Thomas I. Palley[1]

Horizontalists, verticalists, and structuralists: The theory of endogenous money reassessed

June 2013

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This paper uses the occasion of the twenty-fifth anniversary of Basil Moore's book, Horizontalists and Verticalists, to reassess the theory of endogenous money. The paper distinguishes between horizontalists, verticalists, and structuralists. It argues Moore's horizontalist representation of endogenous money was an over-simplification that discarded important enduring insights from monetary theory. The structuralist approach to endogenous money retains the basic insight that the money supply is credit driven but remedies horizontalism's omissions and over-simplifications. Twenty-five years later, horizontalism has largely morphed into structuralism. The theoretical challenge going forward is to develop the role of money and finance in a Keynesian theory of output determination. As regards monetary policy, the challenge is how to conduct policy in a world of endogenous money. These concerns emanate naturally from a structuralist perspective on endogenous money.

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This paper uses the occasion of the twenty-fifth anniversary of Basil Moore's book, *Horizontalists and Verticalists*, to reassess the theory of endogenous money. The paper distinguishes between horizontalists, verticalists, and structuralists. It argues Moore's horizontalist representation of endogenous money was an over-simplification that discarded important enduring insights from monetary theory. The structuralist approach to endogenous money retains the basic insight that the money supply is credit driven but remedies horizontalism's omissions and over-simplifications. Twenty-five years later, horizontalism has largely morphed into structuralism. The theoretical challenge going forward is to develop the role of money and finance in a Keynesian theory of output determination. As regards monetary policy, the challenge is how to conduct policy in a world of endogenous money. These concerns emanate naturally from a structuralist perspective on endogenous money.

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1. Introduction

2013 marks the twenty-fifth anniversary of Basil Moore's (1988) book *Horizontalists and Verticalists: The Macroeconomics of Credit Money*. The book has made an important contribution to Post Keynesian monetary theory by consolidating and elaborating the line of thought pioneered by Nicholas Kaldor (1970, 1982) in his critique of monetarism. However, this paper argues Moore's elaboration of the theory of endogenous money was overly-simplistic in its distinction between horizontalists and verticalists and it also discarded important enduring insights from monetary theory.

Moore's characterization of endogenous money created unnecessary intellectual discord among Post Keynesians that has found expression in the long-running exchange between horizontalists and structuralists. Both adhere to the core proposition that bank lending drives the money supply, rendering the latter endogenous. However, the structuralist approach, which links Post Keynesian monetary theory to the Yale school of monetary macroeconomics associated with James Tobin, also takes account of the role of portfolio preferences, balance sheet positions, microeconomic finance constraints, and expectations in influencing money supply and interest rate outcomes. It thus strengthens the micro foundations of the theory of endogenous money.

The structure of the paper is as follows. Section 2 discusses the macroeconomic origins of the debate over endogenous money. Section 3 presents the monetarist model of the money supply which is identified with the verticalist approach. Section 4 presents the ISLM money multiplier model which has an endogenous money supply, albeit for reasons that are entirely different from Post Keynesian theory. Section 5 presents the horizontalist model of money supply determination. Section 6 presents the structuralist

model of money supply determination and elaborates the structuralist critique of the horizontalism. Section 7 concludes the paper.

2. Against monetarism: the modern origins of endogenous money theory

The initial impulse for the development of Post Keynesian endogenous money theory was as a response to monetarism. Kaldor (1970, 1982) was the seminal contributor, with his framing of endogenous money building on his long-standing interest in credit and the credit transmission channel. Monetarism emerged as an important macroeconomic doctrine in the 1960s and was largely associated with Milton Friedman. The main claims of monetarism (Palley, 1993a) were 1) the money supply is controlled by central banks; 2) the Great Depression in the U.S. was significantly due to mistaken money supply tightening by the Federal Reserve; 3) money is all that matters and fiscal policy is ineffective; and 4) central banks should adopt a simple money supply growth rule to promote economic stability. Post Keynesian endogenous money theory rejected all of these claims. Its modern roots therefore lie in opposition to monetarism, both as a macroeconomic theory and as a policy prescription.

Monetarism was also vigorously opposed by neo-Keynesians. Tobin (1970) provided a critique of Friedman and Schwartz's (1963a, 1963b) empirical analysis and showed that the monetary patterns they observed were actually consistent with an extreme Keynesian model in which budget deficits were counter-cyclical and money-financed. Tobin (1974) also provided an accompanying theoretical critique, using the lens of the ISLM model, in which monetarism was identified with a vertical LM schedule. Meanwhile Poole (1970) provided a response to monetarism's policy claims: within a

stochastic ISLM model, interest rate targeting is superior to money supply targeting if financial sector disturbances dominate.

The neo-Keynesian critique of monetarism was conducted using the conventional money multiplier theory of money supply determination. Post-Keynesians rejected this and sought a deeper critique of monetarism based on its theory of the money supply. The cornerstone of monetarism is that central banks control the money supply, thereby rendering the money supply exogenous. Post Keynesians sought to demolish that cornerstone.

In *Horizontalists and Verticalists*, Moore (1988) provided a comprehensive statement that consolidated the Post Keynesian position. It is a great pity that the book appeared in 1988 rather than 1968. Had it appeared earlier it might have had an enormous impact on the mainstream economics profession, possibly even changing the course of debate. However, by 1988 monetarism had been intellectually rejected. The monetarist experiments of the late 1970s and early 1980s had turned out to be a catastrophic failure with regard to the claim that they would produce interest rate stability. Unfortunately, rather than being interpreted as vindication of Keynesian analysis and ushering in a second Keynesian era, monetarism was replaced by new classical macroeconomics (which Tobin (1981) termed Mark II Monetarism). The "new" aspect referred to the incorporation of rational expectations within stochastic macroeconomic models. The "classical" aspect referred to the revival of pre-Keynesian macroeconomics in which the economy is assumed to operate continuously at full employment via interest rate, price, and nominal wage flexibility.[2]

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[2] In Keynesian models, output adjusts to equal aggregate demand (y = AD), whereas classical models have aggregate demand adjust to equal full employment output (y* = AD). Within the classical model there can

The important point is that the monetarist debate was superseded by a debate over the nature of the macroeconomic process and the determination of the equilibrium level of output and employment. Endogenous money is not about macroeconomic closure.[3] In the monetarist debate, the theory of money supply determination was a first order issue. In the new classical debate that superseded monetarism, the money supply process is a second order issue. Though Post Keynesians remained justified in their criticism of both neo-Keynesian and new classical models because they both used an incorrect representation of the money supply process, the shift of the terrain of debate rendered the endogenous money critique less salient.

3. Verticalism and monetarism

Figure 1 provides a description of competing representations of the money supply process. It distinguishes between mainstream and Post Keynesian approaches. Reflecting the earlier monetarist debate, the mainstream is divided between monetarists and the neo-Keynesian ISLM school.

Monetarism reflects the true verticalist position, whereas the neo-Keynesian school emphasized the money multiplier. The latter incorporates its own form of money supply endogeneity, but it is not Post Keynesian endogeneity, which emphasizes bank lending.

The Post Keynesian position is divided between horizontalists and structuralists, with the former also often referred to as accommodationists. This terminological distinction between structural and accommodative endogeneity was introduced by Pollin

be unemployment due to enduring market frictions. Friedman (1968) famously labeled such unemployment as "natural".

[3] Though endogenous money is not directly about macroeconomic closure, it can affect equilibrium output via credit rationing impacts on aggregate supply (Blinder, 1987) and via impacts on aggregate demand (Palley, 1997).

(1991). As shown in sections 5 and 6, there are important analytical differences between the positions but they both share the fundamental insight that bank lending drives the money supply.

Figure 1. Competing approaches to the money supply process.
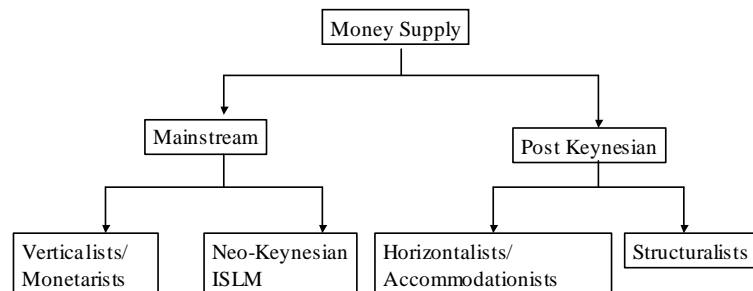
Monetarism corresponds to the purest form of verticalism and it is described by the following two equation model.

(1) M = mH

(2) Y = MV

M = money supply, m = money multiplier, H = supply of high-powered money (monetary base), V = velocity of money, and Y = nominal income. Equation (1) determines the money supply which is equal to the money multiplier times the supply of monetary base. Equation (2) is the Fisher equation and it determines nominal income which is equal to the money supply times the velocity of money. Substituting equation (1) into equation (2) yields

(3) Y = mHV

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The monetarist model of the money market is illustrated in Figure 2. The money supply is exogenously determined by the money multiplier and the monetary base. The money supply schedule is therefore vertical in [M, Y] space, hence the term verticalist. Nominal income adjusts to equalize money demand with the exogenously determined money supply. The central bank controls the supply of reserves (H), and can thereby determine the money supply (M) and nominal income (Y), conditional on given values of the money multiplier (m) and the velocity of money (V). Goods market equilibrium (which is not shown in Figure 2) is accomplished by adjustment of the interest rate in the loanable funds market, thereby bringing aggregate demand into alignment with real output.

Figure 2. The money market in the monetarist model.
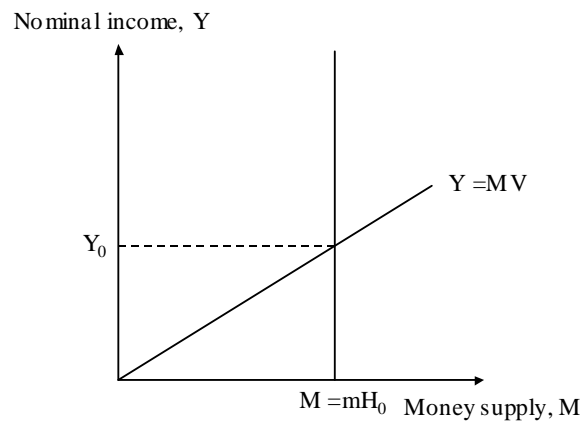
4. The neo-Keynesian money multiplier model

The neo-Keynesian model of the money supply process represents the other branch of mainstream thinking. The model is described by the following three equations.

(4) $M^s = m(i_B)H/P$ $m_{i_B} > 0$

(5) $M^d = M(i_B, y)$ $M_{i_B} < 0, M_y > 0$

(6) $M^s = M^d$

M^s = real money supply, M^d = real money demand, i_B = bond interest rate, P = price level, y = real income. The function $M(.)$ is the real money demand function and corresponds to Keynes' liquidity preference function.

The model is illustrated in Figure 3 which shows the neo-Keynesian construction of the money market. The interest rate on bonds adjusts to equalize the supply and demand for real money balances. There are several features to note. First, the bond interest rate is endogenous and is the mechanism that ensures instantaneous money market equilibrium. Second, the money supply is endogenous because the money multiplier is endogenous. The reasoning is that the money multiplier increases in response to higher interest rates because the interest rate is the opportunity cost of holding high-powered money balances. A higher opportunity cost gets agents (households, firms, and financial institutions) to economize on high-powered money balances, enabling the existing stock to support a larger money supply. This role of money demand and portfolio adjustment in response to higher interest rates is very important and constitutes the essence of Tobin's Yale School approach to monetary theory. It is a feature that remains valid and is discussed later .

Figure 3. The neo-Keynesian model of the money supply process.

Bond interest rate, i_B

M^s

$i_{B,0}$

M^d
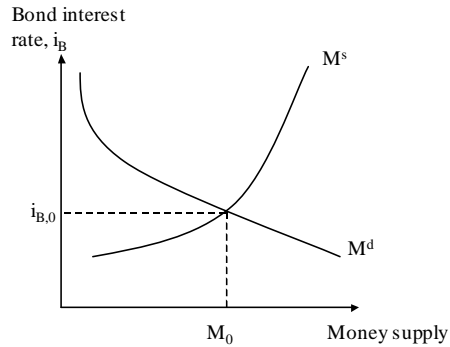
M_0 Money supply

Third, as in the monetarist model, bank lending remains completely invisible and is attributed no role in the money supply process. Fourth, though the money supply is endogenous, the monetary base remains exogenous which is what gives the model its verticalist character. However, as shown in Figure 4, this feature is reversed if the monetary authority targets the interest rate. In this case, the money supply schedule is horizontal and the monetary authority makes available as much base as is needed to meet money demand at the targeted rate.

Figure 4. The neo-Keynesian model of the money supply process with interest rate targeting by the central bank.

Bond interest rate, i_B

M^s

$i_{B,0}$

M^d
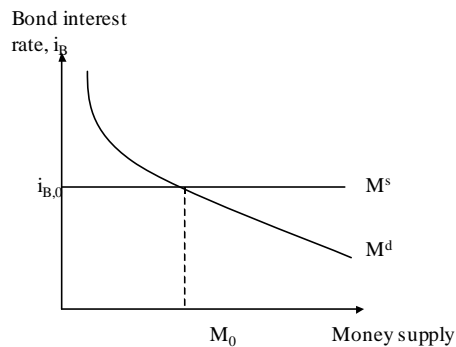
M_0 Money supply

Unfortunately, this horizontal aspect of the neo-Keynesian model has clouded understanding of the money supply process by obscuring differences between the Post Keynesian and neo-Keynesian approaches. Over the past thirty years, as central banks have abandoned money supply targeting regimes and shifted to interest rate targeting regimes, this has led to mainstream claims that the money supply is endogenous. That has created the appearance of equivalence with Post Keynesian theory that has crowded out space for the Post Keynesian model even though its analysis (as shown below) is significantly different.

On one hand, the mainstream's recognition that the money supply is endogenous is an improvement. On the other hand, by obscuring differences it has made it more difficult to establish a correct understanding of the money supply process. First, the mainstream views the money supply as endogenous because of interest rate targeting rather than because of the fundamental nature of the process. Second, credit remains invisible and apparently irrelevant for the money supply process in the neo-Keynesian representation of interest rate targeting regimes.

5. Horizontalism (or accommodationism)

The Post Keynesian approach to the money supply embodies a fundamentally different process. The approach can be sub-divided into horizontalism (or accommodationism) and structuralism. Moore (1988) coined the terminology of horizontalism and is the foremost proponent. Lavoie (1984; 1996; 2006) is another leading proponent, though his views have also gradually incorporated many of the structuralist criticisms of Moore's (1988) original formulation.

The horizontalist position is captured by the following simplified model based on Palley (1994):

(7) $i_L = [1 + m]i_F$

(8) $L^d = L(i_L,.....)$ $\qquad$ $L_{iL} < 0$

(9) $L^s = L^d$

(10) $L^s + R = M$

(11) $R = kM$ $\qquad$ $0 < k < 1$

(12) $H = R$

i_L = loan rate, m = bank loan mark-up, i_F = money market rate set by policy, L^d = loan demand, L^s = loan supply, R = required reserves, k = required reserve ratio. Equation (7) determines banks' loan rate as a mark-up over the money market rate that is set by policymakers. The policy rate represents the cost of finance to banks. Equation (8) is the loan demand function which is a negative function of the loan rate and other unspecified factors. Equation (9) has loan supply equal to loan demand. Equation (10) is the banking sector's balance sheet. Assets consist of loans and reserves, while liabilities consist of deposits. Equation (11) determines banks' holdings of reserves which are equal to required reserves. Lastly, equation (12) determines the supply of monetary base which is equal to bank reserves. As shown in Palley (1994) the basic model is easily expanded to incorporate bank excess reserves, time deposits, and currency held by the non-bank public. Adding these features leaves the logic of the model unchanged. These features are not included in order to keep the analysis as simple and clear as possible so as to facilitate comparison of approaches.

The solutions for the model are given by

(13) $L = L([1+m]i_F,\ldots)$

(14) $M = L/[1-k]$

(15) $H = kL/[1-k]$

The model is illustrated in Figure 5. The supply of monetary base (northwest quadrant) is horizontal at the policy determined money market interest rate. The loan supply schedule (northeast quadrant) is horizontal at the loan rate which is a mark-up over the policy rate. Banks satisfy all loan demand forthcoming at that rate. Bank lending determines deposit creation and thereby determines the money supply. The central bank then adjusts the supply of reserves to back deposits created. It does so by buying bonds from or selling bonds to the non-bank public, thereby injecting reserves into or draining reserves from the banking system.

Figure 5. The horizontalist model of the money supply process.
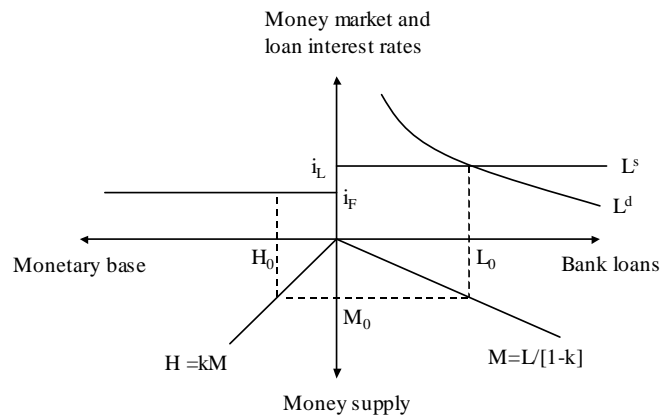
There are several noteworthy features of the model. First and foremost, loans create deposits. This is a very different description of the money supply process from that described by the monetarist and neo-Keynesian stories. It is also very different from the

neo-Keynesian interest rate targeting story in which the supply of reserves is also horizontal. Second, there is a money multiplier as shown in the southwest quadrant of Figure 4. However, it is an after the fact phenomenon rather than being a driver of money supply creation.

Moore (1988) describes banks' loan supply as perfectly elastic. However, the horizontalist model can be adjusted to incorporate a positively sloped loan supply schedule, which shows that there is more to the difference between horizontalists and structuralists than just the slope of the loan supply schedule (Palley, 1994). To see this, let the loan rate be determined as follows

(16) $i_L = [1 + m(L)]i_F$ $m_L > 0$

Equation (16) has banks raise the mark-up as lending increases. This latter effect may be due to increased default risk resulting from borrower quality deterioration as the volume of lending increases. Lavoie (1996) argues for such an effect by appeal to Kalecki's (1937) principle of increasing risk.

Figure 6 shows the model with a positively sloped loan supply schedule. The loan interest rate rises because banks increase their mark-up as lending increases. There is no money supply schedule *per se* because money is created by bank lending. However, if the loan supply is positively sloped, the money supply will show positive correlation with the loan rate as if there were a positively sloped money supply schedule.

Figure 6. The horizontalist model with a variable bank mark-up.
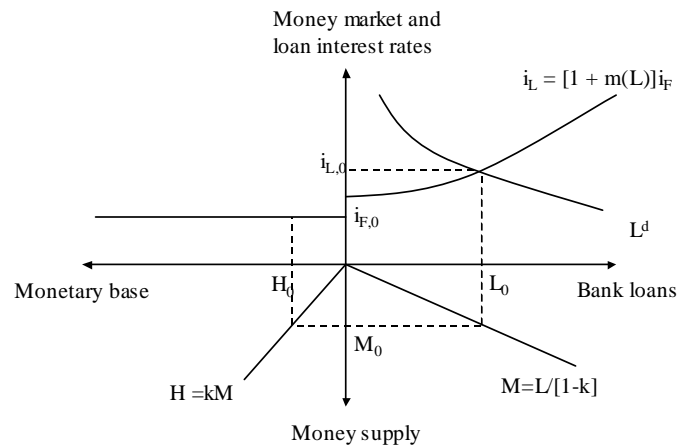
6. Structuralism

Structuralism represents the second branch of the post Keynesian approach to the money supply. Like horizontalism, it also embodies the core logic of loans creating deposits. In many regards it fills in omissions and oversights within the horizontalist argument.

6.1 A simple structuralist model

Rather than presenting a comprehensive structuralist model, this sub-section presents the simplest structuralist framework and then builds it out. Two critical differences from the horizontalist model concern money demand and the endogeneity of interest rates. Moore's (1988) horizontalist model has interest rates as exogenously set. The monetary authority sets the short-term interest rate and long-term interest rates are then determined via the expectations theory of interest rates. The long-term rate therefore depends on the current short-term rate and expectations of the future short-term rate, and long-term yields are priced so as to yield the same as a strategy of holding short-term bonds and rolling them over as they mature.

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> "Since nominal short-term rates are administered exogenously by the central bank, and nominal long-term rates reflect financial markets' expected future short-term rates, interest rates are a monetary phenomenon. It is perfectly correct to regard them as "hanging by their own bootstraps." Over some substantial range they are largely independent of underlying real forces (Moore, 1988, p.264)."

With regard to this horizontalist characterization of interest rates and interest rate formation, Pollin (1991, 2008) provided an early and continuing empirical critique. According to Pollin interest rates are best described as a complex rather than a single interest rate, and that complex exhibits multi-directional causality with long rates exhibiting significant endogeneity.

A second feature of Moore's (1988) characterization of interest rate determination is the absence of any role for liquidity preference. Moreover, as can be seen from the horizontalist model in section 5, money demand is entirely absent. Indeed, Moore (1991) effectively dismisses the legitimacy of the concept of money demand:

> "In conclusion, the demand for money has not been mislaid. There is always some quantity of money effectively demanded. But it is always identically equal to the quantity of money that is supplied (Moore, 1991, p.132)."

This absence of money demand and liquidity preference effects on interest rates has been criticized by Goodhart (1989, 1991), Palley (1991), and Howells (1995). The underlying analytical error in Moore's reasoning stems from a confusion of "want" for money, which is unlimited, and "demand" for money which is limited by agent's willingness to direct scarce income and wealth into money stores:

> "Moore's analysis neglects money demand consideration. In a monetary economy, agents are always willing to accept money as payment for the provision of goods and services. However, when one considers the ultimate impact of an expansion of bank lending, it is necessary to address the question "on what terms are agents willing to hold money balances?" That is, having received a deposit, what will agents do with it? Spend it, repay existing loans, buy bonds, or simply hold it? All of these actions have ramifications for the

final equilibrium, and may have fedback effects on the level of bank lending and the money supply (Palley, 1991, p.397)."

The structuralist model (Palley, 1987/88) addresses both of these concerns by introducing money demand and additional interest rates that are endogenously determined. The equations of the model are given by:

(17) $M = M(i_M, i_B, y, E, X)$ $M_{iM} > 0, M_{iB} < 0, M_y > 0, M_X > 0, M_E > 0$

(18) $L = L(i_L, y, A)$ $L_{iL} < 0, L_y > 0, L_A > 0$

(19) $L + kM = M + B$

(20) $i_L = [1 + m(L)]i_F + c$ $m_L > 0, c > 0$

(21) $i_M = [1-k]i_F - z$

(22) $H = N + B = kM$

M = demand for real money balances (bank deposits), i_M = deposit interest rate, i_B = bond interest rate, y = real income, E = vector of expected future interest rates, X = liquidity preference shift factor, H = supply of real high powered money, L = real loan demand, k = reserve requirement on deposits, N = non-borrowed reserves, B = borrowed reserves, i_L = loan interest rate, c = banks' cost per dollar of making loans, and z = cost per dollar of supplying deposits.

Equation (17) is the demand for bank deposits which depends positively on the deposit rate and income, and negatively on the bond rate. Equation (18) defines real loan demand which is a negative function of the loan rate and a positive function of income. Equation (19) is the banking sector's balance sheet identity. Assets consist of loans (L) and required reserves (kM): liabilities consist of deposits (M) and borrowed reserves (B) which banks borrow at the money market rate. When the banking system is short of

reserves, banks borrow from the central bank.[4] Equations (20) and (21) determine the

loan and deposit rates. The loan rate is a variable mark-up over the money market cost of

funds, while the deposit rate is a mark-down over the money market cost of funds that

takes account of the costs of administering deposits (z) and holding reserve requirements

(k). Equation (22) is the money market equilibrium condition in which the supply of

high-powered money equals demand. The demand for high-powered money consists of

required reserves.

Rearranging equation (19) and using equations (17), (18), (20), and (21) yields

(23) $M([1-k]i_F - z, i_B, y, X) = [L([1 + m(L)]i_F + c, y, A) - B]/[1 - k]$

Substituting equation (23) into equation (22) yields

(24) $H = kL([1 + m(L)]i_F + c, y, A)/[1 - k]$

Equation (23) shows that the deposit money supply is determined by bank lending. Given

the deposit money supply, the bond rate must adjust so that agents willingly hold the

amount of deposits banks have created. Equation (24) has the supply of high powered

money being used as required reserves.

The model is illustrated in Figure 7. The northeast panel shows the loan demand

and deposit supply schedules. The deposit supply schedule is derived from loan demand

via the banking sector's balance sheet constraint, thereby reflecting the endogenous

money process whereby loans create deposits. The level of bank lending is determined by

the loan rate, which is a mark-up over the money market rate. The northwest panel

determines the supply of high-powered money supply which consists of borrowed and

non-borrowed reserves. The borrowed component is $H^* - N$. The monetary authority

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[4] This is the simplest way of modeling how banks get hold of needed reserves. A more complicated way involves modeling the bond supply and having the central bank conduct open market operations to supply reserves and thereby maintain the policy rate at its target level.

targets its policy interest rate and then supplies reserves via borrowed reserves on an as-

needed basis. The southeast panel determines the bond rate needed for deposits created

by lending to be willingly held.

Figure 7. Determination of the supply of high-powered
money, the money supply, bank lending, and interest rates.
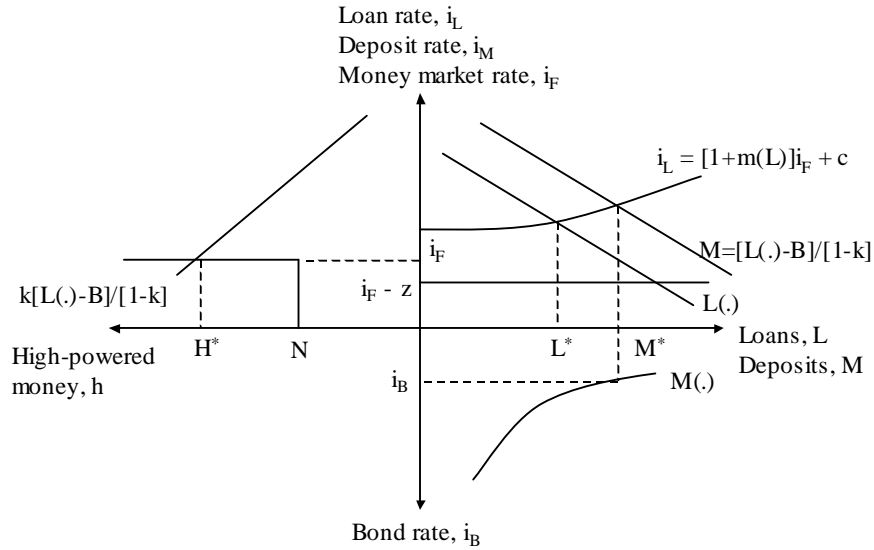
There are now two interest rates: a short-term rate and a long-term rate. The long

term rate is set by money demand which is influenced by the state of liquidity preference

and expectations of future interest rates. An increase in liquidity preference shifts the

money demand function down in the southeast panel, causing the bond rate to rise. An

increase in expected future interest rates also increases money demand as wealth owners

shift out of bonds to avoid capital losses. That causes bond prices to fall, raising the

current bond interest rate.

The model can be further refined by making loan demand and the mark-up

positive functions of the bond rate as follows

(18.1) $L = L(i_L, i_B, y, A)$ $\qquad\qquad$ $L_{iL} < 0, L_{iB} > 0, L_y > 0, L_A > 0$

(20.1) $i_L = [1 + m(L, i_B)]i_F + c$ $\qquad\qquad$ $m_L > 0, m_{iB} > 0, c > 0$

As regards loan demand, the logic is that bank loans and bonds represent alternative ways of financing business so that bond finance is a substitute for loan finance. A higher bond rate therefore increases loan demand, while a lower bond rate lowers loan demand. As regards the mark-up, loans and bonds compete for space in bank portfolios and the bond rate also affects the spread between the policy rate and rates charged on products like mortgage loans.[5]

The above specification of loan demand and the mark-up changes the money supply process, introducing bi-directional causality between loan demand and money demand. As before, an increase in loan demand increases bank lending and the money supply. However, now, an increase in money demand increases the bond rate. That raises the mark-up which tends to contract bank lending. However, it also induces an increase in loan demand that increases bank lending. The net effect on the money supply is ambiguous. The important point is that though the money supply is endogenous, it is not driven exclusively by loan demand. It is also affected by money demand, and money demand also affects loan rates.

More generally, the structuralist model's inclusion of money demand links Post Keynesian monetary theory with Tobin's Yale School approach to monetary macroeconomics. Liquidity preference, the character of asset demands, and the degree of asset substitutability are all critical factors in determining financial market outcomes.

6.2 Aggregation and the fallacy of division

Both the above horizontalist and structuralist models are aggregate models that represent the banking sector as a single entity. That representation risks promoting a fallacy of

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[5] If banks hold bonds the formal model given by equations (17) – (22) needs to be augmented to include banks' demand for bonds and the banking sector's balance sheet needs to be correspondingly adjusted (see Palley, 1987/88).

division whereby it is mistakenly believed that what holds for the system as a whole also holds for the individual components of the system.[6]

At the macroeconomic level, the supply of finance appears horizontal and perfectly elastic. The aggregate model therefore makes it look as if all banks have unlimited access to finance at the money market policy rate. However, structuralists maintain that no individual bank behaves as such. Instead, even as the monetary authority targets a money market rate, individual banks are subject to finance supply constraints that constrain individual bank behavior.

There are several arguments in favor of this structuralist position. First, banking is highly regulated and banks are subject to quantitative restrictions such as capital requirements. Since equity capital is scarce, that limits banks' activities as they must allocate their scarce supply of equity across different banking activities.

Second, the quality of banks' balance sheets varies with regard to the quantity of equity capital, the quality of assets, and the mix (long-term vs. short-term) of financing. All of these factors impact the cost and availability of finance to individual banks even though the monetary authority sets a single common policy rate that benchmarks the system. The important point is that financial markets assess individual banks for credit risk and this assessment affects the terms of access to finance for individual banks. As an individual bank's balance sheet changes, its supply cost of finance will change even though the benchmark policy rate is unchanged. That changed supply cost will then feed into the loan interest rate the bank charges. The loan rate a bank charges will therefore

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[6] The fallacy of division is the opposite of the fallacy of composition. The fallacy of composition involves the mistake of inferring that the whole behaves the same as the individual part.

tend to drift upward as its balance sheet becomes more fragile, reflecting changes in the bank's supply cost of finance.

Third, even though individual banks have access to discount window borrowing, the reality is they face penalty costs associated with using the discount window and borrowing from the central bank (Palley, 1987/88). A bank that is repeatedly short of reserves and forced to use the discount window to cover reserve shortfalls will be sanctioned for credit risk by financial markets, and for regulatory risk by financial regulators. Consequently, banks will be deterred from using the discount window even though they appear to have open access at the policy rate.

The implication of these microeconomic arguments is that individual banks face finance supply constraints and do not have a perfectly elastic supply of finance. There is considerable empirical evidence for this. First, this effect is visible in the fact that banks carry different credit ratings from ratings agencies such as Moodys and Standard & Poors.

Second, the 2008 financial crisis provided evidence of such effects. Banks did not collapse all at once. Instead, banks with the weakest balance sheets were frozen out of markets first.

Third, in the wake of the crisis there is also much talk of the competitive distortion created by "Too big to fail (TBTF)". The argument is that large banks that are deemed TBTF because of their systemic importance, implicitly receive a subsidy from the monetary authority. That is because depositors and lenders know they will be protected from losses as the monetary authority will step in to prevent bank failure in a crisis. Such reasoning has no place in the horizontalist model as all banks supposedly

have access to unlimited financing at the policy rate. However, it makes perfect sense from a structuralist perspective.

Fourth, borrowed reserves used to be a measure of liquidity pressure, and Palley (1987/88) reports a small but statistically discernible impact of borrowed reserves on the federal funds rate. This impact then feeds through to affect commercial banks' prime lending rate.

A fifth empirical finding consistent with the structuralist perspective on interest rate formation concerns the term structure of interest rates. It is empirically well established that the term structure of interest rates is not simply established by expectations of future short-term interest rates (Shiller, 1990). Instead, it incorporates additional term premia that are also volatile and this is inconsistent with the pure expectations theory of the term structure. Since banks price their lending off the term structure, that means they do not set prices as simply a fixed mark-up over expectations of the monetary authority's future target rate. Instead, their lending rates are impacted by liquidity preference and portfolio concerns that impact the term structure.

A sixth and final piece of evidence in favor of the structuralist view of bank behavior concerns lending standards. In the horizontalist model banks meet whatever loan demand there is at a mark-up over the policy interest rate. Credit rationing is not part of the narrative and there is no role for credit rationing beyond normal credit quality controls. In contrast, credit rationing is fully consistent with the structuralist perspective. As banks become loaned up and balance sheets become stressed, banks may vary lending standards to ration lending. In this case effective loan demand becomes

(18.2) $L = \theta(L/E, B/L, \ldots)L(i_L, i_B, y, A)$ $\qquad 0 < \theta < 1, \theta_{L/E} < 0, \theta_{B/L} < 0.$

θ = loan rationing coefficient, L/E = loan-to-bank equity ratio, B/L = borrowed reserves-to-loan ratio. Increases in the loan-to-bank equity ration or borrowed reserves-to-loan ratio are indicative of bank balance sheet stress and induce a tightening of lending standards. Other factors may also affect θ.

In terms of Figure 7, an increase in the loan rationing coefficient shifts the effective loan demand and money supply functions in the northeast panel to the left. That reduces lending and deposit creation at the going interest rate. It also shifts the demand for reserves function in the northwest panel to the right. An interesting feature of such credit rationing is that by reducing lending, rationing reduces deposit creation, which in turn increases long term interest rates.

Events before and after the financial crisis of 2008 provide evidence that banks do vary lending standards so as to impact lending volumes. In the run-up to the crisis, easy access to finance for banks encouraged lowering of lending standards; in the aftermath of the crisis, weakened bank balance sheets prompted higher lending standards.

6.3 Monetary policy and the interest rate targeting function

Sub-section 6.2 focused on microeconomic finance constraints on individual banks. This section focuses on macroeconomic constraints related to the monetary authority's interest rate targeting policy reaction function.

A central claim of the horizontalist position is that monetary authorities have no choice but to supply reserves needed by the financial system, and that in turn renders the reserve supply function horizontal. Thus, Moore writes:

> "The monetary authorities are thus typically caught in a dilemma. They must accommodate all increasing credit demands if they are to fulfill their commitment to orderly financial markets, even if the result may be the accommodation of inflationary pressures. Their only real choice is the price at

which they choose to make liquidity available to the financial system (Moore, 1988, p.83)."

The claim that the monetary authority has no choice but to supply reserves on demand, on a normal everyday basis, rests on the assertion that not doing so risks financial turmoil. This is a central analytical tenet of horizontalism, but it is open to challenge on two counts. One concerns the ability of markets to endogenously buffer reserve demand. The second concerns the fact that the monetary authority must actually convince the market it will not fully accommodate to preserve macroeconomic stability and attain its macroeconomic policy targets.[7]

As regards the former, the everyday fragility of the financial system depends critically on the understandings and expectations of market participants. If market participants expect the monetary authority to supply reserves, they will act on that basis and structure their financial arrangements accordingly. If the monetary authority then fails to behave as expected the system will indeed be fragile and vulnerable to turmoil induced by shortage of reserves. However, that need not be the case. If the monetary authority announces it plans to target monetary aggregates, market participants will then adapt their behaviors in ways that accommodate the monetary authority. Knowing the new rule, participants will increase their buffer holdings of liquidity, and new markets will develop for recycling liquidity from those with excess holdings to those with shortages. Money market funds do just this, and it is no surprise that they grew rapidly in the late 1970s when the Federal Reserve targeted monetary aggregates.

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[7] There is full agreement between horizontalists and structuralists on the need to accommodate fully in financial panics. The disagreement is about how to characterize the possibilities and practices behind normal everyday operating procedures.

As regards the policy rule, the essence of horizontalism is the claim that banks have access to a perfectly elastic short-run supply of finance as a consequence of the monetary authority's interest rate targeting. However, that claim embodies a myopic and simplistic understanding of policy. Looking beyond the market period, which can be thought of as the monetary policy decision-making period, the monetary authority has a systematic policy reaction function so that finance is not available from the central bank on unlimited terms at a constant rate. To the extent that market participants are aware of this, it will be factored into their current financial decision making. Consequently, current market actions and outcomes will be affected by understandings of the policy reaction function and anticipations of future policy.

These issues are raised in Palley (1996) who terms them "super-structuralism". Not only are there microeconomic financial constraints on individual banking firms, there are also macroeconomic constraints resulting from the policy reaction function. One possibility is that the monetary authority sets the money market interest rate according to the following rule:

(25) $i_F = \gamma_0 + \gamma_1 M$ $\qquad\qquad \gamma_0 > 0, \gamma_1 > 0$

Equation (25) has the monetary authority pursue a rule whereby it raises its policy rate target as the money supply increases. Using equation (20), (23), (24), and (25), the policy rate and loan rate can then be expressed as

(26) $i_F = \gamma_0 + \gamma_1 k H - \gamma_1 B/[1\text{-}k]$

(27) $i_L = [1 + m(L)]\{\gamma_0 + \gamma_1 [L - B]/[1\text{-}k]\} + c$

The policy rate is now a positive function of the supply of reserves and the loan rate is a positive function of lending. The logic is that the monetary authority raises its policy rate

as the demand for reserves increases. Since reserve demand is ultimately driven by lending, increased lending drives up the policy rate which in turn drives up the loan rate. As the parameter γ_1 increases in magnitude, both the reserve and loan supply schedules steepen.

In terms of Figure 7, the monetary base supply schedule now becomes positively sloped instead of horizontal. That means the loan interest rate can rise for two reasons. First, it rises because banks increase their mark-up as lending increases because of increased default risk. Second, it rises because the monetary authority raises the cost of finance as bank lending increases the money supply.

Another possibility is that the policy reaction function is conditioned on macroeconomic variables as follows

(28) $i_F = \alpha_0 + \alpha_1 P + \alpha_2 y$ $\qquad\qquad \alpha_0, \alpha_1, \alpha_2 > 0$

P = price level, y = real output. In this case policy responds to the real economy rather than financial market conditions. Finance affects the real economy, which turn impacts the financial sector via the reaction function. However, the essential point is the reserve supply schedule is not horizontal after taking account of the feedback loop between financial markets, the real economy, and policy.

Horizontalists counter that at each "instant" in time the supply of reserves is still formally horizontal. Structuralists respond that over a sequence of instants the monetary authority follows its reaction function (Fontana, 2003). Movement along the reaction function is jagged and corresponds to a disequilibrium process. Market developments push conditions to a new point and the central bank responds by changing the policy rate to attain its desired position on the reaction function. Viewed through the structuralist

lens of a sequence of moments, the economy travels up and down the reaction function. To understand the market's evolution, one needs to recognize that market participants will take this process into account as they make their current decisions.

Anticipations of future monetary policy settings will impact current individual bank decisions if there are any costs to unwinding or adjusting decisions. Anticipations of monetary policy will also impact current bank activity if the mark-up is a function of the current period bond rate as follows

(29) $m = m(L, i_B, \ldots)$ $m_L > 0, m_{iB} > 0$

Such pricing applies to products like bank issued mortgage loans which are a positive function of the current bond rate. Since the bond rate is determined by the state of liquidity preference, expectations about future interest rates feed through and affect banks' current lending and pricing actions.

This bond rate effect on the mark-up can also interact with previously discussed microeconomic finance constraints. Thus, if banks hold many different types of assets and make many different types of loans they will seek to equalize marginal returns across allocations of funds with the marginal cost of funds. As bond rates rise, they will raise the loan rate on those types of loans sensitive to the bond rate (e.g. mortgage loans). They will also redeploy scarce capital to types of lending where the return is positively affected by the bond rate.

Through these various channels, the reaction function is present in each market instant because participants anticipate future policy adjustments. That is why agents spend so much time anticipating Federal Reserve policy and why the Federal Reserve devotes so much attention to "communication".

Horizontalists' blindness to this important dynamic reflects a combination of myopic analysis and resistance to rational expectations analysis (i.e. analysis in which agents use model understandings of the world to anticipate the future). The fact that market behavior may change in response to changed policy regimes exemplifies and confirms the Lucas critique of economic policy assessment (Lucas, 1976). The fact that expectations of future monetary policy within a given policy regime, as reflected in the policy reaction function, impact current financial market behaviors and outcomes confirms the logic of rational expectations. Reflecting a tendency among Post Keynesians in general, horizontalists were initially hostile to the concept of rational expectations, and that hostility blinded them to these effects of expectations of future policy on current behavior.[8] This hostility was because rational expectations was introduced by Chicago school economists using the combination of the classical macro model and probabilistic representations of uncertainty. Unfortunately, that inclined many Post Keynesians to reject rational expectations entirely rather than rejecting the Chicago school's misuse of the concept (Palley, 1993b).

7. Conclusion: horizontalism vs. structuralism

Basil Moore's (1988) book, *Horizontalists and Verticalists*, is an important but flawed book. Its importance lies in its consolidation and elaboration of the theory of endogenous money as the cornerstone of Post Keynesian monetary theory. Its flaws are the misunderstanding and absence of money demand; the presentation of interest rates as exogenously determined by the central bank; the misunderstanding of micro level

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[8] This is evident from the index and citations in Moore's (1988) book. The index contains no mention of rational expectations, there is no discussion of the Lucas critique, and there is only one mention of Lucas in footnote 35 on p.319. This is in a book published almost twenty years after the emergence of macroeconomics with rational expectations.

financial constraints on financial firms (including banks); and the mischaracterization of the market impact of monetary policy via the over-simplification of a horizontal reserve supply schedule.

Moore's analysis defined the horizontalist perspective, and that perspective initially dominated among Post Keynesians in the late 1980s and 1990s. However, over time, the horizontalist position has substantially morphed into the structuralist position regarding the significance of money demand, the endogeneity of interest rates, and the significance of the monetary authority's policy reaction function for instantaneous market outcomes. At this stage, the only remaining substantive difference between structuralists and horizontalists is the latter's claim that that banks are financially unconstrained and have access to a perfectly elastic supply of finance available at the policy rate.

Horizontalism's over-simplifications are useful for purposes of teaching the theory of endogenous money in introductory macroeconomics, but they are misleading for state of the art theory and policy analysis. The structuralist critique remedies those over-simplifications.

As noted earlier in the paper, the Post Keynesian theory of endogenous money was developed as a counter to monetarism. Monetarism is now a dead doctrine and a curiosity of the history of thought, while the theory of endogenous money is now widely accepted. The unresolved controversy in macroeconomics is the theory of output determination and whether the system exhibits gravitational tendencies to full employment. Within that controversy there is the question of the role of flows of finance, the stock of money, and the stock of nominal debt.

From a policy perspective the theory of endogenous money raises questions about the nature of the monetary collar on the economy. Under a gold standard, the (relatively) exogenous supply of gold serves as a significant collar on the system. In a modern endogenous money system the collar is far weaker and restricted to self-imposed restraints on lending derived from banks' assessment of credit worthiness plus financing constraints on financial firms. This internal collar is likely to be unreliable and may even be unstable. For instance, the collar may loosen pro-cyclically for reasons associated with Minsky's (1993) financial instability hypothesis, with bankers and borrowers getting caught up in the hedge - speculative - Ponzi financing dynamic. Likewise, it may tighten excessively in downturns. The extreme case of this is when financial markets freeze owing to panic. For policymakers, the challenge is to manage the monetary collar, ensuring it is neither too tight nor too loose. The collar must be elastic so that it accommodates growth and does not hinder recovery from recession, but it must also restrain speculative boom – bust tendencies. Theorizing and modeling these concerns should constitute the next generation of Keynesian research. They emanate naturally from a structuralist perspective on endogenous money.

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