

What Can We Learn from the Real Bills Doctrine?

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Abstract

The historical development of bank liquidity doctrines is surveyed from the real bills doctrine and its antecedents to the present day. The underlying ideas of the succession of several dominant liquidity doctrines are analysed and compared, with attention to their historical contexts and respective weaknesses as exposed by experience. While the real bills doctrine is obsolete as such, its central idea that the liquidity of banks requires their credit to be linked to real income generation in the economy is unique among the different liquidity doctrines and can be useful as the liquidity regulation of banks is now subject to renewed interest.

Was kann man von Real Bills Doktrin lernen?

Zusammenfassung

Der Artikel bietet einen Überblick über die historische Entwicklung von Theorien der Bankenliquidität seit der Real Bills Doktrin. Die den unterschiedlichen Liquiditätstheorien zugrundeliegenden Ideen werden analysiert und verglichen, mit besonderem Augenmerk auf ihren historischen Kontext und ihre jeweiligen Schwächen. Auch wenn die Real Bills Doktrin weitgehend überholt ist, so bleibt trotzdem ihre Kernidee, dass die Liquidität der Banken eine Koppelung der Bankkredite an die Schaffung realen Einkommens erfordert, einzigartig unter den verschiedenen Liquiditätsdoktrinen. In Zeiten eines erneuten Interesses an der Liquiditätsregulierung von Banken kann sich diese Idee als nützlich erweisen.

Keywords: Real bills, Liquidity, Bank regulation

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I. Introduction

The issue of liquidity is of special interest to banks, as their characteristic liability, deposits and formerly banknotes are redeemable on demand at par value. This exposes banks to the “funding risk” of unexpected withdrawals of deposits (or, historically, presentation of banknotes for redemption) that they have to manage. The liquidity of the banking system is also important to the society in general because of the reliance of other economic agents on banks for their liquidity needs. The different ideas of how bank liquidity should be maintained and managed may be called liquidity doctrines and have gone through several stages of development starting from the 18th century when Adam Smith formulated the famous “real bills doctrine”.

This paper surveys the long-run development of liquidity doctrines for banks. The real bills doctrine, which constitutes the classical model of how banks should ensure their liquidity, is used as the benchmark of the analysis. We follow the development of liquidity doctrines through the historical evolution of the monetary system and banking regulation. Different stages of historical development have emphasized different alternative sources of bank liquidity: the saleability of the bank’s assets, the ability to raise additional funds by borrowing from the money markets or the central bank, or the reliance on a rapid turnover of the asset portfolio consisting of short-term claims on the borrowers’ real income as the real bills doctrine recommended. The insistence on the “self-liquidating” property of prudent bank assets was the defining characteristic of the doctrine, which, although remarkably long-lived, was ultimately superseded in practice by other methods of liquidity management.

The successors of the real bills doctrine that are considered below include the “shiftability doctrine” that emerged in the interwar period, the “anticipated income doctrine” that can be said to have characterized the Bretton Woods era, and the “liability management doctrine”, which dominated the banking industry after the deregulation of money markets that occurred in the 1970’s and 1980’s. Historical experience reflecting the strengths and weaknesses of the various doctrines is discussed, and their success or failure linked to the relevant historical circumstances.

Considering the changes of bank liquidity doctrines in their historical context may shed some light on the problems that have surfaced recently during the great financial crisis of 2007–2008 and its aftermath. During the great financial crisis, the need for liquidity supplied by the central banks increased dramatically as the money markets proved to be unreliable as sources of liquidity. As a consequence, the crisis has prompted a reconsideration of the liquidity arrangements and practices of the pre-crisis years. There is now an ongoing international regulatory effort to strengthen bank liquidity, mainly by increasing the banks’ hold-

ings of liquid, saleable securities. In the terminology of *Brunnermeier/Pedersen* (2009), the ongoing reforms seek to base bank liquidity on “market liquidity” instead of the “funding liquidity” model that dominated the previous decades.

The lessons from historical experience in economics are often negative in nature, appearing in the form of failures of economic theories or policy choices. Even with that limitation, some policy conclusions can be tentatively drawn here. Although the real bills doctrine has been famously criticized by *Friedman/Schwartz* (1963) and others for its restrictiveness during crisis periods, its replacement by more flexible liquidity doctrines relying on market liquidity was not successful in the past either, and led to increased fragility of bank liquidity.

The purpose of this paper is not, therefore, to promote the re-adoption of the real bills doctrine, which was a historical phase in the development of banking. That would be out of place in an objective study on the history of ideas. However, both the insights of the real bills doctrine and an understanding of its weaknesses can inform the present debates about bank management and regulation: the question faced by the post-crisis banking reforms of the present is precisely how to keep banks’ liquidity creation in step with the real economy (which the real bills doctrine sought to do) while ensuring sufficient flexibility in the supply of credit (where the real bills doctrine proved insufficient).

II. The Real Bills Doctrine as a Liquidity Rule

The real bills doctrine was the predominant ideal of good banking practice for most of the 19th century and remained so until the changes caused by the monetary upheavals of the early 20th century, such as the Great Depression. It has been the subject of very diverse interpretations and many misunderstandings. In general terms, however, the real bills doctrine can be summarized as the idea that banks should practice short term lending only, and that this lending should be of a “self-liquidating” nature. The classic definition of the Real Bills Doctrine was given by *Smith*. The following famous passage is from the *Wealth of Nations* (*Smith* 1991, 269):

“When a bank discounts to a merchant a *real bill of exchange* drawn by a real creditor upon a real debtor, and which, as soon as it becomes due, is really paid by that debtor; it only advances to him a part of the value which he would otherwise be obliged to keep by him unemployed, and in ready money for answering occasional demands. The payment of the bill, when it becomes due, replaces to the bank the value of what it had advanced, together with the interest. The coffers of the bank, so far as its dealings are confined to such customers, resemble a water pond, from which, though a stream is continually running out, yet another is continually running in, fully equal to that which runs out; so that, without any further care or attention, the pond keeps always equally, or very near equally full. Little or no expense can ever be necessary for replenishing the coffers of such a bank.”

Here, the term “real bills” refers to a particular type of credit instrument: a bill of exchange originating from financing a real transaction such the sale of physical merchandise. The bill was written (drawn) by the seller of the goods and, once signed (accepted) by the buyer, it constituted a promise of the buyer to pay a given amount of money after a given time, usually in a few months. Note that the bill of exchange (although called “real”) was not secured by a pledge of any specific collateral; it was secured by the drawer’s and acceptor’s names only.

Typically the seller of the goods would get the money before the due date by selling the bill (at a discount) to a bank, which would then become the creditor and would collect the money in due course. The safety of the bill from the bank’s perspective was enhanced by the fact that both the drawer and the acceptor of a bill of exchange are responsible for its payment. According to *Smith*, and the other proponents of the real bills doctrine, the asset portfolio of a prudently run bank should consist entirely or at least mainly of such discounted real bills.

An important reason why *Smith* and his followers considered bills of exchange to be the most suitable form of credit for banks to give was that he considered them to be “self-liquidating”. The important thing to note is that the required self-liquidating nature of the real bills does not refer just to the maturity of the bills. The important criterion for the bill to be “real” was that the activity financed with it would generate income sufficient for the payment of the bill. By contrast, bills drawn in order to finance consumption or the purchase of existing assets (e.g. land or securities) were to be avoided by banks.

Smith also condemns the idea of rolling over by the borrowers of their short term, insisting that the maturing bills of exchange must be paid from real income, not by borrowing on new bills. This connection between the liquidity of credit instruments and the real revenues of the borrowers is at the core of the real bills doctrine.

The doctrine reflects a priority of liquidity in bank portfolios. It was intended to ensure that the asset position of the issuing bank would be easy to adjust under changing market conditions. For example, if the demand for banknotes would diminish for any reason, the issuing bank might have to reduce its assets and needed flexibility in its portfolio order to do this. *Smith* does not mention the possibility that the bank would have to sell some of its bills (that is, have them rediscounted) for liquidity reasons. In the passage quoted above, he refers to the bank’s “coffers” (i.e. cash reserves) as a source of liquidity, but argues that with a well-managed lending policy the reserves would not have to be large, as the liquidity would be ensured by the maturing of its bill portfolio.

Another argument made for the real bills doctrine had to do with the prevention of overissue of banknotes. *Smith* and many later adherents to the doctrine thought that if banknotes were covered by real bills only, that would keep their

volume in circulation in line with the transactions demand for money in the business sector. This would prevent any overissue of them. For *Smith*, the real bills doctrine was important for stability reasons: an excessive issue of banknotes could cause liquidity problems for banks when the notes not needed in circulation would eventually return to the bank and presented for cash.

An occasional misunderstanding about the real bills doctrine is to interpret it as a monetary policy rule. From the modern point of view, it is obvious that the real bills doctrine is not a sufficient determinant of monetary policy. It does not contain a nominal “anchor” and so, if applied without further restrictions for money creation, it would leave the general price level undetermined as pointed out by *Humphrey* (1982) and others. However, *Smith* and the contemporary proponents of the doctrine presented it in the context of the metallic standard, which defined the value of the monetary unit in real terms and provided the nominal anchor. Hence, the real bills doctrine should properly be thought of as a liquidity management rule for banks, not a comprehensive monetary policy regime.¹

The scope of application of the real bills doctrine grew as banking developed. Originally, *Smith* wrote about banks of issue operating under the gold standard. Although he praised the contemporary lending practices of the Bank of England, he did not make a distinction between private banks of issue and public (central) banks, as this distinction had not fully developed in this time. Later, when modern deposit banking started to grow, the real bills doctrine came to be applied to several different types of institutions: not only private note-issuing banks but also to central banks of issue (which evolved into central banks) and to commercial banks taking liquid demand deposits from the general public.

Regarding central banking, the way the Federal Reserve System was established in 1913 is perhaps the most striking evidence of how strong the influence of the real bills doctrine was after more than 130 years after it was presented in the *Wealth of Nations*. According to the Act of congress founding the Fed, the task of the US central bank was to provide an “elastic currency”, which would adjust according to the needs of trade, and to “afford means of rediscounting commercial paper”. The regulations follow the real bills doctrine in a clearly recognizable form. The Federal Reserve Act of 1913 regulated the lending activities of the Federal Reserve Banks strictly in accordance with the real bills doctrine:

¹ During the suspension of convertibility of the pound sterling in 1797–1821, the management of the Bank of England and the “anti-bullionists” argued that the depreciation of the currency of the time could not be have been caused by overissue of the currency, as the Bank had only followed the real bills doctrine. This position was famously refuted by David Ricardo and the bullionists. See e.g. *Blaug* (1968, 211–212).

“... any Federal Reserve Bank may discount notes, drafts, and bills of exchange arising out of actual commercial transactions; that is, notes, drafts, and bills of exchange issued or drawn for agricultural, industrial, or commercial purposes ... Nothing in this Act contained shall be construed to prohibit such notes, drafts, and bills of exchange, secured by staple agricultural products or other goods, wares, or merchandise from being eligible for such discount; but such definition shall not include notes, drafts, or bills covering merely investments or issued or drawn for the purpose of carrying or trading in stocks, bonds, or other investment securities, except bonds and notes of the Government of the United States.” (Federal Reserve Act, Section 13)

The adherence of the Federal Reserve to the real bills doctrine and its reluctance to open market purchases of Government bonds after the 1929 Wall Street crash and in the early years of the Great Depression have later been widely condemned. The most influential criticism was by Friedman and Schwartz, who interpret the early part of the Great Depression in the U.S. as a liquidity crisis, and claim that it could easily have been mitigated by adopting a different, less restrictive lending policy by the Fed (*Friedman/Schwartz* 1963, 407–419).

III. The Antecedents of the Real Bills Doctrine

The real bills doctrine, as formulated by *Smith*, did not appear out of nowhere. It was a reaction to certain other proposed banking principles, which, interestingly, had put a particular concept of borrower solvency ahead of liquidity as the primary criterion of bank portfolios – unlike the real bills doctrine. Solvency here means the wealth of the borrowers, in the form of even illiquid collateral, whereas the real bills doctrine would focus on the immediate income stream of the borrowers generated by the activities financed by the bank.

In particular, *Smith's* argument for the real bills doctrine can be seen as an attempt to refute the different theory expounded by his mercantilist contemporary, *Steuart*. Although *Smith* does not mention *Steuart* by name in the *Wealth of Nations*, he mentions in his correspondence that the desire to “confute” the “fallacious principles” of *Steuart* was one of the objectives of writing the *Wealth of Nations*.²

Steuart, in his “An Inquiry into the Principles of Political Oeconomy”, written a decade before the *Wealth of Nations*, advocated the establishment of “banks of circulation based on mortgage”. By monetizing fixed property, he explained, such banks could transform such property into liquid form, “melt it down” as it were (*Steuart* 1966, 479–482). *Steuart* considers liquidity of the collateral to be a secondary consideration for the rational lender. He writes: “Coin may be wanting, upon some occasions, to men of the greatest landed property. Is this a reason to suspect their credit?” *Steuart* saw mortgages on fixed property as the best

² Quoted e.g. in *Anderson/Tollison* (1984).

backing to banknotes because of the greater security and solidity it would give the banking institution (*Steuart* 1966, 481). *Steuart* used as examples the two big note-issuing banks in Scotland, the Bank of Scotland and the rival Royal Bank of Scotland, banks of issue which were accustomed to secured loans and did not concentrate in the discounting of bills only (*Checkland* 1975, 258–260).

Smith's negative attitude towards mercantilist banking practices seem to be inspired mainly by the collapse of the Scottish Ayr Bank in 1772, an event which occurred after the publication of *Steuart's* book. Ayr Bank was a short-lived banking company, which briefly dominated the entire note circulation in Scotland. According to *Smith*, it lent, “upon any reasonable security”, even the full capital required for “improvements of which the returns are the most slow and distant, such as improvements of land.” As regards discounting of bills, *Smith* writes that it did not make distinction between “real” and “circulating” bills but discounted all equally. In other words, the activities of the Ayr Bank were exactly those which *Smith* rejected by his real bills doctrine. The bank eventually collapsed, and *Smith* concludes that the country suffered a considerable loss by its operations (*Smith* 1991, 281–282).

Even though the contemporary criticism of the real bills doctrine during the suspension of the gold standard in England (by *Ricardo*, for instance, and the Bullion Committee of 1810) and in later scholarship (notably *Friedman/Schwarz*) have presented the doctrine mainly as a fallacious antithesis of the quantity theory, and a defective norm for monetary policy, the original purpose of the real bills doctrine seems mainly to have been to oppose the mercantilist idea of land banks – i. e. backing banknotes with long-term mortgage credit.

IV. Remarks on Narrow Banking

At the extreme, requiring absolute liquidity of bank assets leads to the various narrow banking proposals. These go further than the real bills doctrine, seeking to remove any liquidity risk from banking while limiting the money-creating powers of the banking institutions. The canonical historical example of a narrow banking doctrine is the currency principle. The currency principle required banks of issue to cover their liquid liabilities with assets that are not just relatively, but absolutely liquid, in fact, monetary reserves (such as gold). There would be no maturity transformation in banks, and the social benefit from note-issuing banks would result from a reduction of transaction costs only. This is an old idea originally found in the constitutions of the banks of exchange of Amsterdam and Hamburg, and became fully articulated in the course of the great monetary policy controversies in England during the first half of the nineteenth century (culminating in Peel's Banking Act of 1844)³. Incidentally, the land bank

³ See *Van Dillen* (1964) and *Horsefield* (1944).

proposals of *Steuart* and *Law* before him were motivated by the limitations of the Amsterdam and Hamburg banking models which restricted the money supply to the value of the scarce silver reserves that were available.

As *Bagehot* pointed out already in 1873, on the basis of English experience, the currency principle may actually become incompatible with financial stability in the broader sense. If followed by the central bank, the currency doctrine prevents it from discharging its lender of last resort function, and thus leaves the banking system at large vulnerable to runs. In practice, the stability concerns forced the currency principle to be applied in a flexible way already in the 19th century during crisis periods (*Bagehot* 1910).

As far as practical central banking is concerned, the influence of the currency school was thus never absolute, and vanished in practice in the 1930s with the gold standard. However, parallels to it remain in the monetary systems of countries with a currency board system. In these countries, foreign currency takes a similar role which gold had for the currency school, and domestic currency is thought of as only a representation of the reserve currency used by the central bank. In such systems, the liquidity of banks in times of stress must depend on foreign borrowing or treasury operations if the currency board arrangement is to be maintained intact.⁴

In commercial banking, the narrow banking ideas take the form of 100% reserve requirements, whereby private banks would be restricted in their ability to carry out maturity transformation, the taking of credit risk, or both. This is the basis of the so-called Chicago Plan (see *Phillips* 1996). But this model of a banking system of course leaves open the question how the liquid assets that are supposed to function as bank reserves are created. If they are created by credit operations by the central bank, then maturity transformation, instead of being eliminated, is only moved to another level in the banking system (i.e. to the central bank). On the other hand, if the reserves are constituted of government debt, private credit should be entirely based on non-bank institutions or the securities markets.

V. The Shiftability Doctrine

The real bills doctrine was always only an ideal, from which actual banking practices deviated to some degree, especially in the deposit banking sector (central banks adhered more closely to it until the 1st World War – and even later in the U.S.). The British banking system followed the doctrine relatively closely, however, while the continental European tradition, where universal banking became common in the latter half of the 19th century, was further removed from

⁴ *Williamson* (1995).

the doctrine. In the United States, the deposit banks had always practiced some longer-term lending and investing in securities, even though this was apparently usually considered as an imperfection and a compromise of the ideal state of affairs (this view influenced the Glass-Steagall Act of 1933 which separated commercial from investment banking).

Regarding liquidity policy, it was increasingly acknowledged by the early 20th century that much of deposit banks' liquidity was not in fact based on the maturing of their short term assets such as bills of exchange, but instead on the possibility of banks to sell some of their investment assets in case of need for cash. It was recognized that bankers were not in fact able to reduce their bill portfolios quickly, since the customers were in practice dependent on rolling over their acceptance credit with the banks. For instance, the 1911 edition of *Gilbart* (1911, 285–300), the classic British banking manual, recommended investments in government securities for liquidity reasons, although England had relatively conservative (in the sense of real-bills oriented) banking traditions at the time.

The idea that the liquidity of a bank actually was not based mainly on the maturity of its assets but instead on holding of assets that could readily be sold, came to be aptly labelled in the American literature as the “shiftability theory” of liquidity. The idea was that the assets could be “shifted” to other banks or investors when necessary. Harold Moulton, the University of Chicago professor and later president of the Brookings Institution, summed up the shiftability doctrine in the dictum “liquidity is tantamount to shiftability” (*Moulton* 1918; also *Mints* 1945, 265).

Mitchell (1923) presented the tenets of the shiftability theory in the form of the following points:

- Short-term paper for commercial purposes does not liquidate at maturity.
- Good banking policy would avoid a general forced liquidation of such paper.
- Reliance for the liquidity of earning assets in a crisis must be placed in the ability to shift the earning assets “to an institution with a stronger cash or credit position.”

(In crises) banks have reduced their liquid reserves and are less able to meet the demands of depositors immediately.

The liquidity of assets depends not so much on their maturity or nature but the institutional organization and coordination of the banking system as a whole.

Actual developments in the commercial banking sector in the interwar period demonstrated the declining practical importance of the real bills doctrine. In the U.S., for instance, the share of rediscountable paper (i. e. bills eligible at the Fed-

eral Reserve discount window) in banks' total assets declined from 45 per cent in 1915 to mere 8 per cent in 1935. The share of investment assets (outright bond holdings plus loans secured by bonds, stocks, and real estate) increased correspondingly (*Morton 1939*). In other countries, the large amounts of government paper which the banks held after the First World War similarly underscored the role of investment securities in banks' liquidity management practices. In the U.K., the Macmillan committee of 1931 took the view that banks should invest in industrial enterprises, a deviation from, if not a rejection of the real bills doctrine. In practice, too, the discounting of trade bills was declining in the 1930 in the U.K. (*Born 1983, 235–36*).

The obvious problem with the shiftability theory is the “fallacy of composition”: What is true for a single bank was not necessarily true for the sector as a whole. Although the investment portfolio of a bank might have seemed quite liquid in normal circumstances, when the bank could always find buyers for the bonds it might want to sell, this was not true at the aggregate level. In case the general public tried to withdraw deposits from all banks simultaneously, the banks could not generate additional liquidity by shifting their assets to their peers.

In principle, if banks could sell their investment assets to the non-bank sector, they could replenish their cash holdings in that way, but in conditions of general run for liquidity this is may not be a realistic option. Under such circumstances, the remaining source of liquidity is the central bank. This became evident in the 1930s in those countries that experienced severe financial crises. The central question became what assets should be eligible as collateral at the central bank – or what the central bank should offer to buy outright.

The developments in the U.S. constitute an illustrative case. There, the banking crisis of the early 1930s led to changes which distanced the Federal Reserve policy from the real bills doctrine. The Banking Acts of 1933 and 1935 made the collateral policy of the Federal Reserve more flexible than previously, leaving the eligibility of collateral essentially at the discretion of the Board of Governors. These Acts also made open market operations in U.S. Government securities a normal and more flexible monetary policy instrument by creating the Federal Open Market Committee which obtained much greater powers than its predecessor, the Open Market Policy Conference, had (*Meltzer 2003, 428–441 and 484–486*).

The conditions during the Second World War removed central banking even further from the ideals of the real bills doctrine, as the central banks across the world started to finance government budget deficits on a large scale and usually at a fixed, low rate of interest. In the U.S., the return to more normal practice began only after 1951 (*Hetzel/Leach 2001*). Although the Federal Reserve thereafter generally sought to keep the maturity of its securities portfolio short, there

was no return to the old real bills orthodoxy in terms of investment maturities nor in the eligibility requirements. Treasury bills became the preferred material for open market operations and the collateral acceptable at the discount window remained broadly defined. The pace of change towards a more flexible liquidity policy differed from country to country, of course: in Germany, for example, private bills of exchange remained an important monetary policy tool for longer than in most other countries.

The events of the 1930's led to doctrinal changes also in the deposit banking sector after they revealed the underlying weaknesses of both the classical real bills doctrine and the shiftability doctrine. *Mints*, the prominent banking theorist of the 1940s, summarized the experience of the 1930s with the real bills doctrine and the shiftability theory as follows (*Mints* 1945, 263):

“The truth is that there is no banking asset which is liquid in the sense that the aggregate amount of this asset can be greatly contracted without deleterious effects on the volume of output. Only the existence of a central monetary agency that is willing and able to increase its holdings of a given asset by large amounts will make that asset liquid for the banking system.”

As the result of these developments, there was a radical change in the attitudes towards the relative role of the market and the authorities, especially in the United States, where the crisis of the 1930s had been particularly severe. The change is apparent in the following quote from *Morton* (1939):

“Liquidity is therefore no longer a ‘natural’ or ‘market’ idea but an institutional, legal, or conventional concept. Commercial banking theory is a holdover from the period when banks presumably made only short-term loans and the central bank performed purely banking functions. But it is inadequate under existing circumstances⁵ when the central bank is presumed to liquefy actual portfolios and also to use its power to carry out monetary and economic policies.”

VI. After the Great Depression and the War: The Anticipated Income Theory

The new practice of bank lending, which became prevalent after the great depression and the disruptions of World War II was more oriented to the needs of the real economy than had been the case before the war. The term “anticipated income theory” was coined to describe the new doctrine. It was based on the idea that loans would have to be repaid from the “anticipated income” of the borrower, which thus became regarded as the real source of bank liquidity. This meant that the emphasis shifted from the liquidity of the lending portfolio to the solvency of the borrowers as the criterion of prudent banking practice.

⁵ The “existing conditions” in the passage refer to the new broader collateral policy adopted by the Federal Reserve System after the Banking Act of 1935.

Herbert Prochnow, a Chicago banker who served as the secretary of the Federal Advisory Council of the Federal Reserve Board in the 1940s and the 1950s, explained the emergence of the anticipated income theory with several factors (Prochnow 1949):

- Large excess reserves the banks had after the Second World War (this presumably reduced the weight of the liquidity aspect in bank lending decisions).
- A decline in the demand for short-term commercial loans.
- Changes in the discount window policy of the Federal Reserve System, where longer-term assets were now accepted as collateral.
- The establishment of the federal deposit insurance system, which reduced the probability of large deposit withdrawals and hence the need for liquid assets.
- In terms of managing unexpected liquidity shocks, the anticipated income theory relies on the central bank's liquidity creating powers.

This characterization of the post-war conditions confirms that liquidity considerations were no longer as prominent as before for the investment doctrines of banks. Prochnow relates this to the more accommodating role of the central bank (in his case, the Federal Reserve). As a result, the profitability of lending and the long-term viability of the borrowers rose to a more prominent role in the banks' own management decisions. This explains the increased willingness of banks to engage in the financing of fixed investment, and also of consumption, activities which would have been quite suspect according to both the real bills doctrine (which preferred self-liquidating short-term bills) and the shiftability doctrine (which preferred marketable securities as a source of liquidity).

The idea of adjusting the bank's liquidity position through the self-liquidation of the real bills portfolio was rejected. Prochnow (1949) stated that "the banker has the obligation to work with his customers through good and bad times renewing short-term credit where necessary to assist a borrower who will be able to retire his loan ultimately, but not at the moment." The liquidity provided by the real bills doctrine was recognized as illusory, or at least unworkable. This had also been recognized in the shiftability doctrine, which however had proved insufficient without the liquidity provided of central banks.

In the anticipated income doctrine, pledges of fixed property became an acceptable basis for lending and the valuation of collateral the foremost ingredient in the lending decision. There is an interesting parallel here with the pre-Smithian (mercantilist) model where the underlying solvency of the borrower was the most important consideration. It is evident from Prochnow's list quoted above that the anticipated income theory relied mainly on the central bank as the provider of liquidity, which is an obvious difference compared to the pre-Smithian way of thinking. The difference is, of course, in the reliance on the liquidity pro-

vision by central banks, and to the deposit insurance system after the experience of the 1930s.

The reliance of the anticipated income doctrine on central banks as providers of liquidity and on deposit insurance as preventers of deposit runs coincided with a period of banking stability in the major industrialized economies in the decades that followed the Second World War. As later famously explained by *Diamond/Dybvig* (1983), these “safety nets” protect the otherwise fragile good equilibrium in banking from funding risk which can otherwise threaten the liquidity even of banks that are fundamentally solvent.

The anticipated income doctrine did not prove permanent, however. The system in which banks rely to a high extent on the central bank for ensuring their liquidity would entail problems, which can explain the evident reluctance to construct the financial systems of market economies entirely on that basis. An important category of problems relates to moral hazard. As *Diamond and Dybvig* point out, their analysis of the beneficial stabilizing properties of liquidity-providing safety nets abstracted from risks in banks’ investment portfolios and, more specifically, from the moral hazard that can be caused by the safety nets. The moral hazard would increase the risk taking of banks whose liquidity is being assured. The underlying cause of the moral hazard problem is an information problem, i.e. the inherent opacity of bank portfolios, which makes it hard to control the asset quality of the banks from outside of the organization. This line of argument underlies much of the criticism of the lender of last resort role of the central bank (see eg. *Brunner/Meltzer* 1988).

Finally, the impact of the exchange rate regime and the consequent trade-offs on central banking should not be overlooked among the difficulties with the lender-of-last-resort based liquidity framework. Under a fixed exchange regime, which was prevalent in the post-war decades when the anticipated income theory was most important (that is until the 1970’s), there could, during a balance-of-payments crisis, emerge a trade-off between the maintenance of the fixed exchange rate and the supply of liquidity to the banks. Especially in the smaller countries, this trade-off was mitigated to some extent by foreign exchange control, however. As the money markets became more integrated internationally, the protection to internal liquidity of national banking systems offered by exchange control became less effective (*Claassen* 1985). It could be argued that, at least for the smaller economies running a fixed exchange rate policy, international financial integration gradually undermined the basis of the anticipated income theory. The reaction to this situation would take the form of increased reliance on the international money markets for liquidity, instead of domestic sources such as the central bank.

VII. Liability Management

One of the most important changes in banking practice in the last half century was the growth of liability management as a doctrine of bank balance sheet management. This went hand in hand with the growth of money markets. Starting from the late 1960's, first in the US, then in other countries too, large banks started to rely increasingly on their ability to borrow from short-term money markets as a source of liquidity. The following early description contrasts liability management to the previous mainstream of banking theory (*Luckett/Steib* 1978):

“Prior to the 1960s, banking theory was concerned exclusively with the asset side of the bank's balance sheet and the “menu” of assets deemed appropriate for the bank to acquire. The bank was viewed as a mere passive acceptor of liabilities with no control over their size or mix. With the development of such bank-liability instruments as federal funds, negotiable certificates of deposit, and Eurodollars, however, banks moved from passive acceptance of their liabilities to the active management of both sides of the balance sheet.”

The description, written from the American perspective, may exaggerate the qualitative change brought about by liability management practices in the 1960s, however. In Europe, wholesale borrowing from the money markets by banks had been more prevalent than in the U.S., even before the World War II. For instance, the huge capital imports of Germany, which occurred after the Dawes stabilization of 1924, took the form of foreign short-term deposits in big German banks, which thus became an important conduit for capital imports (e.g. *Aldcroft* 1987, 255–257).

The historical examples notwithstanding, the vast growth of the money markets since the 1960s had an epoch-making influence the financial history of the following decades. Seen after the beginning of this change, the president of the Federal Reserve Bank of Minneapolis, *MacLaury*, defined liability management as “a conscious, aggressive use of funds purchased by a bank to supplement deposit growth, thus expanding earning assets and revenues faster than otherwise would be possible. In less pedantic terms: bankers' efforts to go out and get the money any way they can. Obviously, the concept is a matter of degree because bankers from time immemorial have been out beating the bushes for deposits. Buying funds via liability management is merely a different intensity of what has long been a major thrust of bank managers.” (*MacLaury* 1973)

As banks found that they could use the interbank money market as a flexible source of liquidity, the need to hold liquid assets became less obvious. The prospect of having to turn to the central bank for liquidity, with all its uncomfortable consequences (such as more intensive monitoring and supervision), also became more remote. The use of liability management to ensure bank liquidity became a possible and attractive alternative.

Liability management as a strategy has a common feature with the anticipated income theory: a bank practicing liability management expects that it is able to borrow because the prospective lenders expect the return on the bank's assets to cover the cost of borrowing, over time, with a high degree of certainty, i.e. the borrowing bank is solvent. The underlying assumption in the liquidity management strategy is that a bank that is (and is known to be) solvent should always be liquid because of its ability to borrow whenever needed. In well-functioning money markets, it is assumed, the maturity structure of the bank's cash flow matters little, if its present value is high and certain enough so that the risk of insolvency is small.

As *Stein* (1998) has noted, the idea that banks can always offset deposit outflows (and inflows) by adjusting their borrowing from the money markets relies on an application of the Modigliani-Miller theorem to the banking firm. That theorem is based on the assumption of perfect markets with full (actually, symmetric) information, and the absence of other frictions, where the funding structure of a firm should be irrelevant to its asset behaviour. So, for instance, the lending behaviour of a bank would be unrelated to changes in its deposits. The perfect market hypothesis became widely used in finance starting from the early 1970's. For example *Fama*, a prominent proponent of the hypothesis, argued that, empirically, information asymmetries were not a prevalent phenomenon in the securities market (*Fama* 1970).

More recently, modern economics of information has doubted the usefulness of the perfect markets assumption and shown the consequences of relaxing it. It is known from since the work of *Akerlof* (1970), for instance, that asymmetric information problems can prevent decentralized markets from functioning properly, and destroy their liquidity. Also *Stein* (1998) noted that if banks' wholesale borrowing is subject to asymmetric information, leading to adverse-selection problems, the Modigliani-Miller logic is no longer valid.

Economics of information suggests that because banks are inherently opaque,⁶ the resulting information problems can make their money market liabilities unmarketable whenever the suspicions regarding the bank's financial condition become strong enough. As the severity of the asymmetric information problems change over time, the ability of the money markets to satisfy banks' liquidity needs can vary even if the banks trying to borrow were fundamentally sound in normal liquidity conditions. This explains why the liability management strategy is potentially fragile.

The regulators understood the fragility of the liability management strategy as a source of liquidity early on. Already in 1974, the Federal Reserve expressed its concern over the growing reliance on liability management:

⁶ See *Diamond* (1984)

“To finance their rapid asset expansion, many larger banks, in particular, have turned to heavy reliance on liability management, involving the issuance of market-type deposit certificates and other liabilities to raise whatever added funds are wanted. Such instruments have proved not only highly interest-sensitive but also highly confidence-sensitive in time of stress. Undue banker confidence in their abilities as liability managers has sometimes contributed to the making of excessive loan commitments. Such promises to lend are a practical part of everyday banking, but those promises have not always been prudently limited to amounts that banks could effectively handle in times of strong credit pressures.”⁷

In practice, despite these concerns, the markets functioned well enough for a long time for the banking industry to become more and more reliant on the liability management strategy. The decades of 1980’s and 1990’s in particular witnessed a dramatic increase in liability management and the use in banking of short-term funds borrowed from money markets. A contributing factor was the increase of “shadow banking” such as money market funds, which made more funds available in the wholesale money markets, where banks could finance their asset portfolios.

VIII. The Great Deregulation

The philosophy of banking regulation, which was prevalent in the industrialized world after the Great Depression and the Second World War, was to a large extent based on conduct regulation: it was concerned with what banks were or were not permitted to do. The best known example is of course the Glass Steagall act in the U.S., which strictly limited the range of activities deposit banks could engage in. In many European countries, conduct regulation was even more extensive, even if of a different nature, including credit guidelines and interest rate controls etc.

Towards the end of the 1970’s, the trend in public policy began to turn from conduct regulation of banks to prudential regulation, where the focus was less on the composition of the banks’ asset portfolios and increasingly on the capital adequacy. Internationally, this trend was associated with the Basel Committee on banking supervision which was established in 1975 after the collapse of Herstatt Bank and the ensuing credit crunch. The first set of recommendations agreed by the committee, known as the Basel Capital Accord, was published in 1988. It related the capital requirements of banks to the approximate credit risk in the main asset categories. The next generation of the Basel rules, known as Basel II, were released in 2004. These too continued the focus on capital adequacy in bank regulation (*Goodhart 2011*).

⁷ Statement of Robert C. Holland before the House Subcommittee on Bank Supervision and Insurance. *Federal Reserve Bulletin* (1974).

The deregulation of bank conduct and the concurrent liberalization of cross-border capital movements were facilitated by the collapse of the international system of fixed exchange rates in the early 1970's. One argument for capital controls had been to protect the foreign currency reserves of central banks from capital flows caused by exchange rate speculation. This argument lost its force in countries which floated their currencies after the collapse of the Bretton Woods system. In the context of rapidly internationalizing banks, the conduct regulations previously applied began to seem outdated and cumbersome. This prepared ground for a new, prudential approach which aimed at just making sure that banks had enough capital to cover their credit losses with a reasonably high degree of certainty. Interest rate controls and credit guidelines were largely abandoned (OECD 1985). Regarding the choice of business models of banks, the decade of the 1990's and the early 2000's saw further deregulation of bank conduct and of bank portfolios. In the U.S., for instance, the Gramm-Leach-Bliley Act of 1999 effectively repealed the Glass-Steagall Act which had separated investment banking from deposit banking since the 1930s.

One of the changes that begun during the deregulation of the 1980s and turned to have momentous effects in the financial crisis of the 2000s was the spread of securitization. As a financial strategy this is obviously related to the old shiftability doctrine, with the difference that there is an expectation that the long-term assets will be sold as part of the normal course of affairs, soon after the loans are made and "packaged" to asset-backed securities, not just in a possible situation of unexpected liquidity shortage.

In normal conditions, securitization and selling of some assets of a bank would seem to reduce liquidity risk as the funding needs are transferred to the purchaser of the securitized assets. However, when used as a business model, securitization makes the bank more reliant on the functioning and stability of financial markets. During times of financial market stress the bank may have to postpone planned sales and instead warehouse the assets in question, with all the financing requirements that such warehousing entails.

Just as the shiftability strategy, the securitization strategy is vulnerable to unexpected illiquidity problems occurring in the securities markets. A well-known case is Northern Rock, the U.K. bank, formerly a building society, which in August 2007 found itself unable to sell its securitized mortgages, became the object of a run, and failed. In addition to the risk of not being able to sell the securities as planned, some forms of securitization may also give rise to contingent liquidity risk, i. e. the possibility that the bank will be called upon to provide liquidity in the market of securitized assets, potentially at a time when it is already under stress (BIS 2008).

Parallel to the deregulation of the 1980s and the 1990s, there occurred changes in monetary policy regimes that changed the conditions under which central

banks operated. In the absence of an obligation to exchange their liabilities to gold or to foreign currency at a given exchange rate, the ability of the central banks to discharge their domestic debt obligations is not in doubt.⁸ On the other hand, the increased volume of international capital flows posed new and even more challenging demands on the international liquidity of those central banks, which continued to follow a fixed exchange rate strategy (*Johnson-Calari et al. 2007*).

The fragility of a financial strategy, where liquidity is based on the assumed ability to borrow from the international money markets when needed, was exposed cruelly during the Asian crisis of 1997. This caused a remarkable change in the reserve policy of many central banks especially in the emerging economies of Asia. After the painful experience of the afflicted countries during the crisis, their central banks began to accumulate very large external reserves in order to shield themselves from future liquidity problems. According to World Bank data, the external reserves of the central banks in Emerging Asia increased approximately tenfold during the first decade after the Asian crisis. This can perhaps be seen as a harbinger of a similar change in private financial institutions, which took place later, after the Great Financial Crisis of 2008. In both cases, the trigger was a surprising liquidity shortage, in contradiction to the premises of the strategy followed thitherto, and the consequence was an immense increase of the demand for liquid assets.

IX. The Financial Crisis and its Aftermath

Despite a number of country-specific or regional liquidity crises, some of them severe⁹, the interbank money markets worked well enough until the first decade of the 2000s for the banking industry in the developed world to become increasingly reliant on liability management for its liquidity. The global financial crisis which culminated in 2008 was an enormous shock to the contemporary liquidity management practices, however. As a result, the liability management strategy which had dominated the deregulation era has been largely discredited after the financial crisis. The interbank money markets, which the banks had come to rely on dried up as the result of the uncertainty (asymmetric information) about the participating banks' financial health after the subprime crisis. The fragilities

⁸ In the case of central banks operating under a floating exchange rate, the question of their liquidity takes another form: whether, in the case of a sudden decrease in the demand for central bank money, the central bank is able to reduce the supply of money in the same degree, lest the decrease in the demand for central bank money will show up as a decrease in its value.

⁹ The Latin American Crisis of 1982 and the Asian Crisis of 1997 occurred after periods of particularly large-scale interbank short-term borrowing from the international markets by the countries subsequently afflicted.

of the financial system and the mechanism of sudden illiquidity were pointed out by Raghuram Rajan already before the crisis erupted (*Rajan* 2005).

While there are different views of the underlying causes of the crisis, it is generally recognized that it was triggered by a decline in the prices of US residential real estate which had been used as collateral in asset-backed securities on a large scale. The combination of real estate collateral with short term funding has been identified as a central ingredient in the events (*Holmström/Tirole* 2011, 230–241). The liquidity in the securitized mortgage bond markets was sharply reduced during the crisis and this phenomenon spread also to other bond markets, with the exception of the most highly regarded sovereign bonds such as German bunds and the U.S. treasuries. Consequently, the modern version of the shiftability doctrine, which had been manifest in the belief that bond portfolios and securitization strategies were reliably liquid not only in benign conditions but always, was (at least temporarily) repudiated.

As a result of these events, the crisis caused a sharp change in the then prevailing attitude towards the banks' business models and banking regulation. It was realized that the reliance on solvency and collateral had been too unbalanced and uncritical, and the separate question of liquidity should be taken into account both by regulators and by the banks themselves. In the historical context, it is as if banking had rediscovered the earlier liquidity doctrines. The question was which form the new liquidity policy would take.

The regulatory response to the crisis has been visible in the work of The Basel Committee on bank supervision, which has recently given liquidity a greater role than before in its regulatory agenda. This reflects the recognition that the solvency of an institution does not by itself guarantee its liquidity.

A number of regulatory changes have been agreed after the financial crisis and are being implemented more or less in line with the Basel Committee recommendations. Two such changes which pertain directly to liquidity management of banks are the introduction of the Liquidity Coverage Ratio (LCR) requirement and the requirement for a Net Stable Funding Ratio. The former requires that the bank should have in its possession enough of high-quality liquid assets to meet its liquidity needs for 30 days in a scenario of a severe liquidity outflow. The latter requirement seeks to limit the degree of maturity transformation in the bank so that more illiquid assets should be financed with longer-term liabilities. That would reduce the vulnerability of the bank to difficulties in refinancing its short-term liabilities. However, even long securities are treated as liquid if they have low credit risk and are traded in "large, deep and active" markets (BIS 2013).¹⁰

¹⁰ Different asset and liability categories are accounted for with different "ASF" and "RSF" factors when the net stable funding ratio is calculated (BIS 2014).

Viewed in the context of the historical bank investment doctrines, the Liquidity Coverage Ratio resembles the shiftability doctrine, which relied on the ability of the bank to sell some of its assets should it face a liquidity shortage. The parallel between the Liquidity Coverage Ratio and the shiftability doctrine is highlighted by the observation that in the LCR, the eligible high quality liquid assets are not typically limited to those with a short maturity, but include long-term securities of high quality (see BIS 2013 and 2014). The common element between the Net Stable Funding Ratio and the real bills doctrine is the objective to limit maturity transformation, but the ideas of what assets are considered liquid for the purpose are obviously quite different.

As the BIS recommendations are being implemented in the most important jurisdictions in the world, we can conclude that the crisis has indeed brought liquidity issues back to focus, but mainly in the form of the shiftability doctrine its reliance on markets and the ability to monetize some assets by selling them to other investors.

Even more dramatic than the response of the regulators has been the change in the liquidity behaviour of banks. The banks – especially in Europe – have accumulated unprecedented amounts of free reserves in their accounts at the central bank. Partly this could be due to the very low opportunity cost of holding reserves as central bank lending rates have decreased close to zero after the crisis of 2008 as part of reflationary monetary policy. However, there is also evidence that a precautionary motive has been at work on the large scale reserve hoarding by banks. This is in sharp contrast to the previously prevalent liability management-based strategy of the pre-crisis era (*Berrospide* 2013).

The new emphasis on precautionary hoarding of liquidity can be observed also in the behaviour of central banks as the amount of foreign exchange reserves held by central banks across the world has increased dramatically in the last 15 years. The experience of financial crises is a natural explanation of this trend, but it seems that in the emerging economies, this reserve accumulation started already after the Asian crisis of 1997 rather than the international financial crisis of 2008 (IMF 2010). In any case, also the central banks (at least in the emerging market economies) have clearly revised their priorities in favour of accumulating more international liquidity.

Overall, it appears that the general trend after the crisis has been towards a more asset-based strategy of liquidity policy, which has replaced the liability management-based strategy prevalent before the crisis. This can be seen in the strong demand for high-quality bonds (such as the German Bunds and others), in the unprecedented accumulation of liquid external reserves especially by countries who do not issue a reserve currency, and also in the emerging regulatory standards.

These developments raise several questions. First, does the asset-based liquidity strategy result in a false impression of liquidity, as it is actually based on the assumption of saleability of the assets to other market participants? In other words, is it prone to the same “fallacy of composition” that the shiftability doctrine suffered from? In case of general market stress, the assets previously thought of a liquid might not turn out to be so.

Another related question concerns the real costs of liquidity preference. Does the increased emphasis on liquid assets in bank balance sheets harm real investment, productivity, and economic growth that would require capital to be invested for long periods? If long-term investments are financed with long-term securities, which banks hold under the assumption of their saleability, the productivity of funds is maintained, but the liquidity might be deceptive in the absence of a lender of last resort.

A possible solution to the above problems lies in the provision of liquidity by the central bank. However, the question then becomes the following. Does the accumulation of bank reserves at the central banks, with the associated increase of asset portfolios of central banks, distort the financial markets because the investment behaviour of the central banks is (for political and other reasons) different (more conservative and less entrepreneurial) than that of private investors? Can or should central banks finance real investment, as a permanent arrangement, for example through holding long term private securities? Would a larger share for public-sector lending harm the market processes and productivity growth?

These questions highlight the apparently perennial trade-off between the safety of bank liquidity on the other hand and real economic growth on the other. As noted by *Diamond* (1997), the trade-off depends on how developed the financial markets are. The more limited is the participation in financial markets, the more dependent the economy is on banks, and the trade-off between economic growth and bank liquidity becomes more central.

X. Discussion

The development of banking doctrines reflect recurrent shifts of emphasis. Regulation is important, but it is hardly an autonomous driver of changes in banking: changes of bank regulation reflect the evolution of ideas, too. Both regulation and the accepted practice can be viewed as reflections of the contemporary banking doctrines of any given time, which are therefore in a sense deeper concepts than either regulation or contemporary practice.

Much of the historical development of the banking doctrines has revolved around the question how banks, while carrying out liquidity transformation,

should ensure their liquidity. The review of the history of ideas in banking reveals that this debate, which has been going on for almost 250 years, is still not settled.

The financial crisis of 2008 has brought about the reassessment of the question of liquidity. It has forced economists, bankers and the authorities to take seriously the fact that solvency of a bank, as seen from the inside of the organization, or even as seen by regulators, does not automatically guarantee its liquidity and the latter must be taken separately into consideration. The recent regulatory initiatives and the reserve accumulation behaviour of banks themselves suggest that the trend is again towards an assets-based liquidity management strategy, where banks seek to ensure their liquidity by holding large amounts highly marketable securities and even a lot of monetary reserves.

In the light of historical experience, the reliance on the saleability of securities held for liquidity reasons becomes problematic at least when the system is subject to an aggregate shock. A simultaneous attempt by many banks to liquidate their security portfolios will be destabilizing (unless the central bank provides an assured buyer of the last resort). Moreover, an investment policy concentrating on the most liquid and “information insensitive” securities may be inefficient if, under limited participation in the financial markets, it reduces the supply of capital to long-term productive (and thus risky) projects.

On the basis of the historical survey, what can be learned from the real bills doctrine? The insight behind the real bills doctrine was that true outside liquidity (as opposed to inside liquidity which is borrowed from other agents) in the economy as a whole is created by the real income accruing to the debtors and, through them, to the lenders (this is also the way liquidity is understood in *Holmström/Tirole* (2011) who append it with the real resources than can be appropriated by the government and used to satisfy the demand for liquidity). The conclusion from that was, according to the real bills doctrine, that bank liquidity could be safely based only on the borrowers’ real income stream, not the prospect of selling or rolling over the existing assets.

In theory at least, the trade-off between liquidity and efficient financing of long-term investment hand could be improved through the development of deeper and more complete financial markets. Banks and their liquidity creating function would be thereby less needed. However, in a less than perfect world, where participation to financial markets is limited, the problem of reconciling the liquidity and productive use of assets remains.

The historical survey indicates that the experience of both shiftability-based and liability management-based liquidity doctrines has not been fully convincing in terms of their ability to ensure aggregate stability. Recently, the scale of the potential liquidity problems has grown with the size of the financial sector

relative to the real economy. There are several reasons why the real bills doctrine will probably not return to its past position as a norm for bank management; for one thing, financial development has made bills of exchange a marginal phenomenon in today's corporate finance. Its categorical opposition of the doctrine to long term lending by deposit banks seems unrealistic and inefficient from today's perspective. Moreover, the critique against the real bills doctrine of its dangerously insufficient flexibility in the face of increasing demands for liquidity has not been refuted. Nevertheless, the idea central to the real bills doctrine that prudent lending practices of banks should be somehow tied to the real economic processes and the production and sale of goods is now more attractive than before the great financial crisis, and may serve as an antidote to the increasing financialization of the modern economies.

References

- Akerlof*, G. A. (1970): The Market for "Lemons": Quality Uncertainty and the Market Mechanism. *The Quarterly Journal of Economics* Vol. 84, No. 3.
- Aldcroft*, D. H. (1987): *From Versailles to Wall Street*. Aylesbury: Pelican Books.
- Anderson, G./Tollison*, R. (1984): Sir James Steuart as the Apotheosis of Mercantilism and His Relation to Adam Smith. *Southern Economic Journal*, Vol. 51 No. 2.
- Bagehot*, W. (1910): *Lombard Street: A Description of the Money Market*. London: Smith, Elder & Co. (First edition 1873).
- Berrosipide*, J. (2013): Bank Liquidity Hoarding and the Financial Crisis: An Empirical Evaluation. Finance and Economics Discussion Series Divisions of Research & Statistics and Monetary Affairs Federal Reserve Board, Washington, D.C.
- BIS (2008): Principles for Sound Liquidity Risk Management and Supervision. Basel Committee on Banking Supervision. Basel: Bank for international Settlements.
- (2013): Basel III: The Liquidity Coverage Ratio and Liquidity Risk Monitoring Tools. Basel Committee on Banking Supervision. Basel: Bank for International Settlements.
 - (2014): Basel III: The Net Stable Funding Ratio. Basel Committee on Banking Supervision. Basel: Bank for International Settlements.
- Blaug*, M. (1968): *Economic Theory in Retrospect*. Cambridge: Cambridge University Press.
- Born*, K. E. (1983): *International Banking in the 19th and 20th Centuries*. Leamington Spa: Berg.
- Brunner, K./Meltzer*, A. H. (1988): Money and Credit in the Monetary Transmission Process. *The American Economic Review*, Vol. 78, No. 2.
- Brunnermeier*, M. K./Pedersen, L. H. (2009): Market Liquidity and Funding Liquidity. *The Review of Financial Studies* Vol. 22, No. 6.
- Checkland*, S. G. (1975): *Scottish Banking. A History, 1695–1973*. Glasgow: Collins.

- Claassen, E.-M.* (1985): The Lender-of-Last-Resort Function in the Context of National and International Financial Crises. *Weltwirtschaftliches Archiv*, Vol 121, No. 2.
- Daugherty, M.* (1942): The Currency-Banking Controversy. *Southern Economic Journal*, Vol. 9, No. 2.
- Diamond, D.* (1984): Financial Intermediation and Delegated Monitoring. *Review of Economic Studies* Vol. 51, No. 3.
- (1997): Liquidity, Banks, and Markets. *Journal of Political Economy*, Vol. 105, No. 5.
- Diamond, D. W./Dybvig, P. H.* (1983): Bank Runs, Deposit Insurance, and Liquidity. *Journal of Political Economy* Vol. 91, No. 3.
- Fama, E.* (1970): Efficient Capital Markets: A Review of Theory and Empirical Work. *The Journal of Finance* Vol. 25, No. 2.
- Friedman, M.* (1960): *A Program for Monetary Stability*. New York: Fordham University Press.
- Friedman, M./Schwartz, A.* (1963): *A monetary history of the United States*. Princeton University Press.
- Gilbart, J. W.* (1911): *The History, Principles and Practice of Banking*. London: G. Bell and Sons.
- Goodhart, C.* (1988): *The Evolution of Central Banks*. Cambridge, Mass.: MIT Press.
- (2008): Liquidity Risk Management. *Banque de France Financial Stability Review* No. 11, February 2008.
- (2011): *The Basel Committee on Banking Supervision. A History of the Early Years 1974–1997*. Cambridge: Cambridge University Press.
- Hamilton, H.* (1956): The Failure of the Ayr Bank, 1772. *The Economic History Review, New Series*, Vol. 8, No. 3.
- Hetzel, R./Leach, R.* (2001): The Treasury-Fed Accord: A New Narrative Account. *The Federal Reserve Bank of Richmond Economic Quarterly*, Vol. 87, No. 1.
- Holland, R. C.* (1974): Statement before the Subcommittee on Bank Supervision and Insurance of the Committee on Banking and Currency, U.S. House of Representatives, December 12, 1974. *Federal Reserve Bulletin*, Vol. 60, No. 12.
- Hollander, S.* (1992): *Classical Economics*. Toronto: University of Toronto Press.
- Holmström, B./Tirole, J.* (2011): *Inside and Outside Liquidity*. Cambridge, Mass.: MIT Press.
- Horsefield, J. K.* (1944): The Origins of the Bank Charter Act, 1844. *Economica (New Series)* Vol. 11, No. 44.
- Humphrey, T.* (1982): The Real Bills Doctrine. *The Federal Reserve Bank of Richmond Economic Quarterly*, Vol. 68, No. 3.
- IMF (2010): “Reserve accumulation and international monetary stability”, paper prepared by the Strategy, Policy and Review Department. Accessed 16 February 2018, <https://www.imf.org/external/np/pp/eng/2010/04130.pdf>.

- Johnson-Calari, J./Grava, R./Kobor, A.* (2007): Trends in Reserve Management by Central banks. In Bakker, A. F. P and van Herpt, I. R. Y. (eds.) *Central Bank Reserve Management. New Trends from Liquidity to Return*. Cheltenham: Edward Elgar.
- Laidler, D.* (1984): Misconceptions about the Real-Bills Doctrine: A Comment on Sargent and Wallace. *Journal of Political Economy*, Vol. 92, No. 1. 149–155.
- Luckett, D. G./Steib, S. B.* (1978): Bank Soundness and Liability Management. *Nebraska Journal of Economics and Business*, 17:3, 37–47.
- MacLaury, B. K.* (1973): Liability Management. Speech December 7, 1973. Statements and Speeches of Bruce K. MacLaury. 1971–1976, <https://fraser.stlouisfed.org/title/1114>, accessed on December 9, 2016.
- Meltzer, A.* (2003): *A History of the Federal Reserve. Volume I: 1913–1951*. Chicago: The University of Chicago Press.
- Mints, L.* (1945): *A History of Banking Theory in Great Britain and the United States*. Chicago: University of Chicago Press.
- Mitchell, W. F.* (1923): The Institutional Basis for the Shiftability Theory of Bank Liquidity. *The University Journal of Business*, Vol. 1, No. 3.
- Modigliani, F./Miller, M. H.* (1958): The Cost of Capital, Corporation Finance and the Theory of Investment. *The American Economic Review* Vol. 48, No. 3.
- Morton, W. A.* (1939): Liquidity and Solvency. *American Economic Review*, Vol 29, No. 2.
- Moulton, H. G.* (1918): Commercial Banking and Capital Formation III. *Journal of Political Economy*, Vol. 26, No. 7.
- OECD (1985): *Trends in Banking in OECD Countries*. Paris: OECD.
- Phillips, R.* (1996): The Chicago Plan and New Deal banking reform. In D. Papadimitriou, ed.: *Stability in the Financial System*. New York: Macmillan.
- Prochnow, H.* (1949): Bank Liquidity and the New Doctrine of Anticipated Income. *The Journal of Finance*, Vol. 4, No. 4.
- Rajan, R.* (2005): Has finance made the world riskier? in *The Greenspan Era: Lessons for the Future*, Federal Reserve Bank of Kansas City.
- Smith, A.* (1991): *The Wealth of Nations*. Everyman edition (original 1776).
- Stein, J.* (1998): An Adverse-Selection Model of Bank Asset Management with Implications for the Transmission of Monetary Policy. *The RAND Journal of Economics*, Vol. 29, No. 3.
- Steuart, S. J.* (1966): *An Inquiry into the Principles of Political Oeconomy. Volume Two (original 1765)*. Chicago: The University of Chicago Press.
- Van Dillen, J. G.* (1964): *History of the Principal Public Banks (original 1934)*. London: Frank Cass.
- Williamson, J.* (1995): *What Role for Currency Boards*. Washington: Institute for International Economics.