Title:
The theory and empirical credibility of commodity money[*]

Abstract

The recent instability in financial markets demonstrated the inadequacy of the mainstream treatment of money and the underlying production base. This has stimulated interest in the possible role of a money commodity. I demonstrate that the fundamental function of monetary theory, an explanation of the general level of prices, is provided through only two analytical mechanisms, quantity-based valueless money or a money commodity. I show that the quantity-based explanation is unsound by its own logic. I then present the theoretical argument for commodity-based money, which is analytically consistent. Theoretical superiority of commodity-based monetary theory has little practical impact because the commodity money hypothesis is considered empirically absurd. A final section demonstrates *prima facie* credibility of a link between gold and aggregate prices in the United States since the end of World War II. This credibility might motivate Marxists and other critics of mainstream economics to treat seriously commodity-based monetary theory.

I. Introduction

The recent instability in national and global money markets demonstrated the inadequacy of the mainstream treatment of the relationship between finance and the underlying production base.[1] This inadequacy has stimulated interest in non-neoclassical treatments of money, which has given fresh importance to understanding the possible role of a money commodity in the financial system.[2] The theoretical analysis of commodity money is typically and correctly associated with Karl Marx,[3] who was influenced by earlier and contemporary advocates of commodity money who were not critics of capitalism.[4]

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[*] I wish to thank Alfredo Saad-Filho, Jan Toporowski, Ben Fine, Costas Lapavitsas, Iren Levina, Fred Moseley and Tony Smith for their valuable comments.

[1] Mainstream or neoclassical economics uses the terms "money economy" and the "real economy". The theoretically fraught attempts by neoclassicals to integrate them are treated in Weeks (1989, Chapters 4-7).

[2] One manifestation this increased interest is the rediscovery of the work of Hyman Minsky. Toporowski (2005) provides a concise analytical treatment of heterodox views on money.

[3] See the essays in Moseley (2005), some of which are cited below. Recent heterodox theoretical work on money, with a strong focus on empirical applications, can be found at the website of the Research on Money and Finance Group of the School of Oriental and African Studies of the University of London. www.researchonmoneyandfinance.org/

[4] See Cottrell (1997). The two most important were Thomas Tooke (1844) and James Steuart (1767). The works of both can be accessed from the internet. Karl Marx was an innovative thinker who wrote in a powerful style that comes through even in translation. When dealing with

I shall not review the long running debate over commodity money, which repeatedly results in a consensus to dismiss its practical significance. My purpose is to demonstrate that the recurring discussion of commodity-based monetary analysis reflects its theoretical superiority over quantity-based monetary theory,[5] and, more important, its real role in the global financial system.

A monetary theory must explain the determination of the level of prices. While this may not be the most important task of a monetary theory, no other monetary issue of substance can be seriously treated if it is not resolved. Without success in this analytical task, an economic theory cannot move beyond a barter economy. Over two and one-half centuries, economics has offered only two formal solutions to the explanation of the level of prices, a quantity-based monetary theory and a commodity-based monetary theory. While a third, new explanation cannot be dismissed as impossible, it can be judged as unlikely. When both existing explanations are considered critically, the commodity-based theory must be assessed as the more analytically consistent. The advantage in abstract logic would seem to gain commodity-based theory very little in practice, because each cohort of analysts, if considering it at all, rejects it as irrelevant in practice.[6]

The theoretical superiority of commodity-based theory is more than an intellectual curiosity, because it reveals itself to provide the explanation of prices in the global financial system. I shall use the term "nominal anchor" as shorthand for "that which

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any issue he addressed there is a great temptation to quote from him repeatedly. Yielding to this understandable temptation has been the source of considerable bad writing and superficial analysis for over one hundred years. Therefore, the references to and quotations from Marx are consciously minimized in this paper. His contribution is treated in detail elsewhere (Weeks, forthcoming, Chapters IV and V; Weeks 1981, Chapter IV). A clear statement of his rejection of quantity-based monetary analysis is found in Chapter 34 of volume 3 of *Capital*.

[5] Arguments for an functioning link between a commodity, usually gold, and valueless money are not limited to Marxists. A survey is likely to show that most Marxists reject such a link. Among non-Marxists gold-is-money arguments are usually found on somewhat eccentric websites, such as http://uk.ibtimes.com/articles/20100319/gold-is-money.htm. Equally eccentric are those who do not think that there is a link, but that there should be (for example, the far-right candidate for president of the United States in 2008, Ron Paul).

[6] In the introduction to his influential collection of essays on Marx's theory of money, Moseley wrote, "The most important conclusion is that most of the authors agree…that money does not have to be a commodity in Marx's theory, even in the fundamental function of measure of value (even though Marx himself may have thought that money as a measure of value does have to be a commodity). Pure paper money (not backed by gold) can also function as a measure of value" (Moseley 2005, 9).

determines the absolute level of prices". I shall show that such an anchor is necessary, and the anchor is a money commodity.

Commodity money, which is central to the irresolvable contradiction between value in use and value in exchange, proves the key to unlock both the mysteries of the increasingly esoteric financial system and why capital generates periodic financial disruption. The values of commodities are the hidden, underlying basis for their prices of production and, therefore, for their relative prices. In a similar process the money commodity is the underlying basis for nominal prices. To paraphrase Marx when he discussed the relationship between concrete and abstract labor, the money commodity acts to determine absolute prices "by a social process that goes on behind the backs of producers". Obscured by the mediation of fiat money,[7] the functions of commodity money "appear to be fixed by custom" and habit, not material necessity.[8]

Central to this paper are two analytical and practical distinctions. First, there are at least two versions the so-called quantity theory, the assumption-laden version of the modern neoclassical economists, and that of the Classicals, David Ricardo being the most famous. Second, discussion of the role of commodity money must distinguish between the abstract analysis of its relationship to the circulation of capital, and its concrete role in the national and global financial system. This distinction can be concisely identified in two questions: "must money have a commodity base?", and "does a commodity serve as money?" The answer to the first is "yes", while the answer to the second can be either "yes" or "no".

This paper is directed to at least three audiences. First, it seeks to convince Marxists who have rejected commodity money as irrelevant to reconsider it with an open mind. Second, it challenges non-Marxist heterodox economists to recognize in Marx the solution to the indeterminacy in which they find themselves after rejecting neoclassical analysis.[9] And, third, by summarizing the technical parts in non-specialist language, it

[7] I use the term "fiat money" to mean currency (paper or coin) issued by or guaranteed by a government that has a trivial production value.
[8] The quotation is found in Chapter One, Section 2 of *Capital*, volume I (Marx 1970b).
[9] Foley is perhaps the most outstanding example of this group. His two articles on money in the 1980s concluded that both quantity and commodity theory were wrong. From this he drew the inescapable conclusion that no solution was possible to the determination price level (Foley 1983, 1989).

hopes to show progressives in general that the reactionary monetary analysis that fills the capitalist press is based on incoherent and indefensible theory.

The conclusions from my analysis are as follows. Quantity-based theory has no nominal anchor. Therefore, its monetary analysis is entirely dependent upon demonstrating the existence of an exogenous "money supply" whose amount is fixed.[10] It follows that quantity-based theory sets no limit to how low or how high prices can be. However, neoclassical analysis cannot establish the fixity of supply either in theory or practice. By contrast, commodity-based theory provides an unambiguous nominal anchor. It cannot on the basis of that anchor alone construct a general theory of inflation. This failing can be overcome by a non-neoclassical quantity link between fiat money and the money commodity.[11]

II. The Neoclassical Quantity Theory

The hypothesis that prices respond to the quantity of money available for circulation is hundreds of years old. The analytical and practical issue is not whether the hypothesis is valid, but to what extent, under what social and institutional circumstances ("the monetary regime"), and for what definition of money. In various manifestations this hypothesis is consistent with commodity-based monetary theory.[12]

Neoclassical economics has a version of the quantity theory that the Classical economists would neither have recognized nor accepted. Indeed, the neoclassicals have given quantity-based monetary arguments such a bad name that the term "quantity theory" is used with a disdain bordering on contempt among heterodox writers, especially Marxists.[13] This section treats the neoclassical version because unlike the Classical, the

[10] By "exogenous" I mean determined independently of the level of exchanges.
[11] This paper with its emphasis on the importance of a nominal anchor benefited from discussions with and writings of Costas Lapavitsas (see Lapavitsas 1997, 2004, 2009a, 2009b and 2010, and Fine, Lapavitsas and Saad-Fihlo 1999).
[12] David Ricardo unsuccessfully attempted to have a commodity-based monetary analysis that incorporated a quantity element. Ricardo stated clearly that the quantity of a money commodity is determined by its value, "The quantity of money that can be employed in a country must depend on its value" (Ricardo 1951, 352). His contradictory use of a monetary mechanism in the analysis of trade ("comparative advantage" theory) is discussed in Shaikh (1979).
[13] Early non-Marxist alternatives to quantity-based monetary theory are briefly treated in Likitkijsomboon (2005).

neoclassical has pretensions to be a comprehensive explanation of the level of output and employment as well as prices and interest rates.

The analysis of prices and money within the neoclassical framework presents two difficulties from the outset. The first and simpler is superficially definitional, whether the term "price level" refers to a system with one or more than one commodity. The second more complicated ambiguity arises from the abstractions or simplifications it must mkae. The simplifications required in neoclassical money analysis prove so severely restrictive that even pretence to generality is lost. These will present themselves as our analysis of neoclassical monetary theory proceeds.

We begin as capitalist exchange presents itself. In a given time period, the sum of all sales is equal to the sum of all purchases. The sum of sales equals the quantity sold of each commodity times the price at which it was sold, and the sum of all purchases is the aggregation of the means of payment used for those purchases. "Money" is the means of payment, no matter what form it takes. This commonsense definition can be formalized in algebraic notation in which all the commodity prices are multiplied by their commodity quantities and added up. We can write,

1) [sum of all purchases] = [sum of all payments]

$\Sigma(P_iQ_i) \equiv \Sigma M_i$

P_i = sale price of commodity, i = 1, 2, etc. (measured in money units, e.g., dollars)

Q_i = quantity sold of commodity i, and i = 1, 2, etc. (measured in units)

M_i = the means used to make the purchases.

All the means of payment, the M_i's, can be measured in the same units whatever they may be, fiat money, credit cards, or personal IOU's. This allows me to simplify and by division obtain the following definition, $v \equiv \Sigma P_iQ_i/M$. The letter v is the turnover rate of means of payment or turnover rate of money.[14] In each means of payment is used only once, or the time period is for only one set of exchanges, v is equal to one. Moving from this to the behavioral relationship among money, prices and quantities requires a clarification of the two sums, $\Sigma(P_iQ_i)$ and ΣM_i. The sum of commodity prices, $\Sigma(P_iQ_i)$,

[14] In the analysis of the circuit of capital in volume II of *Capital*, the turnover rate of money is one. This results from Marx's choice of analytical time, the production period.

is the observed total of all transactions, exchanges of means of production as well as of consumption commodities. This was the measure used in theoretical specifications by the two greatest post-Classical economists, Leon Walras and John Maynard Keynes.[15]

The standard approach in the neoclassical quantity-based monetary framework is to assume that the hypothetical economy has only one product, and that the quantity of the means of payment is determined *ex machina* by an entity usually identified as the "monetary authority". That which the monetary authorities control I shall call "official money", which includes fiat money and bank deposits.[16] The symbol v is assumed constant, designated the "velocity of money". While the assumption of a single, composite commodity may seem absurd (which it is for most purposes),[17] it is essential in neoclassical monetary theory. The price-quantity-money relationship is reduced to a simple behavioral equation, in which there is one commodity multiplied by one price, purchased by use of one means of payment. The neoclassicals assume the turnover of the means of payment constant. This makes for very simple algebra, in which the single commodity is designated as Y, its price as P and all means of payment as M. The composite commodity is, in effect, value added or national income. An asterisk indicates that the "monetary authorities" can fix the quantity of the homogenous means of payment. These strong assumptions produce a variable which is called "the price level".

2) $PY = vM^*$

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[15] Walras' analysis of general equilibrium (Walras 1926) is discussed in Weeks (1989, Chapters 3 and 11). Keynes explicitly argued for including all transactions in the appendix on "User Cost" in *The General Theory* (Keynes 1936), and is treated in detail in Weeks (1989, Annex to Part I). The input-output distinction is irrelevant for the general equilibrium analysis of Walras because buyers and sellers appear in the market with commodities previously produced. The theoretical inconsistencies that result from treating the circulation of capital as the circulation of value added are treated in Weeks (1983).

[16] In neoclassical monetary theory, the money supply is a multiple of what is called the money base, which in the simplest case is fiat money which banks hold. Banks can make loans by a multiplier equal to the inverse of the reserve requirement, the proportion of fiat money that they must hold idle. By the 1990s the effective reserve requirement for US banks was near zero, which partly explains the financial crisis of 2008. Explanation of reserves and some historical statistics can be found at http://news.goldseek.com/GoldSeek/1238970345.php.

[17] By making this assumption one avoids two complications. The more immediately important is that associated with establishing the neutrality of money; i.e., that at full utilization of resources the relationship between changes in the quantity of the means of circulation and changes each commodity price is strictly proportional (Weeks 1989, Chapter 8). Of more profound methodological significance is that one commodity eliminates means of production, so that the total price of the only commodity is P = [wages] + [profit].

and the price level is

$P = vM^*/Y$

When the quantity of official money is fixed at M* by the monetary authority and v is constant, neoclassical causality runs from money to price and quantity. If output is not at full potential, an increase in the quantity of official money will increase price and the quantity of the output in some unspecified combination, determined by one's theory of macroeconomic adjustment. Therefore, if value added/national income is not at full potential, the level of price that results from an increase in official money is in part determined by the level of output. In what might be called the pure neoclassical quantity theory of money, value added/national income is fixed at full potential. The price level is unique with respect to the quantity of official money, and changes in the quantity of official money result in an equal proportional change in the price.[18] In principle price can be anything because it has no nominal anchor. It has a unique value because the quantity of official money is fixed by a monetary authority.

The neoclassical "price level" in equation 2 has no empirical counterpart. It is a purely theoretical construction that cannot be observed nor measured. Ignoring for the moment the difficulty of defining M*, the simple form in equation 2 requires a physical measure of output which exists only in the case of an economy with one product. In the full version of equation 1 the price level cannot be defined because the prices of commodities cannot be separated from their quantity weights.

Because it may seem to the non-specialist that it required a great deal of space and unnecessarily tedious discussion to present the obvious, I summarize why the analytical validity of the basic quantity equations, $PY = vM$ and $P = vM/Y$, is not obvious, though neoclassicals wish us to believe so:

> Complication 1: The observed sum of transactions involves many commodities and many prices, and some of these commodities are inputs into other commodities. Over any discrete time period a commodity is likely to reappear

[18] This proportionality is an extremely important analytical outcome in neoclassical analysis, "the neutrality of money", but proves very difficult to establish theoretically. Its importance lies in its reactionary implications for policy. For example, if changes in the quantity of money have no impact of relative prices, then full employment is consistent with any price level, even a lower one achieved by a deflationary process. Even with one commodity, neutrality does not hold if the financial system includes bonds (Weeks 1989, Chapters 7 and 8).

subsumed within the price of another. This complication is eliminated by assuming there to be only one commodity.

Complication 2: Some money may be held idle, and this idle amount may vary over time.[19] Thus, the quantity of official money circulating in exchange may not equal the quantity created by the monetary authority. This complication is eliminated by calling v the velocity of money and treating it as a constant.

Complication 3: The equation PY = vM is valid only if Y is constant. This complication is eliminated by assuming that the system is always at full potential.[20]

Complication 4: The quantity of means of payment is assumed equal to or strictly proportional to the quantity of official money. The rest of this section focuses on this assumption.

Quantity-based monetary theory might survive by eliminating the first three complications through assumptions, but it cannot *assume* that the quantity of official money is fixed and comprises all means of payment. That the quantity of means of payment is determinate and independent of the prices it is alleged to determined is the *raison d'etre* of the neoclassical quantity theory. In order that the theory not assume what it seeks to establish, it must provide a logically consistent explanation of why the quantity of official money is equal to the quantity of means of payment, or that the former directly determines the latter. Further, it must link this theoretical explanation to a process in actual economies.

The importance of this theoretical explanation cannot be overestimated. Many transactions occur without the use of official money, and the neoclassical hypothesis is that the quantity of official money determines prices. If official means of payment are

[19] This possibility was central to the critique by Keynes of the monetary theory of his time, a theory which changed very little as a result of that critique.

[20] A full explanation of this complication is beyond the scope of this paper. To state the problem concisely, the neoclassical money market adjustment process implied by PY = vM is inconsistent with the aggregate demand adjustment process implied by the necessity to equate consumption plus investment to the supply of the single commodity. This inconsistency is summarized in the term the False Dichotomy. "Dichotomy" refers to the analytical separation of the two markets. Resolving this contradiction within neoclassical monetary theory requires introduction of at least one variable that mediates between the money market and the commodity market. The contradiction was pointed out in a rigorous manner by the neoclassical Pigou (1941).

not strictly linked to alternative means of payment, then the quantity of official money does not determine the prices of commodities, either in theory of practice. This simple requirement of a quantity-based monetary theory is recognized and accepted by the neoclassicals themselves: if M* determines prices, then M* must be unambiguously defined.

The basic problem for neoclassical monetary theory lies with the nature of its money, that it is intrinsically without value. Following in the tradition of the American monetary economist Irving Fisher, neoclassical theory defines money in terms of exchanges: money is anything generally accepted as medium of exchange. Using this definition, a leading monetary theorist wrote that money is anything acceptable "as such", and "as such" refers to the property of general exchangeability (Johnson 1972, chapter 7). The difficulty with this apparently sensible definition is it implies that money literally can be *anything*. If money can be anything, then its amount is indeterminate unless all other things can be strictly linked to official money. In the absence of a money commodity as the anchor for nominal prices, and in the absence of a determinate quantity of money, the theory is left with nothing.

As serious as it is, this definitional and practical indeterminacy reflects an even more serious problem in neoclassical monetary theory, accounting for the existence of money. The existence ambiguity is implied, because something which can be anything has no separate existence from all other things. The existence problem derives from the methodological core of neoclassical economics. It is the necessary consequence of the combination of the assumptions of individual utility maximization and full knowledge of the information generated by markets. If people have full knowledge of all markets, they will know the money price at which each commodity would be bought and sold. If they know this, they can exchange commodities directly without passing through the intermediary of money.[21]

[21] Graziani provides a clear and concise explanation for why the neoclassicals are unable to account for the existence of money (Graziani 2003, Introduction). This theoretical impasse provides perhaps the clearest demonstration of the analytical failings of mainstream monetary theory: people use money in all aspects of life, it takes many forms, and neoclassical analysis struggles to account for its existence.

As mad as this argument is, it is the unavoidable collateral damage arising from the equilibration process in competitive markets. If people do not have full knowledge, then ignorance can result in a commodity being sold at different prices during a market period and commodities going unsold.[22] If this happens, then markets do not generate economically and socially optimum outcomes,[23] and there is a *prima facie* case for public intervention to correct their failings.[24] To state it simply, the absurd assumption of perfect knowledge is necessary to reach the reactionary conclusion that markets unrelated by governments produce socially desirable outcomes.

Neoclassical writers have for the most part resolved the problem, in principle money can be anything, but for rigorous theory it must be something quite specific, by reference to practice. In practice, "anything" does not serve as money. By some process commodity producing societies sort out a limited number of things to serve as money. Neoclassical textbook writers are content to leave the issue as settled: anything can be money, but in practice only a few things are. Custom and time have resolved the indeterminacy. On this basis theory proceeds with a supply of money that is exogenous with respect to the level of economic activity.

Without recognizing it, neoclassicals have refuted their own theory. One is first offered a definition: anything can serve as money. This theoretical generalization proves to be absolutely central to the theory, for it is the basic defence of the argument that money has no value. However, this generalization creates a potential analytical problem of major importance: how are limits to be set on the definition of money so that its quantity can be treated as exogenous with respect to the transactions it finances? Second, one discovers that the theoretical prediction, "anything can be money", is refuted in practice because very few things serve as money. Third, the empirical rejection of the definition is taken as the vehicle to solve the major analytical problem created by the

[22] J. R. Hicks assigned the term "false trading" to markets in which the same product sells at different prices (Hicks 1939). Since this phenomenon occurs in all markets, we have a case of reality being false and the ideal being true.

[23] This efficiency condition is called "Pareto Optimality" and is explained in non-technical terms in Weeks (1993), which is also available in Spanish (Weeks 2009).

[24] Two neoclassical proposals to account for money further indicate the theoretical quandary, that money is used because many commodities are not adequately divisible, and because a seller may be unable to find a buyer that wants to trade the commodity she/he seeks. Both problems imply market failure, which opens the door not only to money but to public intervention also.

definition; empirical rejection of the definition is used to reconcile its own contradictory nature.

This indeterminacy is more than a problem in formal logic. If the means of payment can be anything, then it cannot be defined and it cannot be linked to official money. Consider the case in which the "monetary authority" judges inflation to be a danger and it acts to reduce the quantity of official money. In the United States, the Federal Reserve would do this either by selling government securities to banks, or by raising the interest rate it charges to banks when they borrow to increase their reserves. If means of payment can be anything, this action by the Federal Reserve may have little or no impact. Confronted with less or more expensive official money, capitalists could issue IOU's among themselves. The extent and frequency that they do this may be unrelated to the quantity of official money.

People in the street, and even most students of economics, go about their affairs largely unaware that the mainstream economists who set the public debate over inflation cannot resolve in theory or in practice something as basic as why there is money and what it is. The hypothesis that there exists a supply of means of payment that can be effectively adjusted by a monetary authority is not only unproved, it cannot be rigorously formulated. The essence of the neoclassical monetary problem can now be simply stated: the theory provides no nominal anchor for prices. Without a nominal anchor, the need to define and restrict what can serve as means of payment is absolute. With a nominal anchor, the quantity of official money and the quantity of substitutes for money remains important, but need not be subject to such analytical limitations. The indeterminacy of the means of payment presents no theoretical or practical problem to resolve. The next section shows why and how a produced commodity can function as the necessary nominal anchor, and how it is related to its representations.

As a final clarification, I consider whether neoclassical monetary theory could solve its logical problems by incorporating commodity money into the explanation of the price level. A moment's reflection sows this to be impossible, because the theory would have two competing explanations for the level and change of prices. Unlike Marx's analysis, the neoclassical method is one based in pure logic. If the logic is not consistent, and a commodity-based element would insure this, the entire analysis collapses. An

analysis linking commodity money to fiat money does resolve the neoclassical contradictions, and the result is Marxian monetary theory.

III. Commodity-based Theory: Value and the nominal anchor

Commodity Money and Commodity Prices

Despite the intractable problems in quantity-based analysis, commodity-based monetary theory has been discarded by the vast majority of each successive generation of those who seek to explain how money economies function. Though it is at heart of value theory, most writers who identify themselves as Marxist tend to disown commodity money analysis. This is a mistake, because once one overcomes the analytical taboo associated with commodity money, Marx emerges as the greatest monetary theorist.

Marx revealed that the underlying basis of the prices of commodities is the abstract socially necessary labor time objectified in them during the production process, their "values". Before using algebra to derive formally fiat money prices from values I explain the process in non-mathematical and non-technical language. For current purposes, commodities fall into three analytical categories, those that are produced to be inputs (designed as 1 below), those produced for consumption (as 2) and the commodity that is money (commodity "e", for general equivalent). Money or the general equivalent emerges from other commodities in a process described by Marx in Chapter III of *Capital* (see also Weeks 1981, Chapter IV; Weeks forthcoming, Chapter IV; and Lapavitsas 2004).

To isolate the role of money as such, I assume that the money commodity has no other use.[25] I also make the standard assumption that workers in all sectors receive the same wage. This latter assumption allows the analysis to focus on differences in the technical composition of capital across sectors. Because living labor is the source of value and surplus value, capitals with a lower composition of capital would enjoy a higher return unless some distribution process intervenes between production of value

[25] This assumption is for algebraic simplicity. The algebra can be expanded to many consumption and production commodities without changing the conclusion we reach. I also make the simplifying assumption that there are no consumption commodities that only capitalists buy.

and its realization. In this intervening process value is distributed to create a new set of quantitative relationships among commodities, which Marx called prices of production.[26]

Prices of production imply equal rates of profit for all sectors, achieved by a change in the relative exchange value of means of production, articles of consumption and the money commodity itself. As the measure of value, the money commodity provides the denominator of prices, and the prices we observe are determined by the amount of fiat money per unit of the money commodity. This latter ratio can be legally fixed, as it was in the United State until 1970, or allowed to fluctuate.

The movement from values to fiat prices can now be formally presented. The reader uninterested in the algebra can move directly to the start of the next sub-section. The abstract socially necessary labor time (ASNLT)[27] required to produce each commodity is:

ASNLT = value = (constant capital) + (variable capital) + (surplus value)

= [value of the means of production]

+ [value of labor power]

+ [surplus value]

This can be specified in greater detail:

value = [(units of means of production) times (unit value of means of production)]

+ [(units of labor) times (units of articles of consumption)

times (unit value of articles of consumption)]

+ [surplus value]

In algebra, the value for each commodity is:

3) $\Lambda_1 = (a_1\Lambda_1 + w_1n_1\Lambda_2) + \pi_1$

$\Lambda_2 = (a_2\Lambda_1 + w_2n_2\Lambda_2) + \pi_2$

$\Lambda_e = (a_e\Lambda_1 + w_en_e\Lambda_2) + \pi_e$

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[26] The clearest presentation of the transformation process that considers money is Fine, Lapavitsas and Saad-Filho (1999).

[27] "Abstract" because the interaction of production and circulation abstracts from the specific skills and abilities applied in each production process. "Socially" because the process of abstraction generates a norm that applies to all producers. "Necessary" because the social process of abstraction disciplines each producer to use his/her workers and means of production with maximum efficiency. And "labor" because human toil is the source of all value expansion. See Weeks (1981, Chapters II and III).

Symbols:

Λ_i = abstract socially necessary labor, measured in units of time;

a_i = amount of the input required in production, measured in physical units;

w_i = amount of the consumption commodity paid to a worker during the time period, measured in physical units (the "real wage");

n_i = amount of abstract socially necessary labor time required to produce the output; and

π_i = surplus value arising in the production of each commodity.

The consumption of workers is the same in each sector, and I define a unit of each commodity as the amount produced by one worker in one day.[28] This implies that the production of each commodity differs only by the amount of the input required in each sector (means of production, the a_i terms).

4) $\Lambda_1 = (a_1\Lambda_1 + w\Lambda_2) + \pi$

$\Lambda_2 = (a_2\Lambda_1 + w\Lambda_2) + \pi$

$\Lambda_e = (a_e\Lambda_1 + w\Lambda_2) + \pi$

The three commodities have the same labor input and, therefore, the same surplus value. With different amounts of the material input, the rate of return to capital would vary across sectors. This inequality results in the distribution of surplus value through the realization of commodities to form prices of production, the so-called transformation problem. I designate these prices as λ_i and the common rate of profit as r, and re-write the commodity equations as:

5) $\lambda_1 = (a_1\lambda_1 + w\lambda_2)(1 + r)$

$\lambda_2 = (a_2\lambda_1 + w\lambda_2)(1 + r)$

$\lambda_e = (a_e\lambda_1 + w\lambda_2)(1 + r)$

I can now define the price of means of production and consumption items in terms of the general equivalent as the ratio of their values to the value of the general equivalent:

[28] With this assumption $w\Lambda_2$ is the system-wide value of labor power.

6) $p_1 = \lambda_1/\lambda_e$

$p_2 = \lambda_2/\lambda_e$

In both cases the commodity price is expressed as an amount of the general equivalent commodity; e.g., ounces of gold. In general, the price of production of the money commodity is not equal to its value ($\lambda_e \neq \Lambda_e$). It is imprecise to conclude that prices are determined by the *value* of the money commodity, though this is a close approximation. The value of total production, measured in labor time, is the sum of the prices of production weighted by their quantities. The price of this output is in units of the money commodity, the commodity money value of total output:

7) $\Sigma(p_i x_i) = \Sigma(x_i \lambda_i)/\lambda_e \quad$ for i = 1, 2…n.

The algebra of prices is completed by specifying the ratio of fiat money to units of the money commodity. Let α be the number of currency units ("dollars") per unit of the money commodity. The prices of the commodities in fiat money are:

8) $P_1 = \alpha p_1 = \alpha\lambda_1/\lambda_e$

$P_2 = \alpha p_1 = \alpha\lambda_2/\lambda_e$

These fiat prices stand in the same ratio as prices of production and could be called "center of gravity prices" to distinguish them from the prices one observes in market exchanges. Observed prices fluctuate around these "centers of gravity" due to transitory factors such as short term changes in demand.

The So-called Price Level

As explained in the Section II, in neoclassical analysis the term "price level" refers to a purely theoretical construction that has no empirical counterpart. Some Marxists have tried to produce the equivalent of P = vM/Y for commodity money. Neoclassical monetary theory constructs an abstract concept it calls the price level because at the aggregate level it is a one commodity model in which there is a strict dichotomy between quantities and money, "real" and "nominal" variables. No such dichotomy is possible with commodity money, because the value of the money

commodity is determined in the same process as the values of all other commodities. Even in theory commodity production cannot be reduced to a one product system.

In commodity-based monetary analysis there is no simple specification for a general level of prices, nor is there a simple formulation of the aggregate average value that a unit of the money commodity purchases, except as a tautology.[29] As an empirical measure, the price *level* is an index in which prices vary over each period for which it is measured while the quantities are held constant. It is more accurate to call this measure the general level of prices rather than the price level. The calculation for the general level of prices measured in commodity money (the p's in equation 6) would be:

9a) $$I_p = \Sigma(p_{it}x_{ib})/\Sigma(p_{ib}x_{ib})$$

$$= [\Sigma(\lambda_{it}x_{ib})/\Sigma(\lambda_{ib}x_{ib})][\lambda_{eb}/\lambda_{et}]$$

The letter t is for the current time period, and b is for the base period. For example, the base period might be 1980 (b = quantities in 1980), and the time period any previous or subsequent year, such as 2008. As a general rule, indices of the general level of prices are more inaccurate the larger is the chronological distance from the base year to the year being compared to it. This issue is discussed in the next section.

For fiat prices (the P's) the expression is:

9b) $$I_P = \alpha[\Sigma(\lambda_{it}x_{ib})/\Sigma(\lambda_{ib}x_{ib})][\lambda_{eb}/\lambda_{et}]$$

An increase in the productivity in the production of the money commodity increases the level of prices, and increases in the productivity in the production of other

[29] Moseley (2005, Introduction) approaches the calculation of the price level with a concept he calls the "monetary equivalent of labor time" (MELT). He measures the commodity money price for product i using the notation, so that a commodity's price is the ratio value of gold and the value of the commodity: $P_i = (1/L_g)L_i$. He obtains the aggregate average price ("MELT") by use of two additional concepts, the quantity of fiat money in circulation (M_p) and the quantity of the money commodity (M*). The aggregate "MELT" is [1/Lg][Mp/M*]. At an earlier point he refers to the "sum of prices", which is given algebraically as $P = \Sigma P_i$. This sum applies to the case in which there is only one commodity so no need arises for quantities to weight the prices. The term M*, the quantity of the money commodity, is clear and in principle could be measured. However, the term M_p features in common with the neoclassical money supply. Whatever notation is used for the amount of money in circulation, it cannot be defined *ex ante* in a manner that restricts its actual or potential supply, as explained in Section II. Therefore, Mp/M*, the relationship between commodity money and fiat money, only exists after exchanges have occurred, which was noted by Foley (Foley 1983).

commodities lowers it. The money commodity and its fiat price formally provide the nominal anchor for each price and, therefore, the anchor for all prices taken together as the general level of prices. The specific meaning of "anchor" is, that commodity which determines the absolute price of all other commodities. The unique level of prices results from the prior determination of the abstract socially necessary labor time for each commodity, so each price is a ratio of each commodity's value and the value of the money commodity. It is now obvious that the law of value is the basis of the determination of the price level, not commodity money as such. Commodity money is the vehicle by which values determine the absolute level of prices.

Commodity money is directly derivative from the law of value. This distinguishes Marx's treatment of money from the approach of other "anti-quantity theorists" of his time, Tooke being the most prominent. Tooke, a member of the so-called banking school, objected to quantity-based monetary analysis on empirical grounds, arguing that valueless money could not in practice serve the needs of finance and exchange (Tooke 1844). While Marx agreed, his was not an empirical argument. It was an analytical inference from value theory manifested in practice.

If the composition of production does not change and the rate of profit equalizes across commodities, the level of prices will rise if the productivity in production of the general equivalent increases relatively to productivity for all other commodities (λ_e falls more than for all other commodities). I shall refer to this as the "productivity differential" and in the specific case of gold, the "gold productivity differential". It is the implied prediction about productivity in production of the money commodity and fiat prices that more than any other issue that prompts rejection of commodity-based monetary analysis.

The more commonplace objection, that "gold (or some other metal) is not used as money", that we cannot see or concretely track the regular use of some commodity such as gold in modern economies, is not a serious argument. There are many aspects of economies that cannot be observed but are recognized as analytically valid, neoclassical money being the most obvious in this context.[30] Indeed, as Marx famously wrote, all

[30] A concept which cannot be adequately defined (a money supply controlled by a monetary authority) can not be considered real and concrete.

theory involves the explanation of the observed (the exoteric) by the unobserved (esoteric).

What would appear to undermine commodity-based monetary analysis beyond salvation is that even casual observation makes it obvious that inflation cannot be explained by changes in the value of the money commodity; i.e., by changes in the abstract socially necessary labor time required to produce it. It is impossible to avoid the conclusion that in some manner price levels are affected by the quantity of a valueless means of circulation. The next section takes a step to reconcile the apparently irreconcilable tension between commodity-based and quantity-based monetary analysis.

IV. Commodity-based Theory: The circulation of fiat money

The previous section established the consistency of the formal theory of commodity money. Consistency does not necessary imply credibility. The fatal flaw in all versions of quantity-based monetary theory is the inability to provide an adequate theoretical or operational definition of money. The definition must establish a money supply which is quantitatively determinate and has an empirical manifestation. The task is impossible for the simple analysis in which money serves only as a means of circulation, and the flaw creates an increasing number of contradictions for other functions of money. In contrast, the analytical strength of commodity-based monetary theory increases as these functions are elaborated. In the simplest function of money, as means of circulation, commodity-based theory is internally consistent (unlike quantity-based analysis), but appears to be irrelevant (exchanges are not done with commodity money).

Analysis of the other functions of money dispel this appearance of irrelevance, and reveal commodity money as the basis of all manifestations of money, the underlying basis for the level of prices, while value is the underlying basis of relative prices. Elsewhere I have shown that other functions of money, especially money as means of payment, require a money commodity (Weeks forthcoming, Chapters IV and V). Here I

restrict the discussion to money as means of circulation, where quantity-based analysis would appear to on its strongest ground, and commodity-based analysis weakest.[31]

For presentational purposes, the money commodity is gold in the following discussion. Limiting money to one commodity is an oversimplification if the link between fiat money and the commodity base is not formally legalized. The essential characteristic of exchanges in gold (or any money commodity) is that the means of payment has an intrinsic value *via* its price of production equal to that of the commodity against which it is exchanged, either immediately or through conversion.

Many argue that gold cannot and does not serve as money because, among other reasons, of the inconvenience implied by its use. It may indeed be more convenient for people to conduct their exchanges in representations of gold rather than gold itself, because of its weight, potential to deteriorate, or some other reason. However, the development of representations of money comes in response to the needs of capital, not for the convenience of the subjects of capital.

As part of the accumulation process, the circulation of capital requires a form of money to redistribute value among capitals, as some capitals expand and others contract. Credit is this form of money, which allows a capitalist enterprise to expand beyond the limits of the value it realizes in the sale of its commodity. Credit derives from reserves of money held by commercial banks, and somewhere in the financial system these reserves take the form of gold that has accumulated in hoards.[32]

In each of the volumes of *Capital* Marx treats the role of money held idle by capitalists. The usual interpretation of his discussion is that hoards function as a residual depository of money that increases and decreases in response to the need to circulate

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[31] Means of circulation is the strongest ground of quantity-based analysis because it is possible to treat circulation as if it were the simple circulation of commodities (commodities sold for money, money purchases other commodities, C-M-C). Were this the nature of circulation, many things could serve as money. Elsewhere I have argued that it is not possible to make a convincing theoretical or practical argument for commodity money without reference to money as capital (Weeks 1981). While raising interesting issues, Germer's defense of commodity money, which in presentation is a defense of Marx's treatment of commodity money, suffers from the absence of capital in the analysis (Germer 2005).

[32] Monetary systems or regimes can take many forms. For example, a state controlled central bank may assume a monopoly over gold, as was the case in the United States until the early 1970s. The discussion considers the hypothetical case in which there is no central bank and commercial banks hold the gold reserves.

commodities whose value is fixed prior to realization (see Campbell 2005, Likitkijsomboon 2005). To put that hypothesis simply, all prices are a multiple of the value of gold, and when more or less gold is need to circulate commodities, the amount in hoards decreases or increases. Among other problems this interpretation does not explain how the circulation process responses when accumulation is so rapid that reserves of gold are exhausted.

Another interpretation of hoards links them to the creation of credit.[33] Hoards have various functions, one of which is to serve as the reserves for the expansion of bank credit. These reserves take many forms depending upon a country's monetary regime. Commodity money serves this function particularly well because it is the real basis of all other forms of money, and it is less suited for transactions both routine and complex than its representations. When the state guarantees a conversion rate for representations of gold into gold, it is unnecessary for capitalists to hold gold themselves, and the gold accumulates in hoards either in banks or in the coffers of the state.

Moving from the abstract demonstration that the nominal price anchor is a money commodity, to the concrete, that the prices we observe are determined by the relationship between the money commodity and fiat money, requires specification of the institutional context for the analysis. Currencies are fiat money issued by national governments. The few currencies that are used for the vast majority of international transactions are also national currencies, managed by the governments. The price anchor for the national currencies of all but a few countries is one or a combination of those currencies that finance international transactions.

In analytically the simplest case, one national currency would be legally denominated in gold and all other currencies linked to that gold-based currency. An arrangement very close this simple case prevailed for twenty-five years, 1945-1970. National currencies were formally linked to the United States dollar by a treaty agreement that was part of membership in the International Monetary Fund.[34] Gold was

[33] See volume 3 of *Capital* (Chapter 19 and all of Part V).

[34] The Soviet Union set its currency, the Ruble, on par with the US dollar. This peg was of limited importance because the great majority of Soviet trade was through barter exchanges. The currencies of the allies of the Soviet Union were pegged to the Ruble.

the legal anchor for the US dollar, set at US$ 35 per ounce,[35] and other currencies operated a fixed exchange rate to the US dollar. During 1945-1970, the commodity money inflation hypothesis predicts that changes in the value of gold determined changes the price level in the United States. US inflation was then transmitted *via* dollar fixed exchanges to other countries. Devaluations or revaluations would explain differences between inflation in the United States and in any specific country with a dollar-fixed exchange rate. Therefore, to explain the inflationary process in any specific country during that period one must first explain inflation in the United States.

In 1970 the US government announced it would no longer purchase gold at a fixed price, which ended the postwar period of fixed exchange rates. Several years of international monetary instability followed as governments sought an alternative global exchange rate mechanism including the fictitious Special Drawing Right. In the second half of the 1970s the current arrangement emerged, in which all of the major economic powers operate "floating" rates that are managed to varying degrees.[36] If commodity-based monetary analysis is valid, it should apply to both before and after 1970.

To test the commodity money hypothesis I accept measures of labor productivity as an adequate approximation of changes in values. On this basis, the hypothesis to test empirically can be simply stated: the rate of inflation in the United States should be equal to the rate of growth of labor productivity across all commodities, minus the rate of growth of labor productivity in the production of gold, the gold productivity difference. The hypothesis should be modified to distinguish between the period of a fixed price of gold when UN inflation should closely track the relative productivity difference (1945-1970), and subsequently when one would expect a chronologically slower adjustment of the US price level to its underlying determinant.[37]

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[35] Long term gold prices are found at http://www.measuringworth.com/datasets/gold/result.php.

[36] The IMF categorizes countries by exchange rate "regime", and the *Annual Report* for 2007 listed thirty-five out of over 150 as having an "independently floating" exchange rate. All advanced countries are in this category.

[37] The empirical test can be formally stated as follows. Define the rate of productivity growth for gold as ε, the weighted average for all other commodities as θ, and assume that the fiat price of gold does not change. If the value of gold is one in the base period, one period later it is $(1 - \varepsilon)$, two period later $(1 - \varepsilon)^2$, etc. The same calculation applies to all other commodities if their weighted productivity growth is constant at θ. From equation 9 one obtain an expression for the

As a first step to test the commodity money hypothesis an accurate measure of inflation in the United States is required. The standard price indices are not satisfactory because they do not adequately incorporate quality changes of existing products and introduce new products in an *ad hoc* manner. In 1996 an expert commission established by the US Congress estimated that the commonly calculated aggregate indices overestimated actual price changes in the United States by slightly more than one percentage point per annum.[38] The commodity money hypothesis should be tested against an annual rate of inflation in the United States that is adjusted downward by this amount.

From 1947, marking the end of wartime price controls, through 1969, the trend rate of change in the US national product deflator was 2.1 percent per annum, while the trend for aggregate productivity was almost exactly two percent.[39] When corrected for quality change and new products inflation falls to one percent per annum. To confront the hypothesis with the evidence, 1947-2008 is divided into three periods (see chart): 1947-69 when the US dollar link to gold was legally set at US$ 35 an ounce; 1970-1987, almost two decades after the end of the formal link which I call the "instability period"; and 1988-2009, which I designate the "reversion to gold" period.

The commodity money hypothesis predicts that the observed trend in quality-adjusted prices in the United States should be equal to the difference between the rate of growth of aggregate productivity (two percent) and that rate for the production of gold. If

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level of prices n time periods after the base period, with the base period value of the index defined as zero.

10a) $I_{pt} = (1 - \theta)^n/(1 - \varepsilon)^n$, for gold prices; and

10b) $I_{Pt} = \alpha(1 - \theta)^n/(1 - \varepsilon)^n$, for fiat prices.

[38] The commission was chaired by Michael Boskin of Stanford University, and the report, *Toward a More Accurate Measure of the Cost of Living* (Boskin Report), can be found at http://www.ssa.gov/history/reports/boskinrpt.html. The conclusions are briefly summarized at http://www.highbeam.com/doc/1G1-20897236.html. The estimate of upward bias was extremely controversial for its political implications, which implied, for example, that social security adjustments for inflation should be reduced.

[39] The trend in prices falls slightly, to two percent for 1953 through 1969, when one excludes the Korean War, during which some price controls were re-introduced. The productivity trend is for the production of commodities (agriculture, mining and manufacturing). The relevant statistics for calculation can be found in the *Economic Report of the President*, various years. The trend rate calculated here is the same as reported in the entry on productivity in the *Concise Encyclopedia of Economics* (Nasar nd).

one accepts the interpretation that the years of a formal link (1947-1969) would have been followed by a period of instability as the monetary regime sought to re-define the price anchor, then the commodity money hypothesis performs well.

For 1947-1969 and 1987-2009 the necessary productivity differential would need be only one percent. For the earlier period an estimate of productivity changes in gold production is relatively easy because South Africa accounted for about eighty percent of the world trade in the metal. Simple trend data for labor productivity in South African gold production for 1947-1970 is not statistically different from three percent.[40] Since the average rate of productivity growth for US commodities was two percent and adjusted inflation was one percent, the calculation of the gold productivity different conforms to the commodity money prediction:

(US adjusted inflation) = (gold productivity differential)

= (US commodity productivity growth)

minus (South African gold productivity growth)

1% = (3 percent - 2 percent)

Subsequently an estimate of labor productivity in gold production is much more difficult because of the rapid decline in South Africa's share of world production and trade, discussed below. This empirical problem makes establishing the commodity money hypothesis difficult after 1970 because it requires productivity statistics from several countries and share in world gold trade.

I conclude that the commodity-based analysis passes the test of consistency with inflation rates if the 1970s and 1980s are interpreted as decades of adjustment by global capital to a different monetary regime. The policy shift by the Nixon administration occurred in the context of several complicating changes aggravated the adjustment difficulties to a new form of a gold-based monetary regime. The most important was the decline United States as the overwhelming world economic power as the countries defeated in World War II recovered. Over the long term this reduced the role of the dollar as the fiat currency of international transactions. This had important implications for the determination of inflation in the rest of the world, because the international

[40] I wish to thank Lefteris Tsoulfidis of the University of Macedonia, Thessaloniki, for providing me with data on productivity of gold production in South Africa, 1945-2009.

monetary system had to adjust to the end of a formal price anchor and a world of several major economic powers.

Second, and conjunctural, were the large increases in petroleum prices during 1973-1974 and 1978-1979, which were denominated in US dollars. The decline of US economic hegemony weakened the role played by the dollar as the intermediary between gold and other national currencies, while the oil "shocks" prompted large adjustments in relative prices among commodities. The third complicating factor directly affected the value of gold. As noted above, the share of world production of gold from South Africa suffered a sharp fall, from eighty percent in 1970 to less than ten percent in 2008.[41] This decentralization of gold production resulted in a more complex process for the determination of the international value of gold. The combination of these three changes required a period of adjustment in prices, price levels and exchange rates within and among countries, to a new mechanism for determination of the nominal anchor for what would be several rather one global currencies.

Demonstrating that the trend in the US GDP price index is consistent with a credible trend in the value of gold provides an *explanation* of the level and rate of change of aggregate prices in the United States by the value of gold, *not a proof*. The price statistics demonstrate only the credibility of the gold hypothesis as the functioning nominal anchor for prices is credible. The chart itself is but a first step towards a more careful specification of the relationship between gold and inflation, both in terms of statistical technique and measurement of the variables. For example, it may be that a more precise formulation would involve percentage changes with an analytically specified time lag that might vary for the fixed gold price period and subsequent periods.

Important issues remain: 1) empirically establishing the link between a measure of the value of gold and aggregate prices; 2) explaining the relationship between the value of gold and the fiat price of gold that Marx considered the source of rapid inflation;[42] and, therefore, 3) the relationship between the fiat price of gold and the fiat

[41] The largest producer in 2008 was China, with 12.2 percent. The sharp declines for South Africa came after 1975 (http://www.goldsheetlinks.com/production.htm)

[42] In *A Contribution to the Critique of Political Economy*, Marx explicitly analyzed inflation in the context of commodity money:

price of all other commodities. These issues become important only after demonstrating the empirical credibility of a link between aggregate US prices and the value of gold.

As a final comment on the observed price trends, I reiterate the irrelevance of quantity-based theory as the prime explanatory mechanism. Inspection of various measures of money in circulation during the postwar years would show a close correlation between changes in this quantity and changes in prices. This correlation provides no support for the quantity hypothesis. On the contrary, it is exactly what the commodity (gold) money hypothesis would predict, that the fiat means of circulation are endogenously determined by the circulation of commodity capital.

V. Credibility of Commodity-based Monetary Analysis

I began by rejecting the hypothesis of valueless money ("quantity theory") as logically and empirically unsound. After doing so, I turned to the value of commodities, and following Marx I argued that money must be a commodity. I then derived commodity money prices and fiat prices, and deduced from value theory how these prices would change over time. This deduction led to the prediction that prices in the United States would have a trend equal to the difference between productivity growth for the money commodity and productivity growth for all other commodities. Statistics on price changes in the United States suggest that since the end of World War II the hypothesis of commodity money should not be rejected.

For all but the true-believing neoclassical, the theoretical superiority of commodity-based monetary analysis over quantity-based analysis is obvious. The latter, with neither a nominal anchor nor a theoretical limit to the quantity of money, has no explanatory power. Its apparent analytical prowess is an illusion created and sustained through repetition. All neoclassical monetary analysis is based on the specific repetition that the quantity of money is limited by a "monetary base" that some authority regulates. Such a base exists, but its link to the quantity of means of circulation cannot be established *ex ante* either in theory or practice (Foley 1989).

> It is these contradictory functions of money, as measure, as realization of prices and as mere medium of exchange, which explain the otherwise inexplicable phenomenon that the debasement of metallic money...causes a depreciation of money and a rise in prices. (Marx 1970b, 212)

In the eighteenth and nineteenth centuries many argued that a commodity, usually gold, was the basis or "backing" for the circulation of fiat money. Their view was swept aside by quantity-based arguments that eventually changed into the neoclassical Quantity Theory of Money. One reason the supporters of commodity-based money lost the argument was that they had no theoretical explanation for why money should be a commodity. The explanation is the labor theory of value, from which commodity money emerges at an early stage of the analysis.

Perhaps Marx's single most important insight into capitalism was and remains that the appearances of capitalism are not only misleading, they are frequently the direct contradiction of the underlying relationships.[43] There is no better example than money, which appears to be valueless, but is a commodity. It is a mystery why this powerful insight has been rejected by Marxian writers. As a result of the distribution of surplus value as profit on the basis of total capital advanced, it appears that capital itself is a source of value along with labor, but no Marxist is misled by this appearance. Certainly no Marxist has ever argued that the exploitation of labor was a phenomenon of Marx's time that no longer applies to capitalism.

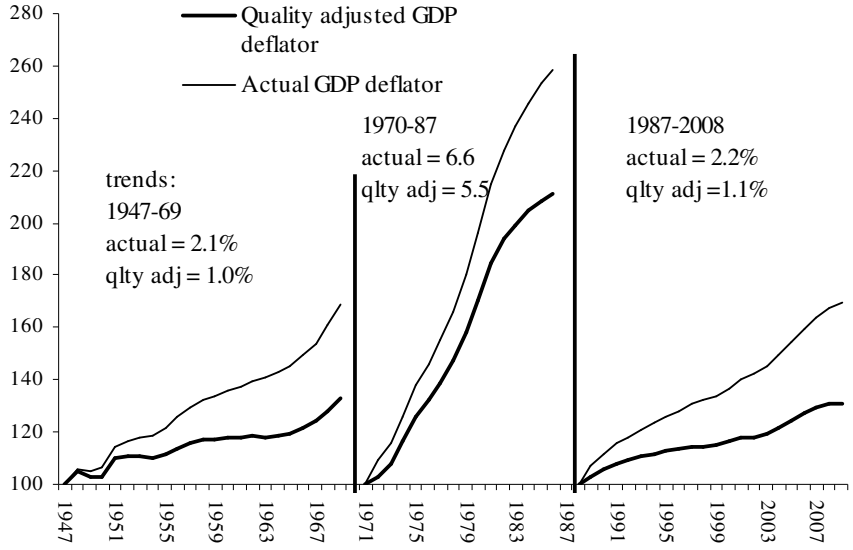
Yet, these arguments are made for Marx's treatment of money: we cannot observe the use of commodity money; it is a relic of the past. This is as wrong as denying exploitation. Marx's theory of exploitation is directly derivative from his theory of value, and that theory of value explains the process by which one commodity differentiates itself from all the others as the general equivalent. This differentiation is not a historical event, but a social process that is continuously repeated, just as the process and relations of exploitation are repeated.

This article has taken a step towards establishing the credibility of the empirical link between commodity money and the prices one observes. Moving beyond credibility to demonstrate causality is undertaken in a subsequent study. Conan Doyle has his famous detective, Sherlock Holmes, say, "after eliminating the impossible, whatever remains, no matter how improbable, is the truth".[44] Quantity-based monetary analysis is

[43] Marx repeatedly refers to the process of competition causing relationships to appear as their opposite (see, for example, Marx 1973, 657).
[44] From "A Scandal in Bohemia".

the impossible, and commodity money is what remains, though it is improbable only if one discards or fails to understand Marx's labor theory of value.

Index of actual GDP price deflator and the "quality adjusted" price deflator, 1947-2008



Source: Council of Economic Advisors 2010.
Notes: The quality adjusted GDP deflator is explained in the text. The GDP deflator is the wholesale price index. The trends are derived from regressions. For each period both indices begin at 100.
1947-69: Inflation is 2.1% and quality-adjusted to one percent.
1970-87: Inflation is 6.6% and quality-adjusted to 5.5%.
1987-2008: Inflation is 2.2% and quality-adjusted ot 1.1%.

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