

# FINANCIAL INTERMEDIARY IN MONETARY ECONOMICS: AN EXCERPT<sup>1</sup>

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(1) The literature demonstrates no coherent view on the nature of economic exchange and, in particular, provides no conventionally accepted, fully satisfactory explanation of the real effects of money. Recent developments in macroeconomics suggest a role for financial intermediaries. (2) The economics literature, however, has very little to say about that though the role of intermediaries in economic history has always been emphasised. (3) Further reading suggests that intermediation is largely missing from economics for methodological reasons. Revival of interest in this topic became evident in recent years thanks to developments in the treatment of asymmetric information, thin markets, and dynamics with innovations. (4) Today's literature, however, still primarily addresses empirical and specific issues like particular functions of intermediaries. Analysis of intermediation in the context of general equilibrium, explanation of its role in the monetary transmission and non-neutrality have not been seriously undertaken. Only a few authors so far have put forward their proposals for this perspective.

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## 1. Monetary economics: money does matter and so does intermediation

Philosopher Jean Bodin, writing about the effect of the inflow of gold and silver from new colonies after the overseas expeditions of the late 15th and early 16th centuries, was probably the first to establish a link between liquidity and inflation. In the debate that took place in 1568, he argued that inflation is a consequence of excess money supply and its level is also determined by institutions. Later, David Hume (1752) inquired into the short-run non-neutrality and long-run neutrality of money and, since that time, admittedly, "the discussion of the short-run effects of an increase in money on output was not much improved" (Blanchard, 2000)<sup>1</sup>. Today macroeconomists offer several rival explanations of the real effects: staggering adjustment stemming from imperfect information (Lucas, 1973), real and nominal rigidities (see, for example, Taylor, 1980), the menu costs (Mankiw, 1985; Akerlof and Yellen, 1985), intertemporal distributional effects for risk-averse agents that leads to the time inconsistency problem (Stiglitz and Greenwald, 2003). These explanations, with the notable exception of the latter, are not really compatible with one another but share one common assumption: money is considered to be a homogeneous, exogenously given medium of exchange.

This striking feature of modern monetary economics suits the traditional general equilibrium framework, but appears to be at odds with the reality where economic exchange is prevalently facilitated by credit and private claims, either tradable or individually contracted. As for the publicly supplied 'outside money', this accounts for a tiny percentage of transactions, plays the limited role of a unit of account (which is often needed for reporting taxes rather than anything else) and, in the case of inflation or government crisis, often goes out of circulation and being substituted by a hard foreign currency. The literature on the existence of money is huge but studies of more general issues and the real effects of money in particular usually assume money as a non-diversified, exogenously given thing. In this sense, the current economics has been receding since Adam Smith (1776), who offered a coherent analysis of the nature of economic exchange by reasoning for the specialisation (division of labour) with coordination by prices but without the leading role of a superior medium of exchange.

As soon as the diversity of the economic exchange is admitted, some degree of disability of monetary economics becomes evident. According to Kiyotaki and Moore (2001a), only recently has monetary economics become a theory of liquidity and private exchange. According to Stiglitz and Greenwald (2003), it should focus not on the role of money in facilitating transactions (that would be misleading terminology) but "on the role of credit in facilitating economic activity."<sup>2</sup> It is, however, "remarkably difficult to incorporate credit within the standard general equilibrium model. Credit can be created with almost no input of conventional factors, and just as easily be destroyed. There is no easy way to represent the supply function for credit. The reason for this is simple: credit is based on information".<sup>3</sup> Furthermore, it appears that the interest rate, unlike a commodity price, more strongly depends on the promise, in other words, on the trust. This, in turn, invalidates the principle of anonymity and thus undermines the neo-classical analysis. Being based on private information, the value and the price of credit are subject to the individual characteristics of a given economic agent. These three considerations from Stiglitz and Greenwald (2003) already provide a new insight into the nature of the real effects: (1) an individual failure on credit becomes an important source of a monetary (liquidity) shock to the economy and (2) informational aspects,

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<sup>1</sup> Blanchard (2000), p. 4

<sup>2</sup> Stiglitz and Greenwald (2003), p. 26

<sup>3</sup> *ibid*

the agency problem and credit rationing in particular may cause noisy adjustment of output and expenditures as well as changes to individual production/consumption plans.

The recognition of the diversity and complexity of economic exchange also makes it evident that intermediation plays its own role in creation and propagation of liquidity shocks. One may assume at this point that an analysis of the above problems is hardly possible without an explicit modelling of intermediation. I formulate the hypothesis in a more general manner: "the optimising behaviour of financial intermediaries is one of the sources of the real effects of liquidity shocks". To summarise, we still have no unified view on the mechanism of exchange, the existence of money, monetary transmission, and the real effects of money. Even where consensus is achieved, we are not entirely satisfied with the results. In such a situation, one can assume that our understanding of those issues might be improved by considering financial intermediation. More fundamentally, if the demand and supply of loanable funds do matter, then the outcome might be contingent on information and the role of banks, especially in assets evaluation and risk management (see Stiglitz, 2003; Stiglitz and Greenwald, 2003).

## **2. Further motivation for studying financial intermediaries**

Financial intermediaries are economic agents that bring together creditors and debtors. This is a very general and yet precise definition. Scholars differ over its refinements, putting emphasis on particular functions and, sometimes also on institutional aspects, depending on the purpose of research. This will be the case in my paper too. Essential in the definition, however, is the link between the two. By providing this link, intermediaries facilitate trade, saving, and investment activities. They serve the purpose of resolving (a) the lack of the double-coincidence-of-wants problem in the time dimension, (b) a mismatch between excess supply and excess demand in risk/maturity/liquidity, by providing (c) assets evaluation and (d) diversification (Kiyotaki and Moore, 2001b; Santomero, 1984; Stiglitz, 2003). Since my research is focused on the relationship between liquidity and real output, I intend to talk more about (a) and (b), though the importance of each of the four functions will be investigated.

My interest in financial intermediaries has been explained in section 1. Yet the motivation comes from studying a broad range of the literature. First, the issue of their existence deserves attention simply because the financial sector occupies a leading position in all industrialised economies. Economic activity not involving financial services is rare, so the question "why do they exist?" must thus be more than one of ordinary curiosity (see Gorton and Winton, 2002).

The second motivation is one of methodological order: explicit modelling of optimising financial intermediaries provides a tractable alternative to the money-in-utility and cash-in-advance specifications where necessary. In many cases, including the problem of asymmetric information, both are well-grounded. Money, for example, may enter the utility function as a carrier of the future consumption due to uncertainty. In many cases, however, the cash-in-advance and money-in-utility specifications are considered to be dubious or meaningless, see Stiglitz and Greenwald (2003).

Third, modelling intermediation can help in our understanding of the dynamic effects of liquidity shocks. This year's NBER monetary programme report constitutes that "the accumulation of many empirical studies following varied strategies has led to a consensus among economists about how monetary policy affects the key measures of macroeconomic performance. The exact timing is open to debate, but a rough rule of thumb is that employment and production respond about six months after a change in monetary policy, whereas it takes a year or more before there is any significant movement in the inflation rate." (Mankiw, 2003).

What is true for a stable US economy, however, is not so for emerging markets and many post-high-inflation economies. As an extreme example, the Russian market after financial liberalisation witnessed that the price level responded to monetary injections with a lag shorter than for output (the former was 2-3 months during the first year of liberalisation, then increasing to 6-8 months by 1994 and 1 year by 1996-97 while the lag of production was 8 to 24 months). A common explanation was the absence of an institutionally strong and functionally manifold financial market which could absorb credits from the central bank. With its development, however, the 'price level – money supply' lag naturally increased. An alternative hypothesis suggested that the length of the lag depends on the particular instruments of monetary policy or on the current velocity of circulation (or inflation rate). None of these hypotheses has been wholly accepted but, obviously, understanding the role of financial intermediaries can shed light on the dynamic effects on monetary shocks.

A formal model of financial intermediation can help in the understanding of the transmission in detail and provide insight into the interaction between asset prices, aggregate activity and effects of changing liquidity (for example, as a result of open market operations) on the assets holdings. Today's literature tackles this problem with non-competitive models, of which the peculiar random matching framework is now most popular (Kiyotaki and Wright, 1989, 1991). Kiyotaki and Moore (2001c), however, believe that "there is a need for a workhorse model of money and liquidity, with competitive markets, which does not stray too far from the other workhorse, the real business cycle model."<sup>4</sup> They develop one without intermediation but warn about the shortfalls of such setup: "In practice, an open market operation constitutes a tiny change in a composition of asset holding in the economy, so it is difficult to see why this change should have significant effects. The answer may lie in a more layered model of banking, where the government supplies extremely liquid assets for banks to use, who in turn supply somewhat less liquid assets for use by the rest of the economy. We conjecture that the effects of government policy may be amplified in such a multi-layered model."<sup>5</sup>

Earlier, Bernanke and Gertler (1995) addressed this problem in the context of frictions. They argued that the number of "puzzles", like the failures on empirical tests of the quantitative theory, the permanent income hypothesis, the neoclassical and the "q" theories of investment can be resolved if the endogenous adjustments in the external finance premium of the real sector are taken into account. In particular, this could explain (a) a large portion of variations in inventories in response to a transitory monetary shock and, thereby, the lag and persistence in the response of output and business investments and (b) a relatively large negative effect of a permanent liquidity shock on long-lived assets, especially housing investment. For example, in response to an unanticipated liquidity shortage, firms are found not to start spending the inventories but rather to maintain them at the expense of additional short-term borrowing.<sup>6</sup> This observation is consistent with risk-averse behaviour. The additional borrowing naturally causes the lending rate to increase and that, in turn, deteriorates the firm's financial position. If the situation is not improved, the firm eventually has no other choice than to drop inventories and suspend investment: a sharp decline in both will be observed.

Obviously, such adjustments would not be possible without intermediaries able to provide the additional 'emergency' loans – inter-corporate and trade credit in such situation cannot help much if the liquidity crunch is economy-wide. Bernanke and Gertler (1995) passed over the role

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<sup>4</sup> Kiyotaki and Moore (2001c), p. 2

<sup>5</sup> *ibid*, p.7

<sup>6</sup> Bernanke and Gertler (1995), p. 32. They implicitly assume that part of the inventories accumulation is intentional. In their study, inventories = GDP – demand for final goods.

of intermediaries, leaving the impression that they add nothing to the effects of monetary shock on inventories and output. But this impression would be wrong because what is going on in the financial market in the aftermath of the shock is the qualitative transformation of assets – financial intermediaries offer firms assets of more suitable risk-return-maturity structure, thus allowing the firms to adjust. Without intermediaries, the liquidity shock would probably be followed by an immediate contraction of inventories and output. Moreover, if financial intermediaries possess more information about the nature of the shock – quite a natural assumption – they could correct firms' decisions with regard to inventories and investment by properly adjusting interest rates, thus increasing their own value and improving the total welfare (provided that the intermediaries hold deposits, debts, and assets of those firms). This corresponds to the conclusion of Bernanke and Blinder (1992), namely that banks respond to adverse liquidity shocks by capital market operations such as selling or purchasing bonds and equities and only in the long run adjust the loan supply by reducing the number and volume of newly extended loans.

### 3. Modelling financial intermediation: methodological problems

**The prevailing economics literature has little to say about those problems and the intermediation.** Forty years ago, Patinkin (1961) complained that banks and other intermediaries were treated by economists as "parasitic members of the community"<sup>7</sup>. Today the treatment of credit and intermediation in economic literature is still "ambivalent" (Dowd and Lewis, 1992)<sup>8</sup>, "insufficient" (Stiglitz, 2003), "flawed" (Kiyotaki and Moore, 2001)<sup>9</sup>, and even "schizophrenic" (Blanchard, 2000)<sup>10</sup>. In the Millennium Issue of the *Journal of Finance' Papers and Proceedings*, "financial institutions were only mentioned in passing, usually to say that they can be ignored" (Allen, 2001)<sup>11</sup>. No single paper on financial intermediation in context of monetary economics has been presented at the ASSA Annual Meetings this year.

**In economic history, ironically, the role of banks and financial institutions has always been emphasised.** It has long been recognised that banks have been playing an important role since the dawn of capitalism in Holland and England, as important as in today's complex global economy. Financial intermediation received more attention in the literature of the 17th-19th centuries than in the 20th. This is not surprising considering that economies, and their financial systems in particular, had never been so highly regulated as in the 20th century; this has given to the potential subject of research a strong normative flavour, which thus made it less attractive for positive theory. But, in the time of industrial revolution, all private institutions were subject to the owner's discretion. Financial intermediaries performed two basic functions: brokerage – bringing providers and users of capital together without changing the nature of the claim being transacted (Bhattacharya, 1993) – and the pooling of capital. In fact, the institution of banking – deposit-taking and lending with qualitative asset transformation – did not exist until the 19th century. In those days, the qualitative asset transformation was at a primitive level as the intermediaries were normally not supposed to accept or share the liabilities of others; thus, banks' capital market activities were limited to participation in project evaluation.

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<sup>7</sup> Patinkin (1961), p. 97

<sup>8</sup> Dowd and Lewis (1992), p. 3

<sup>9</sup> Kiyotaki and Moore (2001), p. 4

<sup>10</sup> Blanchard (2000), p. 30

<sup>11</sup> Allen (2001), p. 1166

Research has been primarily devoted to the demand for and the back-up of the fiat currency, and to the effect of government operations with gold and paper money on the stability of credit (see section A of the bibliography). In the absence of private bond and stock markets, with a highly significant seasonality of expenditures and revenues, external credit was a great deal for agricultural business, manufacturing, and even commerce. As for the governments, the economic policy of the day was greatly concerned with fiscal affairs, both tax collection and seigniorage. Accordingly, the issue of the stability of credit and paper money circulation was addressed, at least in part, on the ground of stability of production and government revenues. The terms "monetary transmission" and "real effects" had not yet entered the economics language but this is what was often kept in mind.

**The economics of banking has initially been developing as an empirical discipline** and the banking business itself was always highly constrained by social institutions and public regulation. Hence, understanding the current state of economic theory is hardly possible without learning the evolution of economics methodology in a historical perspective. While the challenge to the modern economy sometimes appears reminiscent of old problems, analysing it in retrospect, from today's point of view, can be misleading. Taking this into account, I will follow the course of history.

In the post-Breton Woods world, one of the new concepts of financial stability was that of the 'free banking' concept. This dates back to the Europe of the first half of the 19th century. The big issue then was whether or not the government should eventually take control over finance. Apart from seigniorage considerations, there was a point for business too, as was noticed above. The reality was that monetary control, including maintenance of circulation of paper monies, was essentially an issue of the direct regulation of banking institutions while nominal targeting and the monitoring of capital adequacy were not considered, as one can imagine, due to thin financial markets and absence of qualitative asset transformation. The conventional view was that a limited supply of base money (coins and notes) would suffice for economic stability. This position was opposed by the theory suggesting that the central bank should maintain responsibility for the entire monetary system, including liabilities of commercial banks, by appropriate discretionary management of their portfolios. In England, the 1844 Bank Charter Act adopted the former concept, but a series of following financial crises associated with liquidity shortages led to the Act's suspension in 1870. Regulation of commercial banking proved to be necessary.

Bagehot (1873) argued in this respect that free competition among private banks was necessary, while the number of banks in the industry would be determined by the market depending on economies of scale. Since central banks have historically been established by governments and given some monopoly rights, basically in order to collect seigniorage, they tend to conduct an inflationary policy. For this particular reason, demanding the pursuing of currency supply control from them would be naive. Ultimately, he argued, central banks should be abolished on a constitutional basis, while commercial banks should be left free –which would be the case with any profit-seeking company.<sup>12</sup> The objection to this theory rests upon the same argument, namely, that intermediation and financial services more than any other kind of business are associated with an increasing return that will necessarily lead to high concentration in this industry and, therefore, to its vulnerability to external and internal shocks (Edgeworth,

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<sup>12</sup> See Dowd, K., M. Lewis (1992); also Cobb (1891) for objections to Bagehot (1873) on the ground of technical feasibility.

1888). Besides, Bagehot has not provided a convincing argument for the money and price level stability.

Though Bagehot's proposal was much appreciated it had a limited influence, mostly for a very non-economic reason: the institutional structure of the banking sector and public finance had been historically well-established and deep-rooted, so it was simply impossible to think of abolishing the Bank of England and similarly central banks in other countries. At the same time, the conclusion about the economy-wide instability following on from Edgeworth's argument had a strong impact on banking reform in the United States where the banking system was effectively free. In 1913, after a sequence of severe crises in the late 19th – early 20th centuries, the Federal Reserve System was established.

Two significant events – German hyperinflation and the Great Depression – seriously influenced economic thought but, surprisingly, did not have an immediate influence on the theory of money and intermediation; inflation and structural crises were only addressed decades later. This can perhaps be explained by the apparently minor role of the intermediaries. They were primarily seen as (a) providers of current account services and (b) depositary institutions involved in the provision of credit on the basis of some risk-return evaluation. The qualitative asset transformation in that time, however, was a plain business and, accordingly, did not attract much attention. Thus, financial and intermediation theory has long been developing as a functional approach where each function – acceptance of deposit, transaction services, capital market operations, etc. – was explained separately, without an explicit behaviour modelling.

The first attempt to provide a complex model of financial intermediation – **a model that would be integrated in economics** – was due to Gurley and Shaw (1955, 1957, 1958), who had been developing a "theory of finance that encompasses the theory of money and the theory of financial institutions that included banking theory"<sup>13</sup>. Their research culminated with the book (Gurley and Shaw, 1960) in which they attempted "a presentation of the theory of money as part of a general theory of optimum portfolio selection and a theory of the banking system as part of a general theory of the choice of optimum portfolios of assets and debts by financial institutions of different kind."<sup>14</sup> They developed the view on money as assets and, simultaneously, liabilities of economic agent. Various monetary assets are created and backed differently, and thus have unique characteristics. Individuals diversify their portfolios primarily in order to achieve an optimal (balanced) liquidity structure and minimise risks. This is viewed as a perpetual, continuous process on both the supply and demand sides. In particular, they suggested that an important source of short-run non-neutrality is the diversity of money which results in different sensitivity of the components of money to nominal price changes. A change in the outside money supply causes the stocks of the components of inside money to adjust though not equally. As a result, some of the assets are out of equilibrium, though this can be restored via adjustments of the respective interest rates. The movements in the interest rates therefore bring about real effects by affecting investment activities. This clearly must be a continuous process but it was formalised in a static symmetric framework.

This mechanism appears to be very similar to that of staggered nominal adjustment. Basically, the difference was that Gurley and Shaw (1960) did not assume informational asymmetries and conditioning upon information sets. Their methodology is understandable for research conducted in the 1950s, but it was too stylized when applied to an analysis of

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<sup>13</sup> Gurley and Shaw (1960), p. 1

<sup>14</sup> Patinkin (1961), p. 1

intermediaries. An empirical testing of this theory by Jefferson (1997) on U.S. data over the 1900-92 sample period failed to confirm its validity, though specification of his econometric model and the timeseries is debatable. Gurley and Shaw, together with Tobin and Brainard (1963) in their following paper and Patinkin (1965) in his book, did not achieve integration of analysis of intermediation into the monetary theory of the day. As Patinkin (1961) noted, the work was not sufficient to generate much progress in this area, so attention to intermediation soon faded.

In the late 1960s – early 1970s macroeconomics came through what was later called a revolution (though in fact it was a natural evolution): the Keynesian IS-LM framework linking output and interest rate under the assumption of a constant price level failed on empirical evidence of high inflation and unemployment and was challenged by **the monetarist theory** (Friedman, 1968, 1975; Stein, 1976) that linked output to the price level and inflation. In fact, monetarism was largely a reproduction of David Hume's work: the quantity theory with focus on the price level rather than on relative prices, the view on transmission with an emphasis on the multiplicity of channels and on money stock rather than interest rates, the temporary effect of inflation on output (already mentioned above), as well as the reliance on the reduced-form models instead of the structural frameworks have already been advanced by Hume (1752). Comparative analysis can be found in Friedman (1975) and Mayer (1980). But, interestingly, being a reaction to the Keynesian tradition that failed to account for inflation and intermediation, monetarism had been ignoring the issue of intermediation too.<sup>15</sup> Does this mean that intermediation was overlooked? The era of microfoundations came a few years later with the work of Lucas and Sargent (more, precisely, it came when economists learnt how to treat expectation formation as being conditional upon an information set).

A careful reading of the articles of the day leaves the impression that Friedman, in the mid-1970s, was actually one step away from saying that the neutrality comes from the uniformity of money. Friedman (1975) and Fischer (1975) emphasised that money cannot affect output directly via the interest rate: an interest rate is a price of credit and the opportunity cost of holding money while the price of money is the inverse of the price level. But, having demonstrated the faultiness of the IS-LM theory, monetarism then shifted the focus away from the interest rate-output relationship. Here is another interesting observation: adverse selection was not well articulated at that time but, for example, it was possible to see in articles included in the book edited by Stein (1976) that the lending/borrowing interest rate does not adequately reflect money supply and does not explain aggregate output under inflation due to the increasing risks. But this is what was emphasised a decade later when the role of asymmetric information was revealed, for example, in Stiglitz and Weiss (1981). Neither the latter article, nor the following works by Stiglitz contain references to Friedman, at least in relation to this issue. What is evident, was that the trouble, the impediment to progress had been recognised. It was just approached by the means available at that time and in the empirical context of the day.

Interest in the role of financial markets and intermediation was revived in the late 1970s and in the 1980s. After the recession of the 1970s, followed by the banking crisis of the 1980s in the US, and thanks to technological advances, **commercial banks moved towards the capital market** by inventing derivatives and developing schemes for trade credit, futures and options. The latter two were initiated by firms to facilitate trade under uncertainty but today these

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<sup>15</sup> For instance, there are no references to works by Gurley and Show in Friedman's articles. The only reference I found is one to Gurley (1960) in Friedman and Meiselman (1965) "Reply to Ando and Modigliani and to DePrano and Mayer", *American Economic Review* 55 (4), pp. 753-785. This was mentioned in a footnote listing research on weighted aggregate measures of money.



instruments are evolving into a two-stage scheme which takes almost all diversified risks away from the real sector to the intermediaries. Such an intensive innovation process required deregulation, so the concept of free banking again became sound, now for the reason of the complexity of networks and information (see also Allen and Gale, 1994; Levine 1994).

Operations with capital assets became the core of the qualitative asset transformation in modern financial systems. This caused the decline of S&Ls and building societies while giving rise to pension funds, mutual funds, and investment banks.<sup>16, 17</sup> The capital market innovations, together with innovations on the deposit market (such as the abandoning of interest rate control), aimed primarily at more efficient risk management and screening/signalling. In fact, today's literature constitutes a significant improvement in the financial environment, reduction in transaction costs and asymmetric information and thus less intensive moral hazard and adverse selection (Allen and Santomero, 1999).

Now what about economic theory? With regard to innovations and deregulation, it is difficult to say whether they were influenced by the economics of the day. Macroeconomics initially fell behind. A surprise about the "missing money" (Goldfeld et al., 1976) was evident, money was shown to be a poor predictor of inflation, so the position of monetarism had been spoilt. The problem, overall, was treated as a purely empirical issue and the above mentioned changes, at the model level, were regarded as external innovations. The innovations were found to have a strong effect on the velocity of the conventional, theoretically predefined monetary aggregates and to cause crowding out of the "conventional" monies. A number of studies, evaluating the possible consequences of the structural instability of money for macroeconomic management, central banking, monetary transmission, seigniorage and inflation tax were carried out in application to high inflations and structural transformations in Latin America, Israel and, later, the post-Communist countries. Only a limited number of works have been devoted to the theoretical generalization of these issues and to the incorporation of endogenous money and multi-currency systems into a general equilibrium framework – in particular, again, with regard to the long-term effects of inflation and exchange rate shocks. Some authors suggested the concept of the empirical definition of money<sup>18</sup> but even with that financial intermediaries deserved very little attention: the diversification of money was persistently studied without modelling the intermediaries.

**The macroeconomics of the day was probably not ready to accommodate the theories of asset pricing, corporate finance, and banking** for three reasons. First, during the 1970s and 80s, with the lack of consensus about the principles of macroeconomics, there was confusion concerning the role of intermediaries. Second, treatment of intermediation without formalisation of information, thin markets, and coordination was not feasible, as was it equally not feasible to cast macroeconomic analysis in terms of microfoundations. Third, the traditional dynamic methods of economics failed to capture the rapid innovations. So divergence became evident. While asset pricing, corporate finance, and banking started developing into a rather practical knowledge producing managerial manuals, formulas, and analytical papers on very specific problems, economics – in the view of growing new empirical evidence – turned to building new fundamental concepts.

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<sup>16</sup> Among other reasons behind the decline of S&L was the removal of the interest rate ceilings.

<sup>17</sup> For formal definition to types of financial institutions see Appendix 1.

<sup>18</sup> Empirical definition of money in context of monetary and macroeconomics was first discussed by Laidler (1966) and Kaufman (1969), years before the instability of monetary aggregated was recorded. When this happened, several approaches had been offered; see for example, Koot (1975), Lieberman (1979), Barnett, et al (1981).

Indeed, there is no evidence in the literature of the 1970s and 80s that intermediation was missing from macro- and monetary economics for its unimportance. In its theoretical representation, an intermediary remained engaged in the reallocation of funds between borrowers and creditors, entirely dependent on the demands from both sides, and thus with no room for their own decision making. Accordingly, the scope of research in this field was rather introspective – it was limited to analysis of problems within the financial sector but no serious attempt was made to extend it beyond the boundaries of the industry and show the impact of financial sector on macroeconomy. Texts on banking and finance used to repeat respective parts of macroeconomic courses with more descriptive material about organisation and business practice in finance (and recent editions, for example, Banks (1995), Howells and Bain (2002) or Mishkin (2001), have not made much progress in the coverage as well as the depth of the analysis).

The serious methodological difficulties with intermediation have been reflected in the fact that even recently Merton (1989, 1993), Merton and Bodie (1995), Oldfield and Santomero (1997) and Allen and Santomero (1998) adhered to the above-mentioned **functional approach**. They advocated this methodology by arguing that functions are more stable than institutions: "Over long periods of time functions have been much more stable than institutions. This has clearly been a characteristic of the intermediary sector in the recent past. Institutions have come and gone, evolved and changed, but functional needs persist while packaged differently and delivered in substantially different ways... Using this functional approach to the financial sector, the literature that explains its activities can be seen as focusing on one or another function performed by it." <sup>19</sup>

The functional approach, technocratic by design, is able to provide a background for purely quantitative studies and statistical models. But it cannot help to integrate theories of intermediation in dynamic macroeconomics and the general equilibrium framework as it is not built on too general microfoundations. Moreover, it is believed to be potentially faulty as being not designed for capturing the double-sided nature of financial operations, reflected in the balance sheet. This, however, is crucial because deposit-taking and lending proved to be "just two different manifestations of the same function – the provision of liquidity on demand. This is especially true to the extent that banks are heavily involved in commitment-based lending"<sup>20</sup> (Kashyap, Rajan, and Stein, 2002). They provided theoretical and empirical justification because "the resilience of the institutional form of the commercial bank may be attributable to real considerations of economic efficiency, rather than simply to historical accident or the distortions inherent in policies such as deposit insurance"<sup>21</sup>. But this is exactly what is necessary for carrying the analysis of liquidity, monetary transmission, and neutrality.

Today's literature, indeed, addresses primarily specific and empirical issues like particular functions of the intermediaries. As a reflection of the intensive innovations and institutional diversification, as well as the developments in asset pricing, corporate finance, and banking, it pays significantly more attention to the capital market operations, the stability of financial systems, and the existence of intermediaries. The *Handbook of Economics and Finance* warns that its scope is limited by concentrating "on research addressing why bank-like financial intermediaries exist, and the implications for their stability" (Gorton and Winton, 2002)<sup>22</sup>. The provision of liquidity and transaction services in their view tends to be a function, closely

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<sup>19</sup> Allen and Santomero (1998), p. 6.

<sup>20</sup> Kashyap, Rajan, and Stein (2002), p. 65

<sup>21</sup> Kashyap, Rajan, and Stein (2002), p. 65

<sup>22</sup> Gorton and Winton (2002), p. 2

linked to and largely dependent on the capital market operations. This raises a question as to **whether the role of intermediaries in monetary transmission can be explained without a deep insight into capital market operations**. The answer seems to be straightforward: it must be necessary to know the degree to which decisions on the liabilities are subject to changes in the capital market. The capital market, obviously, gives banks an opportunity to offer a continuum of the risk-return combinations allowing it to mitigate and hedge risks related to credits and deposits. One may argue, however, that it does not appear to be rational to subsidise expected losses from credit/deposit activities by earnings from equities unless the marginal expected profit remains positive. Thus, analysis of the role of intermediation in the monetary transmission requires that we learn about the interaction between assets and liabilities rather than the capital market operations. This is where the functional approach fails to deliver the necessary results and where a microeconomic model of the intermediary would be more useful.

To summarise, the "traditional view" is not fully adequate because (a) its application is limited to purely quantitative studies and statistical models, (b) it cannot help to integrate theories of intermediation in dynamic macroeconomics and the general equilibrium framework, and (c) it is not designed for capturing the double-sided nature of financial operations, reflected in the balance sheet. It is therefore reasonable to explicitly model the double-sided nature of financial operations and microfoundations.

#### 4. Towards microfoundations of financial intermediation

There are only a few examples of such models in the literature. Some earlier papers addressed the conventional issues of **portfolio choice** under uncertainty to banks (often called 'depository financial intermediaries') on the basis of the standard Tobin-Markowitz theory (Kane and Malkiel, 1965; Parkin 1970; Pyle 1971; Hyman, 1972; Hart and Jaffee, 1974). This approach, being designed for analysis of the stock and bond markets, appears to be irrelevant for analysis of deposits as it ignores the presence of operational costs and market imperfections. Sealey (1980) argued that it "omits two key aspects of the behaviour of depository financial intermediary. First, it assumes that assets and deposits markets are perfectly competitive so that quantity-setting is the relevant behavioural mode in both markets. This assumption is not applicable to the deposit market since such markets are virtually always concentrated"<sup>23</sup>. Ignorance of the costs previously was noted by Pesek (1970) and Towey (1974) and the fallacy of the perfect competition assumption by Klein (1971). But it was Sealey (1980) who attempted to develop a behavioural model of a bank that would account for uncertainty and risk aversion – incorporated in the form of the non-linear risk preferences, market imperfections – in the form of deposit interest rate setting, and operation (resource) costs. He demonstrated that those three considerations "play a crucial role in determining optimal portfolio and deposit rate decisions under non-linear risk preferences"<sup>24</sup>, so that many of the conclusions of the previous papers do not hold. His paper provides a valuable background for developing microfoundations of financial intermediation in monetary economics.

Some attention to the examination of the role of intermediaries was paid by macroeconomics. **Fischer (1983)** analysed price level determination with a dynamic equilibrium model extended to include the banking sector and inside money, gradually replacing the "traditional" exogenous

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<sup>23</sup> Sealey (1980), p. 1152

<sup>24</sup> *ibid*

high-powered money. This model is instructive as it demonstrates both the significance of the intermediation in the determination of the price level and, equally, the striking limits of the representative-agent model when it comes to macroeconomic dynamics, the structure monetary aggregates, and its real effects.

Approximately at the same time, **Hartley and Walsh (1986)** made a further step towards understanding intermediation. They posed two fundamental – for monetary theory – questions: the neutrality of temporary and permanent shocks to money supply, and the effect of incomplete information on adjustment (where incompleteness refers to the lack of information on the nature of the shock that does not allow the agent to distinguish a temporary shock from permanent). Hartley and Walsh answer these questions by examining the "interaction between the financial and real sectors within the framework of stochastic, rational expectation model that distinguishes between inside and outside money."<sup>25</sup> They argue that the incorporation of inside money into a standard model would yield non-neutrality of temporary and permanent outside money shocks even if agents had complete information about the nature of the shock.

The model features three sectors: banks, firms, and households. Households hold claims against the banks and the central bank in the form of deposits and currency respectively against their net worth; banks hold loans and reserves and issue deposits; and the central bank has currency and reserves. The banking industry is assumed to be competitive in the sense that interest rates are exogenous and a representative bank maximises profit – interest earned from lending minus costs associated with providing loans and deposits. Demand for loans is derived from the investment demand of the firm. With complete information, thanks to the presence of the real costs of intermediation, both a shift between the outside and inside monies (currency and deposits) and temporary changes in the monetary base (currency plus reserves) lead to movements in the real interest rate and output. With incomplete information, due to the presence of the white noise disturbances to the shocks, the agents can mistake a permanent shock for a temporary one, so the former will also have real effects. Apart from that, Hartley and Walsh (1986) show that changes in the variance of shocks alter money-output correlations, the result consistent with equilibrium business cycle models.

This paper provides a useful extension to the traditional framework by introducing the financial sector but, from the viewpoint of new empirical evidence as well as recent advances in the theory, it exhibits several drawbacks. Firstly, the real effects of structural changes in the broad money cannot be tested and identified correctly because of the interrelation between inside money and income. This is not only an econometric fallacy generating a simultaneous equation bias, mentioned earlier by King and Trehan (1984) and Bernanke (1986), but also a logical pitfall. Whereas in models with a single currency the causality is straightforward, in models with inside money it is rather an assumption to be introduced.

Secondly, derivation of demand for loans from productive activity is a move towards reality; but without endogenously determined interest rates, loans have little to do with financial assets.

Thirdly, by the 1990s, the monetary base ceased to be an instrument of monetary control in many countries while reserve requirements became an inadequate instrument of banking regulation. Hence, the structure of the model becomes less adequate too. It, however, cannot simply be rewritten in terms of inside money because its diversification cannot be shown in terms of a representative bank, so the diversification of banks is also needed.

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<sup>25</sup> Hartley and Walsh (1986), p. 1

Fourthly, in view of recent developments as well as the above remarks, the informational aspect, as it is dealt with in their paper, seems to be misleading. Incompleteness of the market (i.e. agents have equally limited knowledge about the state of nature) is relevant for modelling open systems which have been subjected to external shocks with the latter being part of the analysis. Today such an approach does not seem very useful. A more relevant concept here could be incomplete contracts (deposits, for instance) in the market with imperfect information (where agents lack knowledge about each other either across or within sectors).

Several authors have developed microeconomic models of deposit-taking and lending to serve various purposes. Being designed for specific needs, they all have a reduced (partial equilibrium) form though this is not necessarily a defect. They still provide a very useful background for further research. Works by **Stein (1998)** and **Chami and Cosimano (2001)** deserve our special attention. Both describe the behaviour of a bank as an intertemporal choice in terms of its balance sheet, so that the double-sided nature of financial intermediation is well established. Both assume that banks are risk-neutral and maximise their value (cash flow) by setting interest rates subject to exogenous quasi-linear demand for loans. The latter is assumed to be a function of its own interest rate that immediately limits the scope and value of the model.

Stein (1998) develops "an adverse-selection-based model of bank asset and liability management" in which "banks raise funds from individual investors and then turn around and lend these funds out to borrowers, who can be thought of as bank-dependent corporations. The typical bank's job is complicated by the fact that individual investors are not as well informed as is bank management about the value of the bank's existing asset"<sup>26</sup> Three things in this paper need to be emphasised. The first one is the assumption that households face no cash-in-advance constraint and are thus allowed to hold only interest-bearing deposits. As a consequence, their portfolio preferences have no effect on the transmission of monetary policy shock onto the bond interest rate. Instead, the central bank is able to influence it by means of the bank reserve management. Second, in this paper and with reference to his other papers, he discusses the significance of the elasticity of substitution between bank and non-bank financing. It is admitted that, because of the measurement problems, the economy-wide interpretations to results of a microeconomic analysis often lack credibility. For example, Kashyap, Stein, and Wilcox (1993) found a strong effect of the change in a relative cost of bank versus non-bank financing on corporate investment and inventories, but the measurement problem makes any quantitative analysis unreliable. Third is the way the adverse selection is treated within the balance sheet framework. Stein distinguishes between bad and good banks on the grounds of the bank's history, the record of accumulated bad loans, etc. and assumes that lending by good banks is determined through what "bad banks underlend". Asymmetric information is relevant in this model because of two key features of the liabilities – the presence of uninsured external finance and the fact that its cost for the bank does not depend on the investors' perceptions about the bank's type.

Two things deserve our attention in Chami and Cosimano (2001). First, they suggest a more articulated two-stage competition – an individual bank precommits to a quantity of loans through its dividend policy and then, in the next period, enters price (interest rate) competition. The Bertrand competition is of limited power also for another reason: by increasing interest payment (and, it must be added, in the absence of adverse selection), a bank cannot gain the entire market due to the binding capital constraint. Second is the way they incorporate the

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<sup>26</sup> Stein (1998), p. 466

informational aspect. They avoid explicit treatment of information asymmetries and, for simplicity, assume that the monopoly power of a bank rests, at least partly, upon its private information. It soon becomes evident, however, that this simplification does not help to serve the purpose of their paper which was the evaluation of the effects of BIS' capital requirements on banking.

The above models provide a valuable contribution to our own analysis. We learn (1) why and how to formalise the double-sided nature of the lending-borrowing, (2) how to model competition among financial intermediaries and the financial market structure, (3) what institutional features are relevant for understanding intermediation in its side effects on the economy, and (4) why and how to deal with risk/portfolio preferences of economic agents. Yet we learn from those models how the information must not be treated. Failure to provide tractable and comprehensive formalisation of informational asymmetries in the context of financial intermediation does not allow us to proceed with an analysis of (a) credit supply, (b) agency problem in general and credit rationing in particular and, therefore, (c) the effects of the intermediaries' decisions on the real sector activity, output, and relative prices and, further, (d) as well as with the incorporation of financial intermediation into the general equilibrium framework.

A significant improvement in this direction is due to recent works by Stiglitz. The most recent microeconomic model of a bank was offered by **Stiglitz and Greenwald (2003)**. This has been designed as part of the credit-based general equilibrium framework in order to understand how the banking intermediation works. In this model, aggregation and macroeconomic implications are derived from explicitly formalised behavioural characteristics under the assumption of asymmetric information. The objective function is the bank's net worth which is a sum of returns from loans and T-bills minus payments to depositors and expenditures on screening. The bank maximises the objective function subject to the loan demand and a bankruptcy constraint. The latter can be expressed in deterministic or stochastic terms. The bankruptcy constraint acts as an endogenous termination condition under no anonymity; it is necessary if the objective function is assumed to be risk-neutral but it becomes redundant if the objective function exhibits risk-aversion.

The banking industry in this model has three distinct features: (1) Transactions costs are small because of technological advances and can generally be assumed to be zero. (2) Reserve requirements on deposits are held at a central bank on interest-free accounts. (3) Each bank faces a horizontal supply curve of deposits at the T-bill rate because (a) in the presence of government deposit insurance, depositors are indifferent as into which bank to put deposit money and (b) banks compete with mutual funds for deposits where (c) both banks and mutual funds have the same safety, the same liquidity, and provide similar checking account services. Stiglitz and Greenwald advocate this representation of the market structure with two arguments. First, in theory, deposit insurance is a necessary condition for preventing potential bank runs and public insurance is more efficient than private. In other words, it is efficient to remove all information asymmetries from the deposit market and this can be achieved by providing full public insurance. Second, it is suggested that this model is "not too different from what may emerge in the fairly near future in the USA".<sup>27</sup> These assumptions might be viewed as simplification but the rationale is that they allow us to focus on the loan supply/demand and the informational complications. Stiglitz and Greenwald then proceed with an analysis in terms of mean-variance analysis (return and risk), mostly relying on graphical representation.

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<sup>27</sup> Stiglitz and Greenwald (2003), p. 43

This model, as presented, is rather descriptive. Clearly, better specified and articulate models will develop in a problem-specific context. One area of study is the real effects of a monetary or liquidity shock and the monetary transmission mechanism. Another candidate is the self-selection of financial intermediaries and stability of the financial markets. More detailed proposals to come shortly.

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