Profitability in the International Gold Market in the Early History of the Gold Standard

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By looking at the available evidence on the London gold market in the late 18th Century and early 19th Century, the paper presents a new formulation of the gold points and models the market behaviour behind gold movements. While there is evidence that the merchants' behaviour sustained the purchasing power parity of gold in terms of currency, there is none to support the view that gold flows realised the purchasing power parity of gold in terms of traded commodities. Therefore, the equilibrium condition imposed by both the monetary approach and the price-specie-flow mechanism seems unnecessarily restrictive.

INTRODUCTION

The distinctive feature of the Gold Standard was the equilibrating mechanism of gold movements which, by altering the world distribution of gold from deficit to surplus countries, restored international balance of payments equilibria. Although, on average, the occurrence of gold movements was in fact less frequent than expected, it was the implicit discipline of gold flows that gave to the Gold Standard its equilibrating mechanism.

The adjustment paths followed by the Gold Standard have been widely analysed in the literature, though the issue of what was the dominant mechanism does not seem to have been settled (Schwartz, 1984, p. 6). But the microeconomics of gold movements—i.e. who are the agents and what is the relevant market behaviour behind the occurrence of gold flows in the early history of the Gold Standard—has not been analysed. In the most recent interpretations of the Gold Standard the focus has been rather on the evolution of the 'management' of the Gold Standard by the Bank of England and on the violations of the rules of the game, in response to movements of gold, by central banks in the pre-1914 Gold Standard (Bordo, 1984, pp. 94–8).

In this paper we discuss the profitability of gold flows when the development of an organized international gold market centred in London was on its way, and when the basis for the rise of the Gold Standard as an international monetary system, which gave London a 'special position' within the system, was laid.

The purpose of the analysis is to lay down the necessary and sufficient conditions of profitability of gold imports and exports from the point of view of individual agents, both when the Bank of England was committed to exchange her notes at a fixed gold price (until 1797), and when she was not (1797–1821). Besides the expected result that the rise of the Gold Standard depended on the development of integrated markets, our analysis produces a less familiar result. By looking at gold flows from the point of view of individual agents, we show that the equilibrium condition imposed by both the monetary
approach and the price-specie-flow mechanism (i.e. such that gold flows will come to an end only when the equalization across countries of the purchasing power of gold in terms of commodities is attained) is unnecessarily restrictive. We claim instead that the stopping rule for gold movements can be limited to the attainment of the purchasing power parity of gold over each currency, i.e. when each currency buys on the domestic market no more and no less gold than it buys on the foreign markets.

In Section I we review the available evidence on the London gold market in the early history of the Gold Standard. In Section II we develop an alternative formulation of the gold points. In Section III we allow for the possibility of institutional frameworks in which the price of gold is not fixed. Finally, in Section IV we derive the main analytical conclusion of the paper, namely, the distinction between the necessary and sufficient conditions for gold movements to take place.

I. THE LONDON GOLD MARKET

We do not have reliable data on the gold market in the early history of the Gold Standard in England, i.e. before the middle of the nineteenth century. One of the reasons why the evidence about international gold movements is so scanty may be the fact that it was a trade in which secrecy mostly ruled (Sutherland, 1932, p. 369), and that the export of bullion was illegal in most countries. However, we do have a fairly good idea of how the market in precious metals worked from the middle of the eighteenth century to the first quarter of the nineteenth century. The evidence comes from two types of sources: from the evidence given to the British Parliamentary Committees, notably the Bullion Committee (1810) and the Resumption of Cash Payments Committees (1819), and from the ledgers and papers of merchants engaged in the bullion trade.

Spain and Portugal shared the monopoly of the supply of silver and gold respectively, as they had complete control over the mines of these metals in their colonies. During the eighteenth century the centre of the international gold market shifted from Amsterdam to London, where the export of foreign gold or 'sworn off' gold (i.e. upon oath that it did not come from the melting of domestic coins) had been legalized since 1663 (Shaw, 1896, p. 162). By the middle of the eighteenth century, London was already the chief gold importer from Portugal, given the strong trade relationship between England and Portugal (see Shillington and Wallis Chapman, 1908). Smuggling gold from Portugal was an ongoing business for British ships which called at Lisbon whenever the fleet from Brazil arrived (Gonçalves, 1950, p. 133). Precious metals were also smuggled from South America, through the West Indies, by British merchants, who at the same time handled the shipping of silver to the East Indies. London quickly became the world transhipper of gold and silver and, after 1815, the largest gold market in the world. This occurred not only because of the low freight charges that British ships could offer, but especially because London was becoming the best organized market, both in gold and in foreign exchange (dominated by specialized intermediaries: Christelow, 1947, pp. 19-20), and the City was becoming the commercial and financial centre of the world (see Chapman, 1977, 1979).
before they determine on the exportation or importation of other commodities. [Ricardo, 1951, p. 73]

The market of foreign bills of exchange depended on the conditions prevailing in the commodity trade and in the capital flow sector of the economy. The supply of foreign bills of exchange was regulated by domestic exports (commodities and capital inflows), while the demand for foreign bills of exchange on the domestic market was regulated by domestic imports (commodities and capital outflows).

The foreign exchange market in London from the end of the seventeenth century was a highly organized market, which was to become increasingly dominated by specialized intermediaries (brokers and dealers). Arbitraging among different foreign currencies and gold prices in the international markets of the world, exploiting discrepancies in the price of bills, the price of gold and the rate of discount, was the business of a specialized class of economic agents who found in London the chief market place for their transactions. They could supply foreign bills of exchange, when the demand was high, by undertaking the risk of exporting gold, or they could buy bills of exchange to import gold as soon as the rate of exchange made this trade profitable.

According to Blake, the merchants in the bullion trade [are] remarkable for their shrewdness and the small profits upon which they transact their business; and as soon as the profit on a foreign Bill exceeds, by a very small amount, the expenses of the transit of bullion, the certainty of the profit compensates in some degree for its smallness, and the opportunity, when it occurs, is seldom neglected. [Blake, 1810, p. 23]

After the Napoleonic wars, the bill on London had become the chief means of remittance in international transactions. Bills on London were quoted in every foreign exchange market, while relatively fewer currencies were quoted in the London Royal Exchange. This in turn had an impact on the way in which international gold transactions were carried out.

II. INTERNATIONAL GOLD TRANSACTIONS OPTIONS

The conditions under which it is profitable to export or import gold can be looked at from different viewpoints. We start by looking at the profitability of importing gold in the domestic market, say, from the point of view of a merchant in London. There are two ways to carry out this particular transaction.

A The merchant in London buys a foreign bill of exchange, sends it to his correspondent abroad and asks him to ship gold to London.

B The London merchant's correspondent abroad sells a bill drawn upon the London merchant, then buys gold in the foreign market and ships it to London.

The profitability conditions for A and B require that (1) and (2) respectively hold, where the left-hand sides describe the cost and the right-hand sides describe the revenue from the transaction for each pound initially spent, when one looks at the matter from the point of view of the London merchant's account:

\[ 1 + i_{(A)} < \frac{E_a}{p_b^2(1 + r_0)} \]

where

\[ r_0 = \text{cost of shipping gold (brokerage, insurance, commission and freight) as a percentage of the price} \]

\[ E_a = \text{price of a 'sight bill' in the domestic foreign exchange market; i.e. units of foreign currency for 1 unit of domestic currency} \]

\[ E_a^2 = \text{price of a 'sight bill' in the foreign exchange market abroad} \]

\[ p_b = \text{price of gold bullion in the foreign market (per ounce)} \]

\[ p_b^2 = \text{price of gold bullion in the domestic market (per ounce)} \]

\[ t_{(A)} = \text{time interval between the purchase of the foreign bill and the sale of the gold imported} \]

\[ t_{(B)} = \text{time interval between the payment of the bill and the sale of the gold imported} \]

\[ i = \text{rate of interest for t days in the domestic money market} \]

In (1) we assume that the London merchant buys a sight bill on the foreign country from which gold is imported, at a cost of £1. The loss of interest during the interval, \( t_{(A)} \), from the time when the bill is purchased and mailed until the gold is bought, shipped and sold, as measured by the domestic market rate \( (i) \), must therefore be added to the cost of purchasing the bill. If \( E_a^2 \) is the amount of foreign currency that can be bought with one unit of domestic currency, then \( E_a^2 / \left( p_b^2 (1 + r_0) \right) \) is the amount of gold that the correspondent will buy and ship to the London merchant.

In (2), the correspondent abroad sells a sight bill on London, say, for £1. Gold must be sold in London before the bill comes due. But if either the delivery or the sale of gold is delayed, there will be a loss of interest from the day the bill comes due to the day the revenue from the sale of gold becomes available. The loss of interest is given by \( i_{(B)} \).

It is clear that \( t_{(A)} < t_{(B)} \). Moreover, in (2) the only uncertainty concerns the domestic price of gold at the time of its delivery in the domestic market as \( E_a^2 \) and \( p_b^2 \) are observed variables, while uncertainty about \( p_b \) and \( p_b^2 \), which are both expected prices, is a feature of (1). It follows that, in principle, (2) is always preferred to (1). This is particularly true when the time interval required to complete the transaction, in an age well before the transport revolution, is very long.

There is then the question of whether a particular foreign currency is quoted in the domestic market. We know, for instance, that bills on Hamburg and on US cities were hardly quoted in the Royal Exchange until the second quarter of the nineteenth century, either because all the transactions related to the US market were carried on in pounds (Einzig, 1970, p. 173), or because the market for that pair of currencies was more developed abroad, as was the case with Hamburg. So, if we look at the profitability conditions for a merchant in the United States, it follows that only option A is viable. Likewise, if the transaction involved a London merchant with his foreign correspondent in the United States, then only option B is viable.

Generally speaking, it follows that, on the assumption that \( E_a = E_a^2 \), B will always be preferred to A because in B the opportunity cost of the
investment, measured by \( i \), is minimized, given that \( i_{(a)} < i_{(s)} \). Moreover the uncertainty about \( p^s \) is zero.

The assumption \( E_m = E_m^* \) may appear too strong. In fact, there were significant fluctuations of \( E_m^* \) both below and above \( E_m \), so that the difference between the rates of exchange at a certain point in time could offset the greater cost of \( A \).\(^{10}\) Given, however, that \( E_m \) and \( E_m^* \) could not be known simultaneously, random discrepancies between \( E_m \) and \( E_m^* \) did not play a crucial role in the choice between \( A \) and \( B \).

We turn now to the question of the profitability of exporting gold from the domestic market, again from the point of view of a merchant in London. Once again, there are two ways to carry out this transaction:

C The London merchant buys gold on the domestic market. This gold is shipped to his correspondent abroad who will sell it in the foreign market and remit a bill on London to him.

D The London merchant sells a bill of exchange denominated in foreign currency, drawn by him on his foreign correspondent, and ships gold to the foreign market.

Transactions C and D are profitable if (3) and (4) hold, respectively, where the left-hand sides are the costs and the right-hand sides the revenues involved in transactions C and D, respectively, for each unit of foreign currency:

\[
(3) \quad p_m(1 + r)(1 + i_{(c)}) - \frac{1}{E_m^*}
\]

\[
(4) \quad p_m(1 + r)(1 + i_{(d)}) - \frac{1}{E_m^*}
\]

where

\( i^* = \) rate of interest for \( t \) days in the foreign money market

\( i_{(c)} = \) time interval from the time gold is purchased and shipped abroad until the time when the bill remitted comes due

\( i_{(d)} = \) time interval between the payment of the bill and the sale of gold in the foreign market

While the domestic price of gold, \( p_m \), is an observed variable, \( p_m^* \) and \( E_m^* \) are expected prices. Sudden changes in \( p_m^* \) could turn a profitable gold export into a loss.\(^{11}\)

In (3), the loss of interest for \( i_{(c)} \) days (i.e., the time necessary to complete the transaction) must be taken into account as a cost sustained by the London merchant and added to the shipping costs. It is measured by \( i_{(c)} \), i.e., by the rate of interest prevailing in the domestic money market.

In (4), \( 1/E_m \) is the revenue from the sale of a bill for one unit of foreign currency. The cost to the London merchant of buying and shipping gold to pay for the bill when it becomes due is given by

\[
(5) \quad p_m(1 + r)(1 + i_{(d)}) - \frac{1}{E_m^*}(1 + i_{(m)}).
\]

It is clear that \( i_{(c)} > i_{(d)} \). From (3) and (4) it follows that D is preferred to C if (5) holds:

\[
E_m(1 + i_{(d)}) < E_m^*(1 + i_{(c)}).
\]

In this case, it is impossible to decide whether C is more profitable than D even under the assumption \( E_m = E_m^* \), given that \( i^* = i \). But it is safe to say that uncertainty about \( E_m^* \) at the moment in time when gold is to be sold and a bill has to be remitted accounts for the preference given to D.\(^{11}\)

### III. The Gold Points

With respect to the early history of the Gold Standard, inequalities (1)-(4) qualify the proposition that gold movements will occur when the market rate of exchange hits the 'gold points'. Gold points are said to be reached when the deviations of the rate of exchange from parity (from below or above) are higher than the costs of shipping gold. The par of exchange between two currencies was defined as the ratio between the bullion content of the respective coins, or (which amounts to the same thing) as the ratio between their mint prices.

But as there was no institutional enforcement of the par of exchange—i.e., no central authority in charge of maintaining a fixed rate of exchange between two currencies—there was scope for a wide oscillation of the market rate of exchange around parity. Determining whether the 'premium' or 'discount' of a bill of exchange, at which they were usually quoted, was large enough to make bullion a cheaper remittance than buying foreign currency required a tiresome calculation.\(^{14}\) First, if two currencies were on different standards, as was often the case, the computation of the deviations of the market rate of exchange from par was complicated by the necessity of calculating the actual parity, i.e., of taking into account the change in the ratio of gold to silver with respect to their mint ratio in both markets. This was called the 'real exchange'. The real exchange of a Gold Standard currency with a Silver Standard currency obviously became more favourable to the former whenever gold appreciated in the foreign market. The real rate of exchange differed from parity as much as the market gold/silver ratio differed from the mint ratio. Second, the price of gold bullion itself was not fixed, even when it was adopted as standard of the currency.

The Gold Standard actually arose in England in 1717 when the gold/silver ratio in the market proved to be lower than the mint ratio, although it was formally introduced only one hundred years later. During these one hundred years another step was taken which favoured the Gold Standard, by instituting a new coinage and declaring that silver was legal tender up to £25 by tale, and beyond that by weight. In the 1816 Act, gold coin 'made according to the indenture of the Mint' was made 'the sole standard measure of value and legal tender for payment, without any limitation of amount' (56 Geo III c. 68), and silver coin was declared to be legal tender only up to 40 shillings.

In the meantime, from February 1797, the Bank of England had suspended cash payments and its notes were not to be payable at demand at a fixed gold price until May 1821, even if guineas continued to circulate at their face value.
until 1810. Hence, in the discussion of gold movements in the early history of the Gold Standard, two general cases have to be considered.

In the first case, the price of gold is bounded and can vary only within a very limited range. The price of gold was such that

\[ \rho_m - \varepsilon \leq \rho_0 \leq \rho_m + \eta \]

where

- \( \rho_m \) = official (mint) price of gold
- \( \varepsilon \) = Bank of England Commission or seignorage expenses. The loss of interest while waiting for the gold to be coined can also be considered as seignorage
- \( \eta \) = monetary compensation for the risk involved in melting domestic coins, which was against the law

This general form encompasses different institutional frameworks which marked the early history of the Gold Standard. These are reflected in the values taken on by \( \varepsilon \) and \( \eta \). The value of \( \varepsilon \) was never high in England where coinage at the Mint was free. Only in 1816 was a seignorage imposed on silver coinage in order to depress the price of silver bullion (Officer, 1983, p. 589).

As for \( \eta \), after 1797 guineas could not be obtained from the Bank. Therefore the monetary compensation for the risk had to be higher than before to induce people to search for guineas in order to melt them down. Obviously, \( \eta = 0 \) when gold in bar can be obtained from the Bank at the mint price.

The second case is given by

\[ \rho_m - \varepsilon \leq \frac{1}{m} + \frac{\eta}{m} \leq \frac{1}{m} \]

where

- \( m \) = actual bullion content of 1 unit of domestic currency

(7) is the general form to describe monetary regimes in which the price of gold varies over a wider range. In the case of inconvertible paper money, \( m = 0 \) and the price of gold is not bounded from above.

The distinction envisaged in (6) and (7) is more general than the distinction between convertible and inconvertible monetary regimes. In fact, monetary regimes described by (6) include the case where there was no seignorage (as long as there were guineas in circulation), and monetary regimes described by (7) include also the case of a pure metallic circulation (as long as it consisted of devalued coins). This distinction is therefore more suitable to describing institutional frameworks such as those prevalent in England from the middle of the eighteenth century to the first quarter of the nineteenth century.

Excluding times in which there were 'runs' on gold arising from widespread panic, the oscillations of the price of gold around the mint parity were chiefly determined by changes in the exchange rate. When the rate of exchange becomes so 'unfavourable'—for reasons that will be discussed later—that gold can be exported at a profit, the price of gold rises. But once an increase in the price of gold has taken place, the exchange can fall even further.

Under the assumption that the foreign country was on a silver standard and the domestic country was on a gold standard, the range of variations of the exchange rate below and above the 'real parity' can be written as

\[ \Delta \rho_{XP} = -(\tau_0 + \delta_{(\rho)}) + (\Delta \rho_{M} - \Delta \rho_0) \]
\[ \Delta \rho_{MP} = (\tau_0 + \delta_{(\rho)}) + (\Delta \rho_{E} - \Delta \rho_0) \]

where

- \( \Delta \rho_{XP} \) = maximum depreciation of the exchange rate relatively to the 'real parity'
- \( \Delta \rho_{MP} \) = maximum appreciation of the exchange rate relatively to the 'real parity'
- \( \Delta \rho_{M} \) = percentage variation of the foreign price of silver relative to its mint price
- \( \Delta \rho_0 \) = percentage variation of the domestic price of gold relative to the mint price

These are simply the 'export and import points' which bound the profitability conditions of gold movements. To explain what makes the exchange rate reach the gold points, a theory of the exchange rate is required.

IV. STOPPING RULES FOR GOLD MOVEMENTS

In order to explain why the exchange rate has become so low or so high as to make gold the most preferred traded commodity, a comparison has to be made between the profit in the bullion trade and the profit in any other commodity trade; in what follows we analyse only the case of gold exports, as the case of gold imports is perfectly symmetrical.

Let us define the following, under the assumption that there are \( n \) traded goods:

- \( \rho_i \) = domestic price of commodity \( i \)
- \( \rho^*_j \) = foreign price of commodity \( j \)
- \( t_i \) = time interval between the payment of the bill drawn against the shipping of the commodity \( i \) \( (i = 0, 1, \ldots, n) \) and the sale of the same commodity in the foreign market
- \( \tau \) = costs of shipping commodity \( i \) \( (i = 0, 1, \ldots, n) \) as brokerage, freight, insurance and commission calculated as percentage of the price.

The profitability condition of gold exports has been expressed by equation (4), which can be rewritten in a more familiar form as

\[ \rho^*_0 - E_{\rho_0}(1 + \tau_0)(1 + t_{\rho_0}) > 0 \]

where \( t_{\rho_0} = \tau_{\rho_0} \).

We postulated that whenever (9) holds there are economic agents who are ready to export gold. But in order to explain why the excess demand for foreign bills of exchange in the domestic market (which is responsible for the fall in the exchange rate) is matched by bills drawn against the shipping of gold and not of any other commodity, a further condition is required. This is that there be no other commodity more profitable to export. It is expressed
by equation (10):
\[ \frac{p_e}{p^*_0} (1 + \tau_0) (1 + f^*_0) \leq \frac{p_i}{p^*_0} (1 + \tau_i) (1 + f^*_i) \]
where \( i = 1, 2, \ldots, n \).

From inspection of (10), there can be only five possible causes that explain why, from a situation of zero gold movements, gold is exported:

I. Increase in the shipping costs \( \tau_i (i = 0, 1, \ldots, n) \): an increase in shipping costs affects bulky commodities more than gold, which has a high value/volume ratio.

II. Increase in the foreign price of bullion \( p^*_0 \): this may occur when a new parity has been fixed or a new coinage has been introduced in the foreign country.

III. Decrease in foreign prices \( p^*_i \rightarrow (i = 1, \ldots, n) \): gold prices are more ‘sticky’ than commodity prices.

IV. Increase in the prices of all commodities except gold in the domestic market \( p_i \rightarrow (i = 1, \ldots, n) \).

V. Increase in \( \tau_i \rightarrow (i = 1, \ldots, n) \): gold always has a market: it has superior marketability compared with most commodities, and therefore it has the lowest arbitrage cost.

While I and II can be said to be exceptional causes of the fall of the exchange rate in the domestic market and of gold outflows, III, IV, and V depict the chain of causes that describe the adjustment mechanisms of the classical Gold Standard. It is clear in fact that III and IV on one side, and V on the other, are the alternative explanations of the adjustment mechanisms of the Gold Standard as they are envisaged by the price-specie-flow theory and by the monetary approach, respectively.

The specie flow theory would argue that gold outflows are generated as a consequence of a change, for whatever cause, in the relative prices of traded commodities. If gold flows are the effect of prices of traded commodities in terms of gold being higher at home than abroad, the equilibrating mechanism of gold flows consists in restoring equilibrium by increasing foreign prices, \( p^*_i \), and lowering domestic prices \( p_i \). It follows that gold flows will stop if (10) no longer holds, i.e., when either \( p_i \) or \( p^*_i \) or both have changed.

On the contrary, a theory that assumes that prices of internationally traded commodities can never vary, relies on the explanation of gold outflows given by V, i.e., by the fact that gold has the lowest arbitrage cost. If there is an excess demand for foreign bills of exchange, it is gold that will be exported, thereby supplying the market in foreign bills of exchange, because it can be sold abroad more easily than any other commodity. It follows that gold outflows will come to an end only if the costs of arbitraging in any other commodity are no longer higher than the cost of arbitraging in gold, i.e., when (10) no longer holds.

From the evidence we have on the structure of payments in the British international trade during this period (imports were paid in cash or on a short-term basis, while British commodities were exported on long-term credit: Nishimura, 1971, p. 34), from what we know about the role of London mercantile houses and merchant banks in the network of international settlements (Davis, 1979, p. 61), and from the evidence of the credit pol icy of the Bank of England towards them (see Duffy, 1982), we can infer that the exchange rate was highly sensitive to the state of liquidity and that gold flows into and out from England in the early history of the Gold Standard might have occurred independently from changes in domestic prices relatively to foreign prices in terms of gold.

From what has been said, it can be concluded that (10) states the necessary condition for gold outflows, and therefore it states that gold outflows will come to an end only when changes in any of \( p^*_0, p_i, \tau_i, f^*_i \) have died out. But the adjustment mechanisms envisaged by both the specie flow and the monetary approach introduce a further condition for the attainment of equilibrium, i.e., the equalization of the purchasing power of gold over internationally traded commodities. This is a sufficient condition for the absence of gold outflows, which, when added, does not help to clarify the causes of gold movements. In fact, the equalization of gold prices of commodities is compatible with two theories of the adjustment mechanism of the Gold Standard, because, like any sufficient condition, it does not unequivocally point towards a unique cause. Our conclusion is that it is more useful to stick to the stopping rule given by (10) and to rely only on the equalization of the purchasing power of each currency in terms of gold at home and abroad, which does not impose a constraint on the description of the way in which the Gold Standard really worked.

V. Conclusions

While much attention has been given in the literature to the working of the Gold Standard from the later part of the nineteenth century, relatively less attention has been given to its rise in England during the eighteenth century.

The Gold Standard is usually said to have started in England in 1717, when the new mint ratio between gold and silver favoured gold and therefore silver disappeared from circulation (Jastram, 1977, pp. 12-13), or in 1821, when the Bank of England resumed at the old gold parity cash payments that had been suspended during the Napoleonic wars (Bordo and Schwartz, 1984). But it was the development of the City as the financial and commercial centre of the world, with its network of correspondents and its developed credit market, that provided the conditions for the rise of the Gold Standard as an integrated system.

In this paper we have modelled our analyses of the market behaviour behind gold movements on the London market, which from the beginning of the nineteenth century became the most important international market for commodities, financial assets and gold (see Chapman, 1984, pp. 6-26). Mercantile houses and merchant banks that engaged in the export and import of gold were ready to supply foreign bills of exchange, which the branch house or the correspondents were ready to honour, whenever gold turned out to be profitable merchandise to export (and vice versa for imports).

Looking at the market from the point of view of the individual merchant, we see that gold was traded against foreign currency, and the overall result was the enforcement of the law of one price in the case of gold, i.e., the price of gold in terms of each currency could never differ in the domestic and foreign markets. While there is evidence that merchants’ behaviour sustained the
purchasing power parity of gold in terms of currency, there is none to support the view that gold flows realized the purchasing power parity of gold in terms of traded commodities. Therefore we maintain that the former alone was the market mechanism on which the gold standard was based during the first decades of its history.

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NOTES

1. Evidence of John Humble before the Bullion Committee (British Parliamentary Papers, 1810, p. 146).

2. Evidence of Aaron Goldsmith before the Bullion Committee (British Parliamentary Papers, 1810, p. 38) and evidence of Isaac Goldsmith before the Lords Committee on the Resumption of Cash Payments (British Parliamentary Papers, 1810, p. 255).

3. See Evidence of Isaac Goldsmith before the Commons Committee on the Resumption of Cash Payments (British Parliamentary Papers, 1810, p. 205).

4. In the 1790s there were 17 rates of exchange quoted in the London Exchange (see Cope, 1983, pp. 33-4).

5. The loss of interest was a crucial element in the transaction. See a letter to N. M. Rothschild from M. M. Warburg & Co., merchant bankers in Hamburg, in 1810: 'We could have cheaper freight costs with a schooner, but if one considered the possibility of bad weather and contrary winds, you could receive the gold 8 days later, which represents a considerable loss of interest on such a large sum; we have therefore decided not to take freight costs into consideration, and to ship it by steam...' (quoted in Rosenbaum and Shoven, 1979, p. 27).

6. This is clearly explained by the British Consul in Lisbon in 1741, who complained of the captains of the British ships who, if they have not already got the sum which satisfies their advance, let the consequences be ever so ruinous to those merchants who have already put their money on board, and want to have it delivered in London to answer the bills drawn by a packet-boat that has sailed, they will still remain here two months longer... (in Boxer, 1969, p. 666).

7. There is no uncertainty about $p$ if the correspondent is instructed by the London merchant to buy gold only when the price is $p^*_L$. In this case the entire transaction may require an even larger interval to be completed. But the loss of interest from the time the bill is cashed until gold is bought is now measured by the difference—which can be positive or negative—between the domestic and the foreign rates of interest.

8. The evidence that option B was actually chosen by merchants in the Anglo-Portuguese bullion trade is provided by Fisher (1971, p. 97).

9. Evidence of Mr. -- ---, continental merchant, to the Bullion Committee (British Parliamentary Papers, 1810, p. 74).

10. It can be shown that

$$1 - h = \frac{E^*_L}{1 + h + c} = 1 - h + \min(c, f)$$

where

- $h$ = brokerage fee on the purchase and sale of a bill as a percentage of its price;
- $c$ = commission of the correspondent, as a percentage of the bills purchased or sold;
- $T$ = time necessary to complete the arbitrage.

We assume that the brokerage fees and the commissions are the same in the domestic and the foreign markets. When $E^*_L < E^*_F$, a merchant in London can make a profit by buying a bill of exchange denominated in the foreign currency and sending it to his correspondent abroad.

1987] PROFITABILITY IN THE INTERNATIONAL GOLD MARKET 379

The latter will buy a bill denominated in sterling and send it to the merchant in London. Likewise, a foreign merchant can make a profit by buying sterling at home and ordering his correspondent in London to change pounds into the currency of his own country. The arbitrage costs include, in addition to brokerage fees and commissions, the loss of interest for the time necessary to complete the transactions. When $E^*_L > E^*_F$, the arbitrage costs do not include any loss of interest. A merchant in either country can make a profit by drawing a bill on his correspondent who, in turn, will draw on him to pay for the bill when it comes due.

11. See the account of N. M. Rothschild of the successes and failures, according to the fluctuations in the price of gold in Russia, of his gold exports to Petersburg (evidence before the Commons Committee on the Resumption of Cash Payments, British Parliamentary Papers, 1819, p. 163).

12. But this was not the case if, for instance, the export of (foreign) gold was legal from one country—as in England and in France after 1755 (see Shaw, 1896, p. 13)—but illegal from the other, in which case it was more risky to export it. This was the case for Portugal.

13. See Evidence of C. Lyne before the Bullion Committee (British Parliamentary Papers, 1810, p. 61). See also Cole (1929, p. 396).

14. Gold points have often been misinterpreted, because no attempt was made to calculate the total costs of shipping gold. Even a recent attempt by Clark (1984) has not been entirely satisfactory, as pointed out in Officers (1982).

15. See evidence of A. Goldsmith before the Bullion Committee (British Parliamentary Papers, 1810, p. 35) and evidence of N. M. Rothschild before the Commons Committee on the Resumption of Cash Payments (British Parliamentary Papers, 1810, p. 163).

16. See evidence of A. Goldsmith before the Bullion Committee (British Parliamentary Papers, 1810, p. 55).

17. McCloskey and Zucker (1984, p. 126): "That in one respect [namely, purchasing power parity] the models [the price-specie flow mechanism and the monetary approach, sub-species purchasing power parity] happen to the same outcome in the long run should not be allowed to obscure that the two exhibit radically different behaviour in most other things."

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