Gresham's Law and the Modern Theory of the Demand for Money

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I. Introduction

Gresham's Law—the observation that good (undervalued) money tends to be driven from circulation by bad (overvalued) money—is believed to have been stated, in one form or another, since the time of ancient Greece.[1] Early statements of what later became known as Gresham's Law were concerned with the problems caused by wear, clipping, or debasement of coinage. Although the Law was originally attributed to Sir Thomas Gresham, based on his correspondence with Queen Elizabeth in 1558, Frank W. Fetter (1932) has argued that it is doubtful whether any statement of Gresham's Law can be found in Gresham's writings.[2]

It was in the last part of the 19th century, during the period of deflation and the fierce

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[1]In the literature on Gresham's Law, a passage from Aristophanes' (5th century B.C.) is widely cited. Although MacLeod (1858) coined the term, he later (1892) recognized that Orêsme and Copernicus made similar observations. Translations of statements by the latter two are in Horace White (1895, pp. 466–7).

[2]In a letter by Gresham in 1558, there are references to gold and silver coins which MacLeod regarded as a statement of the Law. Fetter (1932) argued that this letter does not contain a statement of the Law and that, perhaps a statement that comes closest to the principal, is a discussion in Queen Elizabeth's proclamation of 1560. Gresham's writings are found in Raymond de Roover (1949), who agrees with Fetter's position.

currency debate or "battle of the standards," that Gresham's Law became widely discussed. Henry MacLeod (1858) is responsible for proclaiming the idea a "law" and naming it after Gresham, and Stanley Jevons (1875) did much to popularize the doctrine. In the last quarter of the 19th century it was a popular dictum among monometallists with which to counter the arguments of bimetallists and silverites. When the wind was taken from the inflationists' sails by the gold discoveries of the 1890s, Gresham's Law tended to take a backseat in the development of monetary thought.

Gresham's Law is a historical observation which requires a theoretical explanation. It might not be surprising that explanations of the Law developed in the late 19th century, and repeated in the early 20th century, have shortcomings when viewed from the perspective of modern theory. The purpose of this essay is to reconsider the theory needed to explain Gresham's Law. We argue that the most common 19th century explanation of Gresham's Law is incapable of accounting for the phenomena it was designed to explain. Our argument is based, not on a small point in recent monetary theory, but on the basic conception of the demand for money. An adequate explanation of GL (Gresham's Law) requires the modern treatment of the DM (demand for money) as an asset to hold.[3]

[3]Four acronyms will be used in the paper. It might be useful to list them here: DM (demand for money), GL (Gresham's Law), BOP (balance of payments), MABP (monetary approach to the BOP).

In the next section an essential feature of the modern theory of the DM is contrasted with a different concept which is referred to as the "demand for money" in many writings by 19th century monetary economists. The stock nature of the modern DM is shown to be important for explaining why good money is removed from circulation and what quantity is removed. In Section III 19th century and early 20th century explanations of GL are shown to be inadequate whenever the stock concept of the demand for money is absent.

In the last part of the paper the "bad" money driven from circulation in GL is shown to be analytically similar to, in modern times, a loss of international reserves (balance of payments deficit) following an overly expansionary monetary policy. Since the stock conception of the DM is the heart of the modern MABP (monetary approach to the balance of payments) while "bad" money driven from circulations is akin to a BOP deficit, the theory of GL is strikingly similar to the MABP. Or, stated another way, the monetary approach to the balance of payments provides a theoretical framework for explaining Gresham's Law.

II. Conceptions of Money-Demand and the Operation of Gresham's Law

No attempt is made here to present a comprehensive account of the evolution of the demand-for-money concept. But it should be clear from the examples cited below that a change has taken place over the last century. In the 19th and early 20th centuries some authors used the phrase, "demand for money" to refer to a concept that we call, a "flow-DM." Other authors avoided using the phrase, "demand for money," altogether.[4] In

[4]Many readers will be quick to point out that the DM is captured by velocity. Although it is unquestionably true that in the modern quantity theory V is regarded as demand determined, some writers [e.g., Mill (1848, book III, ch. 8), Keynes (1936, ch. 21) and (1979, ch. 4)] regarded the left-hand side of $MV = Py$ (where y is real

modern literature the DM is treated as the demand for an asset to hold and, as such, it is a stock concept.[5] In this section we contrast the two versions of the DM, present some representative examples of earlier thinking, and show why the newer version is essential to an explanation of GL.

The earlier concept of money-demand as used by many 19th and some early 20th century economists can be defined as the sum of all things sold for money. By this definition, the sale of anything for money is the seller's DM. The sale of labor services and IOUs (consumer and mortgage debt) by households constitutes much of their money demand. The sale of (intermediate and final) goods by firms and the issuance of corporate debt is money demand by firms. This concept is clearly a flow—the annual rate of money-demand is twelve times money-demand per month. If every increase in cash balances is summed over all economic agents, the result is the aggregate flow-DM.

The modern DM can be defined as the average inventory of cash balances that an economic agent desires to maintain.[6] When a firm issues debt to finance investment in capital equipment, its flow-DM rises but its stock-

output) as a statement, not of the DM, but of aggregate commodity demand, which has (since the Keynesian Revolution) usually been expressed as $C + I + G$. If, following this line of argument, MV is identical to $C + I + G$, V might depend inversely on interest rates (as does investment) rather than positively on interest rates (as does the reciprocal of money-demand).

[5]D.H. Robertson (1922) characterized the DM concepts as "money on the wing" and "money sitting." The distinction is frequently found in discussions of the transactions versus the Cambridge approach to the quantity theory. See, for example, Eshag (1963), Friedman (1968) (1970), and Keynes (1930, ch. 14).

[6]Theoretical work on the transactions DM by William Baumol (1952) and James Tobin (1956) characterizes the DM as the average inventory of money, and this is what we are calling the "stock-DM" for purposes of contrast. The flow-DM, as used here, is *not* the time-derivative of the stock DM. It is the sum of *gross* receipts of money over time or the rate of gross receipts at a point in time.

DM does not. The firm must go through money, via issuance of IOUs, to obtain equipment, but the average inventory of cash that it desires to maintain increases little if any as a result of the decision to issue debt.

The flow DM can be seen as an application of the kind of demand and supply analysis associated with non-durable commodities that are treated as flows. The stock-DM, by contrast, brings the demand for money into line with the demand for durables or for other financial assets, both of which are stock concepts.

Having defined two versions of money-demand, our next task is to show that the flow concept of the DM was held by some eminent economists during the time that GL was given so much attention in public discussion. In the late 19th century, probably the most eminent American authority in monetary economics was Francis A. Walker. In his authoritative work, *Money*, Walker (1878, p. 63) wrote that "the question as to the demand for money [is] merely the question [of] what goods are offered for money." This same view is found in Kemmerer (1906, pp. 13–28). A more complete statement of the idea can be found in John Stuart Mill:

The demand for money, again, consists of all goods offered for sale. Every seller of goods is a buyer of money, and the goods he brings with him constitute his demand. . . . It is indifferent whether, in characterizing the phenomena, we speak of the demand and supply of goods, or the supply and demand for money. They are equivalent expressions. [(1848, p. 11) or (1909, p. 491)]

Although Fisher (1911) did not use the phrase "demand for money," the right-hand side of his equation, $MV = PT$, is an algebraic statement of the flow-DM, viz., the value of all items offered for sale to obtain money per unit of time.[7]

[7]Will Mason (1976) has objected to Arthur Marget's (1938, vol. 2, p. 105, n. 36) reference to the "'stream' formulation of the Mill-Newcomb-Fisher Type [of monetary analysis]" because it tends to equate classical (e.g.,

Occurence of a shift from the flow version to the stock view of the demand for money is indicated in a classic article by Edwin Cannan (1921, p. 4). To emphasize the distinction between the two concepts of the DM, he posed an analogy between the demand for money and the demand for houses:

. . .we must think of the demand for currency as being furnished, not by the number or amount of *transactions*, but by the ability and willingness of persons to *hold* currency, in the same way as we think of demand for houses as coming not from the persons who buy and re-sell and lease and sub-lease houses, but from the persons who *occupy* houses. Mere activity in the house market—mere buying and selling of houses—may in a sense be said to involve "increase of demand" for houses, but in the corresponding sense it may be said to involve an equal "increase of supply"; the two things cancel. The demand which is important for our purposes is the demand for occupation. In the same way, more transactions for money—more purchases and sales of commodities and services—may in a sense be said to involve increase of demand for money, but in the corresponding sense it may be said to involve an equal increase of supply of money; the two things cancel. The demand which is important for our purpose is the demand for currency, not to pay away again immediately, but to *hold*. Just as you are a less important demander of houses if you occupy a £1000 house than if you occupy a £2000 house, so you are a less important demander of currency if you keep on the average £5 in your pocket than if you keep £10.

These citations indicate that a flow conception of the DM was prevalent at the turn of the century and that this concept is fundamentally different than the modern stock concept. The difference between the two concepts has also been pointed out by Milton Friedman

Mill's) quantity theory with Fisher's neoclassical version of the quantity theory. We are also classifying Mill and Fisher together, but not in their use of time. We recognize, following Mason, that Fisher's statement of the quantity theory was for the long-run (a "run" sufficiently long for the lapse of his "transition period") whereas many classical monetary economists used the quantity theory only as short-run doctrine. It is nevertheless possible to represent the flow-DM at a point in time with Fisher's PT.

(1970). As indicated by Patinkin (1972), the flow concept continued to be used in the United States until the Keynesian Revolution. But the stock conception of money-demand was prevalent at Cambridge in the late nineteenth century. Eprime Eshag (1963) pointed out that it can be found in early writings of Alfred Marshall (1887).

Our next task is to show why the modern stock conception of money-demand is required in any adequate explanation of Gresham's Law.[8] It is useful to begin with a representative statement of Gresham's Law. According to Ralph Hawtrey (1923, pp. 179–80):

The increase in the circulating medium causes, in accordance with the quantity theory, a depreciation of the monetary unit and a general rise of prices. This general rise of prices would, but for the bimetallic system, affect the less plentiful metal as much as other commodities, but as soon as the price of this metal as bullion rises appreciably above its price as the coins begin to be melted down or exported.

The monetization of "bad" money or paper money will, according to the quantity theory and as Hawtrey says, raise prices and this will cause some of the internationally acceptable money, say, gold, to be exported or melted. But *how much* gold is displaced from domestic circulation? The usual view is given by Simon Newcomb:

The equilibrium will be reached when the gold eliminated from the circulation is equal to the paper money which has been added. (1885, p. 413)

This conclusion is an interesting but very

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[8]A distinction needs to be made between two different historical experiences which GL has been used to describe. One situation concerns a limited or government controlled introduction of "inferior" money. This occurred in debasements and, for example, with the limited monetization of silver money under the Bland-Allison Act of 1878. A second situation concerns bimetallism. In a bimetallic standard, the quantity of "cheap" money introduced is market determined. In order to explain the change in the composition of the circulating medium in *either* case requires a stock conception of the DM. The model in the text centers around the first use of GL for simplicity.

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special case. As will be shown below, the stock-DM is essential for determining whether the demonetization of good money is equal to the introduction of bad money.

To show the role of the stock-DM, it is useful to construct a simple model of Gresham's Law. The model uses the same framework of analysis which is the hall-mark of the monetary approach to the BOP [see, for example, Johnson (1972)]. It is a simplified version of the MABP since we abstract from the banking system. Money is composed of a "good" money, say, gold (G) and a "base" or bad money (B).[9] In symbols, $M = \text{Par} \cdot G + B$ where Par represents the gold parity, the price of gold (in terms of the monetary unit) fixed by the monetary authority.[10] Monetary equilibrium can be expressed as $M/P = L$ or $\text{Par} \cdot G + B = PL$ where L represents the stock-DM in real terms. If we restrict our attention to the long-run rather than the short-run and to non-hyperinflationary situations, the explanatory power of interest rates in the determination of L is small compared to real income or wealth. Secular changes in real income and,

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[9]As late as the turn of this century, the term "base money" meant bad or debased money ([e.g., Breckinridge (1903)]. This should not be confused with the modern terminology which uses "base money" for central bank liabilities.

[10]The institutional arrangements underlying the determination of the price of gold at parity differ depending on whether the public holds gold coins or gold certificates convertible into gold. If the domestic currency price of gold bullion is tending to rise above Par, either the cullers of good coin will take gold coins to the bullion market or the public will take gold certificates to the government in exchange for gold which is then taken to the bullion market. Both cases have the same economic effect—they keep the price of gold builion from going above Par and cause a diminution of money. We will focus on the latter case, but the analysis is fundamentally unaltered if we were to consider the case of gold coin or some combination of gold coin and gold certificates.

Since the model will not concern gold flows between countires, it can be regarded as applying to all gold countries on the gold standard taken together.

The definition of M as $\text{Par} \cdot G + B$ is true only if Par has never changed. A more general definition of M would replace $\text{Par} \cdot G$ with the integral from minus infinity to the present of $\text{Par}(t) \cdot G'(t)dt$.

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therefore, L, will be taken as exogenous in our analysis.

The theory of GL tends to reverse the order of causation associated with the quantity theory of money. Rather than focusing on the influence of M on P, GL takes P as (approximately) determined outside the system and focuses on the influence of P (or its determinants) on (the composition of) M. If authorities keep the money price of gold bullion fixed at a value Par, the real value of gold, R, can be expressed as $R = \text{Par}/P$. If, and we will return to this question below, the long-run value of R were independent of domestic money and prices, P would be completely determined as $P = \text{Par}/R$. Substituting this solution for P into the monetary equilibrium equation we obtain

$$\text{Par} \cdot G = (\text{Par}/R) \cdot L - B. \qquad (1)$$

This presents G as the endogenous variable which is determined by R, L (or real income), and B, given the value of parity. There are several issues that must be faced if equation (1) is to be regarded as useful to help explain GL.

Consider, first, the definition of "good" versus "bad" money. The traditional criterion is based on the comparison of the mint ratio to the market ratio. The mint ratio is the ratio of the two parities (e.g., the official dollar price of gold divided by the official dollar price of silver) and the market ratio is the market value of one bullion divided by the market value of the other bullion.[11] These ratios do not appear in the model explicitly since the base money being considered is assumed 100% fiduciary. In this limiting case the "market ratio" can be computed as the market value of gold bullion divided by the market

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[11]If there is no seigniorage charge such that both coins are full-bodied, the market ratio can not deviate from the mint ratio (by more than some transactions costs) as long as both monies are in circulation. A more general definition of the market ratio is the ratio of prices that would clear the gold and silver bullion markets in the absence of the melting of either coin and the coining of either metal.

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value of the physical material used in the fiduciary money, viz., the paper. The market ratio is, therefore, nearly infinite when one money is 100% fiduciary and the other has metallic content. The "mint ratio" is easily computed in this case as the official parity value of gold divided by 1.0, the monetary value of the monetary unit. Since the disparity between the market and mint ratios is so great in this case, it is obvious which is the "good" money without resort to these categories. What we have done is to show that the categories of mint and market ratios can still be used to distinguish between good and bad monies when one currency is 100% fiduciary. But the categories are not as important as they are under a bimetalic system since it is already obvious that the fiduciary money is the base money. The good/bad distinction is already assumed in our model; consequently, the stock-DM (L) plays no role in determining *which* currency is removed from circulation.

In order for equation (1) to be used alone to explain the amount of gold (G) in the monetary system, R must be autonomous to G. One particularly interesting case is the classical condition of constant costs. One can imagine, for example, a linear production frontier between gold and all other commodities with a slope of (minus) R. This could be used as a long-run model which implies that the goods value of gold is determined independently of demand conditions. In order for R to be treated as constant in the long-run, of course, we have to assume that the slope of the production frontier is unaffected by technological change.[12] In this case,

$$- \delta G = \delta B/\text{Par} - \delta L/R \qquad (2)$$

where δB is the net increase in base money. A

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[12]The discussion in the text is alluding to the kind of barter model used in international trade theory which is supposed to be a long run model. Some of the immense changes that technological change have caused in R over centuries are discussed by Flynn (1981) and Miskimin (1977).

net increase in G means that gold is monetized; therefore, $-\delta G$ is the volume of gold demonetized. This equation addresses the earlier question of whether the volume of gold demonetized exactly offsets the volume of base money introduced. In the case of constant costs, the answer is 'yes' only if the demand for money has not changed—if $\delta L = 0$.

Even if the costs of production in gold mining were not constant, R may still be independent of the amount of gold absorbed in the monetary system (δG). The flow demand for gold as a commodity and the flow supply of gold from mining should exercise a dominance over R in the long run.[13] In the short-run, however, the amount of gold demonetized and sold on the bullion market should affect R such that R and G interact in a simultaneous manner. But the longer the time period, the more R can be taken as independent of G and, therefore, an independent determinant of the volume of gold coin or gold backed money.

The special result, that the displaced money is equal in value to the introduction of inferior money, was stated in the preceding quote from Newcomb. Adam Smith obtained this result by using a metaphor, the "fullness" of the "channels" of circulation, which served the role of a stock-DM:

Let us suppose, for example, that the whole circulating money of some particular country amounted

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[13]Models of the gold standard in which the long-run domestic price level is determined independently of the domestic quantity of money have been developed by Barro (1979) and by Roper and Warner (1981). The "long-run" over which GL has been thought to operate can be as short as a few years (as when silver was driven from circulation in the United States after gold was revalued from 15 to 16 in 1834 or as long as several centuries [Watson (1967)].

The model concerns the removal of good money only through its transformation into bullion. The other avenue for the elimination of good money is through exportation. Good or internationally acceptable money was exported when the exchange rate between two countries' monies deviated from the ratio of their parities by more than the cost of shipping and insurance. The stock-DM plays the same role in this process as it does for the melting of good coins.

... to one million sterling, that sum being then sufficient for circulating the whole annual produce of their land and labour. Let us suppose too ... bankers issued [800,000] promissory notes ... The channel of circulation, if I may be allowed such an expression, will remain precisely the same as before. One million we have supposed sufficient to fill that channel. Whatever, therefore, is poured into it beyond this sum, cannot run in it, but must overflow ... Gold and silver ... to the amount of eight hundred thousand pounds will be sent abroad ... (*Wealth of Nations*, Cannan edition, 1937, pp. 277-8)

Some writers recognized that good money would not be displaced by the introduction of bad money unless the total quantity exceeded the stock demand. A sample of statements from such writers is the following:[14]

In point of fact, also, good and bad coins will circulate together in a given country as if they were all good when the circulation itself is not in excess of the demand for it. (Giffen, 1891, p. 304)

Should the silver coins be insufficient to fill the circulation, some gold money would remain in use. (Laughlin, 1903, p. 429)

We thus find, as a limitation of Gresham's law, the condition that the aggregate of good and bad coins must be in excess of the country's need for circulating medium. (David Kinley, 1904, p. 54)

... if there is not too much of the bad money it is just as good as the good money. (Frank A. Fetter 1905, p. 447)

When the authors conclude that the volume of good money displaced might not equal the volume of bad money introduced, they had some, at least implicit, conception of a stock-DM even if they do not call it the "demand for money."

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[14]Although Marshall (1923) did not, to our knowledge, explicitly employ the Cambridge DM concept to explain GL, he did employ analogies based on stock concepts. Other writers who, at least implicitly recognized the need for a stock DM include Frederick Bradford (1928, p. 89), J.F. Johnson (1905, p. 195), James Magee (1926, p. 65), Taussig (1911, p. 269), and J.R. Turner (1919, p. 255).

III. The Flow-Explanation of Gresham's Law

This section examines an explanation of GL given by earlier economists who did not employ a stock conception of the DM. To understand this explanation of GL, we need to consider a central concept—the distinction between hoarded and circulating money—in their general theory of aggregate demand and price level determination.

Classical monetary theory gave the quantity of money a crucial role in determining the price level or, its reciprocal, the value of money. But early statements of the quantity theory frequently distinguished between money which is circulating and money which is hoarded. This distinction is evident in the following passage from Mill [(1848, p. 19) or (1909, p. 496)]:

Whatever may be the quantity of money in the country, only that part of it will affect prices which goes into the market of commodities, and is there actually exchanged against goods. Whatever increases the amount of this portion of the money in the country, tends to raise prices.

The money that is "actually exchanged against goods" or the flow of money which appears in markets as a demand for goods and services is not the stock of money, M, but the product of M and income velocity, viz., MV.[15] Non-circulating or, what was called "hoarded" money, was thought to have no impact on prices, as indicated in the continua-

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[15]The hoarding/circulating distinction can be seen as a special case of the use of the velocity concept. Hoarded money has a zero velocity and circulating money has a positive velocity. The hoarding/circulating distinction was superceded by the more general notion that some money has a higher velocity than other money. Newcomb (1885) was one of the first writers to develop the monetary demand for goods and services as the product of the stock of money and its rapidity of circulation. In post-WWII notation, Newcomb's equation is $MV = Py$. The formal use of the equation of exchange became more widespread as a result of Fisher's work (1911) although Fisher shifted from Newcomb's income velocity or rapidity of circulation (Py/M) to, what we now call, transactions velocity (PT/M). But regardless of the kind of velocity used, these writers did not emphasize the demand for money to hold.

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tion of the passage from Mill:

But money hoarded does not act on prices. Money kept in reserve by individuals to meet contingencies which do not occur, does not act on prices. The money in the coffers of the Bank, or retained as a reserve by private bankers, does not act on prices until drawn out, nor even then unless drawn out to be expended on commodities.

Economists such as Mill and Walker naturally approached GL with these categories of circulating versus hoarded money. To relate GL to their theory they had to argue that the base or light coins fit their theoretical category of circulating money and that the good coins fit their category of non-circulating or hoarded money. Since the hoarding/spending decision is made by the buyer, not the seller, GL must, in order to be explained by their theory, be the result of the behavior of buyers. In other words, if the good coins are to be hoarded and the bad coins are to be spent, the driving force behind Gresham's Law must be the decisions of purchasers. This view of the relation between GL and the behavior of spenders or buyers is reflected in the following passages:[16]

... the principle of Gresham's Law begins at once to operate, acting through the desire of men to pay their debts, or effect their purchases, with the least valuable commodity which will answer the requirements of exchange. (Walker, 1878, p. 1945)

They want coin, not to keep it in their own pockets, but to pass it off into their neighbor's pockets; and the worse the money which they can get their neighbor's (sic) to accept, the greater the profit to themselves. (Jevons, 1875, p. 81)

The reason the cheaper of two moneys always prevails is that the choice of the use of money rests chiefly with the man who gives it in exchange, not with the man who receives it. (Fisher, 1911, p. 113)

The "driving out" under Gresham's law is ...

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[16]Similar statements can be found in William Brough (1896), p. 29), William Scott (1919, p. 27), L. A. Ruefner (1927, p. 500), and D. Kinley (1904, p. 54).

dependent upon the existence of a payer's or debtor's option. (Fetter, 1932, p. 493).

Suppose you have two $1 bills, the one old, dirty and greasy, and the other, brand-new and crisp, and you are called upon to pay out one of them. You pay out the old one; everybody does, every time. It goes back into circulation and the crisp new note remains as long as possible in someone's pocket. That's Gresham's Law . . . (Arthur Faubel, 1932, p. 156)

When it is a question of keeping it for ourselves we prefer good money, but when it is a question of giving it to a tradesman or to our creditors, why give good money if bad will do equally well, i.e., if it cannot be refused in payment? And this is the hypothesis on which Gresham's law rests. (Charles Gide, 1913, p. 298)

Legal Tender Laws in the Flow Explanation

A theory which relies on the preferences of the spender and ignores the seller is suspect because the typical economic agent is, on the average, receiving money as often as spending money. Why should the preferences of the same person, as a buyer, be important and, as a seller, be unimportant? As the preceding quote from Gide suggests, this asymmetry was justified on the gound that legal-tender laws give the choice of currency to the buyer, not the seller. Thus, legal-tender laws seemed to dovetail nicely with the monetary theory based on the decision of the buyer to circulate or to hoard money.

It is necessary to inquire exactly how legal-tender laws make the choice of currency a buyer's option. The most crucial point to note is that, if the seller (or a new creditor) can charge different prices (or different interest rates) depending on the currency used by the buyer (or debtor), then the choice of currency will be a matter of indifference.[17] If a buyer's

or debtor's option is to be of any consequence, the government or Crown must also require that seller or creditor not charge different prices or interest rates. This requires that legal-tender laws be accompanied by price and interest rate controls. As noted by Miskimin (1972), attempts by the Crown to impose price controls in the late medieval period were difficult to enforce. In later times, as in 1862 with the passage of the Legal Tender Act regarding the issuance of Greenbacks in the U.S. Civil War, the legal-tender acts were not accompanied by price controls. If we accept the view that legal-tender laws have usually been accompanied by ineffective price controls or by no price controls, then the role of legal-tender laws in the operation of GL must be derived from another source.

To determine how legal tender laws are related to GL, we must recognize their implications for the behavior of government authorities. If the government or Crown proclaims that two monies are equivalent for *public* debts, this is important inasmuch as it implies that the government or Crown readily accepts either money for taxes and customs duties. If the government accepts base money which, by weight, is worth less than full-bodied money, this tends to support the value of base money in terms of full-bodied money. In other words, a seller of goods in the private sector is *not obligated* to accept the inferior money *at parity* with good money but would be more *willing* to *not discount* the inferior money because it can be used to discharge taxes or government duties. The greater their volume, the less likely inferior money is to circulate at a discount anywhere in the economy.[18]

In order for GL to operate, the two monies have historically had to circulate by tale (in earlier language) or at parity (in last century's language) or at a fixed rate of exchange (in modern language).[19] Legal tender laws, as we have argued, assured that monies of different weights would circulate by tale or nominal value by making it possible for sellers to accept intrinsically inferior money without fear of loss.

If the flow explanation of GL were correct, it would be necessary for the typical buyer to be able to distinguish between light and heavy coins. Advocates of (what we call) the flow explanation of GL implicitly recognized a problem with their explanation when they recognized that not everyone can detect and act on the difference between the heavier and lighter coins:[20]

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[17]Newly enacted legal-tender laws sometimes redistribute wealth on *pre*-existing private debt, but this impact does not force the operation of GL. Litigation over whether a private contract has been fulfilled or not concerns the unit of contract, not the medium in which it

is executed. It is not the medium in which creditors are paid but how much of any particular medium they are paid that matters. As great as the implications might be for pre-existing debt, legal tender laws do not force the expulsion of good money through this route.

[18]This same conclusion has been reached by Miskimin (1972) on historical grounds.

Macaulay's classic *History of England* (1877, ch. XXI) is often cited for a famous historical illustration of the importance of legal-tender laws associated with the recoinage of 1696. Before 1696, the government of William III accepted coins by their face value or "by tale" rather than by weight for the discharge of taxes. Milled coins, which could not be clipped, were melted down and exported while coins that had been shaped by hammer were clipped and used to pay taxes. Finally, in 1696, the Parliament declared that light coins could no longer be used to pay taxes. When clipped money was no longer accepted at its face value for taxes, it began to circulate by weight rather than tale. The mechanism that insured that the inferior money would circulate by tale in typical private transactions before 1696 was not the obligation of sellers but the willingness of sellers as long as they were confident that the government would accept the inferior money at its nominal value. As the date of the recoinage approached, an increasing number of merchants charged differential prices depending on whether the buyer paid in clipped or full-bodied money. This historical illustration, when told in full, supports our view of the role of legal-tender laws in the operation of GL.

[19]It is widely believed [cf. Friedman and Schwartz (1963), Hayek (1976)] that a fixed rate of exchange between the "good" and "bad" monies is necessary for the operation of GL. Although a fixed exchange rate has been, as will be argued in this footnote, necessary for GL to operate in the usual historical setting of commodity or paper monies, a fixed exchange rate can be seen from a general theoretical perspective as a proxy for identical real yields. With commodity or paper money, in contrast to deposit money, it is difficult to pay explicit interest. The absence of interest payments in conjunction with a fixed exchange rate implies that both monies bear the same real yields (viz., the single rate of deflation). If the differential real yield is zero, then the public would be indifferent about the composition of monies they hold if the monies are sufficiently good substitutes. For a given overall DM and a reasonable degree of indifference about the composition, the introduction of "bad" money would displace an equal amount of "good" money. But with a floating exchange rate, the introduction of additional "bad" money could alter the differential real yield in either direction and thereby increase or decrease the

demand for the "good" money causing either more or less of it to circulate. If, for example, an increased issuance of "bad" money produced a differential yield in *favor* of the "bad" money, a comparable amount of the "good" money could be driven from circulation despite the absence of a fixed exchange rate.

To make the example concrete, suppose more Greenbacks had been issued after the Civil War but the public remained convinced that they would, at some future date, be redeemable in gold at the pre-war parity. Then a lower price of Greenbacks (following the new issuance) would mean a higher differential yield in favor of Greenbacks. [A formal statement of this theoretical argument is developed by Salant and Henderson (1978).] If they were a reasonably good substitute for gold money, the increased demand for Greenbacks would come at the expense of the demand for gold money, lowering the amount in circulation.

The point of the preceding argument is that a fixed rate of exchange between two non-deposit monies assures that the two monies have equal real yields. With a floating exchange rate or with deposit monies, differential yields can exist and they will affect money demands. A differential real yield offers a different and alternative mechanism by which one currency can drive another from circulation. The "driving mechanism" in GL is the comparison of the domestic purchasing power of a commodity money with its cost of production or value as a commodity. The "driving mechanism" in modern literature on competitive monies [Girton and Roper (1981)] is a differential real yield. These two analytical structures could, of course, be combined in a general model. But they are separated *historically*—(old) commodity monies did not pay explicit interest whereas (new) deposit monies can and frequently do pay interest. With the switch to deposit monies and the abandonment of convertibility into a commodity, "good" and "bad" monies can *not* be defined with respect to their bullion values. Since deposit monies can pay explicit interest, it is natural to define "good" and "bad" monies with respect to their yields. But upon doing so, we get the modern result that the "good" (higher yielding) money drive the "bad" (lower yielding) money from circulation whether the rate of exchange is fixed or floating. Just as this modern result relies on the absence of commodity money, GL relies on its presence.

[20]See also Wilbur Aldrich (1903, p. 43), Kinley (1904, p. 53), and Taussig (1911, p. 270).

It is not to be understood that the mass of the people engage in this occupation of sifting the coin to get out the heavier pieces. It is the dealer, and especially the dealer in money, who, with his scales always at hand and always adjusted, quickly detects the least difference in weight . . . (Walker, 1878, p. 195)

The mass of people do not follow the market values of gold or silver bullion, nor calculate arithmetically when a profit can be made by buying up this or that coin. The general public knows little about such things, and if they did, a little arithmetic would deter them. These matters are relegated by common consent to the money-brokers, a class of men who, above all others, know the value of a small fraction and the gain to be derived from it. (Laughlin, 1886, p. 26)

The great majority of people have no means practically of testing the coins which they receive . . . (Joseph Nicholson, 1893, p. 44)

The people, as a general rule, do not reject the better, but pass from hand to hand indifferently the heavy and the light coins, because their only use of the coin is as a medium of exchange. It is those who are going to melt, export, hoard, or dissolve the coins of the realm . . . who carefully select for their purposes the new heavy coins. (Jevons, 1875, p. 82)

If one contrasts these quotations with those given a few pages earlier, it becomes clear that the flow explanation of GL frequently leads to a contradiction. *One cannot consistently argue both that the typical purchaser consciously spends the worst coins and that he or she cannot distinguish between the coins.* The flow theorists were concerned with the *volume* of money circulating versus the *volume* of money hoarded in their monetary theory of price level and output determination. But, in their flow explanation of GL, they implicitly proceeded from volumes to kinds of monies. Even if the categories of hoarding and circulating apply to good money and bad money, respectively, they explain only their differential velocity. In order for one money to be exported or melted, its quantity must push against the stock-DM which serves as a constraint.

Hoarding in the Flow Explanation: Further Considerations

The concept of hoarding has a long and interesting history about which much could be written. Our own doctrinal research of this concept is limited and we venture our generalizations with some hesitation. But there are, it seems to us, logically distinct differences is the uses of this term which shed light on the theory of GL. We will consider three distinct meanings of the hoarding concept.

When "hoarding" is used in modern, post-WWII literature, it usually means or is synonymous with the stock-DM.[21] According to this modern use of the term, circulating money and non-circulating money are *both* hoarded. We mention this modern use of the term as a contrast to earlier uses.

In the GL-literature of the period with which we are concerned, there are two meanings of the word "hoarding" which are interesting for our study. We have already encountered one use of the term, as money with (strictly speaking) zero velocity. A third use of the term, one which has a very modern ring, can be found in the writings of Simon Newcomb (1885), Alfred Marshall (1887), Robert Giffen (1891), and Knut Wicksell (1898). "Hoarding" as sometimes used by these authors refers to a speculative demand for capital gain. Like the modern stock-DM, this use of "hoarding" is a stock concept. It can explain, in at least one important situation, why a particular money is taken from circulation. This situation arises when there is an anticipated change in the mint ratio (when two monies are coined) or parity (when money is backed by bullion). The anticipation that convertibility will be abandoned induces speculation that can be self-fulfilling. It is not necessary for bad money to be introduced, just the expectation that a sufficient quantity will

[21]This use of "hoarding" is found, for example, in Keynes (1936) and in several essays in Frenkel and Johnson (1976).

be introduced can induce hoarding and deplete the reserves of the monetary authority.

This use of hoarding raises several questions. First, is this the type of situation to which GL refers? Second, is this use of "hoarding" logically equivalent to the stock-DM? We will begin with the latter question.

The speculative demand for a currency expected to suddenly appreciate is not equivalent to (what we have called) the stock-DM when the currency in question is a commodity or, more generally, a nondeposit money. This distinction is clearest when one reflects on the way that interest can be paid on a deposit money. With money on deposit at, say, a bank, explicit pecuniary interest can be paid continuously (or occasionally on the average balance held over time). *While* interest is accruing, the deposit is used as a medium of exchange—both receipts and expenditures go through the account. But with a commodity or paper money, an interest payment or capital gain that accrues at a point in time interferes with the medium-of-exchange property of the "money." A currency hoarded before an anticipated change in parity ceases to be money. If there are two monies, say, gold and silver, that are good substitutes and there is an expectation of a change in the mint ratio in favor of gold, speculation or gold hoarding will eliminate some gold money from circulation and the (presumably unchanged) stock demand *for money* will have to be fulfilled with more silver money. Since non-deposit currency hoarded ceases to be a medium of exchange, this notion of hoarding is outside of or not part of the stock-DM.

Use of the stock-DM as distinguished from hoarding of a physical asset expected to appreciate reveals two fundamentally different "driving out" mechanisms that can cause a money to cease circulating. The stock-DM is necessary to explain how much money is driven out due to a divergence between the value of the money as bullion and its value as

domestic money. The mechanism that is based on the comparison of the value of a money as bullion to its value as money is due to the presence of intrinsic value in the commodity money—that it can be "consumed." When one considers financial assets with no intrinsic value, their relative demands depend only on anticipated yields. One could argue that changes in relative demands (hoarding one money relative to another fiduciary money) explains GL if the "good" money were defined as the money with the greater anticipated capital gain, not as the money whose mint value is lower than its bullion value. While this notion of "hoarding" may explain which money is taken from circulation through speculation, it does not explain the exportation and melting of undervalued currency. In fact, the mechanism that takes money out of circulation due to an anticipated capital gain can, in principle, remove the "bad" currency from circulation and thereby work in the direction opposite that of GL.[22] The mechanism is so different from the mechanism based on the intrinsic values of currencies that we take this notion of hoarding as not being an explanation of what is usually regarded as GL.[23]

[22]One money might be melted or exported if its value as bullion tends to exceed its value as money (the usual mechanism of *GL*) while, simultaneously, an anticipated future capital gain due to a change in parity could induce the public to hoard the other money. In this case, the "bad" money would be hoarded. In practice this problem occurred rarely if at all. If, for example, the gold parity were less than the market clearing price for gold bullion such that the authorities had to sell gold to support the official parity, expectations frequently developed that they would have to revalue gold; hence, the anticipated change in the mint ratio or parity would induce more gold to be taken from circulation through hoarding. But the fact that both the hoarding and the exportation/melting typically go in the same direction should not obscure the two theoretically distinct mechanisms by which currencies a taken from circulation.

[23]In much of the literature, "hoarding" is placed on a par with exportation and melting as an avenue or channel through which good money was driven from circulation. To take a typical quote, ". . .the three vents by which good money escapes: in *hoarding*, in making *payments abroad*, and in *selling it by weight*." (Gide, 1913, p. 298) The

Although we distinguished between the stock-DM and hoarding (in the sense of commodity speculation), the modern conception of money-demand is sometimes divided between idle and active balances. The earlier notion of hoarding (in the sense of nonspending) is a precursor to the contemporary category of idle balances. So the question arises: How can we simultaneously maintain that the hoarding/circulating distinction used in the flow explanation is inadequate to explain GL and that its successor, the idle/active distinction, are two parts of the modern stock-DM? The answer is that the idle/active distinction concerns different economic behaviors, not different kinds of monies. The modern concept of idle or low-velocity balances is not intended to apply to a particular subset of the medium of exchange. It applies to the behavior of some households or firms that hold high balances relative to their level of income or expenditures. Persons in some activities turn their cash balances over faster than persons in other activities. The idle/active categories, just like the hoarding/circulating categories, are not useful for explaining how much money is removed from the domestic monetary system.[24]

IV. *GL* and the Monetary Approach to the Balance of Payments

Thus far, we have argued that the flow explanation of GL is inadequate and that the modern stock concept of the DM is essential for explaining how much good money is melted and/or exported. As we argued in Section II, the volume of good money driven from circulation is equal to the volume of base or overvalued money introduced minus any growth in the stock-DM. Readers familiar with the modern monetary approach to the balance of payments, MABP, will immediately recognize the similarity between our use of the DM for explaining GL and its role in the MABP. Our emphasis of the stock nature of the DM used in GL is similar to the emphasis that Harry Johnson (1972) has given to the stock nature of the monetary equilibrium condition imbedded in the MABP.[25]

A basic issue for determining the relation between GL and the MABP is whether the exportation and melting of good money in GL and the BOP in the MABP are analytically similar.[26] With the commodity monies frequently discussed in GL, there was no recorded BOP. If a metallic coin were melted into bullion, no accurate records could be kept of this diminution of the circulating media. The melting of full-bodied coin did not involve a central bank or a change in official holdings of international reserves. Institutional arrangements are so fundamentally different that there would appear little relation between the melting of metallic coin discussed in GL and the BOP discussed in the MABP. On the other hand, the melting of coin and a modern BOP deficit both cause the circulating

medium to fall (or keep it from rising faster). This suggests a similarity the exploration of which requires that we pierce the veil of institutional change.

The transition from the GL-world of metallic coins to the MABP-world of fiat monies begins with the transition from the gold-coin to the gold-bullion standard (Ricardo's suggested plan). The circulation of gold coin was replaced by the circulation of representative fiduciary monies which were convertible into gold bullion. Rather than gold coin being melted, central banks operating under the gold-bullion standard lost reserves (i.e., incurred a BOP deficit) when the representative money was converted into gold bullion. The gold bullion sold by the central banks went both to the bullion market and into the monetary systems of other countries or the coffers of their central banks. Consequently, the BOP deficit under the gold-bullion standard is analytically equivalent to the melting and exportation of coins under the gold-coin standard.

The second institutional change that may obscure the relation between the melting of metallic coin and the modern BOP-concept, is the change from a gold-bullion standard to the gold-exchange standard. Widespread adoption of the latter occurred after WWI in an effort to economize on gold. Instead of losing gold as the result of a BOP deficit, monetary authorities lost foreign exchange (or interest-bearing assets denominated in foreign currency units) under the gold-exchange standard. Since the loss of foreign exchange is the gold-exchange standard counterpart to the loss of gold under the gold-bullion standard, and since the latter is the counterpart to the melting and/or exportation of gold under the gold-coin standard, contemporary deficits of foreign exchange are the modern counterpart to the removal of good money in GL-discussions.

Once the similarity between good money exported and/or melted and a modern BOP deficit is recognized, then it becomes obvious

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question is whether such authors [e.g., Paul Einzig (1949, p. 413), Irving Fisher (1912, p. 222), Roy Garis (1933, p. 9), Cyril James (1930, p. 30)] are using "hoarding" in the sense of speculative demand for capital gain or in the money-not-spent sense of Mill, "money kept in reserve by individuals to meet contingencies which do not occur." As we argued in the preceding footnote, hoarding in the sense of speculative demand for capital gain can, theoretically, take the bad rather than the good currency from circulation. And, since it does not rely on the same mechanism which removes good coin through exportation and melting, it would appear incongruous to add hoarding (in the speculative sense) to these other two "vents by which good money escapes." We conjecture that the "hoarding" is placed on a par with the other two routes for good money to leave to form some connection between the hoarding/circulating distinction of monetary theory and the historical observation that good money was exported or melted. But whether it is used in the speculative sense or in the money-not-spent sense, it does not explain why and how much good money is exported or melted.

[24]One can make some connection between different velocities and different kinds of monies, but these connec-

tions do not help explain GL. Suppose, for example, that wealthier persons hold more idle balances, the ratio of their money to expenditures is higher than for low income persons. If this supposition is combined with the 19th century view that gold was the "rich man's money" and silver was the commoner's money, then it would seem to support the idea that the good money, gold, was driven from circulation, in the sense that it was held as idle balances by the upper class. But then how does one explain the oft-cited French experience of the 1850s in which the commoner's money, silver, was nearly driven from circulation? In other words, the money that is driven from circulation is determined by comparing the mint ratio to the market ratio (for which the first approximation might be relative production costs), not by whether it is used most extensively by parties with low rather than high velocities.

[25]In current literature there are two different views of or ways to characterize the MABP. One view [cf. Keleher (1978)] concerns the law of one price or market arbitrage, viz., the view that prices between two countries or regions can not get out of line. Another view is that the BOP can be usefully explained using the categories of the demand and supply of money. Although these two ideas are frequently combined, they are logically separable [cf. Girton and Roper (1977)] and we are using the second view as our characterization of the MABP.

An extensive bibliography of this literature is found in Putnam and Wilford (1978). Applications of the monetary approach to historical periods involving commodity monies are by McCloskey and Zecher (1976) and Flynn (1978).

[26]There are two fundamentally different concepts of the BOP [cf. Girton and Roper (1981)] and the melting-and-exportation of good money under GL corresponds to one concept and not the other. One concept is exchange market pressure, the volume of central bank intervention necessary to keep an exchange rate or a parity value fixed [cf. Girton and Roper (1977)]. Another concept is the interregional BOP, the net flow of money between two regions [cf. Mundell (1961)]. If there is one currency per region, the two concepts are indistinguishable. When two currencies circulate within *one* region (or when, in modern jargon, there is currency substitution), the volume of intervention necessary to keep their rate of exchange fixed is quite distinct from the concept of interregional BOP. Since GL is a historical observation concerning multiple currencies, the relevant BOP concept is the multi-currency concept of exchange market pressure. The distinction between the BOP concepts provides a solution to the perplexing question of the usefulness of the MABP over the traditional approach for explaining "the" BOP. When applied to the interregional BOP, the usefulness of the MABP declines with the multiplicity of currencies of low substitutability. (Their substitutability must be low since a high degree of substitution between multiple currencies approximates a single currency and the distinction between exchange market pressure and the interregional BOP is obliterated.) It may be more useful to add the current account and capital accounts for residents in a region to determine their BOP against another region than to add their demands for various monies to explain the interregional BOP through the monetary approach. In short the MABP has a comparative advantage over the traditional approach for explaining exchange market pressure. Similarities between (the theory of) GL and MABP are between GL and the monetary approach to exchange market pressure, *not* the monetary approach to the interregional BOP.

that the MABP and an adequate theory of GL may have a lot in common.[27] The major commonality or similarity is, of course, the role of the stock-DM, the central analytical framework of both the MABP and the theory of GL. Beyond the role of the DM, other similarities can be recognized.

In a modern country with only one national, fiduciary money, there appears to be no counterpart to the good and bad monies with which GL was concerned. But the MABP is concerned with two *sources* of money as reflected in the assets of the central bank. The two sources of money are the net purchases of foreign assets (i.e., the international reserves of the monetary authority) and the net purchases of domestic assets (i.e., interest bearing assets demoninated in local currency) by the central bank. Rather than the public holding two kinds of monies as they did in the last century, contemporary monetary authorities hold two kinds of assets.[28] The distinction

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[27]Other writers have discussed predecessors of the MABP: Bordo (1980), Fausten (1979), Frenkel (1976), and Keleher (1978). Our work suggests that another place to look is in the literature on GL.

The relation between the theory of GL and the MABP becomes even more apparent if one tries to explain the volume of good money displaced by the introduction of bad money using the traditional approach to the BOP. This is an example of the point of the preceding footnote that the MABP has a comparative advantage explaining exchange market pressure as opposed to the interregional BOP. Note that the model in Section II, which explained the pressure (measured by δG) on the domestic currency value of gold, used the monetary approach (i.e., used the demand and supply for money) rather than the traditional approach (i.e., avoided any reference to the current or capital accounts). This is the same in which the MABP is essential to explain GL. With multiple monies circulating within one region, it would be less useful to try to explain the amount of money demonetized (the BOP deficit) using the traditional approach to the BOP.

[28]The money (e.g., deposits at the central banks) created against the purchase of domestic assets is, of course, indistinguishable from the money created against the purchase of foreign assets. This indistinguishability assures that units of this identical money will circulate at par with one another. In previous centuries, the monies were frequently distinguishable. In order that they circulated by tale or at parity with one another, the government had to accept either money for taxes and duties (as discussed in Section II), or the government could have

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between good and bad monies has been superceded by the distinction between money created against the purchase of foreign assets (the international reserves of the monetary authority) and money created against the purchase of domestic assets. These two sources of money play the same role in the MABP as the two kinds of circulating media play in GL.

Another similarity concerns a conclusion associated with both the MABP and GL but implied by neither. In the MABP literature the conclusion is frequently drawn that a domestic credit expansion by the central bank is completely offset by a BOP deficit of the same magnitude. This is the same sort of conclusion that was given in the quotations from Adam Smith and Simon Newcomb in Section II [cf. also Barbour (1885), Nicholson (1903), Walker (1878)]. Just as we cited some earlier writers on GL who recognized that the offset might not always be 100%, it is well known [cf. Kouri and Porter (1974)] that the BOP will not equal the creation of domestic credit if the stock demand for money changes.[29]

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maintained convertibility of one into the other. The point to note here is that the government obligation in the case of distinguishable monies served the same role in the operation of GL as the indistinguishability of monies created against foreign and domestic assets serves in the MABP.

[29]Some of the reasoning underlying the notion that the quantity of good money displaced might be less than quantity of inferior money introduced has a sophisticated ring much like some arguments in MABP literature. Jevons (1875, p. 139) and Walras (1954, p. 360) discussed a "compensatory action" and Walker (1897, p. 149) discussed a "compensating effect." According to this idea [which is also mentioned, but not with the same name, by Bordo (1975) in his discussion of Cairnes], the absorption of overvalued money from the bullion market and the new supply of demonetized metal to the bullion market affects the market ratio of the two metals. In terms of the model in Section II, this implies a movement in R and, therefore, P. This means that the very displacement of good with bad money allows the domestic price level to rise and the domestic demand for money to consequently increase such that the volume of good money demonetized will be less than the quantity of bad money introduced. This is exactly the reasoning which lies

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An apparent dissimilarity is that GL was frequently stated asymmetrically. In other words, GL concerned the exportation and/or melting of money rather than its importation and/or coining. In contrast, the MABP is as concerned with a BOP surplus as with a BOP deficit. While more public discussion was no doubt generated by proposals of debasement or cheap money, the *theory* of GL *is* symmetric. The theory required to explain the volume of good money displaced with the introduction of inferior money can just as easily explain the coining of money if an insufficient quantity of inferior money is introduced to accomodate growth in the demand for real balances. Our answer is, therefore, that the theory of GL has the same symmetry as the MABP but that there was more public concern about the loss of good money than about the monetization of inferior money (under bimetalism) or the monetization of superior money (under monometalism).

But there is at least one unambiguous difference between the theory of GL and the MABP. The MABP framework, conceived as it was in a world of fiduciary monies, does not require any reference to the intrinsic or commodity value of monies. While the explanation of the melting of good coin employs the same analytical framework as the MABP, it also requires reference to the commodity or instrinsic value of the money. The point of this paper is that, in addition to information about the commodity values of metallic monies, an adequate explanation of GL requires the stock-DM, which is also the analytical cornerstone of the MABP.

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behind the modern argument that a domestic monetary authority can have some control over their domestic monetary policy if their domestic credit policy can alter the domestic prices that enter the domestic money-demand function.

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