk-taking therefore enters the bank's decision making process as an *economic cost*, and one that is *only* meaningful in *monetary terms*. Capital is used for valuing the cost of risk and for that purpose it is only relevant as a purely monetary concept. When capital is used to measure the economic cost of risk-taking, the corporate finance literature refers to it as 'economic capital' or 'ECAP' (Choudhry, 2012; Baer et al., 2011). This concept is clearly distinguishable from that of 'accounting capital', which is an objective accounting measure of the difference between the value of a bank's assets and its liabilities. But one that is independent from how banks subjectively value risk and relate it to their own expectations of future profit in order to guide their business behaviour. It is obvious that 'Capital' as a term referring to specific productive or technological capabilities embodied in some physical means of production is also irrelevant here. But perhaps more interestingly, given its importance for New Keynesian banking theory, 'Capital' as an intangible asset that captures the specialized 'know-how' (e.g. monitoring and credit assessment capabilities) or the information screening capabilities of banks is also irrelevant in this context. Capital, in terms of 'economic capital', is only relevant in so far as it captures the inter-dependence between the concepts of 'risk' and 'money' and its role in explaining the risk-taking behaviour of banks.

Economic capital is also different from the concept of 'regulatory capital' which refers exclusively to the levels of capital that are imposed by an external regulator. As a guide to its own behaviour, what ultimately matters to a bank is how it can relate the cost of obtaining capital in the market to both the *subjective* value it attaches to that capital as a measure of the risks it wishes to undertake and to its *subjective* view about the future profits it expects to derive from that risk-taking.

Various studies have highlighted that most banks actually maintain capital levels *above* the minimum regulatory requirements (Thakor, 1996; Basett and Covas, 2014). Furthermore, as happened following the 2008 crisis and the announcement of Basel III, when new capital requirement are introduced banks typically seek to front-load their implementation. The first observation may reflect the fact that banks often act upon a degree of confidence about what is the appropriate level of capital that is different to that of regulators. In addition, the second observation may also reflect the fact that banks

have to also be wary of the need to inspire confidence in depositors and potential future capital investors that they have ample buffers to cover themselves against unexpected future losses and continue as a viable going concern. Both observations highlight that regulatory capital requirements are not in themselves sufficient to explain how capital needs influence bank behaviour. Regulatory capital enters the decision making process of the bank as a fixed cost, much like taxes, and does not depend on the variability of the profit expectations of the bank relative to its subjective valuation of risk. Regulatory capital may be 'nominally' high but if the bank (and the market that supplies it with capital) attaches a low value to risk and expects high profits this factor will not constrain the bank's ability to lend. On the contrary regulatory capital may be nominally 'low', but if the subjective valuation given to risk is high and the expected derived profits low, it may act as a big constrain on lending. Therefore, independently of regulatory capital ratios, banks have fundamental reasons for calculating their own exposure to risk and managing their risk-taking capacity. Regulatory capital is based on pre-defined risk-weights that are applied to all banks independently of differences in their risk-appetite or confidence in their own risk-taking abilities. Banks will have their own risk models and data to rely on and they will want to track their own performance and price their loans using their own estimates of the economic costs of their risk-taking activities. Although complying with regulatory capital ratios, and factoring-in the costs of doing so, is a necessary pre-condition for running a bank, it is not a sufficient condition for running a profitable risk-taking banking business. Not surprisingly, different industry surveys show that the vast majority of banks measure economic-capital with their own risk models (Baer et al., 2011, KPMG, 2003). They do so in order to produce measures of Risk Adjusted Returns on Capital (RAROC), at least at the aggregate business level, to guide their business behaviour, price their loans and measure their performance. The commonly used RAROC measure, for example, directly relates banks expected returns to economic capital in the following way:

$$\text{RAROC} = \frac{Expected\ profit}{Economic\ Capital} = \frac{Return - expected\ loss - expenses}{Economic\ Capital}$$

When a bank measures the total economic capital at its disposal, it uses money as the common variable with which to aggregate and compare risks that are potentially very different in nature (*KPMG, 2003).* Furthermore, by assigning a monetary value to the cost of risk-taking the bank can also relate this cost to the expected future monetary return of different ventures. The economic cost of risk-taking is only meaningful in monetary terms because the ultimate objective of the bank is to maximize a monetary profit.

Banks rely on their own probabilistic calculations to assign a monetary value to the potential losses that they face in case of default. In doing so, they distinguish between expected losses (EL) and

unexpected losses (UL). The first of these is used to determine the level of general provisions while the second is used to determine the level of 'economic capital':

> *'The expected loss (EL) represents the loss that may be anticipated based on historical experience and is statistically the average loss of the distribution. It serves as the basis for general provisioning. (KPMG, p.4)'*

Although general provisions represent the bank's estimate of the average probability of default of its borrowers, it is not considered to reflect the 'true risk' of doing business, but is instead factored in as part of the 'normal' cost of doing business. It is only the estimated value of unexpected losses, which are covered by economic capital, that represent the 'true' economic value of risk:

> *'… EL is generally not considered a measure of true risk but rather the average cost of doing business. The unexpected loss (UL), in contrast refers to the deviation of real losses from expected losses (KPMG, p.8).'*

> *'(…) if the actual loss is larger than the EL, the general provisions are inadequate and such excess needs to be absorbed by the available capital. (…) Economic capital (ECAP) is an estimate of the size of such unexpected losses (…) (KPMG, p.4)'*

By definition, the maximum amount of losses on its loan portfolio that a bank is exposed to in case of default is limited by the outstanding value of its loans plus any possible undrawn credit lines to which the bank has committed. Banks refer to this maximum amount as their total Exposure at Default (EAD). It is therefore common practice to express the value of a bank's expected (general provisions) and unexpected losses (economic capital) as a percentage of their total outstanding balance or EAD. The table below, drawn from the risk management chapter of the annual report of a Spanish bank, provides an example of how a typical bank expresses its credit risk exposure using ECAP, EL and regulatory capital:

Credit Risk Exposure of BANKIA (EUR millions and% over EAD)

Portfolio	EAD	Regulatory Capital		Economic Capital		Expected Loss	
Public Sector	43,309	241	0.6%	320	0.7%	175	0.4%
Banks	29,634	431	1.5%	284	1.0%	69	0.2%
Corporations	40,805	1,848	4.5%	2	4.8%	4	9.1%
Real Estate Corporations	2,535	134	5.3%	388	15.3%	865	34.1%
Mortgages	69,918	1,949	2.8%	1	1.6%	3	3.7%
Consumer Loans	2,315	107	4.6%	67	2.9%	101	4.3%
Credit Cards	3,258	67	2.1%	55	1.7%	42	1.3%
Small enterprises and self-employed	6,996	239	3.4%	119	1.7%	686	9.8%
Shares	351	66	18.9%	0	0.0%	9	2.5%
Total	199,121	5,082	2.6%	4314	2.2%	8248	4.1%

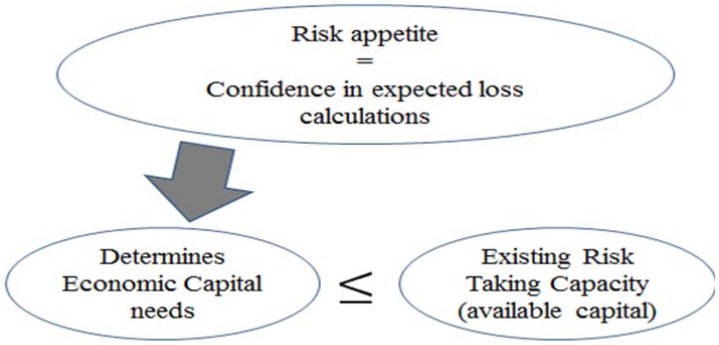
Source: 2014 Annual Report of Bankia (Risk Management Chapter), author's translation from Spanish

Given that the purpose of economic capital is to cover for 'unexpected losses', the level of ECAP that the bank considers is necessary for supporting its risk-taking activities will depend on the *level of confidence* with which the bank holds its own estimates of potential expected losses. The corporate finance literature relates this level of confidence to the bank's 'risk-appetite':

> *'risk appetite (…) can be expressed as the confidence level that overall losses will not exceed the risk-taking capacity and, therefore directly relates to the probability of default. (KPMG, p11)'*

The lower the risk-appetite of the bank, the less confidence will it have in its own expected loss calculations and the more capital (risk-taking capacity) will it demand to cover for unexpected losses. An extreme example can serve to illustrate the point better: If a bank has no confidence whatsoever in its own calculations of the expected probability of default, the aggregate value of its expected losses (provisions) and unexpected losses (capital) would have to equal the total outstanding balance of its loans. The more confident a bank is about its own expected loss calculations the smaller the proportion of its EAD that it will cover with economic capital to protect its business from unexpected losses. The bank's economic capital ratio therefore provides a measure of how confident the bank is about its own probabilistic calculations. When a fall in confidence creates an additional demand for capital which is not covered by the capital resources at the bank's disposal, the bank's risk-taking activity becomes constrained by its available quantity of capital or by the amount of 'risk-taking capacity' that it has at its disposal.

Figure 2: Relation between risk-appetite, confidence and capital demand



3.3 The Keynesian and corporate finance views of Money, Capital and Risk

As we have seen, the corporate finance literature acknowledges that profit-making is inseparably linked to risk-taking. This is much closer to Keynes' original vision of an 'entrepreneurial' or 'monetary' economy than to New Keynesian discussions of banks as capable risk-managers or 'delegated monitors' in a world of imperfect information (Diamond, 1984). For Keynes, the fundamental dynamic that described the functioning of a market economy was the undertaking of

entrepreneurial risk for the pursuit of a monetary profit (Keynes, 1933 and 1936). A risk-averse entrepreneur is thus a contradiction in terms. A premise which is radically different from the basic New Keynesian assumption that both firms and banks are actually 'risk averse' by nature:

> *'Much of the macroeconomic behaviour of firms can be explained by the fact that firms are risk averse (…) Like the equity-constrained firms described earlier, banks, who must worry about the risk of bankruptcy, act in a risk averse manner.' (Greenwald and Stiglitz, 1993).*

For New Keynesians firms and banks are risk averse because imperfect information prevents them from perfectly foreseeing, pricing and controlling risks. This does not completely prevent them from taking any action that is risky because they can still rely on various methods to limit and control the information constraints they face. Some of these include: risk-sharing, portfolio diversification, building long-term business relationships or delegating on specialized monitors (such as savers supposedly do with banks). Nonetheless, compared to an ideal world of complete and efficient markets their actions are inhibited by the prevalence of imperfect information in the real world and this helps explain phenomena such as credit rationing or unemployment.

For Keynes on the other hand, what truly describes the behaviour of all entrepreneurs (including banks) is that they actively pursue risk for the purpose of profit making while being fully conscious of the fact that they can never hope to reduce or control it. He famously described this as the 'animal spirits' of entrepreneurs (Keynes, 1936):

> *'…our decisions to do something positive, the full consequences of which will be drawn out over many days to come, can only be taken as a result of animal spirits—of a spontaneous urge to action rather than inaction, and not as the outcome of a weighted average of quantitative benefits multiplied by quantitative probabilities (…) if the animal spirits are dimmed and the spontaneous optimism falters, leaving us to depend on nothing but a mathematical expectation, enterprise will fade and die;—though fears of loss may have a basis no more reasonable than hopes of profit had before. (Keynes, 1936)'*

According to Keynes' vision, entrepreneurs take risks even though they know that they cannot predict the outcome of their actions with any degree of certainty. They do so *not* because they can devise ingenious mechanisms to limit the problems posed by imperfect information, but because they know that risk-taking is the pre-condition for profit-making.

New Keynesians assume that there is a trade-off between 'risk' and 'information' so that it is possible to reduce risk with more information. Crucially, the New Keynesian paradigm relies on the belief that entrepreneurs make decisions on the basis of this very assumption. The implication is that if *there was* perfect information and markets were complete then risk would not inhibit the behaviour of entrepreneurs at all. They would be able to optimally control, price, share and diversify risk.

By contrast, Keynes argued that it is an illusion to believe that risk can be controlled or reduced with more information and to believe that entrepreneurs act on the basis of this belief. Entrepreneurs know that the future cannot be known with any calculable degree of certainty no matter how much information is available. They therefore act on the basis of *confidence* not on the basis of their ability to access more information:

> *'…decisions affecting the future (…) cannot depend on strict mathematical expectation, since the basis for making such calculations does not exist; (…) it is our innate urge to activity which makes the wheels go round, our rational selves choosing between the alternatives as best we are able, calculating where we can, but often falling back for our motive on whim or sentiment or chance. (Keynes, 1936)'*

It is well known that Keynes distinguished 'calculable risk' from 'uncertainty'. The first kind of risk is identical to the one that the corporate banking literature says guides bank's lending decisions when they try to come up with their best probabilistic estimate of expected losses. Keynes' on the other hand defined 'uncertainty' as non-calculable risk (Keynes, 1937). This does not mean, however, that Keynes' thought that entrepreneurs don't attempt to calculate or quantify risks to guide their decision making. What he meant is that even when they do so, they are conscious of the fact that future outcomes are fundamentally uncertain and they therefore attach a varying degree of confidence to their own probabilistic calculations. Entrepreneurs' decisions are therefore always guided *by a combination* of their best estimates of risk and the confidence with which they hold these estimates:

> *'The (…) entrepreneur's (…)* ***risk arises out of doubts in his own mind as to the probability*** *of his actually earning the prospective yield for which he hopes (Keynes, 1936, p.144).'*

This distinction between 'calculable risk' and 'uncertain risk' closely resembles the distinction made by the corporate finance literature between the use of general provisions to cover for 'expected losses' (EL) and the use of economic capital (ECAP) to cover for 'unexpected losses':

> *'…banks commonly create buffers in the form of general provisions for losses that might be reasonably expected to occur. However, actual losses are often different from expectations, and* ***capital is held to cover unforeseen possibilities****. (KPMG)'*

As was described already in the previous section, the exact amount of capital that banks consider is necessary to cover for 'unforeseen possibilities' or 'unexpected loses' varies with the level of confidence with which they hold their own probabilistic calculations of expected losses. The lower the risk-appetite of banks the lower their confidence in these calculations. Similarly, for Keynes the 'animal spirits' of entrepreneurs depend on the level of confidence with which they believe they can rely on 'calculable risk' estimates based on conventional knowledge.

Contrary to corporate finance theory, however, Keynes was able to take these ideas far beyond what is possible to do within the narrow purview of a 'micro' conception of banking. He was able to relate

variations in confidence in uncertain outcomes to a particular theory of money: the theory of liquidity preference. According to Keynes' theory, changes in liquidity preferences reflect changes in the confidence we attach to our calculations about uncertain future outcomes. Our willingness to hold money rather than commit it to a risky enterprise acts as a barometer of our uncertainty about the future. The reason for this is that the reward for exposing money to the risk of loss (the 'profit of enterprise') is also only meaningful in monetary terms.

Against the background of the discussion contained in section 3, I believe that it is possible to integrate the idea of economic capital within Keynes' broader monetary framework in the following way:

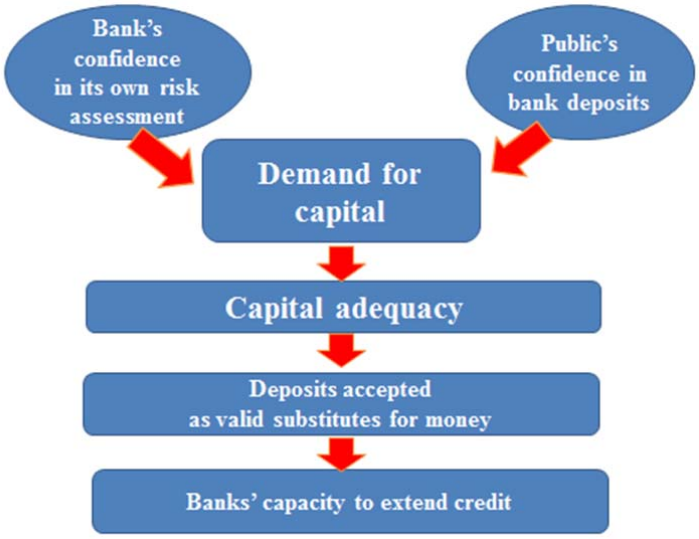
If economic capital measures the cost of risk-taking and this measure is only meaningful in monetary terms, then the desire to hold money rather than expose it to potential losses (liquidity preferences) must also reflect the confidence that banks attach to their own probabilistic calculations about the future. The amount of capital that banks regard as 'adequate' at each moment in time will depend on the fluctuations in the monetary value given to risk. When the preference for liquidity is high, banks will therefore attach a high monetary value to the cost of risk. Their demand for economic capital per unit of risk taken will necessarily increase. The opposite will be the case when their liquidity preferences are low.

A rise in liquidity preferences is often identified with a rise in the 'precautionary demand for money'. It may therefore appear contradictory to state that the banks' increased demand for capital reflects a rise in their demand for 'money' given that the purpose of this capital is to absorb losses *not* to protect banks against them. It has to be borne in mind, however, that the bank's decision to demand more capital is motivated by its desire to protect its ability to carry on its banking business in the event of losses not to absorb losses itself. The losses will be absorbed by those that supply the bank with additional capital: the equity investors, as we will see in section 4. It is the investors that are giving up 'liquidity' in order to take-on risk and expose themselves to potential losses. From the point of view of the bank, its demand for capital *does* constitute a 'precautionary demand for money' because it reflects its desire to protect its own ability to continue to extent credit. As we saw in section 3.1, the pre-condition for the bank to continue to be able to do so is to be able to provide security to deposit holders that they will not have to absorb any unexpected losses. This security depends on the availability of capital to absorb losses and the willingness of the owners of this capital (the investors) to take losses on behalf of depositors.

During financial crisis an increase in liquidity preference, which is equivalent to a fall in banks' confidence in their ability to measure risk, will lead capital to become a 'scarce' resource. From the point of view of the bank, the reason why capital all of a sudden becomes 'scarce', is because the amount of capital previously available to it is no longer sufficient to support the same amount of risk-taking as before.

We are now in a position to bring together the discussion in sections 3.1 and 3.3 to provide a holistic picture of the determinants of the demand for bank capital. Figure 4 provides a schematic overview of these relations. Section 3.1, argued that the demand for capital will partly depend on the confidence with which the public is willing to hold bank deposits as a valid substitute for money. But this is only the case because there is a specific institutional framework that assigns to capital the role of protecting deposits from potential losses. Section 3.3 has shown that the demand for capital will also depend on the confidence that banks attach to their own calculations about the risks they undertake when they extend credit. Banks know that they are only able to extend credit if they are at the same time also able to protect the 'money like' status of their liabilities. This implies that they themselves must make sure that they hold sufficient capital to cover against unexpected losses that may arise from the risks that they undertake.

Figure 4: Determinants of banks' demand for capital and how capital adequacy allows banks to extend credit in an endogenous money framework



So far we have only talked about the *demand-side* for capital. That is the determinants of the quantity of economic capital that is necessary for doing business *exclusively* from the point of view of the bank itself. The increased demand for capital on the part of the bank could in theory be met with an increase supply of capital by external investors. Crises are, however, characterised by a simultaneous rise in the liquidity preferences (or loss of confidence) of all economic actors. As Keynes remarked, the pre-condition for one actor to become 'liquid' is that someone else must be willing to become 'illiquid', yet in a crisis everyone wants to become 'liquid' and none 'illiquid' (Keynes, 1936). A simultaneous rise in the liquidity preferences of investors and banks will therefore make it impossible for the latter to raise the higher amount of capital that it now needs to support its lending business. The purpose of the next section is to explain how changes in the liquidity preferences of investors in bank capital can prevent banks from satisfying their increased demand for capital. The key question

which I will endeavour to answer is: Why is there not a level of return on equity that can 'clear' the market for equity capital by attracting an increased supply of equity funds to meet the additional demand for capital from banks?

4. The supply of bank capital: The liquidity preferences of investors

From the point of view of the outside investor who is considering whether to satisfy the bank's increased demand for capital what matters is the confidence *he* has in his ability to recover his investment in the bank at a profit. As an investor, he is after a monetary profit, but one that is only attainable if he first puts his money at risk by transforming his 'liquidity' into an 'illiquid' asset that leaves him vulnerable to unpredictable losses. Bank equity capital is by its very nature such an illiquid asset because, by definition, there is no contractual obligation for the cash invested by the holders of equity capital to be repaid. But in a monetary economy there is always an alternative to exposing oneself to the *uncertainty* that the original amount of money invested may not be recovered: the alternative is to hold on to liquidity instead of investing it in an illiquid financial asset such as capital. The choice between these two alternatives will depend on the *liquidity preferences* of the investor or the value he attaches to liquidity. The investor's liquidity preferences will in turn depend on the *confidence* that he has in obtaining a future profit instead of losing his money *not*, as New Keynesians argue, on whether he has more or less access to information about the true risk exposure of the bank.

But the choice between hoarding money or investing it in bank equity is not the only one available to the potential equity investor. Even when just considering the different kinds of liabilities that banks issue, there is a wide spectrum of different financial assets that the investor can choose from before deciding to simply hoard money. Each of these assets will offer different degrees of liquidity, risk and expected future financial returns. What then determines the investor's willingness to hold bank equity instead of bank deposits or bonds?

Keynes (1936) argued that when choosing between different assets, investors will take into account three fundamental factors which together make up the *total return* of any assets: First, he will compare the relative returns that he expects to derive in the future from each asset *adjusted* for the relative 'risk' that surround these expectations. He labelled this the 'q' of an asset. Second, all investors have a certain preference for liquidity and all assets possess 'liquidity' to some extent, so investors would also take into account the relative *liquidity premium* of different assets. This he labelled 'l'. Third, investors would subtract the so-called 'cost of carry' (labelled 'c') of holding different assets from the expected total return of an investment. Keynes (1936) defined 'cost of carry' not merely as 'wastage' but in broad terms to refer to any cost due to the passage of time which arises from investing in any durable asset. Putting together these three fundamental attributes, Keynes came up with the following formula for calculating the *total return* (which I will call 'r') or 'own-rate of interest', as he called it, of any asset:

$$r = q - c + l$$

I will now examine each of these variables in more detail. To avoid unnecessary complication I will ignore the 'cost of carry' and focus on the other two variables since 'c' is not essential for the point that I will be arguing. First, there is the 'q' or the expected future return of an asset adjusted for 'risk'. In this particular context, Keynes used the term 'risk' in the conventional sense of the term to refer to 'calculable' or 'probabilistic' risk which can be 'priced' or 'insured' against. This is precisely the reason why the investor can view 'risk' as a 'cost' for which he can be 'compensated' by receiving a higher return on the asset he invests in relative to other less 'risky' assets. This is also what is implied by the term 'risk adjusted return' also referred to as the 'probable net yield' by Keynes (1936, Ch 17). Second, the liquidity premium (or 'l') of every asset forms part of its total return because investors have a preference for 'liquidity'. The reason for this is that 'liquidity' is the only attribute of an asset that can provide investors with protection against 'non-calculable risk' or 'uncertainty'. In this regard, it is important to emphasize that for Keynes *both* 'uncertainty' (i.e. 'non-calculable' risk) and 'risk proper" (i.e. 'calculable risk') formed part of the total return calculation. These two very different kinds of 'risks' were, however, related by him to two separate components ('l' and 'q') because they influenced the total return of an asset in completely different ways and for completely different reasons:

> *'The owners of wealth will then weigh the lack of 'liquidity' of different capital assets in the above sense as a medium in which to hold wealth against the best available actuarial estimate of their prospective yields after allowing for risk. The liquidity-premium, it will be observed, is partly similar to the risk-premium, but partly different; the difference corresponding to the difference between the best estimates we can make of probabilities and the confidence with which we make them. When we were dealing, in earlier chapters, with the estimation of prospective yield, we did not enter into detail as to how the estimation is made: and to avoid complicating the argument, we did not distinguish differences in liquidity from differences in risk proper. It is evident, however, that* ***in calculating the own-rate of interest we must allow for both****.' (Keynes, 1936)*

The 'q' or return on any asset can be adjusted appropriately to compensate for the 'cost' of providing 'insurance' against 'calculable risk'. But such an adjustment is not possible for 'non-calculable' risk because by definition this 'cost' cannot be 'priced'. 'Money' is the only asset that can provide protection against 'uncertainty'. Since Keynes' used the term 'liquidity' to refer to the attribute that describes the relative ability of any asset to be turned back into this unique asset called 'money', protection against uncertainty formed part of the so-called *liquidity premium* of every asset. He used the term 'liquidity' to refer both to the 'power of disposal of an asset' as well as the recoverability of the original monetary value of an investment.

In *equilibrium* the total return r of every asset should be the same, even though for each asset it was derived in different proportions from the three separate ($q,\ c\ and\ l$) factors (Keynes, 1936, p.144). But how is the exact level of this 'equilibrium' determined? Keynes (1936) argued that in a state of equilibrium the rate of return of *all* non-money assets would have to conform to the 'own-rate of interest' of *only* one very special kind of asset: 'money'. He called this the 'money rate of interest' or the 'own-rate of interest' of the asset serving as 'money'. The 'money rate of interest' would set the *minimum* acceptable total level of return to which the total return of *all* non-money assets would have to converge in equilibrium. According to this view, there is therefore already a structural inequality in the relationship between 'money' as such and all other assets, with the latter clearly being subordinated to the former.

Because it was the 'money rate of interest' that set the standard for all other assets, the endogenous 'price' mechanism that allowed equilibrium to be achieved was the result of adjustments in the expected rate of return (the 'q') of the non-money assets and *not* of the 'money rate of interest' which remained determined *only* by exogenous changes in *liquidity preferences*. Specifically, if the expected rate of return on non-money assets (its 'q') was higher than the rate of interest on money this would provide incentives for accumulation (investment) to take place until decreasing returns would bring it in line with the money rate of interest. The reverse process (dis-investment) would take place if the expected rate of interest on non-money assets was lower than the money rate of interest, until again the rate of return would meet the level of interest on money. The final *equilibrium* level of returns between different assets would, however, always depend on the exogenously determined level of the own-rate of interest on 'money'.

But what determined the 'own-rate of interest on money' and why did it set the standard for the total return on all non-money assets? Keynes (1936) relied on the same formula as before ($q - c + l$) to explain this: The so-called 'money rate of interest' should *not* be understood as the 'prospective yield on money' in the same way that he referred to the prospective yield (or 'q') of any non-money asset. In fact the expected future return on money (the 'q' on money) is *nil* and the 'own-rate of interest of money' arises chiefly from the liquidity premium (the 'l') on 'money'. Hence if we denote the 'own-rate of interest of money' as 'i' and we ignore other factors like 'c' (Keynes in fact assumed that the 'c' for money was always lower than the 'l' for money, which is all that mattered for obtaining his result), then we can simplify and say that $i = l_M$. Where l_M denotes the liquidity premium of money as opposed to that of other non-money assets. The own-rate of returns of the non-money assets and of money therefore look like this:

$$Non\ money\ asset: \quad r = q - c + l$$

$$Money: \quad i = l_M\ .$$

Given that the various liquidity premiums possessed by non-money assets simply reflect their degree of similarity to the 'money' asset or their ability to be transformed into it, then it follows that by *definition* the liquidity premium (l_M) on 'money' *must always* be the highest of any asset.

There are a number of key characteristics of money that distinguish its behaviour from that of non-money assets. Even though the *liquidity premium* of money is above that of other assets this does not trigger and increase in the supply of money relative to that of other assets to correct the imbalance, in the way for example that for a commodity a higher 'price' would call forth a higher supply of it. Money has 'zero' elasticity of production. Furthermore, the demand for money is not reduced when the quantity of money increases or when its 'price' relative to that of alternative assets increases. The elasticity of substitution of 'money' is zero. This means that unlike for commodities or 'commodity-like assets' there is no upward sloping supply and no downward sloping demand function for money. The intersection between demand and supply does not provide a market clearing level for 'money' as there is no endogenous price mechanism that 'clears' the market for money. To these particularities of 'money', Keynes also added that while the 'q' on non-money assets tends to decline as investors accumulate these assets (due to the decreasing returns assumption) the 'l' on money does not. Put together, these conditions ensure that: First, when there is an increase in the demand for money caused by a rise in liquidity preferences, the liquidity premium of money ('l_M') will always rise by more than the ('l') possessed by any non-money asset, and; Second, even if the supply of money increases relative to that of the non-money assets the liquidity premium of money will always remain higher than that of non-money assets.

It is useful to contrast this particular behaviour of 'money' with the kind of relative 'price' adjustment that takes place amongst the '$q's$' of the 'non-money assets'. For non-money assets, when the 'return' ('q') of one asset increases relative to that of another asset this shifts relative demand towards the higher return asset and away from the lower return asset. As the relative quantity of the higher return asset increases its relative return declines again until the previous relative return equilibrium between both assets is restored. However, this relative 'price' adjustment mechanism does not exist for the liquidity premiums (the '$l's$') offered by different non-money assets *nor* with the liquidity premium offered by 'money' relative to non-money assets. Firstly, as explained already in section 3 even the relative liquidity premiums possessed by different non-money assets are not the endogenous result of market mechanisms, but are 'fixed' by conventions and institutions external to the market. They are the ones that determine how high is the liquidity premium of each non-money asset. Second, the liquidity premium on money will by definition always remain the highest when there is an increase in the demand for liquidity because 'liquidity' is an attribute that describes how much of the qualities of 'money' do the non-money assets possess without ever being able to be a perfect substitute for 'money'. If equilibrium cannot be restored via changes in the relative ('l') offered by different assets or by the ('l') offered by non-money assets and 'money', then it *must* be restored via changes in the

other components of the $(q - c + l)$ formula. Since the 'q' on money is nil and the 'l'for money will always remain higher than the 'l' on non-money assets, the adjustment to an increase in 'l'caused by a rise in liquidity preference *must* therefore always take place via an adjustment in the returns on the non-money assets via the 'q's'. This is what justifies the statement that the return on all non-money assets must always *conform* to that of 'money' (i.e. the interest rate on money).

The explanation given above highlights that the mechanism by which liquidity preference drives changes in the return on non-money assets, through its determination of the 'interest rate on money', is completely different to the conventional relative-price adjustment mechanism that works for clearing the market for ordinary commodities. There is an equilibrium, but it is not necessarily a market clearing one where the demand and supply for non-money assets *must* always meet, because the equilibrium level of return on non-money assets is not determined *within* the market for different non-money assets but is imposed from outside of it by the 'interest rate on money'. Furthermore, the 'interest rate on money' is not determined by the interplay of supply and demand in an imagined 'market for money', so the interest rate is not the 'price' that simultaneously clears the market for money and the market for non-money assets following the interaction between these two markets. That is, we are not discussing a 'general equilibrium' solution either. If the 'equilibrium' level of return on the non-money asset depends on the exogenously determined level of interest rate on money it can be set at levels where there is 'excess demand' for that asset or 'excess supply' for it in the market for that specific asset.

The above explanation has described the mechanism through which changes in liquidity preferences determine the rate of return on non-money assets by identifying the 'interest rate on money' with the liquidity premium of money and defining this 'l' on money as always the highest of any asset. It was based on the explanation given by Keynes (1936) in Chapter 17 of the GT. Some Post Keynesian's have, however, also put forward alternative explanations of how the same mechanism works. Minsky (1975), for example, interpreted Keynes' 'money rate of interest' as a 'discount rate' that equates the present value of money with the value of 'deferred money'. The following statements from Keynes would support this interpretation:

> *'The money-rate of interest (…) is nothing more than the percentage excess of a sum of money contracted for forward delivery, e.g. a year hence, over what we may call the 'spot' or cash price of the sum thus contracted for forward delivery. (Keynes, 1936, p. 141)'*
>
> *'Interest on money means precisely what the books on arithmetic say it means; that is to say it is simply the premium obtainable on current cash over deferred cash…'(Keynes, The theory of the rate of interest, p. 418).*
>
> *'…it is the reward for parting with liquidity for a specified period' (Keynes, 1936, p.167)*

This 'discount rate' is what allows the 'own-rate of interest' of any non-money assets to be converted into 'money terms' (Minsky, 1975). It is through this conversion that investors can compare the

present value of a future stream of returns of any non-money asset in terms of itself with the present value of money. By definition, this means that if the present value of money rises (i.e. liquidity preference increases) the 'discount rate' that converts the future stream of returns on any non-money asset into present money will also rise. The present value in 'money terms' of the return on the non-money asset (the 'q') must therefore *always* be lower than the present value of money when liquidity preferences increase if the present value of money and the 'discount rate' rise together. However, what is crucial to understand is that while there is an 'equilibrium' level of expected returns between different non-money assets, there can be no such thing as an 'equilibrium' level of interest rate that 'clears' the market for money. If there was, there would be no reason for the return on all other assets to always be subordinated to the standard set by the money-rate of interest because it would always be possible for the relative liquidity premiums of money and non-money assets to adjust.

The fundamental reason why money sets the benchmark to which the expected future returns on all other assets have to conform is that in a monetary economy the expected returns of all non-money assets are not meaningful in themselves but only in terms of future money. These expected future returns do not drive the decisions of entrepreneurs in so far as they provide them with specific commodities which will satisfy their subjective utility in the future but in so far as they provide them with a monetary profit. Indeed, how could entrepreneurs compare the current utility with the future utility of a commodity when deciding whether to invest if the relative of utilities of different commodities cannot be compared across time because by definition they are subjective? This is the truly significant implication of the fact that money acts as the standard of value in a monetary economy.

4.1 Applying the theory to the case of the investor in bank equity

We can easily employ the above theoretical framework to also explain why when there is an increase in the liquidity preferences of investors in bank equity the rate of return required by these investors for satisfying the additional demand for capital from banks could well be set at an 'equilibrium' level above the one that 'clears' the market for bank equity. If we re-write the equations specifying the *total return* to the investor of holding deposits (r_D), equity (r_E) and money (i) in the same way as before but ignore 'c' we get:

$$Deposits: \quad r_D = q_D + l_D$$

$$Equity: \quad r_E = q_E + l_E$$

$$Money: \quad i = l_M$$

To this system we add the following equations to determine the liquidity premium of deposits (l_D) and equity (l_E) as a function of the liquidity premium of money (l_M) which is an exogenous variable driven by exogenous changes in liquidity preference:

$$Liquidity\ premium\ on\ deposits: \qquad l_D = \theta l_M$$

$$Liquidity\ premium\ on\ equity: \qquad l_E = \alpha l_M$$

$$\theta > \alpha$$

$$0 < \theta < 1$$

$$0 < \alpha < 1$$

In this system $\theta = \frac{\partial l_D}{\partial l_M}$ and $\alpha = \frac{\partial l_E}{\partial l_M}$, so θ and α are parameters that represent the sensitivity of the liquidity premium attached to bank deposits and bank equity to changes in the liquidity premium on 'money'. We assume that the value of these two parameters are also set exogenously by a particular institutional framework. As argued in section 3, institutions establish a 'hierarchy of money' in which the liquidity premium of bank deposits is always greater than that of bank equity. This ensures that the sensitivity of the liquidity premium of bank deposits to the liquidity premium on money is always greater than that of bank equity (i.e. $\theta > \alpha$). Both parameters ($\theta\ and\ \alpha$) are < 1 because equity and deposits are imperfect substitutes for money. The parameters are also > 0 because equity and deposits are assets that have some degree of 'convertibility' into 'money'. Then, in equilibrium we have that:

$$i^* = l_M^* = r_E^* = r_D^*$$

Substituting in l_M for r_E and r_D and rearranging gives:

$$q_D^* = l_M(1 - \theta)$$

$$q_E^* = l_M(1 - \alpha)$$

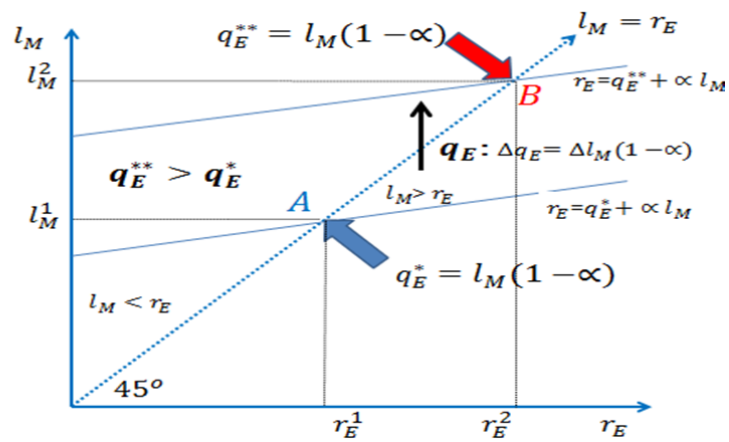
Given that l_M is exogenous we can see that q_E and q_D will always be determined endogenously for a given change in liquidity preference. If we substitute for l_M in equilibrium we get:

$$q_E^* = q_D^* \frac{(1 - \alpha)}{(1 - \theta)}$$

Given that: $> \alpha$, $0 < \theta < 1$, $0 < \alpha < 1$, then it must also always be the case that $q_E > q_D$ or the return on equity must always be higher than that of deposits.

Figure 5 below illustrates this equilibrium relationship. The 45^0 degree line plots all the equilibrium points where $l_M = r_E$. The two schedules that cross the 45^0 line represent the function $r_E = q_E + \alpha l_M$ for two different values of q_E (i.e. q_E^* and q_E^{**}) .

Figure 5: There are multiple levels of q_E at which the total return on equity and liquidity premium are in equilibria



At points *A* and *B*, where the function crosses the 45^0 line, there is no tendency for q_E to change. This means that q_E^* and q_E^{**} are the two unique equilibrium values that keep $l_M = r_E$ for the two specific values of l_M^1/r_E^1 and l_M^2/r_E^2. Starting from equilibrium point A, if l_M increases from l_M^1 to l_M^2, at q_E^* , $r_E^1 < l_M^2$ so r_E would be below its equilibrium value. The only way for equilibrium to be restored is for the intercept of the line to shift upwards which is the same thing as saying that q_E must increase. The increase in q_E necessary to restore equilibrium is: $\Delta q_E = \Delta l_M(1-\alpha)$, where $\Delta l_M = l_M^2 - l_M^1$.

Clearly if the return on equity (q_E) can be determined by an exogenously set level of the liquidity premium of money(l_M), which is the result of the state of liquidity preferences, (i.e. $q_E = l_M(1-\alpha)$), and the only equilibrium condition is that $i = r_E = r_D$, then the new equilibrium level of return on equity q_E does not necessarily have to coincide with the level were the demand for equity is equal to the supply for equity in the equity market. For illustration purposes, we define two simple demand (D_E) and supply (S_E) functions for the equity market and solve for what would need to be the 'market clearing' equilibrium level of q_E:

$$S_E = a + \beta q_E$$

$$D_E = b - \delta q_E$$

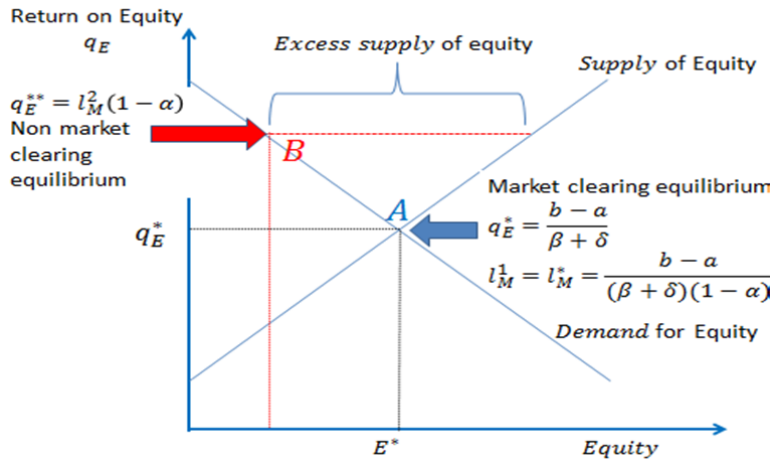
$$S_E = D_E$$

$$q_E^* = \frac{b-a}{\beta+\delta}$$

Given that the system is in equilibrium whenever $l_M = r_E$, for which it is only necessary that $q_E = l_M(1-\alpha)$, then it is only when the exogenous value of the liquidity premium of money exactly equals $l_M = \frac{b-a}{(\beta+\delta)(1-\alpha)}$ that the equilibrium level of q_E would also be a 'market clearing' equilibrium. Figure 6 below illustrates how at point *A*, for example, the equilibrium level of q_E would coincide

with the market clearing level of q_E (i.e. q_E^*). But it also shows that at point *B*, the equilibrium level of q_E (i.e. q_E^{**}) would be one where there is excess supply of equity.

Figure 6: Non-clearing vs clearing equilibrium in the market for equity



At equilibrium levels where $q_E > q_E^*$ equity investors may demand less equity than what banks are trying to place in the market because what matters to them is that the total return on equity matches the return offered by money (i.e. $l_M = r_E$). Paradoxically, equity investors would be willing to buy more equity at a lower return on equity but they will not do so because this would imply a lower return than that offered to them by 'money'.

But why wouldn't investors, even during recessions, simply continue to buy equity from those banks that they continue to regard as relatively healthy and shun those that are not? One could, of course, provide 'asymmetric information', 'moral hazard' or 'adverse selection' explanations as New Keynesians have done. These argue that the asymmetry in access to information about the true state of banks' balance sheets worsens during recessions and that 'bad' banks have more incentives to issue equity than 'good' banks during recessions. One could also use Post Keynesian 'asymmetric expectation' explanations to argue that during recessions the views of investors and banks about the state of the latter's balance sheets diverge by even more than usual.

Keynes' theory of liquidity preference, however, suggests that an alternative explanation can be found in equity investors' unlimited desire to hold 'money' as an irreplaceable store of value in order to preserve the monetary value of their investments. Indeed, the whole point about Keynes' theory is that in recessions the demand for assets that have lost their ability to act as substitutes for 'money' will disappear irrespective of the future monetary return that they promise. When the scramble for liquidity sets in, it becomes apparent that bank equity as an asset category in itself occupies the 'first loss' position within the 'hierarchy of money' irrespective of the bank that issues it. At such times

bank equity is not valued as a relatively 'good' or 'bad' investment in a specific bank, but only as 'money' in relation to other liquid assets within the monetary hierarchy.

4.2 Investor's liquidity preference contrasted with mainstream theory

Mainstream Keynesian economics (Tobin, 1958; Hicks, 1937) has tried to convert Keynes' liquidity preference theory of interest rates back into a conventional theory of market clearing equilibrium prices. Tobin (1958), for example, reduces the 'interest rate on money' to the yield offered by default-free government bonds (the 'money-asset') and counterpoises this to 'money' itself, implying that the liquidity preference theory of interest rates is a theory of arbitrage between two different kinds of money assets. Investors can choose between holding government bonds and 'money' which yields nothing. Government bonds offer a greater 'yield' than money, but this is because holding bonds is more 'risky' than holding money. The reason is that the 'price' of bonds (and hence the market value of the bonds held by the investors) is volatile and fluctuates according to expectations about future changes in interest rates. The investor is therefore trading-off a higher yield on bonds, with the risk of possible capital losses, against the safety of money. The conventional downward sloping demand curve for money depicts this trade-off.

Based on the earlier discussion in this section we can now see why these mainstream interpretations represent a fundamental distortion of Keynes' original liquidity preference theory of interest rates: Firstly, there is no level of yield on government bonds that can ever 'compensate' the investor for 'uncertainty' or 'non-calculable risk' and therefore cause investor's to increase their demand for bonds relative to that for money when uncertainty increases. Only holding more money can 'compensate' investors for 'uncertainty'. Money and default-free government bonds are not substitutable assets when it comes to changes in liquidity preferences and uncertainty. The downward sloping money demand curve therefore cannot explain the demand for money arising from liquidity preferences which was at the core of Keynes' theory of interest rates. Second, there are no different 'money-assets'. Even if different assets possess different liquidity premiums, Keynes was clear in saying that the liquidity premium offered by money can never be matched by that of any other asset regardless of how high a liquidity premium it may also have. Changes in liquidity preferences are about explaining changes in liquidity premium. Third, in Keynes's (1936) theory, changes in liquidity preference produced a positive *not* a negative relationship between the rate of interest on money and the demand for money. Since Hicks (1937) this positive relationship is depicted as the result of a 'shift' in the downward sloping money demand curve caused by an exogenous change in liquidity preferences. This is, however, also at odds with Keynes' theory because, even then, the rise in interest rates relies on the intersection of separate money demand and supply curves. That is, it depends on the 'market' for money clearing. Adjustment in the interest rate on money cannot do away with excesses in the demand or supply for money when these are due to changes in liquidity preferences. Indeed,

Keynes (1936) explained that what characterizes money is precisely the fact that when liquidity preferences increase a rise in the liquidity premium of money does not 'choke-off' excess demand and no matter how much money is accumulated its 'own-rate of interest' rate does not decline. Since Hicks (1937), mainstream theory can only capture this feature as a 'special case' called the 'liquidity trap' in which the interest rate on money does not decline in reaction to an increase in the quantity of money supplied. The implication, of course, is that under 'normal' conditions there is a market for money, where prices clear the relative quantities demanded and supplied in just the same way as happens in markets for ordinary commodities. But the fundamental point of Keynes' theory was precisely to show that it was under 'normal conditions' that there is no such thing as a 'market' for money.

Money has no relative utility compared to other commodities/assets because it is in fact not being exchanged for the sake of obtaining other assets but of obtaining more money in the future. These other assets are in fact only being valued as money and their relative utility is not what is driving the 'exchange' possess. This is the fundamental difference between the logic of what Keynes called a 'real exchange economy' and what he dubbed a 'monetary production economy' to describe how real existing market economies work. Rather than money being the 'means' to facilitate the exchange of commodities with different utilities as in neoclassical economics, the exchange of commodities is the 'means' by which those holding money can obtain more money in the future. This is rather different from a vision of the economic system where the exchange of goods to maximize subjective individual utilities describes the core dynamics of the economic system. Where money is merely a medium for the exchange of those goods and where banks are intermediaries facilitating the inter-temporal exchange of goods between impatient consumers who want to receive goods on credit and patient savers who want to lend them in exchange for future goods.

It is also revealing to highlight how the New Keynesian and Keynesian views about the nature of the risk faced by investors lead to widely diverging interpretations about the relationship between capital and risk-taking. New Keynesians, for example, see equity-capital as a risk-sharing mechanism used by firms to overcome the problem that they have insufficient information to be able to fully control the risks they undertake. Asymmetric information, however, leads investors to ration the supply of equity capital to firms because they fear that the firm still has relatively more information than they do about the risk to which the firm is exposed. They therefore fear that they will inevitably over-pay for their investment and that this will lead them to adversely select the firms they invest in. An interpretation more in line with Keynes' original views would, however, regard capital as a 'risk-taking' not a risk-sharing or risk-reducing mechanism. It would see those who invest in capital also as 'entrepreneurs' who are deliberately exposing their money to the risk of making a loss, knowing that the probability of this loss materializing is something they cannot possibly calculate with any degree of certainty.

The commitment of money today in order to obtain more money in the future is the main motive driving entrepreneurial decisions. This is the reason why 'money' is the only asset that can act as the link through which entrepreneurs' expectations about the future affect their current decision making. The entrepreneur's decision is, however, a risky one that is surrounded by uncertainty. There is no guarantee that a future monetary profit will be forthcoming instead of a monetary loss. But it is precisely because it is a monetary profit that he is after that money can also act as a 'barometer' of the entrepreneur's 'uncertainty' about the future (Keynes, 1937). It acts as a barometer because the greater the degree of uncertainty about the future the greater the amount of money that the entrepreneur will want to hoard in a liquid form rather than commit to an illiquid capital (investment) asset.

5. How capital constraints lead to credit rationing

In section 3.3 we described how a loss of confidence by banks leads them to demand more capital to protect themselves and their liability holders against unexpected losses. Section 4 explained that if this coincides with a loss of confidence also on the part of investors in bank equity (as is likely to happen during a crisis), banks may not be able to raise as much capital as they demand and are willing to pay for in the market. This section focuses on explaining how in such situations the inability of banks to access sufficient equity capital in the market leads them to ration credit to credit-worthy borrowers.

What exactly do we mean by the term 'rationing'? Post Keynesian have employed the term 'credit rationing' to refer to situations where a tightening of banks' credit standards leads them to supply fewer loans than what all of those willing to borrow at the prevailing rate demand (Wolfson, 1996). The reason why these willing borrowers don't receive the loans they demand is that they are no longer classified as 'credit-worthy' by the bank. PKs have also used the term to refer to situations where lenders and borrowers have 'asymmetric expectations' or different perceptions (*not* information) about the risks involved in the potential loan contract (Wolfson, 1996).

The concept of credit rationing which this paper addresses is different. It refers to a situation where once banks settle for a given standard of credit-worthiness not all borrowers meeting that standard have access to bank loans at the prevailing rate or where borrowers meeting banks' credit standards have access to less bank loans than what they would like to at the prevailing rate. As shown by the following quote, this is the definition of credit rationing used by mainstream New Keynesian work on the subject:

> *'We reserve the term credit rationing for circumstances in which either (a) among loan applicants who appear to be identical some receive a loan and others do not, and the rejected applicants would not receive a loan even if they offered to pay a higher interest rate; or (b) there are identifiable groups of individuals in the population who, with a given*

supply of credit, are unable to obtain loans at any interest rate, even though with a larger supply of credit, they would.'(Stiglitz & Weiss, 1981)

When Post Keynesians have in the past criticised the 'imperfect information' foundations of this work they have never actually addressed the same concept of rationing used by New Keynesians. What I wish to justify is that the inability of banks to raise sufficient capital by issuing additional equity in the market will create capital constraints that force them to reduce the size of their balance sheets (to de-leverage) in order to raise again their capital ratio. This 'forced de-leveraging' will produce a situation akin to that of credit rationing because *not all borrowers of the same credit-worthiness* will have access to the amount of borrowing which they wish to undertake. That is, in the presence of two observationally identical borrowers one will receive a loan and the other will not, because the amount of capital available to the bank does not allow it to satisfy the demand from both. It is in this sense that the borrower that does not receive a loan from the bank would have been 'rationed' by it.

There is an important distinction to be made between the concept of 'credit-worthy' and the 'degrees of riskiness' of different borrowers. Both Post Keynesian and New Keynesian 'rationing' theories assume that banks *do not desire* to lend to borrowers that are classified by them as 'not credit-worthy'. Banks, however, classify *credit-worthy* borrowers according to different degrees of risk. They assign higher credit ratings and scores to some companies and individuals than to others. If we therefore simply define 'non credit-worthy' borrowers as those that exceed the maximum 'degree of riskiness' acceptable to the bank, our definition of 'rationing' would remain consistent with that of New Keynesians. But banks typically also take on *limited* amounts of credit-worthy borrowers with different degrees of risk (i.e. from different risk categories). They do so in order to reduce the overall level of risk-exposure through portfolio diversification effects. In this way they make the most efficient use of their available amount of capital. It is this amount of capital, however, that sets the maximum limit to their overall risk-taking capacity. The acceptance of borrowers with different degrees of risk should also not invalidate our claim that we are still using the same definition of 'rationing' than New Keynesians. No matter how diversified the bank is across risk categories it will always take on only a 'limited' amount of credit-worthy borrowers from each risk category. Indeed, the very reason why the bank diversifies its risks is because its overall risk-taking capacity is limited

by the available amount of capital. The fundamental point therefore remains that if two credit-worthy borrowers are given the same credit rating/score by the bank (i.e. the two are observationally equivalent) one will receive credit and the other will not because the overall available risk-taking capacity of the bank cannot accommodate the aggregate volume of loans demanded by both. The borrower that does not receive a loan will be the credit-worthy borrower that is 'rationed' out through the bank's capital constraint.

But how does the process of 'credit rationing' exactly come about as a result of a recession? During recessions a deterioration in banks' balance sheets will automatically cause the regulatory risk-

weights of loans to increase in proportion to the amount of impaired loans against which the bank had not put aside provisions. That is, since banks set aside provisions against 'expected' losses on their loan-book, it is these 'unexpected' losses that will mechanically lower the risk-weighted capital ratio of the bank. If as a result the bank is left below the minimum regulatory ratio it will have no choice but to seek ways to rebuild it. However, since most banks start-off with buffers above the regulatory minimum, the more important consequence will be the fact that these unexpected losses will have shattered the confidence the bank previously had in its own ability to calculate and forecast risk. Independently of the regulatory capital gap that may or may not emerge, the amount of capital that the bank will want to rebuild will be inversely proportional to the weight it now attaches to its previous probabilistic estimates of risk. However, if the confidence that equity investors have in the banking system has also been shattered because of the crisis, then the bank may not be able to find the additional capital in the market.

The banking system could in theory have other ways of restoring its capital ratio during a recession that would avoid it having to reduce the overall size of its balance sheet. We will examine how practical each of these are and to what extent they would invalidate the need for banks to reduce their balance sheet. Banks could retain a higher portion of the profits they are able to generate as capital and to distribute fewer dividends. In fact, this is one of the first measures that banks take when losses on their loans start mounting during recessions. The problem with this solution is that as a recession unfolds by definition there are always less profits to be retained as capital. Another problem is that banks are aware that in the long-run they cannot afford to deliver a lower return on equity to their shareholders than what is conventionally expected of them by the market. This last point is well captured by Post Keynesians like Marc Lavoie who emphasize the importance for banks of meeting pre-established profitability targets (Lavoie, 2014). This means that even if banks seek to cut dividends in the short-run, they will also try to re-structure their balance sheets in order *not* to sacrifice the return to their shareholders for long. Banks could also try to sell part of their assets in order to raise their capital ratio without having to reduce their supply of loans to de-leverage. What characterizes recessions, however, is precisely that asset prices become depressed and that the market for any asset becomes highly illiquid. If banks try to engage in significant volumes of asset sales in such an environment, they will therefore only post losses on these sales which will worsen the capital situation which they were trying to alleviate in the first place. The main avenue open for the banking system to re-establish its previous capital ratio during a recession, is therefore to reduce the amount of new loans that it extends while letting its stock of outstanding loans mature.

But not all assets on banks' balance sheets consume the same amount of bank capital. Banks' capital is 'risk-weighted', which means that some assets impose on them a higher capital requirement than others. This implies that, in theory, banks could also boost their risk-weighted capital ratio by producing new loans (or buying assets) that carry a relatively lower risk weight and allowing the stock

of loans and assets with higher risk-weights to mature without re-placing them with new ones. At first glance, this 're-balancing' or 'substitution' effect would seem to undermine the claim that: 1) banks would still be forced to reduce the overall size of their loan book because of a capital constraint; 2) that even if the reduction of the loan book were to happen, it would still qualify as 'credit rationing' under a definition that requires that not all borrowers deemed credit-worthy by the bank get all their loan demands satisfied. There are several reasons why these two potential objections are not valid:

First, the re-balancing of banks' balance sheets towards lower (or even zero) risk-weighted assets will reduce the marginal consumption of capital by the bank, but it will not bring back the old capital ratio once this has been depleted by loan losses that have already occurred. During recessions banks do in fact accumulate more zero risk-weighted assets like government bonds as they let their existing stock of higher risk-weighted assets mature, but this does not allow them to solve the problem that existing losses on their loan books have already brought down part of their capital below the acceptable ratio. In order for the 'substitution' effect to completely cancel out any need for the bank to de-leverage, the savings in capital generated by it would have to be sufficient to make-up both for the capital consumption that has already occurred due to the recession and the additional capital needs triggered by the lower confidence of the bank. The fact that during a recession the risk-weighted assets of the banking system eventually decline, and do so by more than the non-risk weighted size of the balance sheet, would seem to lend support to the importance of this 'substitution' effect. However, the fact that the overall size of the banking system's balance sheet doesn't stop shrinking either is also evidence of its limitations. The substitution of lower risk assets for higher risk ones can only act as a buffer to stop the problem of undercapitalisation from getting worse but it does not eliminate the existing undercapitalisation problem of banks. In the end banks are anyhow forced to reduce their overall volume of assets.

Second, even if different loan-categories carry different risk-weights they are still *all* deemed to be creditworthy for the bank. The 'substitution effect' discussed above, however implies that some borrowers which are deemed creditworthy by the bank are unable to access all the loans they want simply because their specific type of loan carries a higher risk-weight than others.

Third, this 'substitution effect' is also unlikely to completely cancel out the need for banks to reduce the size of their balance sheets precisely because one of the characteristics of recessions is that the riskiness of all assets increase across the board. The availability of potentially less risky borrowers shrinks while the relative weight of past loans on banks' balance sheets increases. This will cause banks' to ration credit by restricting the supply of new loans to borrowers of equal credit-worthiness.

Fourth, borrowers that fit into each loan category will still receive fewer loans that what they demand independently of the relative risk-weight of their category.

6. Conclusion

Post Keynesians can provide an explanation of credit rationing that poses a significant challenge to the dominant New Keynesian paradigm if they exploit the complementarities between Keynes's theory of liquidity preference and endogenous money. This has been the endeavour of this paper. It has put forward an explanation of why banks ration credit to creditworthy borrowers as a result of the capital constraints they face during recessions. In order to do so it has employed the theory of liquidity preference in three distinct ways: First, it has argued that banks' liability structures are underpinned by a 'liquidity hierarchy' in which banks' ability to have their deposits accepted as substitutes for money depends on the amount of equity capital that is available to them. Second, banks' demand for capital increases during recession because they lose confidence in their previous abilities to calculate risk. Third, given these constraints, credit rationing can emerge from the inability of banks to raise sufficient capital during recessions. This occurs because an increase in the liquidity preferences of investors leads them to restrict the supply of equity capital. The inability of banks to raise sufficient capital to continue extending loans will in turn lead them to ration credit to creditworthy borrowers.

The paper has tried to combine ideas that originate from actual corporate banking theory and practice with Keynesian concepts in order to provide an innovative monetary theory of the role of capital in banking. Firstly, the idea that liabilities representative of equity capital form part of a 'capital structure' designed to protect holders of non-equity liabilities from losses on the bank's balance sheet has been re-interpreted through the lens of endogenous money creation and Minsky's idea of a 'hierarchy of money'. Because banks extend credit by creating liabilities that act as substitutes for money, their ability to do so depends on the existence of a 'liquidity hierarchy' that necessarily underpins their liability structures. Equity capital can act as a constraint on the ability of banks to extend credit because equity is necessary for bank liabilities like deposits to be accepted as money. The quantity of capital that banks demand will therefore partly depend on the confidence with which the public feels that bank liabilities that act as substitutes for money are free from default risk. Second, the corporate finance idea that banking is essentially a risk-taking business in which capital is used by banks to attach a monetary value to the possibility of incurring unexpected losses has been combined with Keynesian ideas of money and uncertainty. Because the possibility of incurring future monetary losses is fundamentally uncertain, capital measures the confidence that banks have in their own probabilistic risk calculations. This confidence can only be measured in monetary terms because the ultimate objective of banking and risk-taking is the pursuit of a future monetary profit not some form of inter-temporal utility maximization. The quantity of capital that banks demand will therefore also depend on the confidence with which banks can make predictions about future potential losses.

The paper has also used Keynesian theory to explain how a rise in the liquidity preferences of investors in bank equity can produce a non-market clearing equilibrium in the market for equity. This occurs because this equilibrium does not depend on the intersection of the demand and supply curves in the market for equity but on the need for the total return derived from investing in equity to match that offered by the liquidity premium on money.

During recessions a loss in confidence by banks in their own risk calculations as well as a loss of confidence by the public in the 'liquidity premium' attached to bank liabilities will lead banks to demand additional capital. If this coincides with a rise in the liquidity preferences of investors in bank equity, banks will not be able to raise as much capital as they demand in the equity market. Banks will become capital constrained. Independently of the regulatory capital ratios imposed by external regulators, banks' existing capital ratios will be viewed as inadequate, by the bank itself as well as its liability holders, to support the risks on their balance sheet. This will cause banks to reduce the size of their balance sheets in order to restore their previous capital ratios. This 'forced de-leveraging' will produce a situation akin to that of credit rationing because not all borrowers of the same creditworthiness will have access to the amount of borrowing which they wish to undertake. That is, in the presence of two observationally identical borrowers one will receive a loan and the other will not, because the amount of capital available to the bank does not allow it to satisfy the demand from both.

REFERENCES

Admati, A. and Hellwig, M. (2013), The Bankers' New Clothes, Princeton.

Baer T., Mehta A., Samandari, H., (2011), 'The use of economic capital in performance management for banks: A Perspective', *McKinsey Working Papers on Risk*, McKinsey & Company

Bell, S. (2001), 'The role of the estate and the hierarchy of money', *Cambridge Journal of Economics*, 25, pp. 149-163.

Brainard, W.C. and J. Tobin (1968) 'Pitfalls in financial model building', *American Economic Review*, 58 (2) (May), pp. 99-122.

Blinder, A.S. (1987), 'Credit rationing and effective supply failures', *The Economic Journal*, Vol. 97 (June).

Chick, V. (1993), 'Keynes's monetary theory: A partial survey', Outubro-Dezembro, *Revista de Economia Politica,* Vol. 13, No. 4

Chick, V. and Sheila, D. (2002), 'Monetary policy with endogenous money and liquidity preference: A nondualistic treatment', *Journal of Post Keynesian Economics*, Summer, Vol 24., No. 4, pp.587-607.

Chick, V. (2005) 'Lost and found: Some history of endogenous money in twentieth century', in Fontana, G., and Realfonzo R. (eds.), *The Monetary Theory of Production: Tradition and Perspectives*, Palgrave.

Chick, V. and Sheila, D. (2013), 'Post-Keynesian Theories of Money and Credit: Conflicts and (Some) Resolutions', in G C Harcourt and P Kriesler (eds) *Handbook of Post-Keynesian Economics*. Oxford: Oxford University Press, vol. 1, 2013: 152-66.

Davidson, P. (1984) 'Reviving Keynes's revolution', *Journal of Post Keynesian Economics*, Summer, Vol. VI., No 4, 561-575.

Davidson, P. (2006), 'Keynes and Money', in P Arestis and M Sawyer (eds) *A Handbook of Alternative Monetary Economics*. Edward Elgar: 139-153.

De Jager, P. (2014), 'Fair value accounting, fragile bank balance sheets and crisis: A model', *Accounting, Organizations and Society*, No. 39, pp. 97-116.

Dow, S. (1996), 'Horizontalism: A critique', Cambridge Journal of Economics, 20 (4), pp. 497-508.

Dow, S. (1998), 'Knowledge, Information and Credit Creation', in R. Rotheim (ed.) *New Keynesian Economics/Post Keynesian Alternatives*: Routledge Frontiers of Political Economy, London: Routledge, pp. 214-226.

Dow, S. (2006), 'Endogenous Money: Structuralist', in P. Arestis, M. Sawyer (ed.) *Handbook of Alternative Monetary Economics*, Cheltenham: Edward Elgar, pp. 35-51.

Dymski, G. (1993), 'Keynesian uncertainty and asymmetric information: Complementary or contradictory?' *Journal of Post Keynesian Economics*, Fall, 16 (1), 49-54.

European Central Bank (2015) 'The euro area bank lending survey'

Eichner, A.S., & Kregel, J.A. (1975) 'An essay in Post-Keynesian theory: A new paradigm in economics', *Journal of Economic Literature,* Vol. 13, No.4, pp.1293-1314.

Fazzari, S., & Variato, AM. (1994), 'Asymmetric information and Keynesian theories of investment', *Journal of Post Keynesian Economics*, Spring, 16 (3), 351-370.

Federal Reserve Board (2015) 'Senior loan officer opinion survey on bank lending practices'

Freixas, X. and Rochet, J.C. (2008), Microeconomics of Banking. Cambridge Massachusetts: The MIT Press

Giovanni B. and Emanuele C. (2013), 'A simple model of income, aggregate demand, and the process of credit creation by private banks', *Levy Economics Institute of Bard College*, (October), Working Paper No. 777

Godley, W. and M. Lavoie. (2012), *Monetary Economics: An Integrated Approach to Credit, Money, Income, Production and Wealth*. Palgrave Macmillan.

Goodhart, C., Tsomocos, D., and Schubik, M. (2013), 'Macro-modelling, default and money', *LSE Financial Markets Group Special Papers Series*, Special paper 224.

Greenwald, B.C. and Stiglitz, J.E., Weiss, A. (1984) 'Informational imperfections in the capital market and macroeconomic fluctuations', *American Economic Review*, Vol. 74 No.2, pp. 194-199.

Greenwald, B.C. and Stiglitz, J.E. (1990) 'Macroeconomic Models with Equity and Credit Rationing', Hubbard G.R. (ed.) in *Asymmetric Information, Corporate Finance and Investment*, University of Chicago Press.

Greenwald, B.C. and Stiglitz, J.E. (2003), *Towards a new paradigm for monetary economics*, Cambridge University Press.

Hayes, M.G. (2003), *Investment and finance under fundamental uncertainty*, unpublished PhD dissertation, University of Sunderland.

Hayes, M.G. (2006), *The Economics of Keynes,* Cheltenham UK, Edward Elgar

Jaffee, D. and Stiglitz, J. (1990), 'Credit rationing', in B.M. Friedman and F.H. Hahn (eds), *Handbook of Monetary Economic*, Vol. II, North Holland, pp. 837-888.

Jacques, K.T. (2008) 'Capital shocks, bank asset allocation, and the revised Basel Accord'. *The Review Financial Economics*, 17, pp. 79-91

Kaldor, N. (1970), 'The new monetarism', Lloyds Bank Review, July, 1-17.

Kaldor, N. (1982), 'The scourge of monetarism', Oxford: Oxford University Press.

Kaldor, N. (1985), 'Lessons of the monetarist experiment', in *Monetary conditions for economic recovery*, Financial and Monetary Policy Studies, Vo. 11, pp.243-262.

Kalecki, M. (1937), 'The principle of increasing risk', *Economica*, 4 (76), November, 441-7

Keynes, J.M. (1930), *A Treatise on Money* (London: Macmillan), in J.M. Keynes, *The Collected Writings of J.M. Keynes*, vols. V-VI, London Macmillan, 1971.

Keynes, J.M. (1933), 'A monetary theory of production', in J.M. Keynes, *The Collected Writings of J.M. Keynes*, vol. XIII, London Macmillan, 1973.

Keynes, J.M. (1937a), 'The general theory of employment', *The Quarterly Journal of Economics*, No. 51 (February), pp.209-223.

Keynes, J.M. (1937b), 'Alternative theories of the rate of interest', *The Economic Journal*, No. 47 (June).

Keynes, J.M. (1937c), 'The ex-ante theory of the rate of interest', *The Economic Journal*, No. 47.

Keynes, J.M. (2007), *The General Theory of Employment Interest and Money*, New York: Palgrave Macmillan.

Kopecky, K. J. and VanHoose, D. (2004), 'A model of the monetary sector with and without binding capital requirements,' *Journal of Banking & Finance*, Elsevier, vol. 28(3), pages 633-646, March.

KPMG (2003), 'Basel II – A closer look: Managing Economic Capital'

Lavoie, M. (1992), *Foundations of Post-Keynesian Economic Analysis*. Edward Elgar Publishing.

Lavoie, M. (2014), *Post-Keynesian Economics: New Foundations*. Edward Elgar Publishing.

Le Heron, E., (2008), 'Monetary and Fiscal Policies in a Post Keynesian stock-flow consistent model', in Wray, R. and Forstater, M. (eds.), *Keynes and macroeconomics after 70 years: Critical assessments of the general theory*, Edward Edgar: Cheltenham, pp.279-308

Minsky, H.P. (2008), *John Maynard Keynes*. McGraw-Hill.

Minsky, H.P. (2008), *Stabilizing an Unstable Economy*. McGraw-Hill.

Modigliani, F. and Miller, M.H. (1958), 'The cost of capital, corporate finance and the theory of investment', American Economic Review, 48(3), pp. 261-297.

Moore, B. (1988), *Horizontalists and verticalists: The macroeconomics of credit money,* Cambridge: Cambridge University Press.

Moore, B. (2006), *Shaking the invisible hand: Complexity, endogenous money and exogenous interest rates,* Palgrave Macmillan.

Myers, S.C. and Majluf, N.S. (1984), 'Corporate finance and investment decisions when firms have information that investors do not have', *Journal of Financial Economics* 13, pp.187-221.

Neal, P., (1994), 'Credit rationing and uncertainty: complementarity in Post Keynesian and New Keynesian Monetary Economics?', The University of Adelaide, Working Paper 94-1

Palley, T.I. (1987/88), 'Bank lending, discount window borrowing, and the endogenous money supply: A theoretical framework', *Journal of Post Keynesian Economics*, X (2), 282-303

Palley, T.I. (1996), 'Accommodationism versus structuralism: time for accommodation', *Journal of Post Keynesian Economics*, 18 (4), Summer, 585-94.

Palley, T.I. (2013), 'Horizontalists, verticalists and structuralists: The theory of endogenous money reassessed', IMK Working Paper No. 121 (June)

Repullo R. and Suarez, J. (2013), 'The Procyclical effects of bank capital regulation', *Review of Financial Studies*, Society for Financial Studies, Vol. 26 (2), pp.452-490.

Rocholl, J., Puri, M., and Steffen, S (2010), 'Global Retail Lending in the Aftermath of the US Financial Crisis: Distinguishing between Supply and Demand Effects', *Journal of Financial Economics*.

Stiglitz, J.E. and Weiss, A. (1981) 'Credit rationing in markets with imperfect information', *American Economic Review* 71, pp. 393–410.

Thakor, A.V. (1996) 'Capital Requirements, Monetary Policy and Aggregate Bank Lending: Theory and Empirical Evidence', Journal of Finance 51-1, March 1996, 279-324.

Tobin, J. (1958), 'Liquidity preference as behaviour towards risk', *Review of Economic Studies*, 25 (1), 65-86.

Tobin, J. (1963), 'Commercial banks as creators of money', in Carson D. (ed.), *Banking and Monetary Studies*, Homewood, IL, Irwin, pp. 408-19.

Wolfson, M. H. (1996), 'A Post Keynesian theory of credit rationing', *Journal of Post Keynesian Economics,* (Spring) Vol. 18, No. 3, pp.443-470.

Wray, L.R. (1999) 'Theories of value and the monetary theory of production', *Working Paper No. 261*, The Jerome Levi Economics Institute.

Wray, L.R. (2006), 'Keynes's approach to money: An assessment after 70 years', (January) The Levy Economics Institute of Bard College, Working Paper No. 438.