Uses and Abuses of Gresham's Law in the History of Money

Robert Mundell
Columbia university

August 1998

Paper prepared for publication in the *Zagreb Journal of Economics*, Volume 2, No. 2, 1998.

Introduction

The economist H. D. Macleod, writing in 1858, first brought attention to the law that he named after Sir Thomas Gresham:

> No sooner had Queen Elizabeth ascended the throne, than she turned her attention to the state of the currency, being moved thereto by the illustrious Gresham, who has the great merit of being as far as we can discover, the first who discerned the great fundamental law of the currency, that good and bad money cannot circulate together. The fact had been repeatedly observed before, as we have seen, but no one, that we are aware, had discovered the necessary relation between the facts, before Sir Thomas Gresham.

This passage errs in two points: Gresham was not the first to make explicit the idea we now know as "Gresham's Law," and the assertion that "good and bad money cannot circulate together" is a glaring error. It is a far cry from Gresham's Law. That Macleod was careless about his statement of the law he named after Gresham serves as a warning that the ideas involved are more subtle than at first appears.

1. Early Expressions .

We can begin this discussion of Gresham's law by outlining some of the highlights of its history. Twenty centuries before Sir Thomas Gresham was born, the elegaic poet, Theognis, born in Megara near Athens, writing in the late 6th and early 5th century BC, wrote some lines suggesting Gresham's Law. Theognis has been described as "an eloquent and strongly biased witness of the struggle of the old aristocracy, for its traditional ideas and ideals which were partly adopted and partly destroyed by the rising lower classes.[(1)] In a book called *Maxims* written for his beloved Cyrnus, he informs us that "alloyed gold and silver is easily detected by a shrewd man."[(2)] More to the point is an earlier comment: "Nor will anyone take in exchange worse when better is to be had."[(3)]

From Theognis, we turn nearly a century later to Aristophanes (450-385 BC). In *The Frogs* he wrote: "the full-bodied coins that are the pride of Athens are never used while the mean brass coins pass hand to hand."[(4)] The idea must have been widely known because the illustrious playwright was able to assume that his audience was aware that the law applied also to politicians (bad politicians drive out good!). It was hardly a novel idea at that time.[(5)]

What was the condition of the Athenian monetary system that led Aristophanes to this insight? *The Frogs* was written in 405 BC, in the closing years of the Peloponnesian Wars. From 413 BC onwards, the Spartans had occupied Decelea[(6)] north of Athens and cut off the supply of silver from the Laurium mines. In 407 BC, confronted with a dire threat to the Athenian fleet and an empty treasury, the Athenians had recourse to melting the gold in some of the statues in the Acropolis to make emergency coins. Eight statues of Nike,[(7)] the god of Victory, on the Acropolis had been clad with two talents of gold each, to be removed in case of emergency. The gold was thus struck into coin.[(8)] (One statue survived and the tools used to produce the coins were subsequently dedicated in the Treasury to Athena.) In the next year, copper coins were issued on the credit of the

state as replacement for silver coinage, and it "is a modern inference that the emergency coinage was of copper plated by silver."[(9)]

Aristophanes' anticipation of Gresham's law in *The Frogs* was by no means his only reference to monetary matters. A new use of small coins gave Aristophanes an occasion to raise a laugh: "It was customary to hold them in the mouth for safe-keeping, and in *The Wasps* (lines 790-1) Philocleon pops fish scales into his mouth, thinking they are coins. When he goes home with his jury pay under his tongue, his daughter (lines 608-9) manages to get it away from him in a welcoming kiss! Uelpides (*The Birds,* 503) swallows an obol by mistake."[(10)] In *The Peace*, Aristophanes has the maker of sickles say that the advent of the brief peace in 421 BC had made the price of sickles soar, while the maker of helmet crests complains that the peace has ruined him.[(11)] In another instance, he makes fun of the Athenian "Coinage Decree" which attempted to establish the Attic standard on all its allied cities.[(12)]

There seemed to be recognition of the principle underlying Gresham's Law during the Middle Ages. It was explicitly developed in Oresme's *De Moneta.* Written in the middle of the 14th century, this was the most important work on the theory of money before Bodin's and Grimaudet's writings in the 1570s. Nicholas Oresme (1320-1382) was the Norman Bishop of Lisieux who made contributions to theology, mathematics and astronomy besides his work on money. His *De Moneta* laid stress on the rights of the public with respect to currency and the great evils associated with debasement and devaluation, a courageous performance in view of the fact that it was written during the reign of John the Good (1350-1364) who devalued eighty-six[(13)] times! Oresme had a clear statement of what we call Gresham's Law. There is sufficient proof, however, that the idea was fairly well-known in the 14th century; its essence appeared in petitions addressed to the parliaments of Edward III and Richard II.

In the Renaissance, John Hales (d. 1571) is probably the first writer to elaborate on the proposition, assuming he was the author of *A discourse on the Common Weal of this Realm of England.* This rich work contains the following explicit statement of Gresham's Law::

"Was there not made proclamations that the olde coyne, specially of golde, should not be current here above such a price: was not that the rediest way to dryve away our golde from us. Everything will go where it is most esteemed, and therefore our treasure went over in heapes."[(14)]

At long last we arrive at Gresham! Thomas Gresham[(15)] was born in London in 1519 and lived through the reigns of four monarchs (not counting Queen Jane) until 1579. He was the second son of Richard Gresham, who already had an important business and banking house in Milk Street and had the distinction of being Lord Mayor of London in 1537. Thomas was educated at Gonville Hall, Cambridge, apprenticed to his uncle Sir John Gresham, also a merchant, and admitted to membership in the Mercers' company in 1543. Upon his father's death, he inherited the business and transferred the bank to Lombard Street, then the heart of London's business world. His immense ability was apparent early and in 1551 or 1552 he became royal agent or king's factor at Antwerp,[(16)] which he retained with few intervals under Edward the Saint, Bloody Mary and the Virgin Queen

until 1574. His initial task was to raise large sums of money for the king, and to maintain a rate of exchange favorable to English currency, keeping watch on the money market and pledging his own credit when it was necessary. The information he provided to England about market conditions was invaluable and upon the ascension of the fiercely Catholic Mary he proved indispensable despite his Protestant convictions.

On Mary's death, Gresham advised Elizabeth on how to restore the base money, to contract as little foreign debt as possible, and to keep up her credit especially with English merchants. He later taught her how to make use of these merchants when political troubles in the Netherlands curtailed her foreign resources; at his suggestion, the Merchant Adventurers and Staplers were forced by detention of their fleets to advance money to the state; but as they obtained interest at 12 percent instead of the legal maximum of 10 percent, and the interest no longer went abroad, the transaction proved advantageous to all parties and increased Gresham's favour. In 1559 he was sent as ambassador to the Duchess of Parma, who was regent of the Netherlands and it was on that occasion that he was knighted.

Gresham had the wide interests fitting to "the greatest merchant in London." He was a banker and goldsmith, with a shop in Lombard Street, as well as a mercer; but he was a considerable country gentleman besides, with estates, chiefly in Norfolk, where his father had considerable property. He also had several country houses besides his house in Bishopsgate which he built and bequeathed to London as Gresham College.[(17)] He twice entertained Queen Elizabeth as his guest.[(18)]

2. Faulty Renderings

Gresham's Law has been frequently misinterpreted even by high authorities. In an article in the authoritative *Palgrave's Dictionary of Political Economy*, Harris (1927) starts off well but ends with a bad mistake:

> [Gresham's Law] denotes that well-ascertained principle of currency which is forcibly though not quite adequately expressed in the dictum--"bad money drives out good." It has also not infrequently been explained by the statement that where two media of exchange come into circulation together, the more valuable will tend to disappear. The principle in its broadest form may be stated as follows: --Where by legal enactment a government assigns the same nominal value to two or more forms of circulatory medium whose intrinsic values differ, payment will always, as far as possible, be made in that medium of which the cost of production is least, and the more valuable medium will tend to disappear from circulation; in the case where the combined amount in circulation is not sufficient to satisfy the demand for currency, the more valuable medium will simply run to a premium."

Leaving aside the confusion between "intrinsic value" and "cost of production," the main error here is the view that where both currencies are needed to circulate, "the more valuable will simply run to a premium." This is merely a variant of Macleod's mistake that "good and bad money cannot circulate together."

In his *History of Economic Analysis*, Schumpeter made two rather derogatory assertions about the 'law.' The first is that "The so-called 'law' can be found in many earlier

writings." The second--and this is an odd statement--is that it does not matter: "Considering its trivial nature, the question of priority is, however, without interest."

Schumpeter's comment points up a paradox: the law is trivially easy to understand, but then why does everybody get it wrong?

It must be conceded that one aspect of Gresham's Law seems trivial. People are motivated by the law of economy:[(19)] "Choose the most useful among goods with the same cost; and its "dual," choose the cheapest from among goods that give the same benefit." The application to money is straightforward: of two types of payment, pay with that which involves the least sacrifice. If one type of money is "good" and the other "bad," pay with the bad and keep the good.

There is no end to illustrations of this aspect of the principle. To make a payment of, say, $100, you might choose from among any valid combination of denominations of 100s, 50s, 20s, and so on not excluding coinage. Portfolio preferences--no pun intended--would determine which notes and coins you want to keep rather than spend. A key element in the law is that all payments must be acceptable to the seller as payment, either by force of law or convenience. Coins, for example, might not be legal tender beyond a certain limit, but might nevertheless be acceptable to the buyer. On the other hand, a buyer might prefer to retain coins needed, say, for parking meters, telephones or laundromats.

Every thinking individual makes such choices all the time as a matter of course. The idea has virtually ubiquitous applications. In the economics of charity, a donor will choose the cheapest from among potential gifts that yield the same utility to the donee. The theorem has a dual. It is that from among gifts costing the same, the donor will choose that which will produce the most utility to the donee. All these ideas are straightforward applications of the theory of rational behavior.

It is in the sense that the motivation behind Gresham's law is the theory of rational behavior that makes Schumpeter think the law is "trivial." But another word is "fundamental!" Leaving aside the choice of words, the law of economy even in its application to payments is not Gresham's Law. Gresham's Law is a theorem about the composition of money in an economy, not a theory of motivation. Schumpeter's error is in mixing up the motivating principle of microeconomics with one of its macroeconomic consequences.

3. Good Money Drives Out Bad?

The usual expression of the law, "bad money drives out good" is a mistake. Schumpeter refers to this common definition as "not quite correct."[(20)] But as the statement stands, it is not just "not quite correct;" it is quite false. The opposite is true!

Standing by itself, the general statement, "good money drives out bad," is the more correct empirical proposition. Historically, it has been good, strong currencies that have driven out bad, weak currencies. Over the span of several millennia, strong currencies

have dominated and driven out weak in international competition. The Persian daric, the Greek tetradrachma, the Macedonian stater, and the Roman denarius did not become dominant currencies of the ancient world because they were "bad" or "weak." The florins, ducats and sequins of the Italian city-states did not become the "dollars of the Middle Ages" because they were bad coins; they were among the best coins ever made. The pound sterling in the 19th century and the dollar in the 20th century did not become the dominant currencies of their time because they were weak. Consistency, stability and high quality have been the attributes of great currencies that have won the competition for use as international money.

The same proposition holds with respect to the use of materials for international money. The precious metals won out over other substances not because they were "cheap" or "bad" but because they were more efficient than other instruments in fulfilling the required functions of money. Among the precious metals, gold drove out others not because gold was bad but because it was more efficient from the standpoint of effecting transactions at the least cost. The dollar became the dominant international money in a world of paper currencies not because it was "bad" but because, among the alternatives, it best satisfied the characteristics of an international money.

If Gresham's Law could be rendered coherently as "bad money drives out good" it would have no claim to our attention as a serious proposition of economics. On the contrary, it is a completely false generalization, and an invalid rendering of Gresham's Law.

4. Cheap Drives Out Dear If They Exchange for the Same Price

A more correct (but not perfect!) rendering of Gresham's Law is that "Bad money drives out good *if they exchange for the same price.*" If, for example, both monies are legal tender, and thus equally capable of paying a debt or making a purchase, the 'bad" money will drive out the "good" money.

It is further necessary, of course, to define the sense in which one money is "bad" and the other "good." The sense in which it is relevant to Gresham's Law is that "good" money has one or more alternative uses that do not apply to the "bad" money. The essential condition for Gresham's Law to operate is that there must be two (or more) kinds of money which are of equivalent value for some purposes and of different value for others.[(21)]

The most typical instance leading to the generalization was the circulation of a particular type of coin, say a silver drachma, in different conditions. Say one is new and the other, badly worn. If both coins are legal tender at their face value, they are equivalent from the standpoint of effecting an internal payment. But they have different values if they were melted down for their commodity values, and in international exchanges where the coins will be valued only (or mainly) for their silver contents. In short, in their roles as internal means of payment, they are equal in value, but otherwise the new coin is worth more than the old.

The fact that the two coins have different external values does not mean that they cannot circulate side by side in a state of equilibrium. As long as the worn coins are insufficient to satisfy the total demand for money, old and new coins can and will circulate together without any premium on the good coins being required or possible.

For Gresham's Law to be activated, there must be a disequilibrium situation. Suppose the demand for money falls. This means that the supply of coins in circulation must fall to an equal extent. Which coins will disappear? Certainly not the worn coins that have a low opportunity cost as metal or sales value abroad. The best coins will disappear abroad or be hoarded, and the average quality of the coinage will deteriorate. The opposite would happen if the demand for money increased: the good coins would be dishoarded or imported and the average quality of the coinage would improve.

Under ordinary circumstances, the old and new coins can circulate side by side as long as the balance of payments is in equilibrium. But should the occasion arise that the country develops a deficit, the difference between the coins will be apparent: the worn coins will have only their value as money at home but the new coins will have their value abroad without discount and will therefore be used to settle the deficit. Automatic forces would thus restore equilibrium. But if the deficit is perpetuated by sterilization operations or otherwise, the good coins will eventually disappear and the coinage will be increasingly composed of "bad" coins, leading eventually to depreciation and inflation.

The tendency for good coins to disappear would become pronounced if the government introduced debased or lightweight coins. The "cheap" money would drive out the dear money. As we shall see later, this is exactly what happened when Athens introduced debased coins during the Peloponnesian War. As Aristophanes noted, all the best coins of Athens were anywhere but Athens!

Gresham's Law does not, of course, apply only in an international economy. The same process would take place in an isolated economy, closed to the rest of the world. Suppose again there are new and worn drachmas in a closed economy, and that the demand for money falls. Which coins will be "exported" to the non-monetary sector? Of course the new coins. The old coins would be weighed and discounted for use in industry and jewelry or hoarded for future purposes.

Coins depreciate with wear and tear, clipping and counterfeiting. New coins are also periodically introduced. At any given time, the money supply is composed of new and worn, clipped and full-bodied coins, all of which, however, may be accepted at face value. In some situations coins separated in age by hundreds of years may circulate side by side. In vast numbers of hoards of coins found over the centuries issued in ancient Rome, coins from the Republic are included in the same hoards as those in the reign of Diocletian, a span of over three centuries. The coins are homogeneous with respect to their legal tender value at home but very heterogeneous as far as their metallic and international values are concerned.

It should be apparent from the foregoing that, contrary to MacLeod's statement, good and bad money can and do circulate side by side. As long as the "bad" money is insufficient to fulfil the total money demand, some of the "good" money will have to remain behind to help. In the same way we see machinery of different ages and people of different abilities working side by side often with the same salaries. Nor is it true, as *Palgrave's Dictionary* asserts, that the "good" money will command a premium.[(22)] No premium can or will be paid.

It is important to realize that the introduction of an overvalued coinage does not necessarily cause depreciation or inflation. The overvalued coinage will displace some of the high quality coins but as long as some of the latter remain in circulation, it will not change the total supply of money. The quality of the money supply is changed, but not the quantity. Depreciation and inflation set in, subject to a minor qualification,[(23)] only after the fully-valued coins have disappeared. The same holds for an issue of paper money. The new paper money will drive out an equivalent value of coins. But it will be the best coins that disappear first, and the average quality remaining will be lower.

The correct expression of Gresham's Law law is: "cheap money drives out dear, if they exchange for the same price." That proposition is neither trivial nor obvious.

5. The Replacement of Gold by Credit and Paper Money

Several propositions that imply or are the companions of Gresham's Law were widely known and used correctly by economists long before the law acquired its name. One of those propositions relate to the relation between paper money or credit and the precious metals. David Hume, writing in 1752, went to great pains to demonstrate that the existence of paper credit would mean a correspondingly lower quantity of gold, and that an increase in paper credit would drive out an equal quantity of gold.

Starting off which what he assumes to be the current condition in Great Britain, he writes:

"Suppose that there are 12 millions of paper, which circulate in the kingdom as money. . .and suppose the real cash of the kingdom to be 18 millions: here is a state which is found by experience to be able to hold a stock [of money] of 30 millions. I say, if it be able to hold it, it must of necessity have acquired it in gold and silver, had we not obstructed the entrance of these metals by this new invention of paper. *Whence would it have acquired that sum?* From all the kingdoms of the world. *But why?* Because, if you remove these 12 millions, money in this state is below its level, compared with our neighbours; and we must immediately draw from all of them, till we be full and saturate, so to speak, and can hold no more. By our present politics, we are as careful to stuff the nation with this fine commodity of bank-bills and chequer notes, as if we were afraid of being overburthened with the precious metals."[(24)]

Hume goes on to explain why some countries have more gold--in proportion to population and wealth--than others; it is because there is no credit to displace gold:

"It is not to be doubted, but the great plenty of bullion in France is in a great measure, owing to the want of paper credit. The French have no banks; merchant bills do not there circulate as with us; and usury, or lending on interest, is not directly permitted; so that many have large sums in their coffers: great quantities of plate are used in private houses; and all the churches are full of it. . .What a pity Lycurgus did not think

of paper-credit, when he wanted to banish gold and silver from Sparta! It would have served his purpose better than the lumps of iron he made use of as money; and would also have prevented more effectually all commerce with strangers, as being of so much less real and intrinsic value."[(25)]

Adam Smith would develop the same idea in *The Wealth of Nations* with the use of paper money and applaud its use in the nation:

"The substitution of paper in the room of gold and silver money, replaces a very expensive instrument of commerce with one much less costly, and sometimes equally convenient. Circulation comes to be carried on by a new wheel, which it costs less both to erect and to maintain than the old one. . ."[(26)]

Gresham's Law can also be seen in its application to paper money and gold in recent centuries. Suppose the unit of account in a country (Britain) is the pound, and that its money initially consists entirely of gold sovereigns (valued at one pound). Suppose now the government introduces into circulation a legal-tender paper currency denominated in pounds to pay for, say, £1 million of its expenses. The addition to the money supply will create an excess supply of money, raising expenditure above income, and generating a balance-of-payments deficit that will have to be settled with gold sovereigns--given that the paper pounds are not acceptable abroad. Provided the national demand for money is unchanged, the £1 million of paper money will exactly displace 1 million gold sovereigns. The "bad" money in this case is the paper money because, unlike the "good" sovereigns, it cannot be used for making international payments.

Gresham's Law has other applications. We have considered Hume's and Smith's examples of credit or paper money driving out specie. But the same analysis applies to debased or light-weight coins driving out full-bodied coins. Examples abound in the ancient literature of the consequences of coinage debasement. From the very beginning of coinage, generally assumed, on the authority of Herodotus, to originate with 7th century Lydia, coinage was overvalued. The earliest coins were made of electrum, a natural alloy of about 70 percent gold and 30 percent silver. But hoards of the earliest coins found in the Temple of Artemis at Ephesus in 1904 contained "artificial" electrum coins with much lower gold contents. The weights of the stater coins (or its fractions) were uniform but the gold contents were as low as 30 percent. The Lydians and Greeks had not only learned how to use ancient Egyptian techniques of metallurgy, but also how to overvalue coins by using less of the more expensive metal and exploit the monetary prerogative as a fiscal device.

6. The Theory of the Breaking Point

The ancients recognized the attraction and succumbed to the fiscal temptations of replacing 'intrinsic' money with overvalued currency. But they did not know when to stop. How far could the precious metals be replaced without running the risk of inconvertibility, depreciation and inflation? What is the relation between the seigniorage benefit and the money supply or GDP?

John Stuart Mill had studied carefully the works of Hume and Smith and gave the following answer:

"Suppose that, in a country of which the currency is wholly metallic, a paper currency is suddenly issued, to the amount of half the metallic circulation. . .[There] will be nothing changed except that a paper currency has been substituted for half the metallic currency which existed before. Suppose, now, a second emission of paper; the same series of effects will be renewed; and son on, until the whole of the metallic money has disappeared. . .

Up to this point, the effects of a paper currency are substantially the same, whether it is convertible into specie or not. It is when the metals have been completely superseded and driven from circulation, that the difference between convertible and inconvertible paper becomes operative. When the gold or silver has all gone from circulation, and an equal quantity of paper has taken its place, suppose that a still further issue is superadded. . .The issuers may add to it indefinitely, lowering its value and raising prices in proportion; they may, in other words, depreciate the currency without limit."[(27)]

Mill concludes that:

"The substitution of paper for metallic currency is a national gain: any further increase of paper beyond this is a form of robbery."[(28)]

According to Mill, the "breaking point" at which the benign process of replacing 'intrinsic' currency for paper or overvalued coin is reached when the "cheap" or "bad" money has driven out all the "dear" or "good" money. To put the point arithmetically, suppose M is the total demand for money at existing prices and incomes. The money can be in either of two forms, gold or foreign exchange, R, or domestic paper money, D. Then M = R + D. If, with Mill, we start off with a purely metallic circulation, then D = 0 and R = M. Now suppose D is increased by half of M. Then R will be lowered by an equal amount. The process of substitution reaches its theoretical end point when R = 0 and D = M. After this point a further increase in D will increase M and lead to inflation along the lines of the quantity theory of money.

In practice, however, the limit is reached long before. As the public sees the process going on, it starts to anticipate the direction in which the government is proceeding and will sooner rather than later start to hoard the good money. The possibility of speculation therefore sharply reduces the extent to which the "good" money can be replaced. In the arithmetic example, we may suppose that confidence requires that a fraction, say , of the money supply is kept in the form of gold or foreign exchange. Then R = M, so that M = R+ D = M + D, and so D/M = 1-, which sets the feasible and safe limit of the substitution. If for example, equals one-third, the limit of the substitution would be two-thirds of the money supply. To translate this into a relation to GDP, we can assume that the money supply must be in equilibrium proportionate to money income, Y, so that M = kY, where k is the desired ratio of money to GDP. It follows that D/Y = (1 -)k. Further qualifications are needed to take account of banking systems.[(29)]

The opportunity for currency overvaluation and the exploitation of the monetary system as a fiscal device is not open to all countries. A sine qua non is the power to monopolize the coinage and to mandate its use as legal tender, two characteristics that require a strong central state. However, as already noted, the ancients were not very aware of the limits to the policy. A good example is Dionysius of Syracuse, who may have been influenced by Plato.

Syracuse was a Greek colony founded in 734 BC--in legend by Archias, from Corinth. After its government proceeded through the usual phases of feudal oligarchy, and monarchy, it succumbed, during the later stages of the Peloponnesian War, to a tyranny in the wake of invasions first by the Athenians and then Carthage. The new leader was Dionysius I, who ruled from 405 to 367 BC, "the strongest and longest tyranny of any recorded by history," says Diodorus.[(30)] What interest us is his coinage policy and his relationship with Plato, the philosopher who championed overvaluation and exchange control in his ideal Republic.[(31)]

In 388 or 387 BC Plato made the first of his three visits to Syracuse. Whether the idea derived from Plato, or from frequent earlier trials with overvalued money in the Greek states, Dionysius issued tin coins around this time overvalued four times.[(32)] The idea would be consistent with Plato--at least the later Plato--who held in *The Laws* that domestic money should be non-exportable, restricted in supply, and exchangeable with "Hellenic" money at what amounts to an exchange control authority. Dionysius' first issue must have been accepted because he tried it again, on the second occasion by overvaluing silver coins twice. Nevertheless, although he compelled these coins to be accepted under penalty of death,[(33)] the penalty was insufficient to keep these coins in circulation at their nominal value and they soon fell to their commodity value. Whether the story told by Plutarch, that Dionysius got rid of Plato by sending him to the slave market at Corinth, where several philosophers were present by a happy chance so they could buy his freedom, is true or not, Plato's intervention into the practical game of power politics proved to be a dismal failure.[(34)]

7. Richard's Ransom

About fifteen centuries later, in AD 1192, King Richard "Coeur-de-Lion," returning from the third Crusade, was shipwrecked on the Dalmatian Coast, taken prisoner by the Duke of Austria, and handed over to his liege-lord, Henry Hauhenstaufen, the German--or Holy Roman--Emperor. His ransom was 100,000 marks, or two-thirds that number of pounds. The sum was almost exactly that which Richard had inherited on the death of his father, Henry (Plantagenet) II, in 1189. Richard had exhausted this legacy and much more in financing his expedition to the Holy Land. The ransom was about the same as one year's government revenue from England and Normandy. How did Richard's mother, Eleanor of Aquitaine, go about raising the money for the ransom?

Queen Eleanor might have contemplated using the monetary system to collect the ransom, collecting the current silver coins (which qualified as ransom money) with overvalued billon coins. The latter would have served perfectly well as a medium of exchange and the capital levy and punitive taxes could have been avoided, all parties being made better off. At the time of Richard, the English monetary system was composed of gold coins issued by the Basileus (God-Emperor) at Constantinople, called bezants or byzants, solidi, nomisma or aurei; a silver coinage of pennies, exactly one-twelfth the value of the Byzantine sicilicus; and a base coinage of local circulation, issued by the nobles and ecclesiastics. The system of accounting, which, through the

Carolingian and Roman system, goes back to ancient Persia,[35] was 1 pound sterling = 20 shillings = 240 pence = 960 farthings = 5760 mites.[36]

Would there have been enough gold or silver in Richard's empire to pay the ransom? We can try some guesses. In 1194, Richard's territories and fiefdoms comprised not just England, but Normandy, Aquitaine, Poitou, Brittany, Maine, Tourraine and Anjou. The population of this huge empire cannot have been less, or much less, than five million. If we assume that the per capita money supply was 1 shilling, the total sum of money in the empire would have been £250,000 sterling (375,000 marks). If the money supply was a fifth of GDP, the empire GDP would be £1,250,000, with per capita GDP of 5 shillings. The ransom would have been not much more than 5 percent of GDP and 27 percent of the empire's money supply. To be on the safe side, we should probably assume that not more than half the money supply was composed of gold and silver coins, and about half of this would have to be replaced or confiscated..

What was a shilling, or a pound, worth? We can start by considering its silver and gold content. At the time of King Richard (1189-1199) the Tower or Saxon pound was 240 pennies of 22.5 grains each, so the pound (in the sense of the sum of 240 pennies because no "pounds" were minted) weighed 5,400 grains. The silver pennies were 11/12 fine so each penny contained 20.625, and the pound, twelve times that or 4,950 grains of fine silver. Gold was twelve times more expensive than silver so a pound was equivalent to 408.3 grains or 26.5 grams of gold, a little less than an ounce. Richard's ransom was therefore the equivalent of about 67,000 ounces of gold (worth about $20,000,000 today).[37]

According to the preceding argument, Eleanor could have acquired the needed silver by replacing the high-valued silver and gold coins with light or billon coins having a face value of £67,000. The money supply would be unchanged but its composition would be drastically altered. Instead of £250,000 divided equally £125,000 of 'intrinsic' gold and silver coins and £125,000 of base coins, after the exchange it would be composed of only £58,000 of 'intrinsic' coins, £125,000 of base coins, and £67,000 of new "ransom" coins. Is there any evidence that Eleanor had recourse to this solution?

Unfortunately, the data are not clear. From the details of the collection process[38] it appears that the sums were contributed mainly in coin. A number of writers assert that the "plate was molten and made into money" and paid in "marks weight of Cologne," but there are reasons to doubt this conclusion.[39]

If the monetary resource was utilized, it was certainly not the only expedient since Eleanor certainly utilized the usually means of raising money:

"The levy was pressed in every quarter with no distinction between layman and clerk, burgher and rustic. . .The barons were taxed a fourth of a year's income, and lesser persons by a descending scale. The churches and abbeys measured up by weight their treasure "Accumulated since olden time," gold and silver vessels, candelabra, the very crosses on their altars. Reliquaries were shorn or their cabochons, basins scraped of their jewels. The Cistercians, those humble brethren of Saint Bernard, possessing no corruptible treasure of this world, sheared their flocks and gave a year's crop of wool. . .As the sluggish tithes flowed in, they were

sealed with the queen's own seal and kept for safety in the cathedral of Saint Paul. . .the collections dragged. . .A second levy was made, and there was a third. . .But the labor progressed at a snail's pace."[(41)]

It was said that the Germans,

"those children of perdition, were levying a treasure that would not be drawn from the royal exchequer, but from the patrimony of Christ, the pitiful substance of the poor, the tears of widows, the pittance of monks and nuns, the dowries of maidens, the substance of scholars, the spoils of the church."[(42)]

There was apparently at the time of the ransom a great deal of "albata" money, composed of a lot of tin and a little silver, or simply tin coins blanched in silver. It is possible that these coins could have been issued to collect the silver to finance the ransom, but it is more likely that the existence of the large quantity of debased coins was one reason why the experiment could not be tried. If 'intrinsic' currency had already been replaced by billon, the opportunity to exploit it further no longer existed.[(43)]

8. The Great Recoinage

One of the most interesting and controversial episodes in English monetary history arose as a result of a faulty diagnosis of a situation that required an understanding of Gresham's Law. This episode has been dubbed in the literature "The Great Recoinage." It arose as a result of the deteriorated state of the coinage in Britain in the last decade of the 17th century and the devoted attention paid to it by the eloquent historian Lord Macaulay.

In the 1690s, old and the new sorts of coins circulated side by side. There even remained a few coins dating from before Elizabeth's reign, having escaped her recoinage. There were even some debased iron and copper coins silvered over of Henry VIII and earlier. The confusions it created became the subject of the literary writings of Dryden, Blackmoor and Cibber. In the latter's comedy, *The Fool of Fashion*, the hero declares naughtily that

Virtue is as much debased as our money, and faith, Dei gratia, is as hard to find in a girl of sixteen as round the brim of an old shilling.

In his *History of England,* Macaulay ridicules the actions taken to correct the situation since the "Glorious Revolution" of 1688:

Since the Revolution, the state of the currency had been repeatedly discussed in Parliament. In 1689 a committee of the Commons had been appointed to investigate the subject, but had made no report. In 1690 another committee had reported that immense quantities of silver were carried out of the country...Schemes were formed for encouraging the importation and discouraging the exportation of the precious metals. One foolish bill after another was brought in and dropped. At length, in the beginning of the year 1695, the question assumed so serious an aspect that the Houses applied themselves to it in earnest. The only practical result of their deliberations, however, was a new penal law, which, it was hoped, would prevent the clipping of the hammered coin and the melting and exporting of the milled coin. It was enacted that every person who informed against a clipper should be entitled to a reward of forty pounds, that every clipper who informed against two clippers should be entitled to a pardon, and that whoever should be found in possession of silver filings or parings should be burned in the cheek with a red-hot iron. Certain officers were employed to search for bullion. If bullion were found in a house or on board of a ship, the burden of

proving that it had never been part of the money of the realm was thrown on the owner. If he failed in making out a satisfactory account of every ingot he was liable to severe penalties. This Act was, as might have been expected, altogether ineffective. During the following summer and autumn, the coin went on dwindling, and the cry of distress from every county in the realm became louder and more piercing.

Macaulay was referring to an Act passed in 1695 which provided that anyone who bought, sold or knowingly possessed any coin clippings should forfeit them, be liable to a fine of £500, and be branded on the right cheek with a capital R. The laws against clipping included capital punishment and were actually enforced: instances of condemnation to death followed by execution occurred by the dozens; seven men were hanged and a woman burnt in a single morning for a crime of this kind.[(44)]

William Lowndes, the newly-appointed Secretary of the Treasury,[(45)] had been requested to undertake an investigation into the state of the currency. He prepared a paper, entitled *A Report containing an Essay for the Amendment of the Silver Coins*, on September 12, 1695, that was circulated to members of both Houses of Parliament.[(46)] While repudiating any debasement of the currency, he suggested, as a necessary measure for placing it on a satisfactory basis, that all denominations of the silver coin should be raised 24 percent.[(47)]

Opposition to devaluation came from Whig quarters, led by two astute men of affairs and two of the most famous intellectuals of any time:

But happily for England, there were among her rulers some who clearly perceived that it was not by halters and branding-irons that her decaying industry and commerce could be restored to health. The state of the currency had, during some time, occupied the serious attention of eminent men closely connected by public and private ties. Two of them were politicians who had never, in the midst of official and parliamentary business, ceased to love and honor philosophy; and two were philosophers, in whom habits of abstruse meditation had not impaired the homely good sense with which even genius in mischievous in politics. Never had there been an occasion which more urgently required both practical and speculative abilities; and never had the world seen the highest practical and the highest speculative abilities united in an alliance so close, so harmonious, and so honorable as that which bound Somers and Montague to Locke and Newton.[(49)]

Macaulay is in error on a number of points, but his account is nevertheless of great interest because his became the conventional wisdom in the nineteenth century.[(51)] He understood nothing about the functions of money as a unit of account and the characteristics that make money accepted *ad talum.* He is also in error in attributing to Newton the same opinion as Locke; although he later changed in mind, moving to Locke's position, Newton, as Warden of the Mint initially supported devaluation. Macaulay is also in error in supposing that Locke's solution would solve the problem or put an end to the cruel penalties on exporters of bullion or coin.

New coins were minted to correct the problem but, of course, they were the first to be exported. In 1694, "King Billy's War" was underway and William III needed money to outfit the Channel fleet. In exchange for a loan of £1.2 million, he issued a charter for the Bank of England, which advanced him the money. Not realizing the impact these new notes would have on the coinage, the government effected a recoinage at great expense to the treasury. But no sooner had the new coins been produced than they were exported. Ignorance of Gresham's Law at that time extended to the highest quarters and included

not just Montagu, Chancellor of the Exchequer (later Earl of Halifax), Lord John Somers, the chief minister to William III and leader of the so-called "Junto," but also the two greatest intellectuals of the age, Isaac Newton and John Locke. The recoinage had fallen victim to Gresham's Law.

9. Gresham's Law Under Bimetallism

An understanding of Gresham's Law was crucial to the formulation of a correct monetary policy, and it turned out to be especially important under bimetallism. Bimetallism was a system in which one of more countries fix the prices of two of the precious metals in terms of the national currency unit, thus fixing the bimetallic ratio. In the following discussion, I shall assume that the two metals are gold and silver, but the theory applies equally to other metals.

Consider the operation of Gresham's law under bimetallism. Its principles can be studied best in the context of a small country facing a bimetallic price ratio in the rest of the world over which they had no influence. This was not far from the actual situation facing many countries between the end of the Middle Ages until 1873, when bimetallism gave way to the gold standard. To fix ideas suppose the bimetallic price ratio is 15½:1, and that there is free coinage in the sense that people can bring either of the metals to the mint to be coined..

Suppose now that a new small country arrives on the scene and it sets its bimetallic ratio at 15:1. At this ratio the mint price of gold is lower and the mint price of silver is higher than the world price. In this situation, silver will be brought to the mint to be coined, but no one will bring gold to the mint when its price is lower there than it is abroad.

There would be perpetual disequilibrium if the market price ratios at home and abroad remained different. Equilibrium can exist only when the market price of gold at home has risen to the international level of 15½:1, which is possible only when all the gold has left the country and the circulation is entirely silver. By overvaluing silver, the country, while nominally bimetallic, has put itself onto a de facto silver standard. Overvaluing a metal makes it "bad money" and brings Gresham's Law into play.

The opposite situation applies if the countries overvalues gold. Suppose the bimetallic ratio is set at 16:1 while, as before, it is 15½:1 in the rest of the world. In this case the underpriced silver will be exported, gold will be imported and equilibrium will prevail only when the entire circulation is made of gold. By overvaluing gold, the countries moves onto a de facto gold standard. Again Gresham's Law worked when the bad money, in this case overvalued gold, drove out silver.

These examples are not abstract possibilities. They apply precisely to the United States after Alexander Hamilton created the bimetallic system by the Act of April 2, 1792. The dollar (which had been adopted as the monetary unit by the Congress of Confederation in 1786) was defined as 24.75 grains of pure gold and 371.25 grains of pure silver, implying a bimetallic ratio of 371.25/24.75 = 15. At this time the dominant monetary power was

France which had in 1785, under Calonne, the able Treasurer-General of Louis XVI, established a bimetallic ratio of 15½:1. It was by no means clear when the French Revolution began in 1789 what the bimetallic ratio would be in the future; Hamilton had to decide at a time when the international situation was unstable. As it turned out, he guessed wrong. When Napoleon (now Emperor) wanted to reestablish French credit in 1803 he set France back onto bimetallism at the Calonne ratio of 15½:1. This made silver overvalued and gold undervalued in the United States. As a result the United States was de facto on a silver standard for the first four decades of its history.

In the early decades of the fledgling republic, complaints were heard over and over that gold coins were not available. Discussion continued in Congress until finally, on July 31, 1834, the long-sought reform measure was passed. Astonishingly, at a single blow, the gold dollar was reduced to 23.2 grains, and soon after, the Act of July 18, 1837, to 23.22 grains, the standard being changed at the same time from 11/12 fine to 9/10 fine. This made the bimetallic ratio 16:1. Now gold was overvalued, silver fled and gold rushed in, putting the United States de facto on the gold standard.[(52)] Silver dollars became extinct and emergency measures came to be required to retain within the country a sufficient amount of small change: the amount of silver in the subsidiary coinage from the half-dollar downward was reduced.[(53)] Overvaluing gold put the United States (de facto) on the gold standard.

The standard of a country could also be affected by a change in supply conditions in the precious metals industries. This happened to France in the 1850s. As we have seen France was theoretically on a bimetallic standard at a ratio of 15½:1 from 1803 until 1870, but in fact most of its currency in circulation was silver. But in the middle of the century there came large gold discoveries: Russia in the 1840s, and the United States and California in the 1850s. This lowered the market price of gold below the French buying price with the result that France exchanged its silver for a gold currency. Gresham's law applies here also because the new supply conditions made gold the overvalued metal in France.

An equally famous example concerned Britain's movement toward the gold standard in the 18th century. The recoinage of the late 1690s had been a failure. Before the recoinage was complete, drawing on a report that was signed by Locke among others, the House of Commons established[(54)] a ratio of 15½:1 at a time when the ratio in Holland (which at that time was the center for the precious metals markets) was 15:1; this was accomplished by rating the gold guinea at 21½ instead of 22s. As a result about a 5 percent profit could be made by importing gold and having them minted into guineas, with the result that gold came to Britain and most of the newly-coined silver was exported.

By 1717 the situation had worsened and there was considerable agitation to prevent further losses of the silver coinage. To deal with the problem, much use was made of the brilliant report on the bimetallic ratios in different countries by Newton, Master of the Mint. It was concluded that the correction of the situation required a lowering of the value of gold relative to silver, with the result that the guinea was henceforth to be rated at 21 shillings. However, this reduction in the price of gold was not enough to erase the

discrepancy between the English and Dutch ratios. With the guinea at 21s. the ratio was still 15.21:1 whereas in Holland and France, with increasing supplies entering Europe from Brazil, it was 15:1 or under. For this reason the practice of culling and exporting the heaviest silver pieces continued. A few decades later, by the accession of George III in 1760, the crown (silver) pieces had almost entirely disappeared and after 1774, when silver was partially demonetized, Britain had stumbled onto a de facto gold standard.

The models established above have assumed a small country faced a given bimetallic ratio in the rest of the world. This assumption, while simplifying the exposition, is by no means necessary. More generally the bimetallic ratio is determined by the interaction of the demands and supplies of the two metals in all the countries in the system. Bimetallism usually requires that at least one large country fix the ratio. Only a large country could "command" the ratio for any length of time; two or more large countries could ensure that it lasts even if their legal ratios were slightly different. Suppose that a large country fixes the ratio at 15½:1 while other countries choose the same or different ratios. If the 15½:1 ratio is consistent with market conditions, the large country will be on a bimetallic standard. Those countries that have fixed the ratio below that rate will have overpriced silver and put themselves on a silver standard; whereas those that have chosen a higher ratio will be on a gold standard. In a world of bimetallism, pluralism is the rule rather than the exception with some countries truly bimetallic, others on silver, and others on gold.

10. Overvalued Money and the Institution of Legal Tender

One important distinction between types of money is whether it is legal tender or not. Gresham's Law can come into play if two types of money are equivalent except in their role as legal tender. Very soon after coinage was discovered, rulers learned that the demand for money was different from the demand for the metal contained in the coins. Coinage began in steps that started when the state first put a stamp on a piece of metal signifying its purity, weight, and/or its value. It is possible that, initially, the value stated on the coin (its face value) was equal to the value of the metal it contained (its value by weight). But in the absence of a mechanism for ensuring that a coin had the same value qua metal that it had qua money--free coinage was one mechanism--the face value of the coin would become different from the coin's value as metal. A coin was said to be accepted *ad talum* (by count) if it was accepted at its face value; and it was said to be accepted *ad pensum* (by weight) when it was accepted for its value in metal.

When a currency must be accepted at its face value for payment of debt--whatever its commodity value--it is said to be *legal tender*. What is the meaning of this term? It should be noted first that it is a legal term. The institution of legal tender is a "term of avoidance" of the courtroom, in which a defendant might admit to borrowing money from his accuser, but plead "legal tender," namely, that at some previous time he physically had offered his creditor money which the law deemed acceptable for debt payments and had been refused. The court might not aid in the recovery of money once it had been turned down. The term legal tender is now used for a currency that cannot

legally be refused in payment of debt. Other things equal, the attribute of legal tender would make one money "good" relative to another money.

There is a question issue whether the concept of legal tender is a term of private or public law. In his *Money in the Law* (1950), Nussbaum writes: "The question of the extent to which a creditor is under a duty to take "legal tender" in payment is undoubtedly one of private law. The endowment of coins or notes with the character of legal tender is, however, an act of sovereignty, hence of public law."[(55)] In other words the sovereign determines that which constitutes legal tender but its enforcement in the courts is a matter of private law.

The concept of legal tender suggests a distinction between two types of money: refusable money and non-refusable money, the latter of course being legal tender. In a typical country in the modern world, for example, currency is non-refusable money, cheques are refusable money, and coins are non-refusable money only up to a limit.

In recent centuries coins and notes may or may not have been non-refusable money. Bank of England notes (the Bank was created in 1694) had high reputation throughout the 18th century but were not made legal tender until 1812, when the government passed a law requiring sheriffs enforcing an order of the court to accept payment for the judgment creditor in bank notes. The notes, however, could not be pressed upon a creditor out of court, and if the creditor were willing to wait until the resumption of cash payments (which occurred only in 1821) he would be entitled to gold.[(56)] In 1833 the notes were made legal tender for as long as the bank maintained their convertibility, a formula that was allowed to persist throughout World War I. In 1928 the notes became unconditional legal tender and convertibility was abolished in 1931.[(57)]

The guinea, first coined in 1664, although a "current coin of the kingdom," was not made legal tender until 1717. The notes of John Law's *Bank Générale*, founded in 1716, were not legal tender but after the bank was transformed into a "Royal Bank" in 1718 the notes became legal tender.[(58)] The notes of the *Banque de France*, founded in 1800, became legal tender (apart from the emergency period of 1848-50) only in 1870. The notes of the *Preussische Staatsbank,* founded in 1775, were never legal tender and when it was replaced by the German *Reichsbank* in 1875, the notes of the latter were refusable until 1910.[(59)] Federal Reserve notes were not made legal tender until 1933.

In earlier times, it was generally true that the proclamation of a new coin implied its legal tender status at the face value. When a new coin was issued with the same name (e.g., penny, ecu, florin) but a lower weight or purity implying devaluation or debasement the question of justice arises between creditors and debtors. Should a debt be paid in the legal tender at the time of contract or at the time of repayment? This subject has given rise to endless controversy. Its relevance was made very apparent in the 1930s when Federal Reserve notes were made legal tender and the US dollar was devalued. The main issue was whether a gold clause in a contract would be legally binding (it was not).

Long ago the ancients had to deal with analogous questions. *Argentum* is a Latin word for both money and silver. Was a debt payable in *argentum* payable in silver or in legal tender? Cicer thought it was the latter:

"in our law we carry out the reasoning of Cicero, who held that *argentum* (in French, argent, or silver) meant money, and not metal. . .It follows that the efficacy of money is due to the value imposed on it by law, a fact deducible from its Greek name *nomos* and its Roman name nummus, both of which mean the Law, or that which is created by the law. It is the law that gives existence and efficacy to money and not the material of which the coins are made. Thus, says Paulus, to the Crown only (the Crown or the State being the living impersonation of the Law) belongs the right to confer denominational value upon money. Such value has often exceeded the value of the material two or three, or more, times, as was manifested in the leather issues of Frederick Barbarossa, the tin issues of Dionysius of Syracuse, the gun metal issues of the Sultan Othman (AD 1259-1326) during the wars against Persia, and in our own copper coins."[(60)]

That "argentum" meant money rather than just silver is amply proved by the following examples:

"argentariæ tabernæ, banker's shops (Livy); argentaria inopia, want of money (Plautus); argentarius, tresurer (Plautus); argentei sc. Nummi, or money (Pliny, xvi, 3); ubi argenti venas aurique sequuntur (Lucretius, vi, 808); cum argentum esset expositum in ædibus (Cicero); emunxi argento senes (Terrence); concisumargentum in titulos faciesue minutas (juvenal, xiv, 291; tenue argentum venæque secundæ (*ibid.,* ix, 31)."[(61)]

The power of legal tender confers on its owner (the sovereign or government) a fiscal resource of the first magnitude. In the ancient world, as suggested in above quotation from Grimaudet, this power was used to overvalue money and reap the benefits of seigniorage, sometimes but not only in great emergencies.

11. The Evidence from Hoards

The study of hoards is one of the most interesting if recent applications of Gresham's Law. Ever since coinage was created, coins have been collected and sometimes buried as hoards, which resurface for the enlightenment and controversy of later generations of archaeologists, numismatists, historians and economists. Sometimes the finds have been merely spectacular[(62)] whereas otherwise--like the great discovery of electrum coins in the Temple of Artemis at Ephesus--they have yielded priceless historical information.

Hoards found in the ground have typically been those that have been buried in the past with the intention, but not the realization, of future recovery. Three questions deserve to be asked: (1) Why are hoards created in the first place? (2) Why are they buried? (3) What determines their composition? We can answer these questions in turn.

(1). Collections of coins may exist for a number of reasons, including numismatic interests; Augustus Caesar, for example, was an avid collector. Nevertheless, the main function of hoards is as a store of value, a form of saving, which reflects a desire to preserve wealth for future use. Moreover, hoards are typically a form of *liquid* wealth, ready cash that is available for use in contingencies. Hoarding always reflects a desire to sacrifice current consumption for the prospect of future consumption.

(2) Hoards are buried because of a real or imagined threat to security. The best proof is that hoarding intensity--measured by the frequency of hoards found--increases during civil wars. In Roman history, for

example, hoards increased dramatically during the Second Punic War, c. 218-206 BC, and then again during the Social War, the Civil War and the Spartacus revolt, c. 90-71 BC, and once again during the Civil Wars, c. 50-31 BC. A similar pattern existed in Britain where hoarding frequency soared during its Civil War period c. AD 1625-49. It is probable that this pattern will be confirmed in similar cases.

(3) The composition of hoards is determined partly by Gresham's Law. Assume that the money supply of a country consists of both overvalued and undervalued coins. Let us now suppose that hoarding intensity increases. By Gresham's Law it is the undervalued coins that will disappear and the overvalued coins will remain.[(64)] The profit motive will ensure that the best coins end up in hoards.

An effective application of Gresham's Law to the study of hoards was made by Sture Bolin in a pioneering work on the Roman monetary system.[(65)] Drawing on work spanning more than two decades, Bolin published in 1958 a comprehensive study of 150 coin hoards from the period AD 69 to approximately AD 250, found in widely separated parts of the Roman Empire and containing over 82,000 denarii from the Republic and Empire up to the year 193. It is of course well known that the denarii was progressively debased over this period, and this fact should have affected the proportion of old to new (depreciated) coins in the collections. Among his striking findings was the vast number of coins from the Republic in the hoards collected in Germany, the Balkans and Britain, confirming what Gresham's Law would predict, that the outer parts of the empire preferred the relatively *undervalued* denarii.[(66)]

The composition of hoards sometimes offers clues about circulation. Other things equal, a large preponderance of coins is, say, the reign of Hadrian or Vespasian would suggest a large production. On the other hand, a low frequency of a ruler's coins does not necessarily imply low production; if it were overvalued, it would not be a suitable candidate for hoards. The worst coins circulate, the best coins end up in hoards.

Given the frequency of hoards discovered, which number in the thousands, empirical analysis can be brought to bear, yielding rigorous statistical inferences that can be used to test the presence of absence of Gresham's Law.

12. Conclusions

Gresham's Law, properly understood, can be a powerful tool in the hands of historians for the study of monetary history. The catchy phrase, "bad money drives out good," is not a correct statement of Gresham's Law nor is it a correct empirical assertion. Throughout history, the opposite has been the case. The laws of competition and efficiency ensure that "good money drives out bad." The great international currencies--shekels, darics, drachmas, staters, solidi, dinars, ducats, deniers, livres, pounds, dollars--have always been "good" not "bad" money.

Gresham's Law comes into play only if the "good" and "bad" exchange for the same price. "Good money drives out bad if they exchange for the same price" is an acceptable expression of Gresham's Law. But a better statement of it is that "Cheap money drives out dear, if they exchange for the same price." Put in this way, Gresham's Law becomes a theorem of the general law of economy, a consequence of the theory of rational economic behavior.

A common application of Gresham's Law arises when coins deteriorate after long usage. At any moment of time a stock of coins in circulation will consist of coins of different ages. The oldest coins in circulation may be much older than the newest coins, the former possibly in a considerably deteriorated condition. It is not true, however, that these coins cannot circulate side by side. Nor is it true that good coins will disappear on their own accord. If the demand for money is equal to the supply of money, no coins will be driven out. Gresham's Law is not a statement about static conditions; it is a statement about dynamic process.[(67)]

Bad coins will drive out good only if a change occurs to bring about an excess supply of money. An excess supply of money could result because of a decline in the demand for money. If this occurred in a closed economy, prices would start to rise and the value of the best coins as metal would be higher than their value as money, with the result that the best coins would be withdrawn from circulation until the excess supply of money had been eliminated. If, on the other hand, the economy were open to trade with the rest of the world, the good coins would be sent abroad until the money supply were reduced to its equilibrium level.

An excess supply of money could also arise because the government increases its supply. If the government issues new full-valued coins, they will be exported or withdrawn in hoards and the composition of the money supply will be unchanged. If, on the other hand, the government issues lighter or debased coins--like Dionysius, Nero, John the Good, or Henry VIII--the best of the coins already in circulation will be exported or otherwise withdrawn from circulation and the average quality of the coins in circulation will deteriorate.

The introduction of paper money is a more extreme case of debased or lightened coins in the sense that the value of the material of which money is made is almost nil. Paper notes or new bank credit would displace part of the coinage, and it would as always be the best part of the coinage. As we saw above that is exactly what occurred in the late 1690s in Britain when the issue of paper notes by the newly-created Bank of England displaced an equal quantity of the best coins. The authorities at that time could not understand why the best coins were being exported despite the cruel punishments of branding, hanging and burning at the stake. It shows also that the genius of Locke and Newton was no substitute for an idea whose time had not yet come.

Gresham's Law has powerful explanatory power in the world of free-coinage bimetallism that dominated the international monetary system for most of the two centuries between the 1660s and the 1870s. Given a world market price of gold in terms of silver--the bimetallic ratio--a country puts itself predominantly onto gold if it overvalues gold, and onto silver if it overvalues silver. Thus, when the United States established bimetallism at the Hamiltonian ratio of 15:1, it undervalued gold and overvalued silver relative to the international ratio around 15½:1; thus the U.S. was de facto on a silver standard after 1792. But when the ratio was altered in 1834 to 16:1, it overvalued gold and the U.S. moved de facto to a gold standard. Similar stories can be told of other countries, most spectacular perhaps being the case of Britain when Newton's recommendations in 1717 overvalued gold relative to the European continent, at a time when Brazilian gold supplies were increasing, nudging Britain toward the gold standard.

Gresham's Law depends on two kinds of money being equivalent for some purposes but not for others. Two coins or notes might be equivalent in all respects except that one is legal tender and the other is not. In most countries, for example, central bank notes are legal tender whereas bank deposits are not, while coins usually have a limit on their legal tender feature. The power of a state to determine that which constitutes legal tender is an important aspect of monetary sovereignty. It is also a privilege that has been subject to great abuse by inflation-prone governments.

The study of coin hoards, in conjunction with an understanding of Gresham's Law, can yield important historical information.The existence of buried hoards often points to an era of insecurity. The frequencies of particular coins in hoards gives clues to monetary circulation in different times. Insofar as hoards are most likely to consist of "good" coins that have been driven out of circulation by "bad" coins, it is also possible to draw inferences about the monetary policies at the time the coins disappeared. A large concentration of heavy coins dated within a few years of one another would be prima facie evidence of an issue of overvalued coins.

Our discussion has been confined to the literal subject matter of Gresham's Law, i.e., its applications to the money sphere. It is of course a completely general law that holds whenever the isomorphism that constitutes its theoretical content applies. As Aristophanes knew as well as we, bad politicians drive out good, cheap conversation drives out dear, bad theory drives out good; cheap gifts drive out dear, bad food drives out good, and so on indefinitely. In each case the qualification must be made that from one standpoint (e.g., acceptability) good and bad have the same value.

It is, perhaps, fitting to close on an extension of Gresham's Law to the theory of money itself. The motivating force underlying Gresham's Law is economy: we settle a debt or transaction with the cheapest means of payment. But that is what money is! In the world of exchange, debts are settled in the cheapest medium possible. In the world of the gold standard, debts are not settled in wheat or oxen or fish, but gold, because gold is the cheapest means of settlement. Gold is the "bad" money that is "driven out" because it has the lowest costs of transport per unit of value. Silver, gold, paper, cheque money, and electronic transfers in succession become the means of settlement--the bad money that is driven out--because they have been increasingly cheaper forms of payment. Thus it is that Gresham's Law can lead to insights into the very heart of monetary theory.

BIBLIOGRAPHY

Andréadès, A. 1966. *History of the Bank of England*. London: Cass.

Arnott, Peter D. 1961. *Three Greek Plays for the Theatre.* Bloomington: Indiana University Press.

Baldassarri, Mario, McCallum, John and Robert Mundell, eds. 1992. *Global Disequilibrium in the World Economy: Central Issues in Contemporary Economic Theory and Policy*. London: St. Martin's Press/SIPI.

Bolin, Sture. 1958. *State and Currency in the Roman Empire to 300 A. D.* Stockholm: Almquist & Wiksell.

Buckley, H. 1924. "Sir Thomas Gresham and the Foreign Exchange," *Economic Journal* 34.

Burgon, J. W. 1839. *Life and Times of Sir Thomas Gresham*. London.

Burman, Edward. 1986. *The Templars: Knights of God*. Rochester, VT: Destiny Books.

Carradice, Ian and Martin Price. 1988. *Coinage in the Greek World*. London: Seaby.

Del Mar, Alexander. 1885. *History of Money in Ancient Countries.* New York: Burt Franklin.

----------1895. *The History of Monetary Systems in Various States.* London" Effingham Wilson and Royal Exchange.

Ehrenberg, Victor. 1973. *From Solon to Socrates.*London: Methuen.

Finley, M. I. 1968. *Ancient Sicily: to the Arab Conquest*. New York: The Viking Press.

Harris, Sir C. Alexander. 1926. "Gresham's Law." In Higgs (1926: 262-63), Vol. II.

Hayek, Friedrich A. 1967. *Studies in Philosophy, Politics and Economics*. Chicago: University of Chicago Press.

----------1967. "The Uses of 'Gresham's Law' as an Illustration of 'Historical Theory.'" In Hayek (1967: 318-20).

Higgs, Henry (ed.). 1926. *Palgrave's Dictionary of Political Economy*. London. Macmillan, 3 vols.

Howgego, Christopher. 1995. *Ancient History From Coins*. London and New York: Routledge.

Hume, David. 1886. *Hume's Essays: Literary, Moral, and Political.* London: Ward, Lock & Co.

Kelly, Amy. 1950. *Eleanor of Aquitaine and the four Kings.* New York: Book of the Month Club.

Knight, Charles. 1881. *The Popular History of England*. 8 vols. New York: Lovell.

Li, Ming-Hsun. 1963. *The Great Recoinage of 1696-9.* London: Wiedenfeld and Nicolson.

Madox, Thomas. 1769. *History and Antiquities of the Exchequer of the Kings of England: Taken from the Records.* 2 vols. London.

Marshall, Alfred. 1923, 1960. *Money, Credit and Commerce.* New York: Kelly.

McCulloch, J. R. 1856. *Old and Scarce Tracts on Money.* London.

Mill, John Stuart. 1848, 1909. *Principles of Political Economy* (Ashley ed.). London: Longmans, Green and Co.

Mundell, Robert A. 1965. "Growth, Stability and Inflationary Finance," *The Journal of Political Economy*, LXXIII, No.2 (April):97-109. 1968.

----------1968. *Man and Economics*. New York: McGraw-Hill Book Company.

----------1989, 1993."The Global Adjustment System," *Rivista di Politica Economica* 79, No. 12 (December 1989): 351-465. Reprinted in Baldassarri, McCallum and Mundell (eds.) 1992: 351-465.

----------1997. "The International Adjustment Mechanism of the Balance of Payments." *Zagreb Journal of Economics* 1 (No. 1): 3-57.

Palgrave, R. H. Inglis. 1926. *Dictionary of Political Economy*, vols. 1-3. London: Macmillan.

Roover, Raymond de. 1949. *Gresham on Foreign Exchange.* Cambridge: Cambridge University Press.

Schumpeter, Joseph Alois. 1954. *History of Economic Analysis.* New York: Oxford University Press.

Seigler, G. L. 1968. *The Emergence of the Eastern World*. Oxford: The Pergamon Press.

Shaw, W. A. 1895. *The History of Currency: 1252-1894.* London: Wilsons & Milne.

Smith, Adam. 1776, 1994. *The Wealth of Nations* (Cannan ed.). New York: Modern Library.

Spufford, Peter. 1986. *Handbook of Medieval Exchange.* London: Royal Historical Society.

Sutherland, C. H. V. 1969. *Gold: Its Beauty, Power and Allure.* London: Thames and

Hudson.

Thompson, W. E. 1970. "The golden Nikai and the coinage of Athens," *Numismatic Chronicle* 10: 1-6.

ENDNOTES

1. Ehrenberg (1973: 26).

2. Del Mar (1895: 49). The reference is to *Maxims* line 119. Del Mar dates Theognis' life from 570 to 490 BC.

3. Quoted in Del Mar (1895: 355). The reference is to *Maxims*, line 19.

4. In Frere's translation:

"Oftentimes have we reflected on a similar abuse

In the choice of men for office, and of coins for common use;

For your old and standard pieces, valued and approved and tried,

Here among the Grecian nations, and in all the world beside,

Recognized in every realm for trusty stamp and pure assay,

Are rejected and abandoned for the trash of yesterday;

For a vile, adulterate issue, drossy, counterfeit and base,

Which the traffic of the city passes current in their place!"

In Arnott's translation (intended for the theater):

"It's the same with solid citizens as with our currency;

Both are calculated to induce despunnency.

It's not that we don't have enough good coinage

Free from counterfeitry and purloinage,

Mint-guaranteed, without a trace of fraud,

Honored at home,hard currency abroad.

But we never use it! We would rather settle

For second-rate adulterated metal,

Struck yesterday! We have men of reputation,

Sober and honest, with a liberal educaton,

But we maltreat them! and our state relies

On wetbacks, not greenbacks, alloys, not allies.

You idiots, return to proper courses,

Honor the men who are your best resources.

If you succeed, the world will sing your praise;

If not, you chose a noble way to end your days.

See Arnott (1961:173).

5. Lord Macaulay, in his *History*, Vol. IV, p. 623n, was one of the first to ascribe the law to Aristophanes. As already noted, it was first called "Gresham's Law" by Macleod in his *Theory and Practice of Banking* in 1858.

6. Howgego (1995: 111).

7. *ibid.*

8. If this account is correct, it implies that 14 talents weight of gold or about 12,440 ounces of gold (taking the talent weight at about 60 pounds).

9. *ibid.* The *Encyclopedia Britannica* article (EB CD-ROM (1995: *Coins and Coinage*)) asserts that the coinage in the year following the reduction of the Victory statues, bronze small change was produced that proved to be "an unpopular substitute for the tiny silver coins previously carried in the mouth." This conflicts with Howgego, who asserts that: "Athens did not produce small change in base metal until the second half of the fourth century BC."

Other writers differ from these accounts. Sutherland (1960: 72-73) argues that it was the 35-foot high gold-and-ivory statue of Athena (the Virgin) Parthenos that was later reduced to finance the Athenian expenses. See also Del Mar (1895: 51). In constructing this statue, Phidias, at the order of Pericles, had the gold put on in such a way that it could easily removed--presumably to keep it as a liquid asset in a time of emergency. It proved to be--for Phidias and Pericles--a lucky stroke.

With war fast approaching the party of Pericles came under attack and the opposition, unable to attack "Zeus" (as Pericles was sometimes called) picked on those near him, first his famous friend and teacher, the scientist Anaxagoras (c.500-428 BC), and then the great Phidias. Anaxagoras had earned the enmity of the priesthood by seeking natural causes of unusual events and was persecuted for asserting that the Sun is an incandescent stone larger than the region of the Peloponnese; he was saved from execution by Pericles but hounded out of Athens, to retire and die in his native Lampsachus. Phidias was fist charged with embezzlement in the matter of the gold appropriated for the great statue of Athena Parthenos, a charge alluded to is Aristophanes' *The Peace*; the scheme failed completely when Pericles ordered the plates to be removed from the huge statue and verified that the amount of gold tallied with the appropriation. But his foes were unrelenting and Phidias was found guilty of introducing his own portrait and that of Pericles on Athena's famous shield, a charge from which Pericles could not save him. The sculptor was thrown into prison, where he sickened and died.

According to Sutherland and Del Mar, it was the gold from the Athena Parthenos that was melted down in 407 BC to cover wartime expenses of the Athenian treasury; according to Thompson (1970) and (Howgego (1995: 111), it was the set of Nikai (Victory) statues. Whichever story is correct--and the implied production of gold coins seems to high in both instances--it was not sufficient. A year later Athens had recourse to a copper coinage. This was not small change, but rather a replacement for silver coinage. The introduction of the debased coins of course caused the beautiful Athenian coins to disappear in hoards or abroad. The lesson was apparent to all Greeks that the introduction of overvalued (cheap, base, bad...) coins would cause all the good coins to be used abroad and all the bad coins, which were legally acceptable in Athens, would stay at home.

10. Carradice and Price (1988: 100).

11. Carradice and Price (1988: 102).

12. Carradice and Price (1988: 54).

13. Seigler (1968: 175).

14. Quoted in Marshall (1923: 60). There remain some doubts that it was written by Hales, who was at one time a parliamentarian and had to leave England for political reasons during the reigns of both Mary and Elizabeth. The work, published in 1581, was signed W. S., A Gentleman, which led, because of the richness of its thought and the characterization of the participants in the debate, that the author was none other than William Shakespeare. Because, however, Shakespeare was only seventeen at the time, this is now thought to be unlikely.

15. The following account is taken from Palgrave (1926) III, 261-263; and Orsingher (1967: 42-43). Basic sources are Burgon (1839) and de Roover (1949).

16. Gresham's pay was twenty shillings a day.

17. His wealth was earned mainly from his private business, but he was not above forwarding his schemes by bribery. His own son having died young, he turned to public activities and philanthropy. The foundation of the royal exchange, of Gresham College, eight almshouses, and the earliest English paper-mills on his estate at Osterley show the breadth of his interests.

18. Schumpeter (1954: 342-43f.) has the following common on Gresham:

"He was a type that can no doubt be found everywhere but of which the English specimens are to this day so much more frequent and so much superior that it may well be called English: the businessman who is just as much a public servant as he is businessman and who, though perfectly successful in looking after his own advantage, serves the state in ways that are beyond the competence of the mere public servant. . . We may use this opportunity to notice the two analytic achievements that have been placed to

his credit. First, he described correctly enough the rules that apply to the movements of the rate of exchange with reference to the specie points, and he holds priority over Davanzati, who however did a much better job in 1582. . . Second, there is Gresham's Law, the proposition that if coins containing metal of different value enjoy equal legal-tender power, then the 'cheapest' ones will be used for payment, the better ones will tend to disappear from circulation--or, to use the usualy but not quite correct phrase, that bad money drives out good money. This phrase occurs in the Royal Proclamation 'decrying' base silver coin in 1560, when Gresham is known to have been the government's chief adviser in such matters. There is also a memorandum of his (1559) which argues the case."

19. On the "law of economy" see Mundell (1968: ch. 1).

20. See the passage quoted above.

21. Cf. Hayek (1967: 318).

22. *Palgrave's Dictionary* II (1926:262) asserts that "in the case where the combined amount [of the good and bad money] in circulation is not sufficient to satisfy the demand for currency, the more valuable medium will simply run to a premium." :

23. The qualification is needed to allow for the fact that the export of gold will raise the world and therefore the home price level, an effect that would be large if the country--and the new money issue--were large. I have dubbed the latter effect in Mundell (1989, 1993) the "Thornton Effect" in honor of Henry Thornton (the banker-economist-parliamentarian-philanthropist who, writing in 1802, first discovered it. It allows for the fact that the export of specie to the rest of the world raises world prices.

24. Hume's essay, "Of the Balance of Trade."

25. *ibid.*

26. Smith (1776, 1994: Bk. 2, Ch.2).

27. Mill (1848, 1909: 544).

28. *loc. cit.,* 551.

29. If there is a private banking system, the government will be able to replace only "high-powered" money, which means that the fraction of GDP available for seigniorage is only a fraction of the above formula. For a comprehensive discussion of the seigniorage issue and its relation to inflation and growth see Mundell (1965).

30. Finley (1968: 75).

31. Plato's main ideas on money, are, however, in *The Laws*, a work that was much later than *The Republic*, completed (if at all) toward the end of Plato's life.

32. Del Mar (1885: 169).

33. *ibid.*

34. See Finley (1968: 91). Plutarch's sources are mainly a collection of thirteen letters dubiously supposed to have been written by Plato. On the first of his three trips to Syracuse, in 388 or 387 BC, Plato met the young Dion, Dionysius' rich brother-in-law, whom he instructed and cultivated when Dion was in exile in Greece. After Dionysius' death in 367 BC, Dion encouraged his successor, Dionysius II, to bring Plato back. Dion later attacked Syracuse and a long civil war broke out, with Dion being assassinated in 354 BC. Plato's involvement in the whole episode remains obscure.

35.

36. Spufford (1986: 198). The term "mite" or "mijt" was borrowed from the Low Countries where it designated the smallest coin issued there; it was never coined in England.

37. Other sums changing hands put the ransom in international perspective. Henry II gave the Templars and Hospitallers 30,000 marks to improve the defenses of the city of Tyre (Burman (1986: 112)); Tancred, who had usurped the throne of Sicily, paid Richard 40,000 ounces of gold for the settlement of his sister Joanna's dower which Tancred had confiscated (Knight 1881: vol. 1, 343)). Richard sold the island of Cyprus to the Templars for 100,000 gold dinars (of which only 40,000 had to paid in cash, and the rest in instalments payable from the island's revenues (Burman (1986: 114)).

38. See Del Mar (1895: 238). The particulars of the collection process are given in Madox (1769)

39. The marks weight of Cologne was natural, Del Mar agrees, "that being the standard of weight with which the emperor was most familiar. Notwithstanding this testimony, it may be safely conjectured that there was no new coinage, for such an operation would have been needless, tedious and expensive. The old coin and bullion was probably melted down, refined, cast into bars, assayed, weighed, and delivered to the emperor's legate--a supposition that precisely agrees with Polydere Vergil's account of the affair."[(40)]

40. -

41. Kelly (1950: 310).

42. *ibid.*

43. Another argument could have been made against the seigniorage approach to financing the ransom. In 1194 the realm was in a state of civil war. Philip II (Augustus) of France had returned before Richard and

was laying siege to Normandy, and Richard's brother, Prince John, was conniving with him. The imposition of a forced currency depends on the strength of the central state and that did not exist during Richard's captivity. Indeed, the Emperor, Henry Hohenstaufen, had already received a competitive offer from Philip and John: they would each contribute 50,000 marks if Henry would keep Richard in captivity until the following Michaelmas (September 29). When Eleanor did finally make her way down to Mainz with the ransom, there was considerable delay, but finally, the exchange was made. See Kelly (1950: ch. 28) for further details.

44. Andréadès, *op. cit.*, 95; and Macaulay *op. cit.*, Vol. II, 543..

45. William Lowndes (1652-1724) was appointed Secretary of the Treasury in 1695.

46. Lowndes' *Report* is reprinted in J. R. McCulloch, *Old and Scarce Tracts on Money*, London 1856.

47. In support of devaluation, he amassed historical evidence going back to the reign of Edward I, in which he showed that the standard of both gold and silver coins had been altered many times with the result that their nominal values were increased more than threefold. Thus in the time of Edward I, a pound troy weight of silver was coined into 20s 3 d, whereas in 1695, it was coined into 62s; and a pound weight of gold of a fineness of 23 carats and 3½ grains was coined into £15 four hundred years ago, but now the same weight of gold of only 22 carats fineness made £44 10s. The change in the monetary standard occurred in almost every reign and it was often done not by altering the fineness or weight of the coins but by raising their denominative value.[(48)]

48. Li, *op. cit,* 95-6.

49. The men referred to were: (1) William Lowndes (1652-1724), appointed Secretary of the Treasury on April 24, 1695; he had worked in the Treasury as early as 1679 at the age of twenty-seven, and occupied the office until his death on January 20, 1724[(50)]

50. Li, *op. cit.*, 95; this information is from the *Dictionary of National Biography*, Vol. XXXIV, Section on William Lowndes. - - -

51. Macaulay apparently did not have access to Newton's manuscript, Goldsmiths' Library MS 62, discovered by Ming-Hsun Li and reprinted as Appendix III in Li, *op. cit.* and excerpted below.

52. In practice, at any time (and as already noted) the coinage supply is composed of coins of different qualities, which means that the sharp conclusions are somewhat blurred. When silver is overvalued, as it was between 1792 and 1834, it will be the dominant standard, but some of the most worn or clipped of the gold coins will remain in circulation. Similarly, when gold was overvalued, as it was between 1834 and 1862 (when, under the exigencies of wartime finance, the dollar became inconvertible), gold will be the dominant standard but the worst of the silver coins will remain in circulation.

53. By the Act of February 24, 1853.

54. This paragraph draws on Shaw (1895: 226-34).

55. Nussbaum (1950: 44-45).

56. Nussbaum (1950: 47).

57. Nussbaum (1950: 48).

58. Nussbaum (1950: 46 f.6). The reference is to the contribution of Paul Harsin on "La Banque et la Système de Law" in Van Dillen (1934: 282).

59. Nussbaum (1950: 46).

60. Grimaudet (1579, 1900: 49).

61. Del Mar (1895: 136).

62. The most spectacular of all discoveries has been described as follows: "On 12 June 1366, at Touvres, fifty kilometres east of Marseilles, children came across some coins which had fallen from a small hole. When they enlarged the hole with their hands coins proceeded to shower from the side of the bank 'like a water fountain'. The shower continued for some time, and when the silver was collected it required twenty mules to carry it off. It has been estimated that the weight must have been in the region of two thousand four hundred kilogrammes. The coin type was described and can be identified as an obol of Massalia which weighed only half a gramme. The deposit must have contained some four million pieces!"[(63)]

63.

64. In the example I have introduced, an increase in hoarding would be deflationary since the coins remaining in circulation, i.e., not hoarded, will have to do the work also of the hoarded coins. A more likely situation is that the same emergency (e.g., civil war) that increases the intensity of hoarding will also increase the supply of overvalued currency, and usually by more than the hoarding. In this case the combined effect will be one of inflation rather than deflation.

65. Bolin (1958: ch. 4 on "Denarius perpetuus and Gresham's Law.")

66. Bolin (1958; esp. Ch. 4).

67. See Friedrich Hayek's conclusions about the usefulness of Gresham's Law for historians, in which he concludes:

"If Gresham's Law is properly stated with the conditions in which it applies, it will appear that as a proposition of compositive social theory it can indeed provide a useful tool of historical explanation. . .The historian who knows of Gresham's Law merely as an empirical proposition might well be puzzled when he find that, after good and bad coins had been circulating concurrently for decades without a noticeable deterioration in the average quality, at one point of time the good coins had suddenly begun to grow very scarce. He would be able to discover any new information which had become available concerning the 'undervaluation' of one kind of coin. Indeed if he were able to ask those immediately concerned they would tell him that they merely continued to do exactly what they had done before. What theory will tell him is that he must look for some cause which led to a fall of the internal value of both good and bad coins relative to their value in foreign commerce and in industrial uses. He will have to understand that neither wear and tear nor clipping can have caused this relative depreciation. He will have to look for a cause which either increased the relative supply or decreased the relative demand for coins and their substitutes in internal circulation. One need merely read the usual accounts of the events during the 'Kipper and Wipper' period (1621-1623) in Germany, or of those preceding the English re-coinage of 1696, in order to see how easy it is to go wrong without some knowledge of monetary theory. Like most of the theory which is likely to be useful to the historian, it is only very simple and elementary theory which is required; and the usual conception of Gresham's Law is a very good illustration of how theory may and how it will not help the historian." Hayek (1962: ch. 24).