

John Wheatley's Theory of International Monetary Adjustment

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Of the bullionist writers who advocated restoration of the gold convertibility of England's currency during the Bank Restriction period 1797–1821, few are as little known today as John Wheatley. Certainly his name is not as familiar as those of David Ricardo, Henry Thornton, Thomas Malthus, Francis Horner, William Huskisson, and other bullionists. Yet in some respects he was the most original of the group. His *Essay on the Theory of Money and Principles of Commerce* (1807) spelled out the logic and implications of the strict bullionist position more forcefully and systematically than any document before Ricardo's *High Price of Bullion: A Proof of the Depreciation of Bank Notes* (1810).

To Wheatley belongs much of the credit for expounding at least four hard-line bullionist propositions often attributed to Ricardo. First, money-stock changes have no effect on output and employment. Second, exchange rate depreciations, a high price of gold, and specie drains stem solely from an excess issue of currency. Third, being purely monetary phenomena, exchange rate changes, gold price movements, and specie drains are immune to real shocks operating through the balance of payments. Fourth, exchange rate depreciation and the excess of market over mint price of gold constitute proof and measure of overissue in inconvertible paper regimes. To these can be added a fifth contribution: his demonstration that monetary expansion and price inflation can continue indefinitely on a given gold base if all countries expand in step.

Wheatley derived these propositions from an analytical model characterized by sharp dichotomization of real and monetary sectors. He sought to show that monetary shocks do not affect real variables nor real shocks monetary

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variables. To do so, he partitioned his real and monetary variables into separate compartments and allowed little or no interaction between the two. Neutrality, block exogeneity, and absence of reverse causality—these were the hallmarks of his analysis. They allowed him to contend that his monetary indicators were uncontaminated by real disturbances. As such, they signaled overissue pure and simple and so constituted an unambiguous measure of the need for monetary contraction to correct the excess issue. More than most economists before or since, he took the extreme position that monetary shocks affect only monetary variables and real shocks real variables.¹

Despite Wheatley's originality, his work has suffered from neglect. Ignored in his own time because of a labored, archaic expository style and a hypercritical, vitriolic attitude toward his fellow economists, he has also been underrated in ours.² Modern commentators, when they mention him at all, typically focus exclusively on certain striking aspects of his work rather than on his complete analytical model. Thus Schumpeter (1954) concentrates on his crude version of the quantity theory of money. Einzig (1962), Frenkel (1978), Officer (1984), and Wu (1939) emphasize his purchasing power parity doctrine. Fetter (1942) and Viner (1937) spotlight his assumption of price and exchange rate invariance to real shocks. Metzler (1948), Morgan (1943), O'Brien (1975), and Viner (1937) accent his income-expenditure theory of unilateral transfers. Chipman (1983) criticizes his theory of gold price determination. None, however, mention his integration of these elements into a consistent theory of how an open economy responds to real and monetary disturbances.

The result is a gap in our knowledge of Wheatley's theory of the international adjustment mechanism. This gap is all the more regrettable because it contributes to the notion of a monolithic classical theory based on David Hume's account of the price-specie-flow mechanism. In fact, Wheatley's theory differs from Hume's. It emphasizes continuous purchasing power parity, gold market arbitrage, and unilateral payments accomplished through income changes rather than through price adjustments. It demonstrates that there is more than one classical theory of the international mechanism.

This article represents an effort to fill the gap and to give Wheatley his due. First, it specifies the basic building blocks of Wheatley's model. Second, it shows how he used these components to explain international adjustment to monetary disturbances under convertible and inconvertible currency regimes. Third, it shows how he modified his model to handle real disturbances and in so doing contributed to the theory of international transfers. Fourth, it outlines

¹ Wheatley's strong real-nominal dichotomy has its closest modern counterpart in the work of the contemporary real business cycle school founded by Kydland and Prescott (1982) and Long and Plosser (1983).

² On Wheatley's expository style and attitude toward his fellow economists, see Chipman (1983), pp. 7 and 49–50, and Hollander (1911), p. 464.

some policy implications of his analysis. Last, it evaluates his place in classical monetary thought.

1. BASIC BUILDING BLOCKS

The first task is to sketch the chief components of Wheatley's model. These consist of (1) the quantity theory of money, (2) the purchasing power parity doctrine, and (3) a theory of gold arbitrage. Together, they trace out a causal chain in which money determines prices, prices determine exchange rates, and exchange rate movements trigger specie drains under metallic and convertible currency regimes and currency depreciation under inconvertible paper regimes. Of the three components, the quantity theory employs closed-economy propositions; the parity and arbitrage doctrines, open-economy ones.

Quantity Theory

Wheatley adheres to a particularly strict or rigid version of the quantity theory. This version embodies the notions of (1) proportionality of money and prices, (2) money-to-price causality, (3) neutrality of money, (4) monetary rather than real theory of prices, and (5) exogeneity of the nominal stock of money.

On the proportionality postulate, Wheatley (1807) declares that "all prices are in proportion to the quantity of money." "This principle," he writes, "appears so obvious, that it would be superfluous to enter into the proof of its validity; and I shall assume it as a postulate that would be universally conceded" (p. 12). In symbols, $P = kM$, where P is the home country's price level, M is its money stock, and k is a constant coefficient equal to the ratio of the circulation velocity of money to real output—both variables (velocity and output) treated as fixed constants by Wheatley. A similar equation holds for the foreign country in Wheatley's two-country model. That is, $P^* = k^*M^*$, where the asterisks denote foreign country variables. Thus, "if the currency of one country is relatively greater than the currency of another, its price will be proportionally higher" (1819, p. 24), or $P/P^* = K(M/M^*)$, where K is the ratio of the constants k and k^* .

As for the notion of money-to-price causality, Wheatley endorses it in no uncertain terms. "Prices," he says, "are determined by the quantity of money" (1819, p. 24). Thus a money-stock expansion has "no other operation than to raise the price of produce" (1807, p. 38). It "has no other effect than to cause its own depression" in purchasing power $1/P$ (p. 37). In his view, money drives prices through a direct expenditure mechanism. A monetary expansion raises the ratio of cash to nominal transactions above the fraction people desire to hold. Cash holders spend the excess money immediately and mechanically in an effort to work off the unwanted balances. The increased spending raises prices and the volume of nominal transactions. The process ends when the desired cash ratio is restored and the new money is willingly held.

Having asserted direct causality, he implicitly rejects the notion of reverse causality running from prices to money. Reverse causality might arise in metallic currency regimes if an exogenous fall in the price level, by raising the goods value of gold, induces an increase in the supply of specie flowing either from the mines or from abroad through the balance of payments. It also might arise in a fiat paper regime if the central bank validates exogenous price increases with monetary expansion. Wheatley, however, says nothing about such mechanisms.

He does, however, expand at length on the quantity theory's neutrality proposition. He argues that money-stock changes exert no influence, temporary or permanent, on real output and employment. Perfect wage-price flexibility, he claims, ensures as much. Such flexibility means that nominal wages and prices adjust instantaneously and equiproportionally to monetary shocks. The result is that the real wage rate and thus the output and employment variables it determines are invariant to such shocks. Thus, contrary to the popular notion that "an increase of currency gives a stimulus to industry by the elevation of prices," the truth is that "no greater stimulus can in reality exist" (1807, p. 40). For "the wages of labour are augmented only in proportion to the increase [of money and prices], and purchase no greater quantity of produce after the addition than before it" (p. 40). Wheatley concludes: "[A]n increase of money . . . has no effect like an increase of produce to augment the wealth of a nation" (p. 37). It has "no other operation than to raise the price of produce, and augment the nominal incomes of all, without making any addition to their real opulence" (1807, p. 38). One can hardly find a clearer statement of the neutrality proposition in the entire classical literature.

Wheatley's neutrality proposition states only that monetary shocks affect prices and not real variables. It does not deny that real determinants might also drive the price level. To rule out this possibility, Wheatley asserts that price changes stem exclusively from monetary rather than real disturbances. "There is no other cause," he writes, "than a relative excess of currency which makes prices higher" (1819, p. 24). True, he notes that real shocks might depress output and so the demand for money, thereby rendering the existing money stock excessive. But he argues that any resulting price increase must be attributed to the monetary excess and not to the real shock. Likewise, he denounces as "imbecilic" Sir James Steuart's view that the same real forces of "demand and competition" that determine relative prices also drive the general price level (1807, p. ix). Not so, says Wheatley. Money-stock movements govern the general price level. He also asserts that secular inflations emanate from excessive paper money growth rather than from output contractions and a shortage of goods.

Finally, Wheatley posits money-stock exogeneity, which he sees as a corollary of the proposition that money is the independent causal factor governing prices. He realizes that if money were an endogenous variable responding passively to prior changes in the economy, he could not claim it plays the

active initiating role in raising prices. For this reason, he treats gold coin and paper notes as exogenous variables emanating autonomously from “the fertility of mines, and the general publication of state and bank paper” (1807, p. 60). He ignores the feedback effect of prices on the profitability of mining and the production of gold. By dismissing such real determinants of commodity money, he essentially treats it as fiat currency.

Purchasing Power Parity Doctrine

The purchasing power parity doctrine forms the second building block in Wheatley’s model of international adjustment. In what is the clearest and most complete account of the doctrine before Gustav Cassel’s statement in the 1920s, he enunciates it in both its absolute and relative versions.

The absolute version says that the exchange rate E —defined as the domestic currency price of a unit of foreign currency—equals the ratio of domestic to foreign general price levels. This condition renders the purchasing power of money expressed in terms of a single currency everywhere the same. In symbols, $E = P/P^*$ or, equivalently, $P = EP^*$. As Wheatley (1807) puts it, “the course of exchange is exclusively governed by the relative state of prices, or the relative value of money, in the different countries between whom it is negotiated” (p. 85). It “approximates the price of their produce to a general level” (p. 45). He sees price-level parity $P = EP^*$ as emanating from the law of one price. That law, of course, states that abstracting from tariffs, transport costs, and other impediments to trade, the price of any given traded good is the same in all locations when quoted in the same currency. Since Wheatley assumes that all goods are traded and that identical commodities bear the same weight in each country’s price index and product mix, he essentially treats them as a single composite commodity. In his composite-commodity model, the law of one price applies to aggregate price levels as well as to the prices of individual goods. Therefore, the real exchange rate, or commodity terms of trade, between two nations equals unity, or $EP^*/P = 1$. In Wheatley’s words, “the state of exchange must uniformly coincide with the state of prices, or the interchange of produce could not be transacted on equal terms” (1819, p. 21). A unitary value of the terms of trade permits “any given quantity” of the composite commodity to “exchange for the same value in every part of the world” (1807, p. 46).

He gives an equally lucid statement of the doctrine’s relative version, according to which the percentage change of the exchange rate is the differential between the percentage changes of the price levels. “The exchange between London and Hamburgh,” he says, “is at any given moment five percent against London, only because the general prices at Hamburgh are at that time five percent lower than the general prices of London” (1807, p. 63). Here is his

description of the relationship $e = p - p^*$, where the lowercase letters denote percentage changes in their uppercase counterparts.

Wheatley saw the parity doctrine as an extension of the quantity theory to the open economy. It is therefore not surprising to find him treating the exchange rate as a purely monetary phenomenon determined by relative national money stocks operating through national price levels. “Nothing can alter the state of the exchange,” he wrote, “that does not alter the state of prices, and nothing can alter the state of prices, the quantity of produce being the same, that does not alter the state of currency” (1819, p. 27). In terms of the quantity theory equations presented above, Wheatley held that $E = P/P^* = kM/k^*M^* = K(M/M^*)$. From this equation derives his conclusion that “there is no other cause than a relative excess of currency, which makes the exchange unfavourable” (1819, p. 24). Thus “the course of exchange is the exclusive criterion of how far the currency of one country is increased beyond the currency of another” (1803, p. 207).

Wheatley comments at length on key propositions of the doctrine. Regarding causality, he asserts it runs unidirectionally from price levels to exchange rates. Regarding the transmission mechanism, he posits rational expectations. He argues that agents, observing price-level changes and anticipating the compensating exchange rate correction, incorporate those anticipations into the rate and so make them a reality.³ The result is that exchange rates adjust instantaneously to price levels.⁴ Regarding deviations from purchasing power parity, he denies their occurrence. Rational expectations maintain the exchange rate at parity equilibrium. Therefore, currencies cannot be temporarily over- or undervalued on the market for foreign exchange. Finally, regarding neutrality, he argues that because exchange rates are always at parity, their fluctuations cannot affect real trade balances or the terms of trade in the least. His treatment of these issues is among the more extreme and uncompromising in the classical literature.

³ According to Wheatley, the exchange rate attains purchasing power parity equilibrium so swiftly as to bypass trade-balance effects. Other classical economists, notably Henry Thornton (1802, p. 198), had suggested that a rise in one country’s prices relative to another’s could only exercise its self-correcting influence on the exchange rate through the trade balance. In their view, a rise in home prices relative to foreign prices would, by spurring imports and checking exports, cause a trade deficit and a corresponding excess demand for foreign exchange to finance it. This excess demand in turn would bid up the exchange rate, thereby equalizing common-currency price levels. But Wheatley thought such intermediate steps unnecessary. In his view, the exchange rate adjusts immediately.

⁴ “But immediately that the prices of one country become relatively higher than the prices of another, the course of exchange . . . will note the difference, and become unfavourable to the same extent” (Wheatley 1819, p. 24). “The instant that the variation occurs it is announced by the exchange, and a credit given in conformity to the difference” (Wheatley 1807, p. 64).

Gold Price Arbitrage

Wheatley's theory of gold arbitrage constitutes the third building block of his model. It explains how countries eliminate their excess or deficient money stocks under metallic and convertible currency regimes.

His theory is simplicity itself. It says that arbitrageurs will ship gold from where its monetary value is low to where its monetary value is high. Comparison of fixed domestic and foreign mint prices of gold quoted in a single currency at the rate of exchange reveals these respective monetary values. Let a rise in the exchange rate—that is, a depreciation of the home currency relative to the foreign currency—raise the common-currency value of gold abroad over its value at home. The result will be to precipitate a specie export. For arbitrageurs will find that they can convert domestic paper into gold at the fixed mint price, sell the gold abroad at its foreign mint price, convert the proceeds at the given exchange rate into more domestic currency than they started with, and thus buy more gold than they had before. They will continue to engage in this sequence of transactions as long as gold's geographical value differential yields arbitrage profits.

At this point, Wheatley introduces transport costs into the analysis. Instead of abstracting from such costs as in the case of goods, he argues that these costs are too substantial to neglect in the case of gold. In particular, he estimates that specie transport costs amount to at least 3 percent of gold's value. Consequently, arbitrageurs will find it profitable to export specie only when the exchange rate exceeds relative mint prices by more than enough to cover such costs. In symbols, $E > (1 + s)P_g/P_g^*$, where P_g and P_g^* are the domestic and foreign mint prices of gold and s is gold's shipping cost expressed as a percentage of the domestic mint price. Rewriting this condition as $EP_g^* - P_g > sP_g$ yields the profitability criterion for gold exports: such exports are profitable when the foreign-to-domestic gold price differential exceeds the cost of transit. It follows that "when the exchange becomes unfavourable to . . . the extent of five, ten, or fifteen percent, gold will find its way out." For arbitrageurs will reap "as a profit what remains after the charge of transit, which is . . . three percent" (1819, pp. 24–25).

Symmetrically, Wheatley argues that gold imports become profitable when the exchange rate falls below mint par by more than transit costs, or $E < P_g/P_g^*(1 + s)$. Then the home price of gold exceeds the foreign price by more than the cost of transit, or $P_g - EP_g^* > sEP_g^*$. Arbitrageurs, secure that their profits will not be eaten up by shipping costs, will import gold to realize the differential. In short, Wheatley specifies certain critical values of the exchange rate that trigger gold inflows and outflows. These values of course are the famous specie points of the trade literature.

2. ADJUSTMENT MECHANISMS

Armed with the foregoing concepts, Wheatley explains how an open economy adjusts to real and monetary shocks under alternative currency regimes. According to Wheatley, monetary shocks trigger specie redistributions under metallic and convertible currency regimes and exchange rate changes under inconvertible paper regimes. Adjustment ceases and equilibrium reigns when the common-currency prices of goods and gold are the same worldwide. By contrast, real shocks prompt changes in real incomes and expenditures but leave nominal exchange rates and specie flows unchanged. Adjustment ends when the income and spending changes re-equilibrate the real balance of payments.

In the following paragraphs, it will be useful to consider Wheatley's analysis of monetary shocks first. Such shocks take the form of exogenous increases in the domestic money stock. He examines the resulting responses in purely metallic, convertible currency, and inconvertible currency regimes. In all cases, money's influence is confined to nominal variables. No real variables change except for gold's relative price EP_g^*/P_g , which moves to its export point.

The Process of Adjustment to Monetary Shocks in a Purely Metallic Regime

Consider first a metallic or 100 percent reserve gold-standard regime. Let an exogenous increase in the quantity of specie attributable to "the fertility of the mines" occur in the home country. The monetary expansion produces an immediate, equiproportional rise in the domestic price level. With perfect wage-price flexibility, nominal wages rise in step with prices, leaving real wages and thus employment and output unchanged. Here is the first strict bullionist or Ricardian proposition, namely, that money is neutral in its effect on real activity.

Turning to the market for foreign exchange, Wheatley argues that agents there observe the rise in domestic prices and anticipate the compensating exchange rate depreciation. They incorporate those anticipations into the rate, which depreciates immediately. The resulting equiproportional rise in the price level and the exchange rate leaves the terms of trade or relative price of goods at home and abroad, EP^*/P , unchanged. With no terms-of-trade improvement to induce a trade deficit, none occurs.

Instead, adjustment occurs in the market for monetary gold. Given the fixed foreign and domestic mint prices of gold, P_g^* and P_g , it follows that the rise in the exchange rate raises gold's common-currency price abroad, EP_g^* , above its price at home, P_g , or $EP_g^* - P_g > 0$. Still, the exchange rate may not depreciate enough to raise the gold price differential $EP_g^* - P_g$ above the cost of transit sP_g . If so, nothing further happens.

But let the exchange rate rise above mint par by more than the cost of transporting gold and arbitrage becomes profitable. Agents then have an incentive to ship specie abroad to realize the gold price differential. By contracting

the domestic money stock and deflating the domestic price level, the resulting loss of specie will restore the exchange rate to mint parity, thus putting a stop to further gold drains. In this way, the efflux of gold will have restored the natural distribution of specie required for national (and world) monetary equilibrium. The upshot in Wheatley's small-open-economy case is that (1) P and E are the same as before, (2) the specie increment is dispersed abroad where it is too small to affect the world money stock and world price level, and (3) P^* accordingly remains unchanged. Wheatley (1807) summarizes: "In every instance, therefore, where a relative excess of currency caused the same sum to measure a less value in one country than it measured in others, the course of exchange would become unfavourable, and by leading to the departure and general distribution of the surplus specie, maintain inviolable the level of money" (pp. 66–67).

Wheatley Versus Hume

Here was a new theory of the adjustment mechanism. It differed from David Hume's celebrated account of the price-specie-flow mechanism enunciated in his 1752 essays "Of Money" and "Of the Balance of Trade." In his first essay, Hume maintains that increases in the stock of metallic money temporarily stimulate real activity before raising prices proportionally. Wheatley's model permits no such temporary nonneutrality. And in the second essay, Hume implies that the rise in domestic prices produces no fully offsetting rise in the exchange rate. The result is an increase in the relative price of home to foreign goods, which, by rendering imports cheap and exports dear, precipitates a trade deficit. Wheatley's model allows no such terms-of-trade or trade-balance effects.

Moreover, since the exchange rate in Hume's model is fixed (or at least remains below the export point), it cannot depreciate sufficiently to produce the gold price differential that triggers specie arbitrage. True, gold moves abroad in his model to equalize commodity prices. But it does so passively just to finance the trade deficit rather than actively in search of a higher price abroad.

Thus, while Hume's model achieves the same equilibrium distribution of specie as Wheatley's model, it does so through a different process. In short, Hume's account features exchange rate fixity, terms-of-trade variation, trade deficits, continuous gold price parity, and no gold arbitrage. By contrast, Wheatley's account stresses exchange rate variation, continuous purchasing power parity, no trade deficits, and temporary gold price differentials that activate specie arbitrage. Evidently there is more than one classical theory of the adjustment mechanism.

Adjustment to Monetary Shocks in Convertible Currency Regimes

Wheatley notes that a process similar to that described above works to eliminate excess money supplies in convertible currency regimes wherein paper is freely

convertible into gold at a fixed price upon demand. Now, however, correction is achieved through retirement of excess notes as well as through specie drains.

Let an exogenous increase in the “publication of state and bank paper” occur in the home country (1807, p. 60). Money, prices, and the exchange rate rise equiproportionally maintaining relative prices EP^*/P and the trade balance unchanged. When the exchange rate depreciates to the point where gold export becomes profitable, arbitrageurs present paper notes to banks for conversion into gold at the official mint price. The resulting specie drain obliges banks to contract the note issue to protect their gold reserves. Such contraction causes the price deflation that restores the exchange rate to mint par and puts a stop to specie drains.⁵ Indeed, Wheatley contends that central bankers’ knowledge of this process disciplined them to contract as soon as the exchange rate signaled overissue.⁶

Wheatley also pioneered the distinction between small and large open-economy models. He was the first to point out that a small economy’s excess issue, being a negligible fraction of the world money stock, could have no perceptible influence on that stock or world prices. By contrast, a large economy’s excess issue could affect both. The large economy would, after working off its excess balances, retain its relative share of the enhanced world money stock and its price level would be higher than before. By contrast, adjustment would leave the small economy’s price level unchanged.

In this connection, he also observes that all nations expanding in concert could do what no single nation could do alone, namely, generate an unlimited rise in money and prices. “Paper,” he writes, “might be increased in any given country to any extent, provided that the currency of other nations were augmented in a similar ratio to preserve the equivalency” (1807, p. 28). For if all countries expanded in step, none would be conscious of an excess of currency. Although money and prices would rise in each country, there would be no exchange rate depreciation, no rise in the market price of gold, no drain of gold reserves from one country to another to limit expansion. Each country’s paper, no matter how greatly augmented, would retain its value relative to gold and to other currencies. Wheatley was the first economist to enunciate this point.

⁵ “When the over-issue of paper made the prices of this country higher than the prices of others . . . and the course of exchange marked the difference, bullion, which is foreign money . . . sold at a correspondent premium . . . together with the charges of transit. . . . Bank paper, therefore, was pressed upon the Bank to be exchanged for guineas, that the guineas might be converted into bullion, to be . . . sent abroad. By this process, Bank paper was reduced in amount . . . and . . . its contraction lowered our prices to a level with prices of other countries . . . and restored the exchange to par” (1819, pp. 39–40).

⁶ “The unfavourable exchange, which naturally resulted from a partial redundancy, constituted the exclusive check to the issues of the Bank of England throughout the whole of the preceding century, and prevented the publication of a greater sum than that proportion, which was adequate to circulate the produce of this country at par with the produce of others” (1807, pp. 68–69).

Adjustment to Monetary Shocks Under Inconvertible Currency Regimes

Wheatley was also among the earliest to analyze the operation of an inconvertible paper currency, which he saw as introducing a new twist to his model. Under inconvertibility, money cannot leak out into foreign trade. An excess issue cannot be worked off through specie drains as it can under metallic and convertible currency regimes. Instead, the exchange rate eliminates the redundant currency by devaluing it in proportion to its excess.

As before, Wheatley begins his analysis by introducing an exogenous monetary disturbance into his model. He assumes the banking system, desiring to reduce its reserve ratio, injects additional paper notes into an economy initially in monetary equilibrium with the exchange rate at mint par. He then traces out the ensuing sequence of events.

As in the convertible currency case, the overissue of inconvertible paper generates immediate and proportional rises in the prices of goods and foreign exchange. Together, these increases operate to maintain the real terms of trade EP^*/P unchanged, thus forestalling trade deficits.

At the same time, the depreciating exchange rate raises gold's relative price abroad EP_g^*/P_g . But as long as that increase does not exceed the cost of transit, gold remains a non-traded good that sells domestically at its unchanged market (and mint) price.

Let the exchange rate rise by more than the cost of transit, however, and gold becomes a traded good and therefore subject to the law of one price. As a result, market and mint price diverge. No longer tied to the mint price by convertibility, gold now fetches a price equal to its common-currency price abroad, EP_g^* , minus the cost of transit.⁷ And since that common-currency price varies one for one with the exchange rate, it follows that gold commands a premium over its old mint price equal to the percentage rate of depreciation of the exchange rate. As this percentage rate is also the rate of expansion of the money stock, Wheatley arrives at the Ricardian or strict bullionist proposition that the percentage premium on gold constitutes proof and measure of overissue under inconvertibility.

The gold premium also prohibits specie exports. For the same law-of-one-price condition that equalizes gold's value worldwide precludes arbitrageurs from making profits on shipping the metal. Wheatley's (1807, p. 70) exposition of this point is both seminal and definitive. Under inconvertibility, arbitrageurs cannot obtain gold from the central bank. If some coin remains in circulation, however, they can obtain it from domestic coin holders. To induce the latter to part with their gold, arbitrageurs must pay the asking price. But coin holders themselves have the option of shipping their gold abroad, selling it at the

⁷ In Wheatley's words, specie annexes a premium and "resiliates to a level with its value abroad" (1807, p. 367).

foreign mint price, and converting the proceeds net of transit cost into domestic currency at the rate of exchange. Consequently, arbitrageurs must pay a per-ounce price of $P_g = EP_g^* - sP_g$ for domestic gold, to which must be added the cost of shipping it sP_g . But this sum $EP_g^* - sP_g + sP_g$ leaves no arbitrage profits to induce gold exports. For it just equals EP_g^* , exactly what gold fetches abroad.

Since no profits can be made by exporting gold, none is exported. Instead, exchange rate changes rather than gold drains eliminate excess money stocks. Exchange depreciation devalues money in proportion to its excess. Such devaluation keeps demand-adjusted money stocks everywhere the same, as international monetary equilibrium requires. Let k^*M^* be the foreign demand-adjusted money stock and kM/E its domestic counterpart measured in terms of a common currency. Then world monetary equilibrium requires that $k^*M^* = kM/E$. Any excess of kM will be offset by compensating rises in E to maintain the equality. In Wheatley's words, "the course of exchange has no other means" of working off an excess supply of inconvertible currency "than to reduce it to a discount in proportion to its excess" (1807, p. 69).

In short, Wheatley argues that exchange rates bear the full burden of adjustment under inconvertibility. Specie movements do not occur. To explain why specie does not move, he appeals to the law of one price. He also appeals to the idea of comparative cost. He argues that inconvertibility renders gold just another commodity whose price during inflation rises identically with all commodity prices. But identical rises in the prices of goods and gold imply that gold cannot be cheap in terms of goods. And not being the relatively cheap commodity, it cannot qualify for exportation on comparative cost grounds. Therefore it is not exported. For that reason, specie does not move when inconvertibility reigns. Instead, it leaves adjustment to the exchange rate.

3. ADJUSTMENT TO REAL SHOCKS

Having argued that exchange depreciation, gold price premia, and specie drains constitute proof and measure of overissue, Wheatley had to show that those same phenomena could not also arise from real shocks operating through the balance of payments. For if his monetary variables registered real disturbances as well as monetary overissue, they could hardly be unambiguous indicators of the latter alone. Candidate real shocks included domestic crop failures, subsidies and loans to Britain's allies in the war against Napoleon, and the expenses of maintaining troops on the continent. He had to show that these disturbances propagated their effects through non-monetary channels and could not affect his monetary variables in the least.

To do so, he posits a demand-shift, income-expenditure mechanism. In the case of domestic crop failures, he sees adjustment occurring through shifts in

reciprocal demands. Jacob Viner explains. Wheatley, he says, insisted that “the demand of England and the rest of the world for each other’s product would necessarily so immediately and completely adjust themselves . . . as to result under both a metallic and an inconvertible paper standard in the maintenance of equilibrium in the balance of payments without the aid of specie movements, changes in the relative level of prices in the two areas, or movements of the exchange rate” (Viner 1937, p. 142).

Let a home harvest failure depress domestic income. Imports, a function of income, therefore fall. The resulting decline in the foreign country’s export sales induces it to cut back its purchases from the home country. Home exports consequently fall to match home imports. The trade balance remains unchanged, as do the exchange rate and the ratio of national price levels—provided, of course, that the central bank eradicates that portion of the money stock rendered redundant by the fall in income. In terms of Marshallian reciprocal demand schedules or offer curves, the curves of both nations shift inward by equal amounts to intersect the unchanged terms-of-trade vector at a smaller volume of trade. Exchange rate movements and specie flows are not required.

Wheatley uses the same demand-shift, income-adjustment mechanism to resolve the transfer problem. He argues that foreign remittances—loans and subsidies to Britain’s allies plus military expenditures abroad—are effected by a transfer of goods without disturbing price levels, exchange rates, or the distribution of specie. Causation runs from remittances to incomes to import demands to the export surplus that transfers the goods. The home government, say, taxes domestic citizens and gives the proceeds to the foreign country as a subsidy. The subsidy reduces home income and raises foreign income by equal amounts. Imports as a function of income fall in the home country and rise in the foreign country. The result is a home-country export surplus that, if the propensities to import in the two countries just add up to one as Wheatley assumes, precisely equals the amount of the subsidy.⁸ Here is Wheatley’s special case in which income shifts accomplish the goods transfer with no help from

⁸ By definition, the home country’s real trade balance B is the difference between its real exports X and its real imports I , or $B = X - I$. Also by definition, home exports X are the foreign country’s imports, I^* , so that the trade balance may be expressed as the difference between foreign and domestic imports, each a function of real national income, or $B = I^*(Y^*) - I(Y)$. Differentiating the trade balance with respect to the subsidy T yields $dB/dT = (dI^*/dY^*)(dY^*/dT) - (dI/dY)(dY/dT)$. Since Wheatley assumes the recipient’s and the payer’s incomes increase and decrease, respectively, by the exact amount of the subsidy—that is, $dY^*/dT = -dY/dT = 1$ —the expression simplifies to $dB/dT = (dI^*/dY^*) + (dI/dY)$, where the right-hand side is the sum of the marginal propensities to import. If this sum is one, as Wheatley assumes, then $dB/dT = 1$, or $dB = dT$, and the trade balance moves into surplus by exactly the amount of the subsidy. In the final analysis, the subsidy is paid in goods. Hence he concludes that “the superiority of our exports above imports must nearly correspond with the amount of our foreign expenditure” (1807, p. 219).

monetary variables or the terms of trade.⁹ Here too is his formulation of the Ricardian or strict bullionist doctrine that monetary phenomena are invariant in response to real shocks to the balance of payments.

Wheatley's income-shift theory differed from the dominant gold-flow, price-adjustment theory of his contemporaries (see Fetter [1968], pp. 65–69). They held that real transfers are accomplished through price changes and specie flows prompted by the initial financing of the transfer. Such financing requires the paying country to obtain the recipient country's currency to make the cash payment. The resulting increased demand for foreign exchange bids up the exchange rate. Given national price levels, the rising exchange rate lowers the relative price of goods P/EP^* in the paying country, thus spurring its exports and checking its imports. Net exports get an extra boost when the exchange rate reaches its specie point and the resulting gold drain and monetary contraction deflate the paying country's price level. With deflation and depreciation lowering relative prices, the export surplus expands to effect the transfer in goods.

The view that transfers operate through monetary variables was, of course, anathema to Wheatley, who omits such channels from his model. Transfers were real phenomena. As such, they were entirely independent of monetary phenomena. To dramatize this independence, Wheatley argued that even as the paying country was making massive unilateral transfers abroad, it could still enforce specie inflows to any extent simply by contracting paper issues and deflating prices until the exchange rate fell to its import point.¹⁰ Foreign payments, in other words, had nothing to do with exchange rates and specie flows.

4. POLICY IMPLICATIONS OF WHEATLEY'S WORK

Although Wheatley's analysis was primarily theoretical, it had some practical policy implications.¹¹ First, exchange rates, gold prices, and specie movements offer infallible indicators of overissue. When they signal monetary excess, it must be occurring since they respond to nothing else. Their invariance to real disturbances means that such disturbances cannot distort their signal and render it ambiguous.

A second implication is that persistent inflation is less likely to occur in convertible than in inconvertible currency regimes. Under convertibility, inflation is self-correcting. It automatically precipitates gold drains and forces

⁹ "Foreign payments . . . have no effect to alter the state of our currency, they have no effect to alter the state of the exchange" (1819, p. 29).

¹⁰ "A due compression of our paper circulation would have led to its [gold's] influx at the very moment, that the loan was in payment, and would have glutted the country with specie" (1807, p. 193).

¹¹ On Wheatley's policy views, see Fetter (1942), pp. 368–74.

banks to contract their note issue to protect their gold reserves. The resulting shrinkage of the money stock ends the inflation. No such corrective drains occur under inconvertibility when gold, if available at all, commands a price that renders specie exports unprofitable. It follows that convertibility offers the stronger safeguard to overissue.

A third implication of Wheatley's work is that price-level stability can be achieved by monetary means. A staunch advocate of such stability, Wheatley stressed the evils of price fluctuations. They arbitrarily redistributed income and wealth among the social classes and provoked social discontent. Avoiding such evils meant removing their monetary causes. To this end, Wheatley advocated (1) ending the suspension of specie payments and restoring convertibility of the British pound, (2) eliminating small notes which he saw as the most unstable component of the money supply, and (3) removing the note-issuing privilege from competing private banks and lodging it with the Bank of England.¹² These reforms, he thought, would prevent or minimize sharp variations in the money stock that constituted the primary obstacle to price stability.

A fourth implication of Wheatley's work is that indexation can immunize real payments from unanticipated movements in nominal ones. In this connection, he proposed price-level indexation of long-term contracts to compensate for fluctuations in the value of money. "Some criterion," he said, "should be assumed for the purpose of providing a graduated scale of the value of money" so that nominal incomes could be adjusted "in conformity to the result." Of the candidate criteria, a general price-index series such as that constructed by Sir George Shuckburgh Evelyn would be "the least objectionable" (1807, pp. 328–29). Earlier writers had advocated stabilizing real incomes by adjusting nominal incomes according to changes in the price of a single commodity such as rye or corn. But Wheatley was the first to recommend a general price-level index number for that purpose. The modern notion of indexation originates with him.

5. WHEATLEY'S PLACE IN CLASSICAL MONETARY THOUGHT

Even at its best, Wheatley's *Essay on the Theory of Money* could hardly match the subtlety and insight of Henry Thornton's *Paper Credit of Great Britain*. Nor could it match the power, brilliance, and lucidity of David Ricardo's *High Price of Bullion*. Still, if originality is any criterion, Wheatley's name belongs in the

¹² Unlike other bullionists, Wheatley was unwilling to exonerate private banks from overissue. By perversely varying their reserve ratios, such banks overissued notes independently of the central bank. He denied that the Bank of England controlled such banks through their reserves or that overissue was prevented by the operation of an interregional price-specie-flow mechanism.

front rank of classical monetary theorists. He formulated the strict bullionist model, which dichotomizes real and monetary sectors and posits neutrality and exogeneity in the short run as well as the long. True, this model looks primitive compared to Thornton's sophisticated schema. But its ultra-simplicity entails certain positive strengths. The model yields clear-cut policy conclusions. And it avoids confusion between real and nominal variables. It emphasizes money's permanent price effects but ignores transitory output and employment effects that might distract the central bank from pursuing its primary goal of price stability. Ricardo, for one, found these properties desirable. He employed a version of the strict bullionist model after Wheatley first presented it.

Nor should Wheatley's other contributions go overlooked. He established, three years before Ricardo, the theoretical underpinnings of the Ricardian definition of excess (see O'Brien [1975], p. 148). This definition says that if (1) the exchange rate is depreciated, (2) gold is selling at a premium, and (3) specie (under convertibility) is leaving the country, then the currency is by definition excessive and must be contracted. Here was the tool strict bullionists needed. With it they could counter antibullionists' and moderate bullionists' claims that such phenomena might well originate in real shocks so that monetary contraction was not required.

Beyond these ideas were his specific contributions to international monetary theory. He presented the clearest and most complete statement of the purchasing power parity doctrine before Gustav Cassel. He was the first to use the rational expectations argument to explain why the terms of trade is always in equilibrium. He originated the distinction between large- and small-open-economy models in which a large country's note issue perceptibly influences world money and prices whereas a small country's issue does not. Likewise, he introduced the notion that all nations expanding in step in a convertible currency regime can do what no single nation can do alone, namely, generate an unlimited rise in money and prices. And his demand-shift, income-expenditure theory of unilateral transfers anticipated the subsequent contributions of Mountifort Longfield, J. E. Cairnes, C. F. Bastable, J. S. Nicholson, and Bertil Ohlin.

Perhaps his most outstanding contribution, however, was his specification of the link between exchange rates, gold prices, and gold flows. In an explanation superior to any before Ricardo, he showed that in metallic and convertible currency regimes gold is not simply a means of discharging international payments. Rather it is a commodity that flows across nations to capture arbitrage profits created when exchange rate movements generate gold price differentials.

A related contribution was his use of the law of one price to show that gold ceases to move across nations when its common-currency value is equalized worldwide such that no arbitrage profit can be realized by shipping it. He showed that money's purchasing power parity over gold, not its purchasing power parity over goods, is what halts gold movements. These contributions,

together with his indexation proposal, were the products of an original mind. They identify Wheatley as a creative scientific economist who deserves a prominent rank in the classical pantheon. Above all, his ideas identify him as the most monetarist, or strictly quantity theoretic, of all the classical writers.

Wheatley took three key ideas—(1) the quantity theory of money, (2) the purchasing power parity doctrine, and (3) the notion of gold arbitrage—and endowed them with sharp analytical content. He then combined these concepts into a powerful framework capable of tracing the effects of monetary disturbances produced by England's suspension of convertibility during the Napoleonic Wars. To analyze the effects of real disturbances produced by the wars, he developed a separate demand-shift, income-expenditure mechanism. His achievements merit recognition from economists today.

REFERENCES

- Chipman, John S. "Balance of Payments Theory from Locke to Ricardo." Manuscript. University of Minnesota, 1983.
- Einzig, Paul. *The History of Foreign Exchange*. London: Macmillan, 1962.
- Fetter, Frank W. "The Transfer Problem: Formal Elegance and Historical Realism," in C. R. Whittlesey and J. S. Wilson, eds., *Money and Banking in Honour of R. S. Sayers*. London: Oxford University Press, 1968.
- _____. "The Life and Writings of John Wheatley," *Journal of Political Economy*, vol. 50 (June 1942), pp. 357–76.
- Frenkel, Jacob A. "Purchasing Power Parity; Doctrinal Perspective and Evidence from the 1920s," *Journal of International Economics*, vol. 8 (1978), pp. 169–191.
- Hollander, J. H. "The Development of the Theory of Money from Adam Smith to David Ricardo," *Quarterly Journal of Economics*, vol. 25 (1911), pp. 429–70.
- Hume, David. "On Money" and "On the Balance of Trade," in E. Rotwin, ed., *Writings on Economics*. Madison: University of Wisconsin Press, 1955.
- Kydland, Finn, and Edward C. Prescott. "Time to Build and Aggregate Fluctuations," *Econometrica*, vol. 50 (November 1982), pp. 1345–70.
- Long, J. B., and C. I. Plosser. "Real Business Cycles," *Journal of Political Economy*, vol. 91 (February 1983), pp. 39–69.
- Metzler, Lloyd A. "The Theory of International Trade," in *A Survey of Contemporary Economics*, Vol. 1. Philadelphia: The Blakiston Company, 1948.

- Morgan, E. V. *The Theory and Practice of Central Banking, 1797–1913*. London: Cambridge University Press, 1943.
- O’Brien, D. P. *The Classical Economists*. London: Oxford University Press, 1975.
- Officer, Lawrence. *Purchasing Power Parity and Exchange Rates*. Greenwich, Conn.: JAI Press, 1984.
- Ricardo, David. *The High Price of Bullion: A Proof of the Depreciation of Bank Notes*. London: Murray, 1810, reprinted in Piero Sraffa, ed., *The Works and Correspondence of David Ricardo*, Vol. 3, *Pamphlets and Papers, 1809–1811*. Cambridge: Cambridge University Press (for Royal Economic Society), 1951.
- Schumpeter, J. A. *History of Economic Analysis*. New York: Oxford University Press, 1954.
- Thornton, Henry. *An Enquiry into the Nature and Effects of the Paper Credit of Great Britain*. 1802. Edited with an introduction by F. A. von Hayek. London: Allen and Unwin, 1939.
- Viner, Jacob. *Studies in the Theory of International Trade*. New York: Harper, 1937.
- Wheatley, John. *Report on the Reports of the Bank Committees*. Shrewsbury, England: W. Eddowes, 1819.
- . *An Essay on the Theory of Money and Principles of Commerce*, Vol. 1. London: Cadell and Davies, 1807.
- . *Remarks on Currency and Commerce*. London: Cadell and Davies, 1803.
- Wu, C-Y. *An Outline of International Price Theories*. London: Routledge, 1939.