International Review of Financial Analysis 46 (2016) 361–379

Contents lists available at ScienceDirect

International Review of Financial Analysis

A lost century in economics: Three theories of banking and the conclusive evidence☆

Richard A. Werner

Centre for Banking, Finance and Sustainable Development, Southampton Business School, University of Southampton, United Kingdom

ARTICLE INFO

Available online 8 September 2015

JEL classification:
E30
E40
E50
E60

Keywords:
Bank accounting
Bank credit
Credit creation
Economics
Financial intermediation
Foreign borrowing
Fractional reserve banking
Money creation

ABSTRACT

How do banks operate and where does the money supply come from? The financial crisis has heightened awareness that these questions have been unduly neglected by many researchers. During the past century, three different theories of banking were dominant at different times: (1) The currently prevalent *financial intermediation theory of banking* says that banks collect deposits and then lend these out, just like other non-bank financial intermediaries. (2) The older *fractional reserve theory of banking* says that each individual bank is a financial intermediary without the power to create money, but the banking system collectively is able to create money through the process of 'multiple deposit expansion' (the 'money multiplier'). (3) The *credit creation theory of banking*, predominant a century ago, does not consider banks as financial intermediaries that gather deposits to lend out, but instead argues that each individual bank creates credit and money newly when granting a bank loan. The theories differ in their accounting treatment of bank lending as well as in their policy implications. Since according to the dominant *financial intermediation theory* banks are virtually identical with other non-bank financial intermediaries, they are not usually included in the economic models used in economics or by central bankers. Moreover, the theory of banks as intermediaries provides the rationale for capital adequacy-based bank regulation. Should this theory not be correct, currently prevailing economics modelling and policy-making would be without empirical foundation. Despite the importance of this question, so far only one empirical test of the three theories has been reported in learned journals. This paper presents a second empirical test, using an alternative methodology, which allows control for all other factors. The financial intermediation and the fractional reserve theories of banking are rejected by the evidence. This finding throws doubt on the rationale for regulating bank capital adequacy to avoid banking crises, as the case study of Credit Suisse during the crisis illustrates. The finding indicates that advice to encourage developing countries to borrow from abroad is misguided. The question is considered why the economics profession has failed over most of the past century to make any progress concerning knowledge of the monetary system, and why it instead moved ever further away from the truth as already recognised by the credit creation theory well over a century ago. The role of conflicts of interest and interested parties in shaping the current bank-free academic consensus is discussed. A number of avenues for needed further research are indicated.

1. Introduction

The failure by leading economists to incorporate banking in their economic theories has been identified as a significant and costly weakness (Werner, 1997, 2005; Kohn, 2009). Likewise, it has been pointed out that the macro-economic feedback of banking activity had been neglected in finance research (Werner, 2012). Recognition of these shortcomings has led to the emergence of 'macro finance' as a new discipline, nested within the finance research agenda. The present paper contributes to this growing literature by addressing a long-standing central dispute about the role and function of banks, which has major implications for monetary and macroeconomics, finance and banking, as well as government policy: it is the question whether a bank lends existing money or newly creates the money it lends.

As Werner (2014b) showed, during different time periods of the 20th century, one of three distinct and mutually exclusive theories of banking has been dominant: The oldest, the *credit creation theory of banking*, maintains that each bank can individually create money 'out of nothing' through accounting operations, and does so when extending a loan. The *fractional reserve theory* states that only the banking system as a whole can collectively create money, while each individual bank is a

☆ The author would like to thank Mr. Marco Rebl and Mr. Michael Betzenbichler, directors of Raiffeisenbank Wildenberg e.G., for their interest, time and kind co-operation. Without them and Mr. Rebl's ideas and suggestions the test reported in this paper would not have taken place. The author also wishes to thank Plamen Ivanov and Shamsher Dhanda for their capable research assistance. Many thanks to Professor Brian Lucey, the editor, and Dr. Duc Nguyen, the editor of the special issue, and to a capable anonymous referee for pertinent and helpful comments. Finally, should grains of wisdom be found in this article, the author wishes to attribute them to the source of all wisdom (Jeremiah 33:3).

E-mail address: werner@soton.ac.uk.

http://dx.doi.org/10.1016/j.irfa.2015.08.014

mere financial intermediary, gathering deposits and lending these out. The *financial intermediation theory* considers banks as financial intermediaries both individually and collectively, rendering them indistinguishable from other non-bank financial institutions in their behaviour, especially concerning the deposit and lending businesses, being unable to create money individually or collectively.

Although various economists support each of the three theories, and despite the pivotal significance for research and policy, the question which of the three theories is accurate has until recently not been empirically examined. The first empirical test published in a learned journal on this issue was Werner (2014b), in which the author obtained the cooperation of a bank to examine the actual operations and accounting entries taking place when a 'live' bank loan is granted and paid out. It was found that only the credit creation theory was consistent with the observed empirical evidence. However, as a 'live' empirical test of a bank in operation, the test design did not allow a fully controlled environment: Advances in IT and service offerings mean that bank operations take place continuously, even 'after hours' and during holidays (thanks to online banking and round-the-clock banking IT systems). As a result, during the observation interval of one day, other transactions took place in addition to the test transaction. While the final results of the test were unambiguous, a number of aggregated uncontrolled factors had to be jointly evaluated. Therefore as a robustness check it would be desirable to test the three theories of banking using a different methodology, in a fully controlled environment, without the potential interference from other transactions.

The main contribution of the present paper is to provide such an alternative empirical test, allowing complete control of all other factors. For this purpose, use is made of the fact that modern banking and its constituent accounting operations take place entirely within the IT systems of banks. In this paper a controlled test design is proposed that uses the relevant banking software to simulate a bank loan transaction and booking it as if it was a real transaction. While humans may change their behaviour in such simulation situations when they become aware of the nature of the test, such potential bias does not apply to software code. The test of booking a bank loan in banking software yields the finding that the credit creation theory of banking alone conforms to the empirical facts, providing a separate and different corroboration of the findings in Werner (2014b).

The results from the test on bank lending are used to throw new light on capital adequacy-based bank regulation (such as the Basel III/CRR approach) and its alleged ability to prevent banking crises, illustrated through the case of the capital raising by Swiss bank Credit Suisse in 2008. It is found that capital adequacy-based bank regulation cannot prevent banking crises. Instead, it is noted that central bank guidance of bank credit and banking systems dominated by small banks have a superior track record in generating stable growth without crises.

Furthermore, the question is asked why the economics profession has singularly failed over most of the past century to make any progress in terms of knowledge of the monetary system, and instead moved ever further away from the truth as already recognised by the credit creation theory well over a century ago. The role of conflicts of interest is discussed and a number of avenues for needed further research are indicated.

The paper is structured as follows: The second section will briefly survey the literature on the three theories of banking and their differing accounting implications. Section 3 presents the new empirical test. Section 4 analyses and interprets the results. Section 5 applies the insights to examining capital adequacy-based bank regulation, considering the case of Credit Suisse. Section 6 discusses the implications for development policies, and specifically, the advice for developing countries to borrow from abroad in order to stimulate economic growth. Section 7 considers the failure by academic and central bank economists to make progress for a century concerning the role of banks. Closing words are recorded in Section 8.

2. A brief overview of the three main theories of banking and their accounting

Like Werner (2014b), this brief literature review is confined to works by authors who are concerned with banks that cannot issue bank notes. With a few exceptions, the citations differ from those in Werner (2014b) and are meant to complement them. Several authors of the 'Austrian' and 'post-Keynesian' schools of thought are included, which had not been cited by Werner (2014b).

2.1. The financial intermediation theory of banking

The presently dominant *financial intermediation theory* holds that banks are merely financial intermediaries, not different from other non-bank financial institutions: they gather deposits and lend these out (Fig. 1). In the words of recent authors, "Banks create liquidity by borrowing short and lending long" (Dewatripont, Rochet, & Tirole, 2010), meaning that banks borrow from depositors with short maturities and lend to borrowers at longer maturities.

The financial intermediation theory of banking is publicised by highly ranked economics journals, and also includes some well-known economists. Examples are Keynes (1936); Gurley and Shaw (1955); Tobin (1963, 1969); Sealey and Lindley (1977); Diamond and Dybvig (1983); Baltensperger (1980); Diamond (1984, 1991, 1997); Eatwell, Milgate, and Newman (1989); Gorton and Pennacchi (1990); Bencivenga and Smith (1991); Bernanke and Gertler (1995), Rajan (1998), Myers and Rajan (1998), Allen and Gale (2004a, 2004b); Allen and Santomero (2001); Diamond and Rajan (2001); Kashyap, Rajan, and Stein (2002); Matthews and Thompson (2005); Casu and Girardone (2006); Dewatripont et al. (2010); Gertler and Kiyotaki (2011) and Stein (2014).

Earlier proponents of this theory include von Mises (1912), who wrote:

> "The activity of the banks as negotiators of credit is characterised by the lending of other people's, that is, of borrowed, money. Banks borrow money in order to lend it; … Banking is negotiation between granters of credit and grantees of credit. Only those who lend the money of others are bankers; those who merely lend their own capital are capitalists, but not bankers"
>
> (Mises, 1980, p. 294f).

While Mises argued that this was only one of the functions of banks,[1] Keynes (1936) in his *General Theory* clearly states that for investments to take place, savings first need to be gathered. This view has also been reflected in the Keynesian growth models by Harrod (1939) and Domar (1947), which are based on the *financial intermediation theory of banking*, although not explicitly modelling banks. Indeed, this theory provides the justification for failing to incorporate banks and the way they operate in economic models. Harrod and Domar's conclusions have had a significant influence on economic policy in the post-war era, as their work has been interpreted to the effect that developing countries could be helped by international banks who could provide missing domestic savings through their

[1] Von Mises also pointed out that

> "…those banks that issue notes or open current accounts… have a fund from which to grant loans, over and above their own resources and those resources of other people that are at their disposal"
>
> (Mises, 1980, p. 304).

Mises (1912) thought that banks could act either as financial intermediaries, in which case they would not create money, or at times stop being financial intermediaries and function as creators of credit and money. How this should be reflected in terms of bank accounting remains unclear and doubtful. This line of thinking may, on a high level, however have prepared the ground for the idea that banks could be financial intermediaries on the one hand and on the other, somehow, create money — a position that the *fractional reserve theory* maintains.

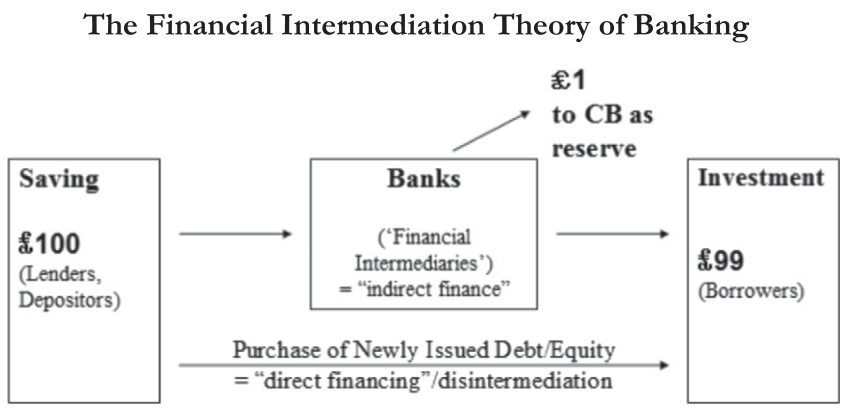

Fig. 1. The financial intermediation theory of banking.
Source: Werner (2005).

lending from abroad in order to fund economic growth. This logic has resulted in a significant increase in foreign borrowing and indebtedness by developing countries since the second world war.

Gurley and Shaw (1955, 1960) argue that banks and non-bank financial institutions largely share the function of being financial intermediaries, thus arguing that there is nothing special about banks. Tobin (1963) backed this view in his influential work. He argued:

> "The distinction between commercial banks and other financial intermediaries has been too sharply drawn. The differences are of degree, not of kind... In particular, the differences which do exist have little intrinsically to do with the monetary nature of bank liabilities… The differences are more importantly related to the special reserve requirements and interest rate ceilings to which banks are subject. Any other financial industry subject to the same kind of regulations would behave in much the same way" (p. 418).

Since in many countries, such as the UK, today there are neither interest rate ceilings nor reserve requirements for banks, Tobin's classification of banks as financial intermediaries should hold true more than ever, since he staked any differences between banks and non-bank financial intermediaries on these.

Sealey and Lindley (1977) develop a production theory for depository institutions:

> "The transformation process for a financial firm involves the borrowing of funds from surplus spending units and lending those funds to deficit spending units, i.e. financial intermediation" (p. 1252).

> "…the production process of the financial firm, from the firm's viewpoint, is a multistage production process involving intermediate outputs, where loanable funds, borrowed from depositors and serviced by the firm with the use of capital, labor and material inputs, are used in the production of earning assets" (p. 1254).

Baltensperger (1980) also believes banks are merely financial intermediaries, unable to create money, and instead engaging in a somewhat vague process of 'risk transformation':

> "The main economic functions of financial firms are those of consolidating and transforming risks on the one hand, and of serving as dealers or 'brokers' in the credit markets… on the other hand" (p. 1).

Riordan (1993) holds that

> "Banks serve as financial intermediaries between borrowers and lenders. More precisely, banks borrow from depositors and lend to investors…. In a capitalist economy most investment projects are owned and managed by private entrepreneurs and firms. Generally these investors lack enough equity fully to finance their projects and consequently seek loans to complete financing. Banks, on the other hand, aggregate deposits to make these loans" (p. 328).

Kashyap et al. (2002) believe that banks are pure financial intermediaries, presenting a model of banking in which a bank purchases assets with funds it had acquired in the form of deposits or the issuance of equity or bonds. The authors seem to be envisaging a cash-based economy, whereby deposits constitute amounts of cash paid in:

> "The total assets to be financed at date 0 are $L + S_0$. They are financed partly by demandable deposits…. In addition to deposits, the bank can also issue claims in the public market…. These claims mature at date 2, and can be thought of as either bonds or equity" (p. 41).

The more recent and substantial 'credit view' literature (such as Bernanke and Blinder, 1988; Bernanke and Gertler, 1995), the monitoring literature on financial intermediation (Diamond, 1984; Sheard, 1989), and the sizeable literature on the various other theories of financial intermediation, do not distinguish banks from other non-bank financial institutions (see, for instance, Casu et al., 2006). The authors in these branches of the literature hold that banks are just another type of financial intermediary among many, without the power to create credit in any way.

Influential textbooks on money and banking are also proponents of the *financial intermediation theory*, such as that by Cecchetti (2008), who does not consider banks able to create credit or money:

> "…an institution like a bank stands between the lender and the borrower, borrowing from the lender and then providing the funds to the borrower" (p. 39)

…or the banking textbook by Casu et al. (2006):

> "Banks, as other financial intermediaries, play a pivotal role in the economy, channelling funds from units in surplus to units in deficit. They reconcile the different needs of borrowers and lenders by transforming small-size, low-risk and highly liquid deposits into loans which are of larger size, higher risk and illiquid (transformation function)" (p. 18).

Matthew and Thompson (2005) state that banks first need to obtain deposits in order to be able to lend:

> "Financial intermediation refers to borrowing by deficit units from financial institutions rather than directly from the surplus units themselves. Hence, financial intermediation is a process which involves surplus units depositing funds with financial institutions who in turn lend to deficit units" (p. 33).

> "An exogenous increase in the demand for loans shifts the LL schedule up to LL' and increases the loan rate. The bank (or banking system in the case of a non-monopoly bank) will respond by supplying more loans and deposits. To attract more deposits, the bank (banking system) will bid for deposits by increasing the deposit rate" (p. 110).

As there is no clear distinction of banks from non-banks in such models, economists also see no reason why banks need to be singled out for special treatment or indeed included in their macroeconomic theories at all. Thus it came to pass that the seminal articles in leading journals and widely-used macroeconomics and monetary economics textbooks have long dropped out banks entirely: banks do not feature at all in 'advanced macroeconomics' or 'advanced monetary economics' textbooks, such as the influential 785-page tome by Woodford (2003), the 820 pages of Heijdra and Van der Ploeg (2002) or the 751 pages of Sorensen and Whitta-Jacobsen (2010).

Finally, even recent popular discussions of banking, written by finance or economics professors with the hindsight of the financial crisis of 2008, continue to present banks as mere financial intermediaries:

> "…banks make their profits by taking in deposits and lending the funds out at a higher rate of interest"
>
> (Krugman, 2015).

> "The bank acts as an intermediary, channeling money from thousands of depositors and other investors to its loan clients"
>
> (Admati and Hellwig, 2012, p. 50).

> "The use of deposits to fund loans has been a standard practice in banking for centuries"
>
> (op. cit., p. 51).

> "…the use of deposits and short-term debt to fund loans has gone on for centuries and is enshrined in banking textbooks…"
>
> (op. cit., p. 51).

> "…banks benefit the economy by taking deposits and making loans. Of these two activities, deposit taking is unique to banks. Loans can also be made by any other institution that has the capacity to assess the loan applicants' creditworthiness and to monitor their performance. The concentration of banks on lending is due to ready availability of funds from deposits"
>
> (op. cit., p. 148).

2.2. The fractional reserve theory of banking

This theory of banking also argues that each bank is a financial intermediary. However, it disagrees with the former theory concerning the collective, macroeconomic role of banks: it argues that, together, the banking system creates money, through the process of 'multiple deposit expansion'. Thus when Gurley and Shaw (1955) argued that banks and non-bank financial institutions are largely similar in that they were both financial intermediaries able to 'create financial claims', they were challenged during the 1950s and 1960s in influential journals by, among others, Culbertson (1958), Aschheim (1959), Warren Smith (1959), Solomon (1959), Paul Smith (1966) and Guttentag and Lindsay (1968), many of whom were supporters of the *fractional reserve theory*.[2] Phillips' citation of the credit or money multiplier rendered him one of the earlier and most influential economists to formulate the mechanics of fractional reserve banking.[3] According to Phillips:

> "What is true for the banking system as an aggregate is *not* true for an individual bank that constitutes only one of many units in that aggregate."
>
> (Phillips, 1920, p. 40).

Crick (1927) is another supporter of this theory. He argues that while each bank is a financial intermediary, the system as a whole can create money. Like later Keynes and Tobin, Crick adopted the habit of placing the concept of creation in inverted commas ('credit "creation"'). This implies scepticism, if not even derision and ridicule for those who believe in the ability of banks to create credit. While not entirely denying the potential for banks to create credit and money, Crick (1927) and colleagues succeeded in downplaying the significance of any such action and re-assuring the public – or academia – that all was under control, as the money creation was the result of a kind of diffuse process, a technical detail that experts might debate, but which was of little direct consequence for the economic model builder.

Friedrich von Hayek's first book revealed him to be also a supporter of the *fractional reserve theory of banking* (Hayek, 1929, p. 90): He argued that with a reserve of 10%, every bank would lend out 90% of any deposit, which would increase deposits with other banks, resulting in a multiple creation of deposits in the banking system.

Meanwhile, Keynes (1930) supports the *fractional reserve theory*, citing both Phillips (1920) and Crick (1927) approvingly (p. 25). But he then discusses the concept of money 'creation' by referring to any increase in bank deposits as the 'creation' of deposits:

> "There can be no doubt that, in the most convenient use of language, all deposits are 'created' by the bank holding them. It is certainly not the case that the banks are limited to that kind of deposit, for the creation of which it is necessary that depositors should come on their own initiative bringing cash or cheques" (p. 30).

Keynes may have been referring to bank transfers as the kind of deposit that allows a bank to 'create' a deposit, while remaining a mere financial intermediary, since Keynes (1930) deploys the expression 'creation of deposits' also for the instance of a cash deposit at a bank (p. 24), arguing that:

> "only the bank itself can authorise the creation of a deposit in its books entitling the customer to draw cash or to transfer his claim to the order of someone else" (p. 24).

---

[2] Smith (1959), for instance, argues in the *Quarterly Journal of Economics* that banks 'can create money' and that "their credit-creating activities expand the supply of loanable funds available to finance expenditure". …

> "Commercial banks do have a special ability to expand credit for a reason that is simple but often overlooked…. What is truly unique... about commercial banks is… their distinctive role as issuers of means of payment [which] gives commercial banks a peculiar ability to expand credit" (p. 535).

Smith argues that banks are (presumably in aggregate) not financial intermediaries and their function is distinct from that of financial intermediaries (what in modern parlance is referred to as 'non-bank financial intermediaries'). According to Smith, the money creation by banks is due to a 'multiplier process' (which he also calls the "credit expansion multiplier" or "multiple credit creation"):

> "Commercial bank credit creation makes funds available to finance expenditures in excess of the funds arising out of the current income flow. Intermediaries, to the extent that their activities are as described so far, merely collect a portion of current voluntary saving and serve the function of making these funds available for the financing of current expenditures — i.e., they help to channel saving into investment in a broad sense. Thus, intermediaries are exactly what their name indicates. Commercial banks, on the other hand, are distinctly not intermediaries" (p. 538).

[3] Earlier authors include Marshall (1890).

So 'deposit creation' "in the most convenient use of language" here is simply the act of recording a deposit in the bank's account, i.e. a bank accounting entry. If the adjustment of an account is termed the 'creation' of such an accounting record, by this definition banks are of course 'creating' entries whenever a transaction is made. However, by this definition any non-bank corporation would equally be 'creating' assets and liabilities on its balance sheet, whenever a transaction is entered into the firm's accounts. Thus Keynes' terminology does not serve to clarify.

The widely read contemporary textbook by Stiglitz (1997) also favours the *fractional reserve theory*, and mirrors Keynes' ambiguous terminology:

> "The process of multiple-deposit creation may seem somewhat like a magician pulling rabbits out of a hat: it seems to make something out of nothing. But it is, in fact a real physical process. Deposits are created by making entries in records; today electronic impulses create records on computer tapes. The rules of deposit creation are rules specifying when you may make certain entries in the books. It is these rules – in particular, the fractional reserve requirements – that give rise to the system's ability to expand deposits by a multiple of the original deposit increase"
>
> (Stiglitz, 1997, p. 737).

Again, the 'creation' of deposits and loans is defined by the creation of an accounting record. Such terminology distracts from the question whether individual banks can uniquely create new purchasing power out of nothing, and hence cause an increase in total balances without a commensurate decrease. But at least Stiglitz's adherence to the *fractional reserve theory of banking* is clear-cut.

What must be the most influential post-war textbook in economics — that by Samuelson (1948) — squarely addresses the question at hand: The original first edition deals with the third theory of banking, the *credit creation theory* and dismisses it. Under the heading "Can banks really create money?", Samuelson argues against "false explanations still in wide circulation" (p. 324):

> "According to these false explanations, the managers of an ordinary bank are able, by some use of their fountain pens, to lend several dollars for each dollar left on deposit with them. No wonder practical bankers see red when such behavior is attributed to them. They only wish they could do so. As every banker well knows, he cannot invest money that he does not have; and any money that he does invest in buying a security or making a loan will soon leave his bank" (p. 324).

Samuelson also supports the *fractional reserve theory of banking* and holds that a bank needs to gather the funds first, before it can extend bank loans. At the same time he argues that, in aggregate, the banking system creates money. He illustrates his argument with the example of a 'small bank' that faces a 20% reserve requirement and considers the balance sheet accounts of the bank. If this bank receives a new cash deposit of $1000, "What can the bank now do?", Samuelson asks (p. 325).

> "Can it expand its loans and investments by $4000 so that the change in its balance sheet looks as shown in Table 4b?"

Table 4b
Impossible situation for single small bank.

Assets		Liabilities	
Cash reserves……	+$1,000	Deposits……	+$5,000
Loans and investments….	+$4,000		
Total……	+$5,000	Total……	+$5,000

Samuelson (1948, p. 325)

> "The answer is definitely 'no'. Why not? Total assets equal total liabilities. Cash reserves meet the legal requirement of being 20% of total deposits. True enough. But how does the bank pay for the investments or earning assets that it buys? Like everyone else it writes out a check – to the man who sells the bond or signs the promissory note. … The borrower spends the money on labor, on materials, or perhaps on an automobile. The money will very soon, therefore, have to be paid out of the bank. … A bank cannot eat its cake and have it too. Table 4b gives, therefore a completely false picture of what an individual bank can do" (p. 325f).

Samuelson argues that since all the money lent out will leave the bank, after loan extension the true balance sheet of this bank that has received a new deposit of $1000 will look as follows (Table 4c):

Table 4c
Original bank in final position.

Assets		Liabilities	
Cash reserves……	+$ 200	Deposits……	+$1,000
Loans and investments….	+$ 800		
Total……	+$1,000	Total……	+$1,000

Samuelson (1948, p. 326)

Thus Samuelson argues that an individual bank cannot create credit out of nothing, while the banking system can do so:

> "As far as this first bank is concerned, we are through. Its legal reserves are just enough to match its deposits. There is nothing more it can do until the public decides to bring in some more money on deposit" (p. 326).

> "The banking system as a whole can do what each small bank cannot do!" (p. 324),

namely create money. Samuelson then describes the iterative process of a new loan by one bank becoming another bank's deposits, and so forth. He calls this a "chain of deposit creation", which shows total deposits in the banking system of $5000 having come about from an initial $1000 loan, with a reserve requirement of 20%, implying a 'money multiplier' of 5 times. As a result the consolidated balance sheet of the banking system is shown by Samuelson as follows (Table 4i):

Table 4i
Consolidated balance sheet showing final positions of all banks together.

Assets		Liabilities	
Cash reserves……	+$1,000	Deposits……	+$5,000
Loans and investments….	+$4,000		
Total……	+$5,000	Total……	+$5,000

(Samuelson, 1948, p. 329)

> "If the reader will turn to Table 4b previously marked *impossible*, he will see that the whole banking system can do what no one bank can do by itself. Bank money has been created 5 for 1 – and all the while each bank has only invested and lent a fraction of what it has received as deposits!" (p. 329).

Samuelson calls this "multiple deposit expansion". This description has survived over the decades of new editions of his textbook, with the same heading: "All banks can do what one can't do alone" (p. 493), reiterated in the fifteenth edition of his book (Samuelson and Nordhaus, 1995), although the reserve requirement cited as example had been lowered to 10% (still an overstated number). The table with the 'chain' of n-th-generation banks to whom decreasing portions of deposits have moved is the same, as is the caption "All banks together do accomplish what no one small bank can do – multiple expansion of reserves…" (p. 492). Table 4i re-appears, with the same title ("*Consolidated Balance Sheet Showing Final Positions of All Banks*").

Comparing these two versions of this likely most influential economics textbook of the 20th century (1948 vs. 1995) a number of differences can be seen: The amount of space devoted to the topic of bank money creation is much smaller in 1995 compared to 1948. In the

1995 textbook the *fractional reserve theory* is stated more clearly and unambiguously: the central bank-created reserves are said to be used by banks "as an input" and then "transformed" "into a much larger amount of bank money" (p. 490). The alternative *credit creation theory* is not mentioned: There is no equivalent of Table 4b. The idea that an individual bank might create deposits is not mentioned at all.[4] Each bank is clearly represented as a pure financial intermediary, collecting deposits and lending out this money (minus the reserve requirement)[5]:

> "Each small bank is limited in its ability to expand its loans and investments. It cannot lend or invest more than it has received from depositors" (p. 496).

So in this world, where does money (our modern bank deposit money) come from? We are told that it is "supplied" by "the financial system" in a diffuse process that each individual bank has little control over (p. 494).

Another supporter of the *fractional reserve theory*, published in a leading journal, is Whittlesey (1944), who stated that banks are "creating money" (p. 251), "exercising the sovereign function of issuing money" (p. 252), as "administrators of the money supply" and engage in "deposit creation" (p. 247) – but only collectively, not individually, in line with the *fractional reserve theory*:

> "Despite the changes that have taken place, the mechanics of banking operations are essentially similar to what they were in the past. The process, whereby deposits are created – and may conceivably be destroyed – on the basis of fractional reserves and against changes in the volume of debts held by banks, is still fundamentally the same" (p. 247).

The author is aware that the policy conclusion that bank credit creation could be considered a mechanical process that did not need to be modelled explicitly in economic theories, was dependent on a number of assumptions:

> "The rise of a large and fluctuating volume of excess reserves is significant primarily because the assumption of a fixed reserve ratio underlies, to an extent that has not, I believe, received sufficient emphasis, the entire theory of commercial banking. The conventional description of the process of deposit expansion – with reserves overflowing from Bank 1 to Bank 2 and so on up to Bank 10, thereby generating a neatly descending series of deposit growth all along the line – rests on the assumption that reserves will be fully and promptly utilized" (p. 250).

Alhadeff (1954), a staff member of the US Federal Reserve system, also invokes Phillips (1920) in supporting the *fractional reserve theory of banking*:

> "One complication worth discussing concerns the alleged "creation" of money by bankers. It used to be claimed that bankers could create money by the simple device of opening deposit accounts for their business borrowers. It has since been amply demonstrated that under a fractional reserve system, only the totality of banks can expand deposits to the full reciprocal of the reserve ratio. [Footnote: 'Chester A. Phillips, *Bank Credit* (New York: Macmillan Committee, 1931), chapter 3, for the classical refutation of this claim.'] The individual bank can normally expand to an amount about equal to its primary deposits" (p. 7).

The *fractional reserve theory of banking* is proposed in many textbooks, especially for undergraduate students (interestingly, it tends to be left out of books for postgraduates, where the *financial intermediation theory* holds sway). For instance, Stiglitz (1997) writes:

> "In this way, any new deposit into the banking system results in a multiple expansion of the number of deposits. This is the 'miracle' of the fractional reserve system. Deposits increase by a factor of 1/reserve requirement. … Note that as the deposits increased, so did the supply of outstanding loans" (p. 736)."It should be clear that when there are many banks, no individual bank can create multiple deposits. Individual banks may not even be aware of the role they play in the process of multiple-deposit creation. All they see is that their deposits have increased and therefore they are able to make more loans" (p. 737).

2.3. The credit creation theory of banking

The third theory of banking is at odds with the other two theories by representing banks not as financial intermediaries — neither in aggregate nor individually. Instead, each bank is said to create credit and money out of nothing whenever it executes bank loan contracts or purchases assets. So banks do not need to first gather deposits or reserves to lend. Since bank lending is said to create new credit and deposit money, an increase in total balances takes place without a commensurate decrease elsewhere. Therefore according to this theory, over time bank balance sheets and measures of the money supply tend to show a rising trend in time periods when outstanding bank credit grows — unlike with the financial intermediation theory, where only existing purchasing power can be re-allocated and the money supply does not rise. Supporters include Macleod (1856), Withers (1909, 1916), Schumpeter (1912), Wicksell (1898), Cassel (1918), Hahn (1920), Hawtrey (1919) and others. There were more supporters of this theory in the era of widespread bank note issuance by commercial banks, but our concern here is with writers that considered individual banks to be creators of credit and money even if they do not engage in note issuance.

The most authoritative writer supporting this theory is Henry D. Macleod (1856), who was a banking expert and barrister at law. His influential work, published in many editions until well into the 20th century (the quotes are from the 6th edition of 1906), emphasises the importance of considering accounting, legal and financial aspects of banking together. Based on an analysis of the legal nature of bank activity he concluded:

> "Nothing can be more unfortunate or misleading than the expression which is so frequently used that banking is only the "Economy of Capital," and that the business of a banker is to borrow money from one set of persons and lend it to another set. Bankers, no doubt, do collect sums from a vast number of persons, but the peculiar essence of their business is, not to lend that money to other persons, but on the basis of this bullion to create a vast superstructure of Credit; to multiply their promises to pay many times: these Credits being payable on demand and performing all the functions of an equal amount of cash. Thus banking is not an Economy of Capital, but an increase of Capital; *the business of banking is not to lend money, but to create Credit*: and by means of the Clearing House these Credits are now transferred from one bank to another, just as easily as a Credit is transferred from one account to another in the same bank by means of a cheque. And all these Credits are in the ordinary language and practice of commerce exactly equal to so much cash or Currency (Macleod, 1906, vol. 2, p. 311, italics added)".[6]

[4] Furthermore, unlike the original Samuelson (1948), the more recent textbook mentions nowhere that in terms of its operations an individual bank might also be able to 'create deposits' (even though it might then lose the money quickly), which can be said, somewhat contradictorily, to support the *credit creation theory*.

[5] Moreover, the original Samuelson (1948: 331) offered an important (even though not prominently displayed) section headed 'Simultaneous expansion or contraction by all banks', which provided the caveat that each individual bank could, after all, create deposits, if only all banks did the same at the same rate (thus outflows being on balance cancelled by inflows, as Alhadeff, 1954, also mentioned). There is no such reference in the modern, 'up-to-date' textbook.

[6] Also: "We have seen that all Banking consists in creating and issuing Rights of action, Credit, or Debts, in exchange for Money, or Debts. When the Banker had created this Liability in his books, the customer might, if he pleased, have this Credit in the form of the Banker's notes. London bankers continued to give their notes till about the year 1793, when they discontinued this practice, and their customers could only transfer their Rights, or Credit, by means of cheques. But it is perfectly manifest that the Liabilities of the Bank are exactly the same whether they give their own notes or merely create a Deposit" (MacLeod, 1906, p. 338).

"…the Credit [the banker] creates in his customer's favour is termed a Deposit. (p. 406).

"These banking Credits are, for all practical purposes, the same as Money. They cannot, of course, be exported like money: but for all internal purposes they produce the same effects as an equal amount of money. They are, in fact, Capital created out of Nothing "

(Macleod, 1906, p. 408).

Macleod's message was spread far and wide by Withers (1909, 1916), who was a prolific writer about this topic and for many years editor of the *Economist*:

"In old times, when a customer went to a banker for a loan, the banker, if he agreed, handed him out so many of his own notes; now when a customer goes to a banker for a loan, the banker gives him a credit in his books, *i.e.* adds to the deposits on the liability side of the balance sheet"[7]

(Withers, 1916, p. 42).

According to the *credit creation theory* then, banks create credit in the form of what bankers call 'deposits', and this credit is money. Another influential proponent of this theory was Schumpeter (1912):

"The function of the banker, the manufacturer of and dealer in credit, is to select from the gamut of plans offered by entrepreneurs… enabling one to implement their plans and denying this to another"[8]

(Schumpeter, 1912, p. 225).

Schumpeter (1954) argued against the alternative theories of banking:

"this alters the analytic situation profoundly and makes it highly inadvisable to construe bank credit on the model of existing funds being withdrawn from previous uses by an entirely imaginary act of saving and then lent out by their owners. It is much more realistic to say that the banks 'create credit', that is, that they create deposits in their act of lending, than to say that they lend the deposits that have been entrusted to them. And the reason for insisting on this is that depositors should not be invested with the insignia of a role which they do not play. The theory to which economists clung so tenaciously makes them out to be savers when they neither save nor intend to do so; it attributes to them an influence on the 'supply of credit' which they do not have. The theory of 'credit creation' not only recognizes patent facts without obscuring them by artificial constructions; it also brings out the peculiar mechanism of saving and investment that is characteristic of fully fledged capitalist society and the true role of banks in capitalist evolution" (p. 1114).

US supporters of this theory include Davenport (1913) and Howe (1915):

"…banks do not lend their deposits, but rather, by their own extensions of credit, create the deposits"

(Davenport, 1913, p. 263).

"Banks do not loan money. They loan credit. They create this credit and charge interest for the use of it. It is universally admitted that the old State Banks that created credit in the form of bank notes, created currency – and our modern system of creating credit in the form of "Deposits" which circulate in the form of bank checks, is doing exactly the same thing – creating currency.

"All this in effect nullifies the National Banking Act, which provides for National Bank Currency based on U.S. Government Bonds, and also the act levying an annual tax of 10% on all State Bank Currency….

"The public little realizes to what an extent Bank Credit, circulating in the form of bank checks, has supplanted all other circulating media. In 95% of all the business done in the United States, the payments are made in bank checks and in only 5% is any cash used; and of this 5% an infinitesimal fraction only is gold

(Howe, 1915, p. 24f).

"The introduction of bank notes was useful in weaning the public from the use of gold and silver coins, and prepared the way for the introduction of Bank Credit as the means of payment for commodities. As a result of this evolutionary process, the checks drawn and paid in the United States amount to between two hundred billion and two hundred and fifty billion dollars a year. It is clear that it would be a physical impossibility to do this amount of business by the use of gold coin. There is only about eight billions of gold money in the world, of which amount less than two billions of dollars are in the United States.

"The banks have created fifteen billions of dollars of credit by discounting the notes of merchants and manufacturers, and crediting the proceeds to the borrower's account under the head of Deposits. As a result, the borrower is enabled to draw checks and pay his debts with them

(Howe, 1915, p. 25).

Swedish economist Gustav Cassel (1923) pointed out that

"In practice, deposits are also created and constantly fed by the bank's granting advances to its customers, either by discounting bills or by making loans and then crediting the clients with the amount in

[7] "It is true that the customer does not leave the deposit there but draws cheques against it, which he pays to people to whom he owes money. But these cheques, if paid to recipients who also bank at the bank which has made the advance, would simply be a transfer within the bank's own books, and the effect of the transaction upon its balance sheet would be that it would hold among its assets an increase – if the loan was for £100,000 – of this amount among its advances to customers; and on the liability side there would be a similar increase in the deposits. … and if we could look at an aggregate balance sheet of the whole of the banks of the country we should see that any increase in loans and advances would have this effect of increasing the deposits as long as those who receive these banking credits make use of them by drawing cheques against them. In the comparatively rare cases where the borrower makes use of the credit by drawing out coin or notes from the bank, then the first effect would be that the bank in question would hold a smaller amount of cash among its assets and a larger amount of advances to customers. But even here the currency withdrawn would almost certainly come round again, either to this bank or another, from the shopkeepers or other people to whom the borrower had made payments. And so the cash resources of the banks as a whole would be restored to the original level, while the deposits, owing to the increase at the credit of the shopkeepers and others who had paid the money in, would be added to the amount of the advance originally made. (p. 42f)

"Exactly the same thing happens when, for example, in times of war the banks subscribe to loans issued by the Government, whether in the form of long-dated loans, such as the recent War Loan, or in the form of shorter securities, such as Exchequer Bonds, Treasury Bills or Ways and Means Advances. (p. 43).

"It follows that the common belief that a great increase in bank deposits means that the wealth of the community has grown rapidly, and that people are saving more money and depositing more with the banks is, to a certain extent, a fallacy. A rise in bank deposits, as a rule, means that the banks are making large advances to their customers or increasing their holding of securities, and so are granting a larger amount of book-keeping credit, which appears as a liability to the public in the shape of deposits. (p. 44)

"It may be objected that the deposits have to come first before the banks can make advances. Does this necessarily follow? (p. 44)

[8] "Die Funtion des Bankiers, des Produzenten von und Händlers mit Kredit, ist in der Fülle der sich darbietenden Unternehmerpläne eine Auswahl zu treffen, die allen Lebensverhältnissen der Volkswirtschaft entspricht, dem einen die Durchführung zu ermöglichen, dem andern zu versagen" (Schumpeter, 1912, S. 225). Translated by author.

their accounts" (p. 414).[9]

An important difference to the *fractional reserve theory of banking* is the use of singular in the above sentence: it is one bank that is able to create deposits. Hawtrey (1919), mirroring Macleod's (1856) exposition, also argued that banks create money out of nothing. The early Keynes was another prominent supporter of the *credit creation theory*, praising it enthusiastically in the early 1920s as an

> "almost revolutionary improvement in our understanding of the mechanism of money and credit and of the analysis of the trade cycle, recently effected by the united efforts of many thinkers, and which may prove to be one of the most important advances in economic thought ever made"
>
> (Keynes and Moggridge, 1983, p. 419, as quoted by Tily, 2012).

Keynes gives the impression of a recent convert whose eyes had been opened. In his *Treatise on Monetary Reform* (1924) Keynes was also unambiguous about the ability of banks to expand or diminish "the volume of credit quoted" (p. 137):

> "The internal price level is mainly determined by the amount of credit created by the banks, chiefly the Big Five; … The amount of credit, so created, is in its turn roughly measured by the volume of the banks' deposits — since variations in this total must correspond to variations in the total of their investments, bill-holdings, and advances" (op. cit., p. 178).

Yet, his later support for the other theories indicates that Keynes was not settled in his views on the *credit creation theory of banking*. Indeed, there is some evidence that he may have been open to the implication of the fractional reserve banking theory that high powered money is a key driving factor:

> "Thus in one way or another the banks generally adjust their total creation of credit in one form or another (investments, bills, and advances) up to their capacity as measured by the above criterion; from which it follows that the volume of their 'cash' in the shape of Bank and Currency Notes and Deposits at the Bank of England closely determines the volume of credit which they create" (op. cit., p. 179).

A clearer statement coming from Keynes' pen can be obtained from the final report of the Committee on Finance and Industry, commonly known as the Macmillan Committee (1931), after its chairman, Hugh Macmillan.[10] The Committee gathered much evidence, mainly in the form of first-hand eye-witness testimonies, and quickly identified bank credit creation as a central focus of their inquiry.[11] It must be considered as one of the most thorough and wide-ranging investigations of banking and finance in the modern age conducted by such a broad group of stakeholders. The final report, submitted in June 1931, contained a number of statements on the question at hand. It is said to have been drafted and significantly influenced by Keynes, one of the committee members. The following statement expressly refers to bank accounting of an individual bank:

> "It is not unnatural to think of the deposits of a bank as being created by the public through the deposit of cash representing either savings or amounts which are not for the time being required to meet expenditure. But the bulk of the deposits arise out of the action of the banks themselves, for by granting loans, allowing money to be drawn on an overdraft or purchasing securities a bank creates a credit in its books, which is the equivalent of a deposit" (op. cit., p. 34).

The last sentence uses the singular: a loan from one bank results in credit creation, which is the "equivalent" of deposit creation, amounting to the size of the loan. If the bank was a financial intermediary, it would not newly create the deposit of the borrower, but transfer the funds from another account, either inside or outside the bank. This is most clearly seen

> "If no additional in-payments were made by customers and there were no withdrawals in cash," because then "the volume of deposits of a single banker would fluctuate only with the volume of the loans he himself made…" (op. cit., p. 12).

The *credit creation theory of banking* also featured prominently in textbooks, training a new generation of economists and policy makers well into the 1930s: The US textbook on monetary economics by James (1930) was unambiguous and confident in the assessment that

> "… the bank is enabled to make loans to an amount many times larger than the sum of cash which has been deposited with it, and it will already have become apparent that *the greater part of the items appearing on the liabilities side of the balance sheet, under the heading of deposits, is created, not as a result of cash deposited with the bank by customers, but through the making of loans or discounts by the bank* to those customers. …"
>
> "…the bank has monetized credit. *It has created purchasing power which did not exist before*, since it has supplied the borrower with a means of paying his debts, without in any way reducing the amount of money in the hands of the other members of the community. Each addition to the existing volume of bank loans, therefore, results in a net increase in the total supply of money in the community, and any diminution in that volume will decrease the total volume of money"
>
> (James, 1930, 194f, italics in original)

While the star of the *credit creation theory* was on the descent in the mid-1930s, as the *fractional reserve theory* became dominant, a leading – if not *the* leading-monetary economist of his day, Irving Fisher, still insisted on the veracity of the *credit creation theory*:

> "When a bank grants me a $1000 loan, and so adds $1000 to my checking deposit, that $1000 of 'money that I have in the bank' is new. It was freshly manufactured by the bank out of my loan and

[9] This quote is from the English translation of the fifth German edition of the 1918 book, both published in 1932.

[10] The committee was appointed by the Chancellor of the Exchequer in November 1929 to

> "inquire into banking, finance and credit, paying regard to the factors both internal and international which govern their operation, and to make recommendations calculated to enable these agencies to promote the development of trade and commerce and the employment of labour" (p. 1).

It consisted of leading experts, opinion-leaders and stakeholders of the day, including John Maynard Keynes and Professor T. Gregory, professor of Banking at the LSE, treasury and Bank of England representatives and senior executives of banks, but also a union representative, a representative of the cooperative movement and a politician. Over almost two years the Committee held 49 meetings and interviewed 57 witnesses, reflecting "a wide and varied range of representatives of banking and finance, both in this country and in the United States and Germany, as well as of industry and commerce from the point of view both of employers and of employed, while members of the Universities and the Civil Service and eminent economists of diverse schools have also lent their assistance" (p. 1). This included Mantagu Norman, the governor of the Bank of England, Professor A. Pigou of Cambridge University, as well as senior representatives from Barclays Bank, Midland Bank, Lloyds Bank, National Provincial Bank, Westminster Bank, the Scottish banks and the Treasury, and such internationally active banking insiders as Otto Ernst Niemeyer and Henry Strakosch.

[11] In his opening words to witness Josiah Stamp, chairman Lord Macmillan stated: "You appreciate that our main preoccupation is with the question of the basis of credit as affecting industry and employment…" (Macmillan Committee, 1931, appendix, witness transcripts, p. 238, question 3710).

written by pen and ink on the stub of my check book and on the books of the bank... Except for these pen and ink records, this 'money' has no real physical existence"

(Fisher, 1935, p. 3).

Despite being dominated by the other two theories in subsequent decades, pockets of adherents to the *credit creation theory of banking* continued to exist and even thrive, most notably among so-called 'Austrian' economists (since the post-war era largely active in the US), post-Keynesian economists and the inductive-empiricist school.

Examples of the Austrian writers whose views appear consistent with the credit creation theory of banking are Hoppe, Hülsmann and Block (1998). Post-Keynesian writers that have postulated the ability of banks to create credit and money include Rochon and Rossi (2003) and Basil Moore. The latter wrote:

"When a bank grants a loan to one of its customers, it simply credits the amount to the borrower's account"

(Moore, 1988, p. 51).

Moore (1988) also argued against the *fractional reserve theory*, although his choice of the word 'bank intermediation' is not ideal:

"Contrary to conventional wisdom, changes in reserve requirements imposed by the central bank do not directly affect the volume of bank intermediation"

(op. cit., p. 65).

Since the early 1990s, the methodological approach to base economic research not on preconceived theories (the deductive method), but on empirically gained knowledge (the inductive method), has gained credence (see Werner, 1992, 1997, 2005). Employing this approach, Werner (1997) writes:

"…banks create new purchasing power by the extension of loans" (p. 282).

Consistent with this insight, it was also suggested to deploy bank credit information in macroeconomic models:

"Using total bank credit as the measure of the 'money supply' in [the] equation [of exchange] has the advantage that (a) credit always represents *effective* purchasing power, as no borrower will take out a loan if there is no loan to use the money for transactions; (b) it becomes possible to define effective purchasing power clearly – namely not bank liabilities, but bank assets or private sector liabilities to the bank sector; and (c) credit aggregates are available by economic sector and hence provide us with additional information about the direction of purchasing power – something deposit aggregates cannot tell us" (op. cit., p. 283).

The empirical evidence in favour of this disaggregated Quantity Theory of Credit was overwhelming, when a general-to-specific downward reduction from a general model of a major economy was conducted, which included variables from competing theories:

"We found that key economic variables, namely nominal GDP, asset prices and Japanese foreign investment, could be explained single-handedly with quantity variables – the quantity of disaggregated credit – while interest rates and exchange rates dropped out in parsimonious reductions as insignificant. … This opens a whole new avenue of promising work in the new research programme of the macro-economic role of credit" (Werner, 1997, p. 305).

Werner (2005) asks where a bank gets the money from which it credits a borrower's account with:

"The money was not withdrawn by the bank from other uses. It was not diverted or transferred from any other part of the economy. Most of all, although it is shown as a deposit, it was not actually deposited by anyone. The bank simply created the money by writing the figures into its books and the customer's account book. In effect, the bank pretends that its borrower has made a deposit that was not actually made. Unlike the textbook representation, we see that each individual bank can thus create money when it extends a loan. *Showing this truth in textbooks would not only be more memorable, but it would also teach students about what banks really do: they create money out of nothing. The bank just pretends it has the* [*loan amounts*], *credits someone's books with them, and nobody knows the difference*" (p. 178).

Finally, it should be repeated that the *credit creation theory* does not feature in most contemporary economics, finance or banking textbooks.[12]

2.4. Assessment

From the above review of the literature, together with that in Werner (2014b), it can be said that despite today's dominance of the *financial intermediation theory*, the question whether banks create money and are thus 'unique' still "remains unsettled". That was the conclusion by Guttentag and Lindsay (1968, p. 992) almost half a century ago in their *Journal of Political Economy* article, and it has remained true until recently. The situation has not been helped by the fact that many influential economists have been sidestepping the issue, while some eminent authors that addressed it, such as Keynes, supported all three mutually exclusive theories at one point or another. A new standard of ambiguity is set by the Bank of England, which currently appears to be supporting all three theories at the same time:

Most central banks have been active proponents and supporters of the *financial intermediation theory of banking*, helping it become dominant also in the academic world over the past forty years or so. Senior staff at the Bank of England continue to endorse it: Governor Mark Carney (2014) in his Mais Lecture at the Cass Business School cited the monetary theory of Brunnermeier and Sannikov (2015) in support of his arguments. The abstract of this paper makes clear that they believe banks are financial intermediaries that

"take deposits from …households to extend loans…" so that banks "finance themselves by borrowing from households" (p.1).[13]

In late March 2014, external member of the Financial Policy Committee of the Bank of England, Dame Clara Furse, explained:

"The financial system performs vital functions for us all – it exists to intermediate savings and investment… Banks, non-banks and markets all contribute to this…"

(Bank of England, 2014c).

The FPC member argues that for economic growth to take place, bank activity can be substituted by 'direct finance', and she recommends, as one of the lessons of the crisis, to enhance 'market based finance', i.e. funding via channels other than banks. Other economists at the Bank of England also seem supporters of the *financial intermediation* or the *fractional reserve theory of banking*, as can be seen from the Bank's forecasting models, which do not include banks (Bank of England, 2014d).

[12] Ryan-Collins et al. (2011) is being used as textbook, and is thus an exception.

[13] As a result, in their model banks are pure intermediaries: "Intermediaries can take deposits from unproductive households to extend loans to entrepreneurs" (p. 6). In this model, banks could not be anything but intermediaries, because there is no money creation whatsoever ("Assume there is a fixed supply of infinitely divisible money", p. 5). Whether such a model is appropriate for a central bank engaged in 'quantitative easing' is an interesting question.

Yet, possibly triggered by the recent inroads of the *credit creation theory of banking* (Werner, 1992, 1997, 2005, 2012, 2014b; Ryan-Collins et al., 2011, Benes and Kumhof, 2012), the Bank of England in March 2014 suddenly came to additionally endorse this alternative theory (Bank of England, 2014a, b).

This means that staff at the Bank of England currently support all three of the theories of banking at the same time (see also Zoltan and Kumhof, 2015). Since each theory implies very different approaches to banking policy, monetary policy and bank regulation, the Bank of England's credibility is at stake.

One reason why the dispute still remains unsettled after such a long time is that discussions had been based on assertions, implying different accounting operations of banks. But the respective merit of the three theories cannot be settled in theoretical models designed from first principles: theoretical worlds might be conceivable in which each theory is plausible. Instead, the dispute can be settled through empirical evidence on the actual operations and accounting practices of banking. Surprisingly, in the observation period – from the mid-19th century until 2014 – no scientific empirical test had been reported in the peer reviewed journals.

The first empirical test published in a learned journal on this issue was Werner (2014b): With the cooperation of a bank, the operations and accounting entries were examined that take place when a 'live' bank loan is granted and paid out. Only the credit creation theory was consistent with the observed accounting records. The test design however did not allow a fully controlled environment: With bank operations taking place virtually 24 hours a day, it was unavoidable that other transactions would be booked in addition to the test transaction (although no other bank loan was granted). Thus a number of aggregated uncontrolled factors had to be jointly evaluated. Therefore as a robustness check it would be desirable to test the three theories of banking using a different testing procedure, in a fully controlled environment, without the potential interference from other transactions.

In order to allow complete control of all other factors, the IT system at the heart of banking operations – which incorporates bank accounting and operational rules – could be taken off-line and a loan transaction could be booked in the system. While humans may change their behaviour in such simulations when they become aware that a 'mere' test is taking place, there is no such problem when using the regular banking software.

3. A controlled empirical test

3.1. Predictions of the three theories

Before the test is conducted, the predictions of each theory about how the extension of a new €200,000 bank loan would be recorded are stated for convenience:

3.1.1. Accounting implications of the financial intermediation theory

According to this theory, banks are not different from non-bank financial institutions, such as stock brokers or asset management companies, except concerning reserve requirements, capital adequacy or interest rate regulations, as the case may be. Non-bank financial institutions are required by Client Money rules (see CASS in FCA and PRA, 2014) to hold deposits in custody for customers (a form of warehousing or bailment), by placing them with other banks or the central bank. Banks are said by this theory to be in the same position in this respect as non-bank financial institutions. In this case customer deposits are not shown on the balance sheet as liabilities (see Werner, 2014c). All funds are central bank money that can be held in reserve at the central bank or deposited with other banks or financial intermediaries (where they are also held off-balance sheet).

When a loan is granted, the claim on the borrower arising from the loan contract is shown as an increase in assets. However, the payment of the loan involves the drawing down of funds, such as reserves held at central banks, or client money held at other banks. According to this theory, the bank balance sheet does not lengthen as a result of the bank loan, just as is the case with non-bank financial intermediaries (Table 4).

Table 4
Account changes due to a €200,000 bank loan (*Financial Intermediation Theory*).

Assets		Liabilities	
Excess Reserves…	–€ 200,000		…….
Loans and investments….	+€ 200,000		
Total……	0	Total…….	0

3.1.2. Accounting implications of the fractional reserve theory

According to this theory each individual bank is a financial intermediary. Funds are being treated as equivalent to cash or precious metals in the sense that they are thought to have the ability to flow between banks and the central bank. Following Samuelson's description of the *fractional reserve theory*, new loans are granted based on new deposits. With a reserve requirement of 1%, a bank would thus first need to receive a new deposit of €202,000 in order to extend a loan of €200,000. The bank's balance sheet should first show an increase in deposits large enough to accommodate the loan and the reserve requirement (Table 5).

Table 5
Account changes due to a €200,000 bank loan (*Fractional Reserve Theory, Samuelson Version*).

Assets		Liabilities	
Cash reserves……	+€ 2,000	Deposits…….	+€202,000
Loans and investments….	+€200,000		
Total……	+€202,000	Total…….	+€202,000

As the table shows, the balance sheet increases. This is however not due to the extension of the loan, but due to the receipt of a new deposit. This becomes clear when breaking Samuelson's description up into two steps — the receipt of the deposit, and the extension of the loan (Table 6).

Table 6
Account changes due to a €200,000 bank loan (*Fractional Reserve Theory, Samuelson Version*).

Step 1: Receipt of new cash deposit of €202,000

Assets		Liabilities	
Cash reserves……	+€202,000	Deposits…….	+€202,000
Loans and investments….			
Total……	+€202,000	Total…….	+€202,000

Step 2: Extension of new loan of €200,000

Assets		Liabilities	
Cash reserves……	–€ 200,000	Deposits…….	+€ 0
Loans and investments….	+€200,000		
Total……	+€ 0	Total…….	+€ 0

Adding up the changes in step 1 and step 2, we obtain the total change of Table 5 above.

As can be seen, for this fractional reserve model to work, Samuelson is assuming that the new deposit is a cash deposit, and the extension of the loan takes the form of paying out cash. This is hardly realistic, since bank loans are rarely paid out in cash. A more fundamental flaw is that if each individual bank was merely a financial intermediary, as is claimed according to this theory, it could not actually hold client deposits on its balance sheet — but this is what proponents of this theory have maintained (see the discussion of Samuelson or others above, or as shown in Tables 5 or 6): in the UK, according to the Client Money rules, financial intermediaries have to hold client money off-balance sheet (Werner, 2014c). This already makes it clear that banks could not possibly be mere financial intermediaries and that their accounting would

have to be different from that of non-banks — contradicting Tobin's claim that only reserve requirements and interest rate regulations (and even if updated to include capital requirements) distinguish banks from non-banks.

3.1.3. Accounting implications of the credit creation theory

According to this theory, banks do not separate customer funds from own funds. Thus when lending, banks are able to credit the borrower's account with the borrowed amount, although no new deposit has taken place (credit creation out of nothing, Werner, 2014c). The balance sheet lengthens due to the extension of the loan, while neither cash, nor central bank reserves nor balances with other banks are needed (reserve and capital requirements only need to be met at particular measurement intervals and are not a physical precondition of granting a loan). In other words, a bank can extend a new loan, even though it has not received any new deposit money or reserves. The borrower's account is credited with the amount of the loan, although there has been no commensurate equal reduction in balance of any other account, as would be the case had the funds been transferred. Thus bank loans create new deposits, not the other way round (Table 7).

Table 7
Account changes due to a €200,000 bank loan (*Credit Creation Theory*).

Assets		Liabilities	
Loans and investments….	+€ 200,000	Deposits (borrower's A/C).	+€ 200,000
Total……	+€ 200,000	Total…….	+€ 200,000

To test the veracity of the three theories, the balance sheet of a bank needs to be examined before and after the extension of a bank loan, ideally under fully controlled circumstances. If the bank loan increased the balance sheet, while no further reserve or deposit movement took place, then the credit creation theory would be shown to be consistent with the evidence, while the other two theories would be rejected.

3.2. The test

The first empirical test of the three theories of banking, reported by Werner (2014b), involved taking out an actual bank loan from a bank that was co-operating with the investigation and shared its internal records, so that it was possible to reconstruct how the loan extension was accounted for. Raiffeisenbank Wildenberg e.G., a cooperative bank in Lower Bavaria, Germany, co-headed by director Marco Rebl, kindly cooperated in the conduct of this empirical test. As this was a 'live test' and not a controlled experiment, other transactions by bank customers continued to take place during the observation period. Due to the facilities offered by modern 24-hour electronic banking, it is very difficult for researchers to control such a test, as other transactions are likely to take place during the same time period.

Considering this issue, bank director Rebl suggested a method of testing which would allow the researcher to control for all other transactions without fail. Mr. Rebl explained that all bank accounting takes place within the IT system that is used on a daily basis by bank staff. Although the code of the software would directly show the commands following the entry of a bank loan, gaining access to the internal software code is difficult even for senior bank staff, given the high security requirements of bank IT systems that are themselves usually offered by external providers reluctant to allow outsiders access to details of the software. However, Mr. Rebl then pointed out that there are in fact two parallel IT systems in operation at all Bavarian cooperative banks, and both contain the accounting information of each bank. The daily balance sheet and reporting software used in the first empirical test is based on the software called 'BAP Agree' (Bankarbeitsplatz Agree). This software is however not used for the compilation of the formal annual accounts of the banks, which are submitted to bank auditors and the regulatory authorities. For these formal accounts, a second, parallel system is utilised, called Hersbrucker Jahresabschlußprogramm (below 'HJAP'; literally: Hersbruck annual accounts programme, named after the town where the Raiffeisen cooperative bank is located whose director, Mr. Weidinger, originally developed this programme). Mr. Rebl pointed out that the HJAP system contains all the bank accounting rules and functions, and that it conforms with all bank supervisory, prudential and legal requirements, regulations and procedures (which may not necessarily be relevant or enforceable on a daily basis as applied by BAP Agree in day-to-day use). Meanwhile, HJAP meets the more stringent annual reporting requirements and features functions that are useful for the compilation, checking and submission of these accounts to regulators.

All transactions are aggregated in HJAP for the annual accounts at the end of the calendar year. While transactions booked in BAP automatically feed into HJAP, sometimes transactions take place late in December that were not properly recorded or reflected in the BAP Agree system, for instance due to the holidays. In this case, the bank directors have the opportunity to ensure that these omitted transactions are booked by manual entry in the HJAP system even after the end of the calendar year.

Thus Mr. Rebl suggested the following test design: using the latest annual accounts (at the time of conducting the test these were the 2013 annual accounts) and using the latest HJAP software (at the time of writing, 2.0.2013/5), a test bank loan of €200,000 can be booked as if it was a missed trade that had to be booked manually after 31 December 2013, to be added to the official accounts for reporting purposes. Since in this case only one transaction will be booked – the bank loan from the researcher – there is no noise due to other autonomous transactions undertaken by other bank customers. In other words, all other factors are controlled for. Meanwhile, since the software is designed to allow such a possibility, all standard procedures and regulations are applied and this manual entry function in no way overrides the system, but is a regular part of it. Since the bank loan can be entered into the HJAP system by the researcher after the end of 2013 in exactly the same way as a genuine, actual missed trade, as indeed happens on occasion with standard loans, this does constitute a realistic empirical test. This test design was adopted and the procedure was implemented as suggested by Director Rebl in 2014, using the audited accounts of 2013.

Appendix 1 shows the original audited and formally submitted accounts of Raiffeisenbank Wildenberg for the year 2013. Appendix 2 shows the same accounts after the simulation bank loan of €200,000 has been transacted via the same annual reporting bank IT software (HJAP). The summary accounts are shown (assets in Table 8 and liabilities in Table 9), whereby the first column represents the original 2013 annual accounts, the second column the new accounts after the loan has been added, and the third column shows the Difference items between the first two columns.

Table 8
Raiffeisenbank Wildenberg e.G.: Annual Accounts 2013, Assets.

Assets in EUR	31 Dec. 2013	Post-test	Difference
1 Cash	227,072.87	227,072.87	
2 Bills of exchange			
3 Claims on financial. inst.	6,123,707.01	6,123,707.01	
4 Claims on customers	24,066,899.94	24,266,899.94	200,000.00
5 Bonds, bills, debt instr.	19,655,934.00	19,655,934.00	
6 Stocks and shares			
7 Stake holdings	397,768.68	397,768.68	
8 Stakes in related firms			
9 Trust assets	4,713.81	4,713.81	
10 Compensation claims on the public sector			
11 Immaterial assets			
12 Fixed assets	188,977.92	188,977.92	
13 Other assets	335,969.95	335,969.95	
14 Balancing item	2,126.22	2,126.22	
15 Difference from asset valuations	46,334.50	46,334.50	
16 Sum of assets	51,049,504.92	51,249,504.92	200,000.00

Table 9
Raiffeisenbank Wildenberg e.G.: Annual Accounts 2013, Liabilities.

Liabilities in EUR	31 Dec. 2013	Post-test	Difference
1 Claims by financial inst.	5,265,491.16	5,265,491.16	
2 Claims by customers	41,462,424.00	41,662,424.00	200,000.00
2A Savings accounts	*10,494,856.16*	*10,494,856.16*	
2B Other liabilities	*30,967,567.84*	*31,167,567.84*	*200,000.00*
BA daily	*14,069,056.09*	*14,269,056.09*	*200,000.00*
BB with agreed maturity	*16,898,511.75*	*16,898,511.75*	
4 Trust liabilities	4,713.82	4,713.82	
5 Other liabilities	33,812.09	33,812.09	
6 Balancing item	12,787.37	12,787.37	
7 Reserves	682,874.80	682,874.80	
11 Fund for bank risk	420,000.00	420,000.00	
12 Own capital	3,167,401.68	3,167,401.68	
13 Sum of liabilities	51,049,504.92	51,249,504.92	200,000.00

In the assets listed in Table 8, the only two items that are affected are the claims on customers – the bank loan as a claim by the bank on the borrower due to the borrower's obligation to repay the loan – and the total balance of assets. Both increased by the loan amount of €200,000.

Considering liabilities in Table 9, we see that customer deposits ('claims by customers') increased by €200,000 (i.e. current account deposits — daily liabilities), as well as the balance sheet total. Thus we conclude that the variation in accounts before and after the loan has been extended is identical with the a priori expectation according to the *credit creation theory*. As no actual deposit (or reserve increase) took place, the *fractional reserve theory* is rejected. As customer deposits are shown on the balance sheet, the *financial intermediation theory* is also rejected.[14]

Mr. Rebl, himself a trained bank auditor, confirmed that standard procedures had been followed and no other transaction or operation was necessary to complete the booking of the loan and finalise the accounts.

4. Evaluation: Lack of rigour as a cause of confusion

The core activity of banking, what is commonly called 'receiving deposits' and 'lending', are in actual fact the creation and maintenance of accounting records and thus can be considered a form of applied accounting. However, this feature of banking has been unduly neglected in the treatment of banks and their impact on the economy by academic authors, whether in journal articles, books or text books.

There are three theories of banking, with differing claims about how bank accounting, and hence banking, operates. In this paper the results of an empirical test were presented, whereby a loan from a bank was booked in the bank's accounting IT system under controlled conditions that excluded unrelated transactions. It is found that the *credit creation theory of banking* is consistent with the empirical observations, while the other two theories are not.

4.1. Flaws of the financial intermediation theory

The financial intermediation theory argues that banks are indistinguishable in their accounting from non-bank financial intermediaries (Tobin or others have argued that reserve requirements, regulations of interest rates, and capital requirements are the sole distinguishing feature of banks).

Stock brokers do not show their clients' assets, even if invested by them on a discretionary basis, as part of their own balance sheets. The assets owned by mutual fund management firms and the assets of their fund investor clients are kept completely separately. Stock brokers' assets are boosted by their own investments, but not those of their clients. Thus an insolvency of a stock broker or fund management firm leaves client funds unencumbered: they are fully owned by the clients. But bank 'deposits' are owned by the banks and bank insolvency means that the client funds are part of the assets of the bankrupt firm. Depositors are merely general creditors, ranking ahead of shareholders (although smaller amounts may be covered by deposit insurance schemes, which is a separate issue). However, due to the new Bail-In regime agreed by the G20 in 2010, depositors may rank below other creditors. Thus a comparative analysis of stock brokers (as representative examples of non-bank financial intermediaries) and banks reveals that banks are different from non-banks, because they do not segregate client assets (Werner, 2014c).

Since non-bank financial intermediaries, which can also gather deposits, have to follow the Client Money rules and keep customer deposits off their balance sheet, deposited safely with custodians, an equal treatment for banks would mean that banks would also have to conform to Client Money rules. As a result, bank deposits would not appear on the bank's balance sheet. In reality they do, however, appear on bank balance sheets with their creation, contributing to the phenomenal growth in bank assets in the recent decades. Thus the critical distinguishing feature of banks is their exemption from Client Money rules and hence ability to control the accounting records of customers' deposits, enabling them to add fictitious deposits when extending a loan (Werner, 2014c). A rigorous application of basic accounting and financial regulation would have provided ample notice to supporters of the *financial intermediation theory*, so dominant over the past half-century, that this theory has always been a non-starter, since banks could not possibly be financial intermediaries: how else could the rapid growth and massive scale of their own balance sheets be explained? Alas, it seems researchers in banking, finance and economics have woefully neglected basic accounting realities and easily observable facts.

4.2. Flaws of the fractional reserve theory

The fractional reserve theory maintains that banks are financial intermediaries that can only lend out money previously deposited with them. According to this theory, a prior customer deposit or an increase in reserves are the necessary step for a bank to be able to extend a loan, and this is effectively assumed to take the form of a cash deposit by a customer. This produces an excess cash reserve, which is then used to fund a loan. The borrower is then assumed to receive the loan in the form of cash, drawing down the excess cash balance.

As it turns out, this theory neglects, despite its rhetorical awareness of the 'creation of accounting records', the very transaction of booking a loan on the bank's balance sheet: the borrower's account is not shown, as it is simply assumed that the money 'leaves the bank immediately', on the implicit assumption that the loan is paid out in cash. But normally banks will not extend a loan to a customer who has not opened an account with the bank. Loan applicants typically first have to apply for a bank account. The due diligence and credit checks that are always applied before a loan is extended are usually linked to the vetting procedures for opening a bank account. Even borrowers that wish to receive their loan in cash will normally first have to open a bank account, and will first receive the loan as a credit in their bank account.

Let us therefore consider the standard case that the borrower receives the loan as credit to the borrower's cheque account at the bank. We now revisit the scenario laid out by Paul Samuelson, receiver of the Swedish Central Bank Prize in Economic Sciences in Honour of Alfred Nobel: As shown in Table 10, Step 1, the receipt of the assumed cash deposit causes the accounting entries as shown by Samuelson. However, in Step 2, the bank customer receiving the loan causes a further increase in assets, as the loan contract is signed and acquired by the bank, and in liabilities, as the borrower's account is credited with the sum of the loan (instead of the cash payment shown by Samuelson).

[14] The test outcome is in line with the assessment by the Macmillan Committee (1931), which predicted what such a controlled experiment would yield:

> "If no additional in-payments were made by customers and there were no withdrawals in cash, the volume of deposits of a single banker would fluctuate only with the volume of the loans he himself made…" (p. 12).

Table 10
Reconsidering Samuelson's description of the *Fractional Reserve Theory*.

Step 1: Receipt of new cash deposit of €202,000

Assets		Liabilities	
Cash reserves……	+€202,000	Deposits……	+€202,000
Loans and investments….	+€ 0		
Total……	+€202,000	Total……	+€202,000

Step 2: Extension of new loan of €200,000, but not in the form of cash

Assets		Liabilities	
Cash reserves……	+€ 0	Deposits……	+€200,000
Loans and investments….	+€200,000		
Total……	+€200,000	Total……	+€200,000

Total: Receipt of cash deposit, as shown by Samuelson, and extension of standard loan

Assets		Liabilities	
Cash reserves……	+€202,000	Deposits……	+€402,000
Loans and investments….	+€200,000		
Total……	+€402,000	Total……	+€402,000

As can be seen, the balance sheet lengthens further. It becomes apparent that the cash deposit of Step 1 is entirely irrelevant, and can be eliminated in an exposition of a bank's extension of loans. And then it becomes clear that Samuelson's example collapses to Step 2, which is identical with the *credit creation theory of banking.*

So by simply dropping the highly unrealistic assumption that loans are paid out in cash, we are back at the *credit creation theory*: the asset side expands by the amount of the loan (reflecting the loan contract) and so does the liability side, as the borrower's account is credited.

Samuelson based his exposition on a misleading and incorrect representation of bank procedures. In addition, his theory is inconsistent: while each bank is said to be just a financial intermediary, deposits with banks appear on the banks' balance sheet, although non-bank financial intermediaries, as discussed, do not own deposits by customers, and hence these cannot be shown on their balance sheet. Since however Samuelson shows the deposits on the bank's balance sheet, they cannot be a bailment or held in custody – off-balance sheet items – but are the property of the bank. This means that each bank is not a financial intermediary. Bank deposits, unlike deposits with non-banks, are merely a record of a loan to the bank. Thus a further inconsistency is that it is *a priori* not clear why customer deposits or reserves should be any constraint on bank lending as claimed by the *fractional reserve theory*: since deposits are a record of the bank's debt to customers, the bank is not restricted to lending only as much as its excess reserves or prior customer deposits allow. It can extend a loan and record further debts to customers, shown as newly created deposits (as the *credit creation theory* states).

So despite Samuelson's (1948) protestation that "A bank cannot eat its cake and have it too" (p. 325f), we see that in Table 10 (Total) the bank still has all its reserves and deposits at the moment it has granted the bank loan and credited the borrower's account. In other words, instead of being a necessary requirement as claimed by Samuelson's theory, the prior receipt of new funds is unnecessary in order for the bank to extend the loan. A careful examination of the relevant accounting and regulations involved should have made this clear to supporters of the *fractional reserve theory* and the many lecturers who over the past decades have been teaching economics using the Samuelson tract. The argument that the newly created deposit entry of the borrower will 'soon leave the bank' also does not change the results: in this case, in practice, the bank simply swaps a liability to the borrower (the newly created deposit) with a liability to a bank (the bank of the receiver of the payment made by the borrower from their newly created deposit) or the central bank (e.g. in case new central bank promissory notes, a.k.a. paper money or bank notes, are ordered). In either case, the balance sheet total remains unchanged, in its lengthened form.

Thus the accounting representations of both the *fractional reserve* and the *financial intermediation theories of banking*, whereby each bank is considered an intermediary, are deeply flawed: either each lender is a bank and hence able to create money due to the very fact that it does not have to hold client funds outside the firm, or the firm is a financial intermediary and not a bank, in which case the client funds do not appear on the firm's balance sheet at all.

For over a century no proponent of the fractional reserve or financial intermediation theories seems to have ever thought through the accounting implications – and contradictions – of these theories. We conclude that a greater emphasis on bank accounting and a more careful consideration of its implications should have raised serious doubts about the theoretical viability and consistency of both the *fractional reserve* and the *financial intermediation theories* much earlier, even without our conclusive empirical test.

Given the above analysis we can confidently say that the *fractional reserve theory of banking* in its textbook application, including the 'money multiplier' approach, is wrong. This may explain why it has been quietly dropped in textbooks over the past decade or so.[15] But the *financial intermediation theory of banking* is equally wrong, despite being supported by the many leading economists cited in the literature review above, who use it as the foundation of their work in this area, and for their policy recommendations.

4.3. Accounting for the steps after the loan has been spent

"*Bank credit creation does not matter, since banks will gradually lose the deposits.*" — This argument is often used to defend the *fractional reserve* or *financial intermediation* theories. However, banking operates within a closed accounting system: Deposits are bank liabilities and thus can only stay bank liabilities, on the balance sheet of a bank, even after transfer. They are a record of what Bank A owes, and the creditor (in this case, ironically, the borrower of the loan) can re-assign this debt of Bank A to some other bank. But of course it stays the debt of bank A (see Werner, 2014c). So deposits 'lost' can only go to other banks, and thus become an inter-bank liability. In other words, once a deposit has been created and transferred to another bank (Bank B), in this instance the first bank (Bank A) has received a loan from Bank B. If the receiver bank B is willing to 'accept' the transfer of the deposit, this is equivalent to the receiver Bank B giving credit to the first Bank A. So the balance sheet of the first Bank A only reflects a swap of a 'customer deposit' for a liability to another bank. Sorting out and netting such interbank liabilities is the original *raison d'être* of the interbank market. As long as banks create credit at the same rate as other banks, and as long as customers are similarly distributed, the mutual claims of banks on each other will be netted out and may well, on balance, cancel each other out. Then banks can increase credit creation without limit and without 'losing any money'. This has been recognised even by supporters of the *fractional reserve theory of banking*: Samuelson (1948) mentions – though fails to emphasise – that banks do not lose any reserves when they all create credit at the same pace and have equally dispersed customers. It is a mystery why Samuelson did not recognise this as approximating the standard case, and instead chose to highlight a hypothetical and highly unusual special case where a bank will pay out a

[15] Authors that had recognised the flaws in the fractional reserve theory include Charles Goodhart (1984): "The use of the money multiplier identity obscures, rather than illuminates…" (p. 199); Basil Moore (1988): "the notion of a money-multiplier identity is seriously deficient as an analytical concept" (p. 70); Richard Werner (2005): "…we conclude that the textbook representation of the actions of each bank is inaccurate" (p. 176).

loan in cash to someone who does not hold an account at the bank.[16] It is even more mysterious why later editions of this most influential textbook dropped out this section on the netting of interbank liabilities and consequent money creation by the banking system without direct restraint from reserves.

5. Implications for bank regulation

The implications of our empirical findings are far-reaching for bank regulation and the design of official policies. Bank regulation is based on the prevailing understanding of the role of banks. During the past forty years when the *financial intermediation theory of banking* has been dominant, bank regulation has focused on capital adequacy. During the earlier thirty years or so, when the *fractional reserve theory of banking* was dominant, reserve requirements featured as the main way to regulate bank activity. Neither has been successful.

5.1. Regulation via reserve requirements

Bank regulation centred on reserve requirements was based on, and theoretically supported by, the *fractional reserve theory of banking*. It was found, however, that this regulatory policy was impracticable for central banks to operate (Goodhart, 1989). In this paper we have identified just why this had to be the case: the *fractional reserve theory of banking* is wrong. An analysis of bank accounting shows that banks' reserves with the central bank never leave the accounts of the central bank: like 'deposits' of the public with banks (which in reality are simply records of units of accounting money owed by banks to the public), 'reserves' by banks at the central bank are simply accounting records of money units owed by the central bank to the banks. Such indebtedness does not directly result in money circulating in the economy, except when it is due to a demand for legal tender cash (Ryan-Collins et al., 2011). To make central bank expansionary monetary policies more effective, it would thus be sensible to expand the role of cash — although, surprisingly, today central bankers are calling for its abolition (Haldane, 2015). As reserve requirements were not an effective policy tool, they have gradually been de-emphasised. Some central banks, such as the Bank of England and the Swedish Riksbank, have abolished reserve requirements altogether.

5.2. Regulation via capital adequacy

In parallel with the policy to de-emphasise reserve requirements in bank regulation, central banks, via their influence on the Basel Committee on Banking Supervision, have shifted towards regulating banks using capital ratios. This approach is predicated on the veracity of the *financial intermediation theory*, which had been increasingly supported by central banks. As financial intermediaries, banks cannot, individually or in aggregate, increase the money supply available as potential bank capital. Hence imposing capital requirements on banks appears to be a viable way to keep their actions within limits. The contradiction is that, if banks were only financial intermediaries, their actions could hardly have a significant macroeconomic impact in any case, rendering such regulation unnecessary. It seems, once again fundamental facts concerning banking have been overlooked.

In reality the money supply is "created by banks as a byproduct of often irresponsible lending", as journalist Martin Wolf called it (Wolf, 2013). Thus the ability of capital adequacy ratios to rein in expansive bank credit behaviour is limited: imposing higher capital requirements on banks will not necessarily stop a boom-bust cycle and prevent the subsequent banking crisis, since even with higher capital requirements, banks could still continue to expand the money supply, thereby fuelling asset prices: Some of this newly created money can be used to increase bank capital (Werner, 2010). This was demonstrated during the 2008 financial crisis.

5.2.1. How to create your own capital: the Credit Suisse case study

The link between bank credit creation and bank capital was most graphically illustrated by the actions of the Swiss bank Credit Suisse in 2008. This incident has produced a case study that demonstrates how banks as money creators can effectively conjure any level of capital, whether directly or indirectly, therefore rendering bank regulation based on capital adequacy irrelevant: Unwilling to accept public money to shore up its failing capital, as several other major UK and Swiss banks had done, Credit Suisse arranged in October 2008 for Gulf investors (mainly from Qatar) to purchase in total over £7 billion worth of its newly issued preference shares, thus raising the amount of its capital and thereby avoiding bankruptcy. A similar share issue transaction by Barclays Bank was "a remarkable story of one of the most important transactions of the financial crisis, which helped Barclays avoid the need for a bailout from the UK government". The details remain "shrouded in mystery and intrigue" (Jeffrey, 2014) in the case of Barclays, but the following facts seem undisputed and disclosed in the case of Credit Suisse, as cited in the press (see e.g. Binham et al., 2013):

The Gulf investors did not need to take the trouble of making liquid assets available for this investment, as Credit Suisse generously offered to lend the money to the Gulf investors. The bank managed to raise its capital through these preference shares. Table 11 illustrates this capital bootstrapping (not considering fees and interest).

Table 11
How to create your own capital: Credit Suisse in 2008.
£bn.

Step 1: Loan to Gulf Investor

Assets			Liabilities		
			Deposits……	+	7
Loans and investments….	+	7	Capital	+	0
Total……	+	7	Total……	+	7

Step 2: Capital Raising: A Liability Swap

Assets			Liabilities		
			Deposits……	+	0
Loans and investments….	+	7	Capital	+	7
Total……	+	7	Total……	+	7

Since it is now an established fact that banks newly invent the money that is 'loaned' by creating it out of nothing, the loan to the Gulf investor created (in step 1) a simultaneous asset and liability on the bank's balance sheet, whereby the customer's borrowed money appears as the fictitious customer deposit on the liability side, of £7bn. Considering the same change in step 2, but now after the liability swap, we see that the newly issued preference shares boost equity capital: They are paid for with this fictitious customer deposit, simply by swapping the £7bn from item 'customer deposit' to item 'capital'. Credit Suisse is then able to report a significant rise in its equity capital, and hence in its capital/asset ratio. Where did the additional £7bn in capital come from? Credit Suisse had lent it to the investor, using its own preference shares as collateral, and hence had invented its own capital. The risk to the borrower was also limited if the Credit Suisse shares, not other assets, served as collateral.

As has been pointed out (Werner 2014c), in the UK such actions would be illegal, as they violate Section 678 of the Companies Act

[16] In the words of Moore (1988):

"While an individual bank will gradually lose the primary deposits created by its loan, provided that it just keep pace with the rate of loan expansion of its competitors it will gain secondary deposits from the recipients of their borrowers, so that no net outflow of funds at clearing need result" (p. 68).

2006 (Prohibition of assistance for acquisition of shares in public company). However, the Swiss regulators were happy to tolerate this. The transgression is clearly graver in the case of a bank, compared to an ordinary firm lending to an investor to purchase the firm's shares: Credit Suisse had not merely lent a prospective shareholder the funds to buy its shares, but it created the funds out of nothing. A very similar transaction involving similar amounts and also Qatar as investor is alleged to have been undertaken by Barclays Bank in the UK, allegedly also involving an upfront 'fee' paid to Qatar of £322m, which could be a refund of the interest on the loan. The role of interest is a topic not discussed in detail in this article. In such a transaction, Barclays would likely need to charge interest on the loan, in order for it to appear as a regular deal. If the Gulf investor was acting as a strawman for what amounts to an internal accounting exercise to create the bank's own capital out of thin air, a part or all of this fee could have been the refund of the interest on the loan, so that the investor would not even have to pay interest for receiving the newly created money and with it the preference shares.

According to analysts at Italian bank Mediobanca, such bank loans to new bank share investors were a "fairly common practice... during the crisis", whereby Credit Suisse may have been unusual in disclosing this and obtaining regulatory approval. Either way, banks in this way created their own capital out of nothing, thus making nonsense of capital adequacy regulations.

We learn from this that under the right circumstances it is possible even for an individual bank to show almost any amount of capital to regulators. It is even more easily possible for the whole banking system collectively to do likewise, without directly contravening the Companies Act. Since during boom times an increasing amount of money is created by banks (hence the boom), some of that can be siphoned off by banks to bolster their capital by issuing new equity. The regulators seem unaware of this fact, as their descriptions of banking reveal them to be adherents of the erroneous *financial intermediation theory of banking*.

5.3. Empirically successful bank regulation

Having briefly discussed historically unsuccessful bank regulation, it remains to be stated that there is a form of bank regulation that has been empirically successful. Not surprisingly, this form of bank regulation was based on a recognition of the veracity of the *credit creation theory of banking*: Many central banks have successfully avoided banking crises for several decades by imposing regulations on banks concerning the quantity and allocation of bank credit. Known as 'credit guidance' or 'window guidance', such policies have also been at the heart of the high growth in the successful East Asian economies such as Japan, Korea, Taiwan and China (Werner, 2002, 2003, 2005). Using such guidance, bank credit for non-GDP (i.e. asset) transactions could be suppressed, so that asset bubbles and subsequent banking crises were avoided. When instead bank credit was guided towards productive use, high, stable and non-inflationary economic growth could be achieved, as the Quantity Theory of Credit (Werner, 1997, 2005) suggests. An alternative approach to avoiding asset bubbles and banking crises and stimulating high and stable growth has been demonstrated in Germany, where the structure of the banking sector – consisting largely of many small not-for-profit banks – produced this result.

6. Implications for development policies

The findings also have broader implications for policies to ensure economic growth and minimise unemployment, as well as policies for developing countries concerning the question of how to maximise sustainable growth.

As was noted above, the Keynesian growth models by Harrod (1939) and Domar (1947), following the *financial intermediation theory of banking*, argue that savings are necessary for investment and hence economic growth. These theories have, together with more recent theories, been deployed by the IMF and the World Bank in their policy advice to developing countries to obtain the allegedly 'necessary' savings for investment and economic growth from foreign lenders, and to substitute for their lacking 'domestic savings'. The international banks usually came on the heels of the Washington institutions and, whenever a developing country had resources or attractive assets, were keen to lend.

As a result, a large number of developing countries, as well as transition economies and emerging markets have accumulated large amounts of foreign debt. This debt was invariably denominated in foreign currency and needs to be serviced at interest. This suggests that the sophisticated international banks felt that the developing countries are far better at hedging currency risk than they are.

This was not the case: since most of the indebted countries are commodity exporters, in the long-run (over a century or so) their terms of trade tend to fall (as the relative price of their exports declines over time compared to the relative price of their imports — since relative prices are a function of value added, with high value added exports over time becoming more expensive in relative terms and low value added exports becoming cheaper, see Prebisch, 1950, and Singer, 1950). Thus over time their currencies can be expected to decline, compared to the US dollar or European currencies. Therefore the advice to borrow in foreign currency was not in the interest of the borrowers. In domestic currency terms their foreign debt and payments to service them hence rose over time. Meanwhile, fixed exchange rate systems are not likely to remain sustainable, if there is substantial foreign borrowing, as the Asian crisis has shown.

The large and rising amounts of payments to service their foreign debt may explain what otherwise is a puzzle in economic theory, namely why international financial flows seem to be directed from poor countries to rich countries (theory predicts the opposite, due to the yield differential, see Lucas, 1990). As a result, a transfer of net resources from the less well-off countries to the rich countries has been taking place, putting the former ever more at the mercy of the latter. (As long as this process continues the residents of the less well-off countries have an incentive to vote with their feet, and migrate to the richer countries, if they are allowed to).

This article and Werner (2000, 2014b) have demonstrated that the justification for this approach to economic development is flawed. Worse, when considering the bank accounting reality of such international borrowing it emerges that it has been one cruel trick on developing countries: In many, if not most cases, the countries would have been better off by not borrowing from abroad at all. The foreign money never entered their economies: the accounting reality of international banking shows that US dollars stay in the US banking system, and euros stay in the European banking system. Bank money stays within the respective banking system of the currency of denomination. (This is also true for foreign currency accounts or mortgages offered by banks: in these cases, respective balances are recorded in accounts with overseas correspondent banks.) In other words, the dollars that created the 'Third World Debt' problem never even entered the borrowing countries. If and when such foreign currencies are exchanged by developing countries into domestic currency, they will merely result in an increase in credit creation by the domestic banking system, denominated in domestic currency. However, this is something any developing country can arrange for without the need to borrow from abroad at all (Werner, 2000, 2003a).

So the advice to borrow from abroad was largely against the interests of the developing countries: it exposed these countries to foreign currency risk, often resulting in mounting debt and interest outflows in excess of any loans received. But it triggered such 'solutions' to the problem as debt for equity swaps, handing over national assets to the foreign lenders. Bankers suggesting debt relief, such as Alfred Herrhausen, head of Deutsche Bank, were unpopular with their colleagues. To add insult to injury, it is now established that the foreign loans were not necessary for domestic growth, after all: the foreign

lenders merely created the money out of nothing through bank credit creation, something the borrowers could have done themselves at home without the foreign loans.

The alternative to this Washington Consensus approach to 'aiding' developing countries has been showcased in East Asia. The highly successful economies of Japan, Taiwan, Korea and China all used mechanisms to guide domestic bank credit to productive use, funding import substituting domestic and exporting industries, as discussed above in section 5.3. The findings in this paper provide fundamental support for this argument.

The findings are of equal relevance for developed economies. Countries such as Japan, Spain or Greece have been experiencing low nominal GDP growth. Applying the knowledge of bank credit creation to fiscal policy, an important lesson is that the method of funding government expenditure can have a significant impact on the effectiveness of fiscal policy. As Werner (2014a) shows, governments can enhance the degree of stimulation achieved by any given fiscal policy, if the source of government funding is changed from bond issuance to borrowing from banks. The latter expands the money supply and results in growth of nominal GDP and tax revenues.

7. Implications for economics

How is it possible that for the largest part of the past century erroneous and misleading theories have dominated the economics discipline? This is a topic for future research, and only two avenues will be briefly explored here: the role of research methodology, and the role of interested parties.

7.1. Methodology in economics

Classical and neo-classical economics, as dominant today, has used the deductive methodology: Untested axioms and unrealistic assumptions are the basis for the formulation of theoretical dream worlds that are used to present particular 'results'. As discussed in Werner (2005), this methodology is particularly suited to deriving and justifying preconceived ideas and conclusions, through a process of working backwards from the desired 'conclusions', to establish the kind of model that can deliver them, and then formulating the kind of framework that could justify this model by choosing suitable assumptions and 'axioms'. In other words, the deductive methodology is uniquely suited for manipulation by being based on axioms and assumptions that can be picked at will in order to obtain pre-determined desired outcomes and justify favoured policy recommendations. It can be said that the deductive methodology is useful for producing arguments that may give a scientific appearance, but are merely presenting a pre-determined opinion.

Werner (2005) argues that research in economics and finance should instead be based on a rigorous application of the scientific inductive methodology. This will ensure that empirically-based and scientific research is produced, which is far less prone to be influenced by prior political views of the authors than is the case with research based on the deductive methodology. Needless to mention, it is the inductive methodology that has led to the research presented in this paper.

7.2. Information management

Progress in economics and finance research would require researchers to build on the correct insights derived by economists at least since the 19th century (such as Macleod, 1856). The overview of the literature on how banks function, in this paper and in Werner (2014b), has revealed that economics and finance as research disciplines have on this topic failed to progress in the 20th century. The movement from the accurate *credit creation theory* to the misleading, inconsistent and incorrect *fractional reserve theory* to today's dominant, yet wholly implausible and blatantly wrong *financial intermediation theory* indicates that economists and finance researchers have not progressed, but instead regressed throughout the past century. That was already Schumpeter's (1954) assessment, and things have since further moved away from the *credit creation theory*.

The analysis of the fractional reserve and financial intermediation theories in this paper and in Werner (2014b) provides indications that attempts were made to obfuscate, as if authors were at times wilfully trying to confuse their audience and lead them away from the important insight that each individual bank creates new money when it extends credit. An examination of his 1948 textbook suggests that Samuelson was more aware of the power of individual banks to create money than later authors, but he chose to distract from this fact with unrealistic special cases. But also Keynes did much to regress the discipline, with his followers Tobin and others spearheading the promulgation of the *financial intermediation theory of banking*, so that even the *fractional reserve theory* disappeared from sight, and banks became mere financial intermediaries also in aggregate. Many economists appear to have been aware of the fact that banks create money out of nothing, but chose to de-emphasise it, or even produce analysis that contradicts it. Joseph Stiglitz, whose textbook emphasises the fractional reserve theory, in 2003 conceded - only briefly and almost hidden at the very end of his co-authored book- that

> "When a bank extends a loan, it creates a deposit account, increasing the supply of money. … the creation of money and the creation of credit occur together"
>
> (Stiglitz and Greenwald, 2003, p. 295).

Yet, this insight was not visibly applied in their book. Moreover, on the same page the authors appear to erroneously believe that this ability to create money is not unique to banks:

> "Attempts to restrict banks may simply divert more of the credit creation activities to non-bank sources of credit"
>
> (op. cit., p. 295).

That such important insights as bank credit creation could be made to disappear from the agenda and even knowledge of the majority of economists over the course of a century delivers a devastating verdict on the state of economics and finance today. As a result, the public understanding of money has deteriorated as well. Today, the vast majority of the public is not aware that the money supply is created by banks, that banks do not lend money, and that each bank creates new money when it extends a loan.

The question whether the sequential introduction of the incorrect fractional reserve and financial intermediation theories of banking – leading the student ever further away from the truth – was intentional or not requires further research. Such research should focus on the role of interested parties, especially that of internationally active banks, central banks and privately funded think tanks, in influencing academic discourse. It is worrying, for instance, that the topic of bank credit creation has been a virtual taboo for the thousands of researchers of the world's central banks during the past half century. As Cheng and Werner (2015) show, among the 3882 research papers produced and made available online by five major central banking research outlets (Federal Reserve Board Washington, Federal Reserve Bank of New York, Bank of Japan, European Central Bank, Bank of England) in the two decades to 2008, only 19 articles even included the words 'credit creation'. Of these, only 3 seemed to use the term in the correct sense of bank creation of credit and money. On the other hand, experienced central bankers aware of the importance of bank credit creation have spoken out about this topic after leaving the central bank (Kure, 1975; Werner, 2003a). Why have central banks – where the largest number of experts on this topic could be expected to work – singularly failed to even research this topic, let alone formulate and crystallise useful policy recommendations from it? A former central banker in a rare frank interview discusses this issue (Werner, 2003b, Ishii and Werner, 2003) and suggests that central banks have been engaging in 'information management', by purposely

controlling and shaping the research they publish. Senior staff approve the research topics and check, modify and censor articles written by the central bank researchers before delivering them to the public. In this process, what is considered a 'harmful truth' gets weeded out, while what is considered useful for the central bank remains. In other words, the publications of central banks must be considered biased. Considering these facts, one is left to wonder whether the actual goals of central banks are the right ones, and whether the research they publish is useful.

It is also a relevant subject of future research to investigate how central banks have exerted influence over the research conducted by academics. For instance, the Swedish central bank established a pseudo-'Nobel Prize' by awarding substantial sums of money to selected economists – none of them supporters of the credit creation theory of banking – and calling this prize the 'Riksbank [Swedish central bank] prize in economic sciences in honour of Alfred Nobel'. The fact that journalists would abbreviate this as a 'Nobel Prize' in their reporting of the award could neither have been a surprise nor unwelcome to the Swedish central bank, which lobbied for the involvement of the Nobel Foundation in the award of this prize. Through the award of this central bank prize, a particular branch of economics, usually based on the deductive methodology, received a significant boost internationally. It is noticeable that a number of authors implicated in leading the public away from the credit creation reality of banking have been receivers of this Swedish central bank prize (including Samuelson, Tobin and Krugman).

Meanwhile, investigative journalists have pointed out that the editorial boards of leading journals in economics and especially monetary economics are staffed by current or former employees of and consultants to central banks, particularly the US central bank.[17]

More research on the 'information management' policies of central banks, think tanks and even universities is called for.

8. Conclusion

In this paper the reason why bank regulation based on the *fractional reserve* and on the *financial intermediation theories of banking* have not been successful could be identified. On the other hand, having no bank regulation is also not likely to be successful, as the 2008 financial crisis has shown: Bank credit derivatives had been entirely unregulated on the advice of Alan Greenspan and other supporters of unregulated markets. They have since concurred with their critics that regulation would have been better. But what type of bank regulation is likely to be more successful?

In the era when the *credit creation theory of banking* was dominant, its proponents pointed out that bank credit creation and growth in economic activity are connected, and credit for different types of transactions has a diverging effect on the economy. They have thus favoured bank regulation that directly targets bank credit, both its quantity and its quality (i.e. the type of transaction that gets funded by bank credit), whereby economically desirable bank credit is encouraged, and economically harmful credit creation is forbidden or restricted quantitatively. The relationship between disaggregated bank credit creation on the one hand and nominal GDP growth, real GDP growth and asset prices on the other was identified by the Quantity Theory of Credit (Werner, 1992, 1997, 2005, 2012, 2013), which can serve to guide the direction of credit. In particular, guidance could be used to restrict credit for transactions that do not contribute to nominal GDP: such credit for financial transactions creates asset boom-bust cycles and instability in the banking system. Before the use of reserve requirements, capital adequacy or interest rate targeting became dominant in the second half of the 20th century, central banks focused more on controlling bank credit directly. This policy was pioneered by the Reichsbank in 1912, but has been tried and tested by most central banks sometime between the 1920s through to the 1960s (with some continuing the practise until the 1980s, such as the Bank of Japan and the Banque de France with their 'window guidance' and *encadrement du credit* techniques, respectively). Credit guidance has an excellent track record in achieving the targeted credit growth and sectoral allocation (Werner, 2005). This is especially relevant in the era of post-crisis monetary policy (see Lyonnet and Werner, 2012, Werner, 2013).

The fact that banks create credit and money out of nothing which, if used productively, results in non-inflationary growth, is important for developing countries. Often it will not make sense to borrow from abroad in order to stimulate domestic growth: the foreign money does not enter the economy, and the country gets ensnared in spiralling foreign currency debt, when actually the foreign banks just created the money out of nothing, something the developing country could have arranged for through its own domestic banks. It also has implications for the question of who should pay for bank bailouts, shifting the pendulum from burdening tax-payers towards central bankers (Werner, 2012).

The question why economics seems to have made no progress in the 20th century concerning a pivotal issue, namely the role of banks, is important and troubling. The thesis that conflicts of interest and indeed vested interests may have been at play (especially emanating from central banks and large banks) was discussed and requires further research.

Overall it can be said that one of the implications of this study is that it does not make much sense to build economic theories of the financial sector, if these are not based on institutional (and accounting) realities. The role of accounting and law in economics should be increased, both in research and in the teaching of economics. This includes the role of national income accounting and flow of funds information (see Winkler et al., 2013a, b), which have to be reconciled with those records of the banks. These are not only the "central settlement bureau, a kind of clearing house or bookkeeping centre for the economic system" (Schumpeter, 1934, p. 124), but also the creators and allocators of the money supply. The reflection of empirical bank reality within theories and textbooks surely must become the 'new normal' in finance and economics.

Finally, the confirmation of the results reported in Werner (2014b) further strengthens the call for a new, interdisciplinary research agenda on the role of banks and the central bank in particular, and the monetary system in general, which should be firmly rooted in the inductive, empirical research methodology to produce scientific economics. While many authors have proclaimed a continuous blurring of the division between banks and non-bank financial institutions, Werner (2014c) showed precisely what allows banks to create money (and capital) out of nothing, while non-banks are unable to do so. Interdisciplinary work with researchers in politics, law, accounting, management, operational research, information technology, engineering and systems research is called for to ensure that economics and finance on their own cannot continue to ignore empirical reality and embark on another lost century for economic sciences.

Supplementary data to this article can be found online at http://dx.doi.org/10.1016/j.irfa.2015.08.014.

References

Admati, A., & Hellwig, Martin (2012). *The Bankers' New Clothes*. Princeton: Princeton University Press.

Alhadeff, D. A. (1954). *The Rise of Commercial Banking*. Berkeley: University of California Press (reprinted in 1980 by Arno Press as: Monopoly and Competition in Banking).

Allen, F., & Gale, D. (2004a). Financial intermediaries and markets. *Econometrica*, *72*, 1023–1061.

Allen, F., & Gale, D. (2004b). Competition and financial stability. *Journal Money, Credit, Banking*, *36*, 453–480.

Allen, F., & Santomero (2001). What do financial intermediaries do? *Journal of Banking & Finance*, *25*(2001), 271–294.

Aschheim, J. (1959). Commercial banks and financial intermediaries: fallacies and policy implications. *Journal of Political Economy*, *LXVII*(February), 59–71.

Baltensperger, E. (1980). Alternative approaches to the theory of the banking firm. *Journal of Monetary Economics*, *6*, 1–37.

Bank of England (2014a), Money in the modern economy: An introduction, by Michael McLeay, Amar Radia and Ryland Thomas of the Bank's Monetary Analysis Directorate, Quarterly Bulletin, Q1 2014.

[17] Huffington Post: Priceless: How the Fed bought the economics profession. By Ryan Grim. 7 September 2009. Accessed at http://www.huffingtonpost.com/2009/09/07/priceless-how-the-federal_n_278805.html

Bank of England (2014b), Money creation in the modern economy, by Michael McLeay, Amar Radia and Ryland Thomas of the Bank's Monetary Analysis Directorate, Quarterly Bulletin, Q1 2014.

Bank of England (2014c). *Taking the long view: How market-based finance can support stability, Speech given by Dame Clara Furse.* External Member of the Financial Policy Committee, Bank of England at the Chartered Institute for Securities and Investment, Liverpool 28 March 2014.

Bank of England (2014d). *The Bank of England's forecasting platform: COMPASS, MAPS, EASE and the suite of models.* Bank of England Working Paper No. 471.

Bencivenga, V. R., & Smith, B. (1991). Financial intermediation and endogenous growth. *Review of Economic Studies*, *58*, 195–209.

Benes, J., & Kumhof, M. (2012). *The Chicago plan revisited, WP/12/202.* Washington DC: IMF.

Bernanke, B., & Blinder, A. S. (1988). Credit, money and aggregate demand. *American Economic Review, Proceedings*, *78*, 435–439.

Bernanke, B., & Gertler, M. (1995). Inside the black box: The credit channel of monetary policy transmission. *Journal of Economic Perspectives*, *9*(4), 27–48.

Binham, Caroline, Schäfer, Daniel, & Jenkins, Patrick (1. February, 2013). Qatar connection adds to Barclays' woes. *Financial Times*.

Brunnermeier, Markus and Yuliy Sannikov, The i theory of money, mimeo 2015

Carney, M. (2014). *One Mission. One Bank. Promoting the good of the people of the United Kingdom, Speech given by Mark Carney, Governor of the Bank of England, Mais Lecture at Cass Business School.* London: City University available at www.bankofengland.co.uk/publications/Documents/speeches/2014/speech715.pdf

Cassel, G. (1918). *Theoretische Sozialökonomie.* Leipzig: C. F. Wintersche Varlagshandlung.

Cassel, G. (1923). *The Theory of Social Economy.* T. Fisher Unwin.

Casu, B., & Girardone, C. (2006). Bank competition, concentration and efficiency in the single European market. *The Manchester School*, *74*(4), 441–468 Special Issue.

Casu, B., Girardone, C., & Molyneux, P. (2006). *Introduction to Banking.* Harlow: FT Prentice Hall, Pearson Education Ltd.

Cecchetti, S. G. (2008). *Money, Banking and Financial markets* (2nd ed.). New York: McGraw-Hill Irwin.

Cheng, C., & Werner, R. A. (2015). An empirical analysis of economic research produced by five major central banks (1988–2008). *CBFSD discussion paper*. Centre for Banking, Finance and Sustainable Development, University of Southampton.

Crick, W. F. (1927). The genesis of bank deposits. *Economica*, 191–202.

Culbertson, J. (1958). Intermediaries and monetary theory: A criticism of the Gurley-Shaw Theory. *American Economic Review*, *48*, 119–131.

Davenport, H. J. (1913). *The Economics of Enterprise.* New York: Augustus M. Kelley.

Dewatripont, M., Rochet, J. -C., & Tirole, J. (2010). *Balancing the Banks: Global lessons from the financial crisis.* Princeton: Princeton University Press.

Diamond, D. W. (1984). Financial intermediation as delegated monitoring. *Review of Economic Studies*, *51*, 393–414.

Diamond, D. W. (1991). Monitoring and reputation: The choice between bank loans and directly placed debt. *Journal of Political Economy*, *99*(4), 689–721.

Diamond, D. W. (1997). Liquidity, banks, and markets. *Journal of Political Economy*, *105*(5), 928–956.

Diamond, D. W., & Dybvig, P. H. (1983). Bank runs, deposit insurance, and liquidity. *Journal of Political Economy*, *91*(3), 401–419.

Diamond, D. W., & Rajan, R. G. (2001). Banks, short-term debt and financial crises: Theory, policy implications and applications. *Carnegie-Rochester Conference Series on Public Policy*, *54(1)*. (pp. 37–71). Elsevier.

Domar, E. (1947). Expansion and employment. *American Economic Review* March.

Eatwell, J., Milgate, M., & Newman, P. (Eds.). (1989). *The New Palgrave Money*. Basingstoke: Macmillan.

FCA, & PRA (2014). *FCA Handbook.* London: Bank of England (online at fshandbook.info).

Fisher, I. (1935). *100% Money.* New York: The Adelphi Company.

Gertler, M., & Kiyotaki, N. (2011). Financial intermediation and credit policy in business cycle analysis. In B. Friedman, & M. Woodford (Eds.), *Handbook of Monetary Economics*, *3A*, North Holland:: Elsevier.

Goodhart, C. A. E. (1984). *Monetary Theory and Practice: The UK experience.* New York: Macmillan.

Goodhart, C. A. E. (1989). *Money, Information and Uncertainty* (2nd ed.). London: Macmillan.

Gorton, G., & Pennacchi, G. (1990). Financial intermediaries and liquidity creation. *The Journal of Finance*, *45*(1), 49–71.

Gurley, J. G., & Shaw, E. S. (1955). Financial aspects of economic development. *American Economic Review*, *45*, 515–528.

Gurley, J. G., & Shaw, E. S. (1960). *Money in a Theory of Finance.* Washington: Brookings Institution.

Guttentag, J. M., & Lindsay, R. (1968, Sep.–Oct.). The uniqueness of commercial banks. *Journal of Political Economy*, *76*(5), 991–1014.

Haldane, A. (2015). *How low can you go? - speech by Andrew Haldane, given at the Portadown Chamber of Commerce, Northern Ireland.* accessed at: http://www.bankofengland.co.uk/publications/Pages/speeches/2015/840.aspx.

Hahn, A. C. (1920). *Volkswirtschaftliche Theorie des Bankkredits.* Tübingen: J.C.B. Mohr.

Harrod, R. (1939, March). An essay in dynamic theory. *Economic Journal*, *49*, 14–33.

Hawtrey, R. G. (1919). *Currency and Credit.* Longmans, Green and Co.

Hoppe, H. H., Hülsmann, J. G., & Block, W. (1998). Against fiduciary media. *Quarterly Journal of Austrian Economics*, *1*(1), 19–50.

von Hayek, F. (1929). *Geldtheorie und Konjunkturtheorie.* Hölder-Pichler-Tempsky.

Heijdra, B. J., & Van der Ploeg, F. (2002). *Foundations of Modern Macroeconomics.* Oxford: Oxford University Press.

Howe, R. H. (1915). *The Evolution of Banking; A study of the development of the credit system.* Chicago: C. H. Kerr & Company.

Ishii, M., & Werner, R. A. (2003). *The Bank of Japan under Toshihiko Fukui.* Tokyo: Appuru Shuppan (in Japanese).

James, F. C. (1930). *The Economics of Money, Credit and BankingNew York: Ronald Press Co.*

Jeffrey, E. (2014). Barclays' Qatari capital-raising timeline. *Euromoney* accessed at http://www.euromoney.com/Article/3198818/Barclays-Qatari-capital-raising-timeline.html.

Kashyap, A., Rajan, R., & Stein, J. (2002). Banks as liquidity providers: An explanation for the coexistence of lending and deposit-taking. *Journal of Finance*, *57*, 33–73.

Keynes, J. M. (1924). *Tract on Monetary Reform.* London: Macmillan.

Keynes, J. M. (1930). *A Treatise on Money.* London: Macmillan.

Keynes, J. M. (1936). *The General Theory of Employment. Interest and Money*. London: Macmillan.

Keynes, J. M., & Moggridge, D. E. (1983). *Collected writings XI, economic articles and correspondence: Academic, collected works of Keynes, 419.*

Kohn, D. (2009, October 9). Monetary policy research and the financial crisis: Strength and shortcomings. *Speech at the Federal Reserve Conference on key developments in monetary policy, Washington, D.C.*

Krugman, Paul (2015), The rage of the bankers, *The New York Times*, 21 Sept. 2015

Kure, B. (1975). Nihon ginko no madoguchi shido. *Shikan Gendai Keizai*, *17* March.

Lucas, Robert E. (1990), Why doesn't capital flow from rich to poor countries? *American Economic Review*, 80, No. 2, pp. 92–96, (Papers and Proceedings).

Lyonnet, V., & Werner, R. A. (2012). Lessons from the Bank of England on 'quantitative easing' and other 'unconventional' monetary policies. *International Review of Financial Analysis*, *25*, 1–17, (http://www.sciencedirect.com/science/article/pii/S1057521912000737).

MacLeod, H. D. (1856). *The Theory and Practice of Banking*, *2 vols.*, London: Longman, Greens and Co. (citations from the 6th edition of 1906).

Macmillan Committee (1931). *British parliamentary reports on international finance: The report of the Macmillan committee.* London: H.M. Stationery Office.

Marshall, A. (1890). *Principles of Economics.* London: Macmillan.

Matthews, K., & Thompson, J. (2005). *The Economics of Banking.* Chichester: John Wiley and Sons.

Moeller, H. (1925). *Die Lehre vom Gelde.* Leipzig: Quelle und Meyer.

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

Myers, S. C., & Rajan, R. G. (1998). The paradox of liquidity. *The Quarterly Journal of Economics*, *113*(3), 733–771.

Phillips, C. A. (1920). *Bank Credit.* New York: Macmillan.

Prebisch, R. (1950). *The Economic Development of Latin America and its Principal Problems, Lake Success.* United Nations.

Rajan, R. G. (1998). The past and future of commercial banking viewed through an incomplete contract lens. *Journal of Money, Credit and Banking, 30*(3), 524–550.

Riordan, M. H. (1993). Chapter 11: Competition and bank performance: a theoretical perspective. In C. Mayer, & X. Vives (Eds.), *Capital markets and financial intermediation* (pp. 328–343). Cambridge: Cambridge University Press.

Rochon, L. -P., & Rossi, S. (Eds.). (2003). *Modern Theories of Money: The nature and role of money in capitalist economies*. Cheltenham, UK and Northampton, MA: Edward Elgar.

Ryan-Collins, J., Greenham, T., Werner, R. A., & Jackson, A. (2011). *Where does Money come from?* London: New Economics Foundation.

Samuelson, P. (1948). *Economics.* New York: McGraw-Hill.

Samuelson, P., & Nordhaus, W. (1995). *Economics.* New York: McGraw-Hill.

Schumpeter, J. A. (1934). *The Theory of Economic Development: An inquiry into profits, capital, credit, interest, and the business cycle.* Cambridge (Mass.): Harvard University Press.

Schumpeter, J. A. (1912). *Die Theorie der wirtschaftlichen Entwicklung.* Leipzig: Duncker und Humblot.

Schumpeter, J. A. (1954). *History of Economic Analysis.* New York: Oxford University Press.

Sealey, C., & Lindley, J. T. (1977). 'Inputs, outputs and a theory of production and cost at depositary financial institutions'. *Journal of Finance*, *32*, 1251–1266.

Sheard, P. (1989). The mainbank system and corporate monitoring and control in Japan. *Journal of Economic Behavior and Organization*, *11*, 399–422.

Singer, H. (1950). The distribution of gains between investing and borrowing countries. *American Economic Review*, *40*, 473–485 (Papers and Proceedings).

Smith, Paul F (1966). Concepts of money and commercial banks, *Journal of Finance*, 21, 635-648.

Smith, Warren (1959, November), Financial intermediaries and monetary controls, *Quarterly Journal of Economics*, 73, 533-553.

Solomon, E. (1959). "Financial institutions in the savings–investment process". *Conference on Savings and Residential Financing* (pp. 10–55). Chicago: U.S. Savings and Loan League (Proceedings).

Sorensen, P. B., & Whitta-Jacobsen, H. J. (2010). *Introducing Advanced Macroeconomics* (2nd ed.). Maidenhead: McGraw-Hill.

Stein, J. C. (2014). *Banks as patient debt investors.* Philadelphia, Pennsylvania: American Economic Association/American Finance Association Joint Luncheon speech delivered on 3 January 2014.

Stiglitz, J. (1997). *Economics* (2nd ed.). New York: W. W. Norton.

Stiglitz, J. E., & Greenwald, B. (2003). *Towards a New Paradigm in Monetary Iconomics.* Cambridge: Cambridge University Press.

Tily, G. (2012). Keynes's monetary theory of interest. *BIS Papers No. 65*. Basel: BIS.

Tobin, J. (1969). A general equilibrium approach to monetary theory. *Journal of Money, Credit and Banking*, *1*, 15–29.

Tobin, J. (1963). Commercial banks as creators of, money', Cowles Foundation Paper 205 reprinted. In D. Carson (Ed.), *Banking and Monetary Studies*Irwin: Homewood.

von Mises, L. (1912). *Theorie des Geldes und der Umlaufsmittel.* Leipzig: Duncker und Humblot.

Werner, R. A. (1992). Towards a quantity theory of disaggregated credit and international capital flows'. *Paper presented at the Royal Economic Society Annual Conference, York, April 1993 and at the 5th Annual PACAP Conference on Pacific-Asian Capital Markets in Kuala Lumpur, June 1993, reviewed by the Economist on 19 June 1993 in the 'Economics Focus'.*

Werner, Richard A. (1997). 'Towards a new monetary paradigm: A quantity theorem of disaggregated credit, with evidence from Japan', *Kredit und Kapital*, vol. 30, no. 2, 1997, pp. 276–309.

Werner, R. A. (2000). Macroeconomic Management in Thailand: The Policy-induced Crisis. In G. S. Rhee (Ed.), *Rising to the Challenge in Asia: A Study of Financial Markets, Vol.* Asian Development Bank: II, Thailand, Manila.

Werner, R. A. (2003a). *Princes of the Yen, Japan's central bankers and the transformation of the economy*. New York: M. E. Sharpe.

Werner, Richard A. (2003b). 'Aspects of career development and information management policies at the bank of Japan – A frank interview with a former central banker', *The Japanese Economy*, vol. 30, no. 4, New York: M. E. Sharpe.

Werner, R. A. (2005). *New Paradigm in Macroeconomics*. Basingstoke: Palgrave Macmillan.

Werner, R. A. (2010). *Comment on Strengthening the Resilience of the Banking Sector, official submission to public call for comments on 'Strengthening the Resilience of the Banking Sector, Consultative Document' by the Basel Committee on Banking Supervision, September 2009 (http://www.bis.org/publ/bcbs164.htm)*. Submitted 16 April 2010; published by the Bank for International Settlements.

Werner, R. A. (2012). Towards a new research programme on 'banking and the Economy' — Implications of the quantity theory of credit for the prevention and resolution of banking and debt crises. *International Review of Financial Analysis*, *25*, 94–105. http://dx.doi.org/10.1016/j.irfa.2012.06.002.

Werner, R. A. (2013). Towards a more stable and sustainable financial architecture — A discussion and application of the quantity theory of credit. *Kredit und Kapital*, *46*(3), 353–389.

Werner, R. A. (2014a). Enhanced debt management: Solving the eurozone crisis by linking debt management with fiscal and monetary policy. *Journal of International Money and Finance*, *49*, 443–469, (http://www.sciencedirect.com/science/article/pii/S0261560614001132).

Werner, R. A. (2014b). Can banks individually create money out of nothing? — The theories and the empirical evidence. *International Review of Financial Analysis*, *36*, 1–19, (http://www.sciencedirect.com/science/article/pii/S1057521914001070).

Werner, R. A. (2014c). How do banks create money, and why can other firms not do the same? An explanation for the coexistence of lending and deposit-taking. *International Review of Financial Analysis*, *36*, 71–77, (http://www.sciencedirect.com/science/article/pii/S1057521914001434).

Whittlesey, C. R. (1944), Problems of our domestic money and banking system, *The American Economic Review*, Vol. 34, No. 1, (Part 2, Supplement, Papers and Proceedings of the Fifty-sixth Annual Meeting of the American Economic Association) pp. 245–259.

Wicksell, K. (1898). *Geldzins und Güterpreise*. Jena: Fischer.

Winkler, B., van Riet, A., & Bull, P. (Eds.). (2013). *A flow-of-funds perspective on the financial crisis. Studies in Economics and Banking. Money, Credit and Sectoral Balance Sheets*, *I*, . Basingstoke: Palgrave Macmillan.

Winkler, B., van Riet, A., & Bull, P. (Eds.). (2013). *A flow-of-funds perspective on the financial crisis. Studies in Economics and Banking. Macroeconomic imbalances and risks to financial stability*, *II*, . Basingstoke: Palgrave Macmillan.

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

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

Wolf, M. (2013). The case for helicopter money. *Financial Times*, *12* February 2013.

Woodford, M. (2003). *Interest and Prices*. Princeton: Princeton University.

Zoltan, J., & Kumhof, M. (2015). *Banks are not intermediaries of loanable funds - and why this matters. Bank of England Working Paper No. 529* Accessed at http://www.bankofengland.co.uk/research/Documents/workingpapers/2015/wp529.pdf.