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After the Great Debasement, 1544-51: Did Gresham's Law Apply?

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Abstract
In England, across the whole period of the Great Debasement, the mint issued six different kinds of silver coins and three kinds of gold coins. According to Gresham's Law, coins with the same face value but different intrinsic values can not circulate side by side for too long: only those coins with lower intrinsic values stay in circulation; those with relatively high intrinsic values would be hoarded, exported, or melted down. Neither contemporary sources nor modern research about the disappearance of good money over this period has provided any solid quantitative assessment of the effectiveness of Gresham's Law. This paper intends to produce such an assessment. For this purpose, two types of evidence are examined: the composition of the re-coinage of 1560, and the trend of the exchange rate. The result shows that contrary to popular belief, Gresham's Law was rather ineffective in mid-sixteenth-century England.

Introduction

Gresham's Law is one of the most generally accepted and frequently cited propositions in discussions of commodity money, in which the intrinsic value often deviates from the nominal value given by the authority. The proposition that bad (overvalued) money drives out good (undervalued) money has been widely applied to explain the movement of bullion in the late Middle Ages. According to Gresham's Law, the different gold-silver ratios among countries or regions would likely result in the influx of the overvalued metal and the outflow of the undervalued metal either though monetary arbitrage or the unbalanced international trade.[1]

[1] Based on Gresham's Law, bullion movement is generally accepted as the result of different gold-silver ratios among countries and regions. However, scholars have two different theories about how the mechanism of Gresham's Law works: monetary

Apart from the movement of bullion, monetary alteration was another frequent experience in the late Middle Ages. Monetary alteration (often without recalling the old coins) resulted in various standards in circulating coins. Gresham's Law can thus also be used to explain the problems and consequences cased by monetary disarray. However, this paper aims to discuss the validity of Gresham's Law in the narrower term, the effect on the composition of domestic circulation, and argues that information is critical in the operation of Gresham's Law. Therefore, the course of this paper is to examine the prerequisite for Gresham's Law and to quantitatively assess the effectiveness of Gresham's Law in the years 1544-60.

Although Thomas Gresham was mistakenly identified as the first to discover that "bad money drives good money out of circulation",[2] his lifetime, which coincided with a dramatic monetary event: the Great Debasement, an unprecedented deterioration in the English coinage, provides a great opportunity to explore this proposition. From 1544 to 1551, a huge number of debased coins poured into the market, and this disorder in the coinage was not resolved until the Elizabethan re-coinage of 1560. Owing to its monstrous scale and far-reaching impact, the subject of the Great Debasement has attracted wide attention, but questions such

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arbitrage proposed by Watson, and commercial payment. A. M. Watson, 'Back to Gold and Silver', *Economic History Review*, Vol. 20, (1967), pp. 1-34. The critic of Watson's theory see H. A. Miskimin, 'The Enforcement of Gresham's Law', *Cash, Credit and Crisis in Europe, 1300-1600* (Variorum, 1989), pp. 154-6; J. H. Munro, *Wool, Cloth, and Gold* (University of Toronto Press, 1972), pp. 29-32; idem., 'Mint Policies, ratios, and Outputs in the Low Countries', *Bullion Flows and Monetary Policies in England and the Low Countries, 1350-1500* (Variorum, 1992), p. 76 and Appendix A.

[2] F. W. Fetter, 'Some Neglected Aspects of Gresham's Law', *The Quarterly Journal of Economics,* Vol. 46, No. 3, (1932), pp. 480-95.

as the extent to which the money market was affected by the debasement, and the validity of Gresham's Law during this monetary turbulence have not been quantitatively assessed. The assessment of the efficacy of Gresham's Law in the Great Debasement can not only shed some light on the impact of the debasement upon society, but also on the understanding of the movement of bullion due to changes in coinage.

The paper is organized as follows: first, I summarize the recent literature on Gresham's Law and discuss questions arising from the literature, and then employ an asymmetric information model to explain Gresham's Law. Second, the historical context of this analysis will be presented: a series of debasements experienced in mid-Tudor England. Third, two ways of examining Gresham's law are advanced: 1) the discrepancy between the quantities of fine silver coins in circulation on the eve of Elizabeth's re-coinage and the total output of fine silver during 1551-8; 2) the difference between the actual exchange rates and the par exchange rates of London-Antwerp during and after the Great Debasement. Finally, I draw the two types of evidence together and offer some conclusion on the efficacy of Gresham's Law during the Great Debasement.

Gresham's Law

Imagine in a commodity money economy, being a buyer you have two kinds of money: both have the same face value, but one (undervalued or good money) has a higher intrinsic value than the other (overvalued or

bad money). Which money will you hand to sellers in exchange for a certain amount of goods, if sellers will accept both equally? You will give up the bad money in exchange for the same amount of goods that can be obtained for the same quantity of good money. What will you do if sellers can draw a distinction between good and bad money, and set different prices for different monies? It is very likely that you are indifferent toward these two kinds of money when their respective intrinsic values are exactly reflected by their purchasing power. For example, if the metallic content of bad money is only four-fifths of good money, therefore the price paid in bad money has to be one-quarter higher than that paid in good money to enable both to command the same purchasing power. In this case good money can circulate side-by-side with bad money.

The simple example above shows us that the validity of Gresham's Law - bad (overvalued) money drives good (undervalued) money out of circulation - requires an important assumption, namely that some consumers are better informed than others. Therefore, well informed consumers can pass on bad money to less informed consumers and hoard good money. This so-called asymmetric information has been explored by economists in many economic fields: Akerlof linked it to the 'lemons' problem, Chari to labour economics, Leland to licensing laws, Hill to securitized assets, and Gandal and Sussman to the emergence of national commodity money.[3] Gresham's Law could be regarded as an

[3] G. A. Akerlof, 'The Market for "Lemons": Quality Uncertainty and the Market Mechanism', *The Quarterly Journal of Economics,* Vol. 84, No. 3 (1970), pp. 488-500. V. V. Chari, 'Involuntary Unemployment and Implicit Contracts', *Quarterly Journal of Economics,* Vol.98, (1983), pp. 107-122; C. A. Hill, 'Securitization: A Low-Cost Sweetener for Lemon', *Washington University Law Quarterly,* 74 (1996), pp. 1061-1126;

application of the asymmetric information theory to the commodity money economy.

Debates over Gresham's Law have considered in what circumstances Gresham's Law applies and how to explain the numerous cases where either bad and good money circulated side by side, or good money drove bad money out of circulation. Rolnick and Weber strongly argue that the transaction cost related to imposing a premium (or discount) on good (or bad) money is the underlying element in the success of Gresham's Law.[4] Undervalued large-denomination money could circulate at a premium while undervalued small-denomination money would disappear due to the high costs of paying the premium. Greenfield and Rockoff, after their re-examination of the same three examples provided by Rolnick and Weber, claim that there is no strong evidence to invalidate Gresham's Law in nineteenth-century America and that bad money did indeed drive out good money.[5] In contrast to Rolnick and Weber's argument, Selgin, following the orthodox version of Gresham's Law, claims that legal tender legislation is a prerequisite for Gresham's Law.[6] Legal tender laws, "by making it costly or at least risky for sellers to communicate their monetary preference to buyers",[7] could completely

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H. Leland, 'Quacks, Lemons and Licensing: A Theory of Minimum Quality Standards', *Journal of Political Economy,* Vol. 87, No. 6 (1979), pp. 1328-46; N. Gandal and N. Sussman, 'Asymmetric Information and Commodity Money: Tickling the Tolerance in Medieval France', *Journal of Money, Credit and Banking,* Vol. 29, No. 4 (1997), pp. 440-457.

[4] A. J. Rolnick and W. E. Weber, 'Gresham's Law or Gresham's Fallacy', *The Journal of Political Economy,* Vol. 94, No. 1, (1986), pp. 185-99.

[5] R. L. Greenfield and H. Rockoff, 'Gresham's Law in Nineteenth Century American', *Journal of Money, Credit and Banking,* Vol. 27, No. 4, (1995), pp. 1086-98.

[6] G. Selgin, 'Salvaging Gresham's Law: The Good, the Bad, and the Illegal', *Journal of Money, Credit and Banking,* Vol. 28, No. 4, (1996), pp. 637-49.

[7] Ibid., p. 641.

eliminate the possibility of discriminating in favour of any money. In a more theoretical discussion about the conditions under which Gresham's Law holds true, Velde, Weber and Wright (hereafter VWW) establish a search-based model in which the exchange between well-informed and less-informed agents leads to by-weight and by-tale equilibria.[8] Under the by-weight equilibrium, heavy coins are able to circulate among well-informed agents, while under the by-tale equilibrium, well-informed agents impose a premium on heavy coins, but less-informed agents indiscriminately accept heavy and light coins. As Volckart points out recently, whether consumers are a homogeneous group is a critical assumption underlying currency competition.[9] Therefore, only when each party to the transaction possesses different knowledge about the quality of money, and the transaction cost assigning a discount or premium to the two kinds of money is not very high, bad money drives good money out of circulation.

During debasement, the medium of exchange comprised two kinds of coins: those with the old standard fineness, and the debased. Gresham's Law leads us to expect that the old standard coins would be culled and then exported, melted down, or hoarded; in consequence, only debased coins should have remained in circulation. Contemporary evidence and modern literature suggest that Gresham's Law worked at least to some extent in mid-Tudor England: apparently coins of the better

[8] F. R. Velde, W. E. Weber, and R. Wright, 'A Model of Commodity Money, with Applications to Gresham's Law and the Debasement Puzzle', *Review of Economic Dynamics,* Vol. 2, (1999), pp. 291-323.
[9] O. J. Volckart, '"The Big Problem of the Petty Coins", and How it Could be Solved in the Late Middle Ages', *Working Paper* in Economic History, LSE, 2008, p.21.

standard fineness did become scarce.[10] The disappearance of fine coins is not in doubt, but to what extent were these coins wiped out by the appearance of debased currency? How quickly were they withdrawn from circulation? How far can Gresham's Law explain this? Before providing answers to these questions, a review of the historical background is necessary.

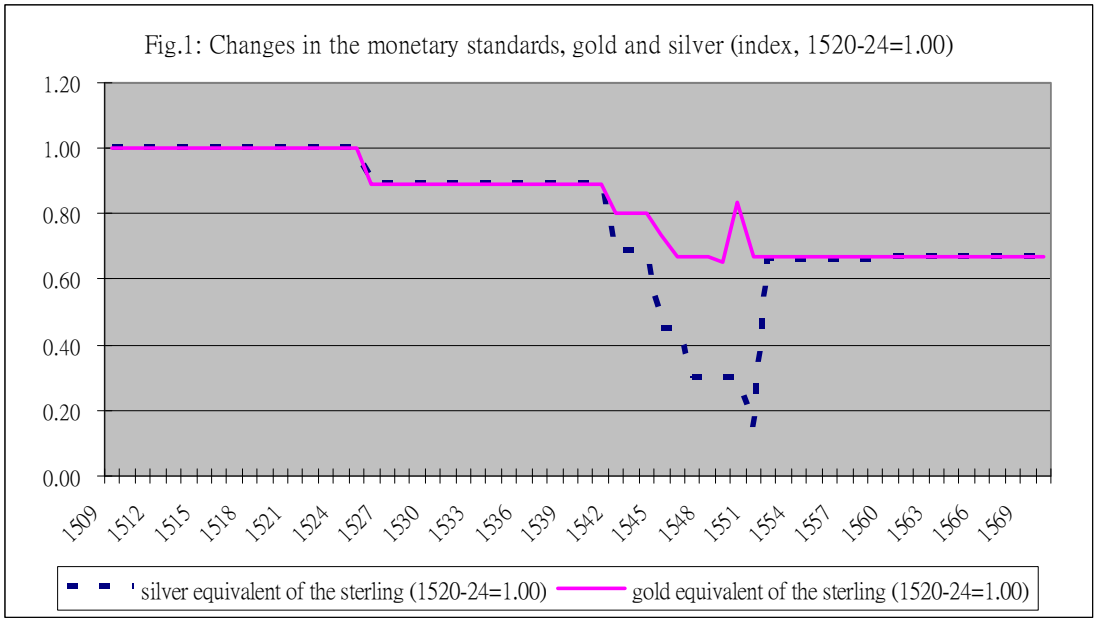
The Great Debasement

Since the High Middle Ages, English coins had long enjoyed a good reputation for stability and fineness, and had for centuries been widely accepted on the Continent. Parliament had for a long time strongly defended the inviolable standard of the coinage (which was that silver and gold coins had a pureness of 92.5 percent and 99.48 percent respectively), and was reluctant to devalue it.[11] However, when Henry VIII faced huge expenses in wars against France and Scotland, and after other resources were exhausted, he had no choice but to debase his coinage. His son, Edward VI, carried on another further adulteration before endeavouring to restore the standard. During the whole period of the debasements (eight years), the fine metallic content of silver coins had been reduced by 83 percent and gold coins by 27 percent (Fig. I). The scale of the debasement

[10] C. W. C. Oman, 'The Tudors and the Currency, 1526-1560', *Transactions of the Royal Historical Society,* Vol. 9 (1895), p. 184; C. H. Challis, *The Tudor Coinage* (Manchester University Press, 1978), p. 116; R. Ruding, *Annals of the Coinage of Great Britain and Its Dependencies* (London, 1840, 3d ed.), volume I, p. 334.

[11] A statute of 1352 made it illegal for any monetary alteration without the consent of Parliament. A. E. Feaveryear, *The Pound Sterling* (Oxford University Press, 1963), p.30; C. M. Cipolla, 'Currency Depreciation in Medieval Europe', *The Economic History Review,* New Series, Vol. 15, No. 3, (1963), pp. 420-1.

was so large and unprecedented that it was a shock after centuries of stable coinage and had a far-reaching impact on monetary policy for the next two centuries.[12] In the history of money, the monetary adulteration experienced from 1544 to 1551 in England has been called the Great Debasement.



The debasement occurred in several stages. In 1544 Henry VIII reduced the fineness of silver and gold coins to 75 percent and 95.83 percent respectively. Later the fineness of silver coins was further reduced to 50 percent and that of gold coins to 91.66 percent. Despite the debasements, royal finances were still in deep trouble. In late 1548, the

[12] Although there had been several debasements in the previous three centuries, the scale of adulteration either in weight or in fineness had never been seen before. Henry VIII and his successor were able to extract approximately £1,285,000 during the Great Debasement, C. E. Challis, 'The Debasement of the Coinage, 1542-1551', *Economic History Review,* Vol. 20, No. 3 (1967), p. 453.The experience of the Great Debasement played a role in 1696 re-coinage which decided on retaining the old standard fineness rather than reducing the fineness standard.

supply of silver to the mint started to dry up, and the King remained in financial difficulty. Now the mint price was too low to attract any more bullion to the mint, the government had no choice but to force people to surrender coins issued earlier by means of re-coinage. Edward VI withdrew the base testoons (twelve-penny) issued since the openness of the debasement (i.e. the silver coins of 75, 50 and 33.3 percent purity) and re-coined it into coins either of the old weight but with lower fineness, or of the same fineness but with lower weight.[13] In April 1551, in the last stage of the Great Debasement, the fineness of silver coins had plummeted to 25 percent, and the pure silver content was only about 17 percent of that of the pre-debasement coins.

Before Edward VI restored the fineness standard to 92 percent in October 1551, it is possible that two types of silver coin dominated in circulation: the ones containing 51.84 grams pure silver per pound sterling; the other being the basest coins issued from April 1551 which only contained 25.92 grams of silver per pound sterling. In August 1551**,** all debased silver coins were devalued to half their previous face values. Even so, the prevalent mint price between the end of the Great Debasement and the eve of Elizabeth's restoration was unable to attract

[13] The re-coinage of 1548-9 was devised against the background of a stagnating supply of bullion. As before, it was justified under the pretext of countering counterfeiting: "what fraud and corruption hath of late time been used in the falsing of his highness's coin now current, specially of the pieces of 12d…for the greatness and facility of counterfeiting…the practicers whereof (as is known) are not only men here dwelling, but also for the most part have been strangers dwelling in foreign parts who have found the means to convey privily and disperse the said counterfeit piece abroad." P. L. Hughes and J. F. Larkin, *Tudor Royal Proclamations,* (1964), Volume 1, No. 302, p. 420. Silver coins of three different kinds of fineness but the same mint equivalent were issued over the re-coinage of 1548-9: (1) those of 66.67 percent fineness, (2) those of 50 percent fineness, and (3) those with 33.33 percent fineness. Challis, *The Tudor Coinage*, Appendix II, p. 306.

the remaining base money to the mint (Table II).[14] After halving the face value, the remaining base silver coins roughly contained 90 percent as much pure silver as those fine coins issued later in the reign of Edward VI and during that of Mary. Debased coins and good coins circulated side-by-side during this period. The situation did not change very much until Elizabeth‘s restoration. Until the face value of base money was further reduced, the government could not afford a viable reform of the coinage.

Testing Gresham's Law

As mentioned earlier, knowledge plays a pivotal role in Gresham's Law: when the information costs are high, the line between good money and bad money cannot be easily drawn. Therefore, the concept of well- and less-informed agents in VWW's model is applied here to examine Gresham's Law during the Great Debasement. Two types of consumer can be distinguished in mid-sixteenth-century England: a minority group composed of merchants, goldsmiths, money changers, and other professionals and tradesmen, and the rest of the population, i.e. in Bedford's words, 'thunlerned and unplandyshe people'.[15] It is reasonable

[14] A few debased coins of 50 percent fineness issued between 1545-7 likely survived in circulation by the autumn of 1551. A part of debased coins of 50 percent fineness had been re-coined in 1548-9, and a part had been withdrawn to mint the basest coins in the early 1551. However, the mint price was unable to bring silver coins of 50 percent fineness to the mint until April 1551 (Table I). After the revaluation of 1551, the mint price (£3.2) was significantly higher than the mint equivalent of these coins (£2.4). The silver coins of 50 percent fineness seems likely to be wiped out of circulation before Elizabeth's re-coinage. J. D. Gould, *The Great Debasement* (Oxford, 1970), pp. 47-8.

[15] During the Elizabethan re-coinage, for example, the Earl of Bedford complained to the Lord Treasurer, William Cecil, that 'thunlerned and unplandyshe people' had

to regard the former as the well-informed agent who was in a better position to identify the intrinsic value of coins because of its greater resources and information, and the latter as the less-informed agent.[16]

Theoretically, people could calculate the intrinsic value of coins by multiplying the weight of coins by their fineness. However, the touchstone test - the common technology used to identify the fineness of coins in the early modern period - was accurate at best only to within two or three percentage points[17] and required a great deal of specialized knowledge and instrument.[18] This implies that for many consumers, the transaction costs of determining the intrinsic value of coins must have been prohibitive. Therefore, the general public likely handled coins by tale. On the other hand, merchants involved with large transactions especially in international trade and the government valued coins on their intrinsic value (that is, by weight).[19]

The two types of evidence used here to examine the efficacy of Gresham's Law during the Great Debasement, the composition of

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difficulty in drawing a distinction between the 50 percent and 25 percent fineness silver coins, and officers had been sent to counties to put different stamps upon the two types of coins. A portcullis was stamped on the less debased coins in front of the King's head and on the basest coins a greyhound behind it. D. M. Palliser, *The Age of Elizabeth* (London: Longman, 1992), p. 135; J. Graig, *The Mint* (Cambridge, 1953), p.119.

[16] C. H. Challis, 'The Circulating Medium and the Movement of Prices in Mid-Tudor England', *The Price Revolution in Sixteenth-Century England,* ed. by P. E. Ramsey, (Methuen, 1971), pp. 139-40.

[17] N. Gandal and N. Sussman, loc. cit., p. 444. Around the mid-fourteenth century, however, in Venice, the needles used in the touchstone test could be accurate to within a few thousandths of a percentage point (though the authors express a degree of skepticism). F. C. Lane and R. C. Mueller, *Money and Banking in Medieval and Renaissance Venice* (The Johns Hopkins University Press, 1985), p. 150.

[18] Although the cost of the touchstone test is unknown, we know the price of the balance and the set of coin weights in Elizabeth's reign: from 54d to 37d (when the wage of a master mason was 7d daily in the 1550s). *A Declaration of an order for the making of certaine small Cases of for Ballaunces and Waightes to weigh all maner of Golde Coynes* (1588), in H. Dyson; *Proclamations* (1618), p. 258.

[19] Lane and Mueller maintain that the general population passed coins by tale; merchants, on the other hand, handled coins by weight. Lane and Mueller, op. cit., p. 59-60.

Elizabeth's re-coinage and the movement of the exchange rate, correspond respectively to the situations of less-informed and well-informed agents. Although gold and silver coins were both involved in the Great Debasement, gold coins will not be considered in the evidence drawn from Elizabeth's re-coinage partially because gold coins suffered less adulteration than silver during the Great Debasement and the standard of gold coins had been restored in Edward's reign, and partially because gold coins were not re-coined in Elizabeth's reform. As the common medium of exchange used in international trade, however, gold coins play a critical part in the evidence drawing from the movement of exchange rates.

i. Re-coinage

In October 1551, the government began to restore the standard of silver coins by calling down the face value of debased coins[20] and issuing fine silver coins. The fine silver coins were struck at 60 shillings per pound of pure silver with 92.08 percent fineness, which was slightly lower than the old standard (92.5 percent fineness). The revaluation of debased silver coins in 1551 was the first step toward the restoration of the old standard. However, the revaluation failed to provide enough incentives to re-mint the remaining debased coins (Table II).[21] In Mary's reign the fineness of silver

[20] The face values of base silver coins were all reduced by 25 percent, with the testoon and groat becoming 9d (instead of 12d) and 3d (instead of 4d) pieces respectively from August. One and half months later, the shilling was called down once again to 6d, the groat to 2d and the smaller coins in the same proportion. *Tudor Royal Proclamations*, No. 372, 378, and 379.

[21] The mint equivalent of debased coins (£3.6000 and £7.2000) was still higher than the mint price of the fine silver coins issued from October 1551 (£3.2000) (Table II).

coins was slightly reduced to 91.66 percent. When Elizabeth came to the throne in 1558, four types of silver coins remained in circulation: those of 50 percent fineness issued in 1549-51, of 33 percent fineness issued in 1546-50, the basest coins of 25 percent fineness issued in 1551, and the fine silver coins issued after the Great Debasement.

According to Gresham's Law, debased silver coins with less intrinsic value should drive fine silver coins of 1551-60 out of circulation. Many scholars assume that this was what actually happened. For example, according to Oman, 'the copious stream of finer pieces [that] poured out from the mint […] seemed to vanish just as it touched the trading world'.[22] But he provided neither statistics nor an explanation to support his argument. Feavearyear had a similar opinion about the disappearance of Edward VI's and Mary's fine silver coins: 'new ones [fine silver coins] which immediately disappeared'; and 'the price of silver was much too high to permit coins as fine and as heavy as his new ones to stay in circulation'.[23] Contemporaries also showed the same concern: Sir John Price told Queen Mary '…as one testoon is better than another, the fine new coin better than the base universally … which inequality is cause of much robbing of the treasure of the realm, while the best money is ever picked and carried over, and the worst only left us'.[24] Nevertheless Gould argues, based on Stanley's estimation,[25] that "a large part of the fine-gold and sterling-silver coinages of the last years of Edward VI and of Mary's

[22] Oman, op. cit., p. 184.
[23] Feavearyear, op. cit., p.66 and 69.
[24] W. A. J. Archbold, 'A Manuscript Treatise on the Coinage by John Pryse, 1553', *English Historical Review,* (1898), pp.709-10.
[25] Thomas Stanley was a senior mint official, and controlled the mint from 1551 to 1571. He also charged Elizabethan re-coinage in the old mint in the Tower.

reign [to have] survived to 1559', calling Gresham's Law into doubt.[26]

In order to solve the question of the accuracy of Gresham's Law in describing events after the Great Debasement, it is necessary to calculate how much base money had been produced since the start of the Great Debasement, what proportion of it was then melted down or converted, and what proportion of the rest of the debased coins of different standards was still current between the end of the debasement and the re-coinage of 1560. Moreover, questions such as how much fine silver money was issued during this period, and how many of these coins still circulated on the eve of the re-coinage also need to be answered. If bad money did drive out good money, the number of fine silver coins in circulation on the eve of Elizabeth's re-coinage should be significantly smaller than the total output of fine silver. The discrepancy between these two figures can be used to assess the effectiveness of Gresham's Law.

In the preparation for the re-coinage, the government had to have a basic understanding about the composition of circulation, and to revalue the debased coins. Therefore, in 1559 Stanley conducted his estimate of the characteristics of coinage in circulation in 1559 (Table III). Later in 1560 the government reduced the face value of lesser debased silver coins (50 percent and 33.33 percent fineness) to 4 1/2d, which amounted to a reduction of 25 percent, and the basest ones (25 percent fineness) to 2 1/4d, which represented a 62.5 percent drop in the face value (Table II, column 5).[27]

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[26] Gould, op. cit., p.55.
[27] *Proclamations*, No. 471.

The change in the number of fine silver after the Great Debasement can be obtained from the comparison between Stanley's estimate and the total output of fine silver issued from 1551 to 1558. However, the mint accounts of 1551-8 are fragmentary. Over these eight years, only thirty months' accounts survive: Oct. 1551-Mar. 1552, Dec. 1553-Dec. 1555. Because of this discontinuity, the calculation of the total output has to rely heavily on the estimate of 1556 privy council and the first year output of Elizabeth's reign (Table IV).[28]

The gold and fine silver coins issued under the name of Edward VI surviving in circulation in 1559 amounted to £100,000 in Stanley's estimate (Table III, row 3), which was £45,332 short of the total mint output (£145,332 17s 6d, Table IV, column 4). If this discrepancy had entirely been due to the disappearance of fine silver coins, 36.5 percent (£45,332 out of £124,179), at most, of Edwardian fine silver disappeared during this period. Did Mary's fine silver suffer the same rate of attrition? Since mint accounts from the second part of Mary's reign (1556-8) are missing, the output of these years needs to be reconstructed in order to extrapolate the rate of disappearance of fine silver.

Mary's marriage to Philip of Spain in July 1554 boosted the supply of bullion to England. Craig describes the brisk activity of the mint:

[28] The estimates of the first two rows are drawn from the study of Challis and Harrison. The estimates of the third row will be explained below in detail. Challis and Harrison, Ibid., p. 831

'Twenty carts of bullion drawn by ninety-nine horse and two wagons of foreign coin lumbered into the Mint…reinforced by men and tools from Spain, it re-minted nearly £17,600 of Spanish ryals.'[29]

The mint output of the first year of Elizabeth's reign probably offers a better proxy for the missing accounts of July 1556-January 1559 than the inflated mint output of the early part of Mary's reign. The mint was likely to have been idle during the latter part of Mary's reign;[30] therefore, the mint output of the first year of Elizabeth's reign (which was two-fifths of the mint output of the early part of Mary's reign) can be seen as the maximum estimated output. Between January 1559 and July 1560, the output of gold and silver was £25,636 and £31,312 respectively.[31] Therefore, the estimates have assumed £37,779 of gold coins and £46,144 of fine silver coins should be added to Mary's mint output, to arrive at an estimated total output for her reign of £379,016 (Table IV, row 3).[32] Comparing this figure to Stanley's estimate, which was £370,000, the discrepancy between them is £9,016. As for the case of Edwardian fine silver, that the shortfall of £9,016 was due to the loss of fine silver coins, only 3.4 percent of Mary's fine silver vanished from circulation, and that figure increased to 4.2 percent when there would have been no mint output late in Mary's reign.

If (1) these estimates are broadly correct,[33] and (2) the difference

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[29] Craig, op. cit., p.118.
[30] Gould, op. cit., p. 53. Challis, however, argues that there may be modest mint output during the second part of Mary's reign. Challis, 'A Contemporary Estimate of the Production of Silver and Gold Coinage', p.832.
[31] Challis, *A New History of Royal Min* (Cambridge University Press, 1992), Appendix I 2.
[32] The average monthly mint output during the period Jan. 1559-July 1560 was £1,648 in silver and £1,349 in gold. Therefore, the estimated mint output from Aug. 1556 to Nov. 1558 (28 months) is £46,144 in silver and £37,779 in gold.
[33] There are good grounds for trusting these estimates. As a senior mint official and a

between the estimated total output of fine silver coins and Stanley's estimate entirely comes from the disappearance of fine silver coins, the above calculation suggests that 14 percent of good money had disappeared in the period between the end of the Great debasement and the Elizabeth's re-coinage.[34] Before any conclusion about the validity of Gresham's Law can be drawn from this estimate, a few points need to be clarified. First, there is a substantial difference in the disappearance rate of fine silver between Edward VI (36.5 percent) and Mary's time (3.4 - 4.2 percent). One possible explanation for this is that since Edwardian fine silver had been in circulation longer than Marian, it was more exposed to culling and hoarding. Moreover, people might still not have felt confident about the English coinage over the years following the Great Debasement, meaning that the incentive to cull fine silver out of circulation remained strong. Once the faith in English currency was restored, the fine silver coins were less likely to be hoarded.

Second, although the fine silver coins issued during 1551-8 did not return to the pre-debasement standard, the fineness of silver coins had been largely improved. The public were not able to benefit from hoarding fine silver coins in that the standard of English sterling was more or less restored, and the production of fine silver coins seemed likely to be continuous. There was no other new debased coins produced to compete

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mint master from 1560-72, Stanley's estimate should be quite accurate. Gould, op. cit., pp. 54-5. For analysis of the estimate of 1556 see C. E. Challis and C. J. Harrison, 'A Contemporary Estimate of the Production of Silver and Gold Coinage in England, 1542-1556', *Economic History Review,* 88 (1973), pp. 821-35.

[34] £470,000 (Table III, row 3 and 4) out of £524,349 (Table IV, column 4) is 86 percent. If the disappearance of gold during this period is included, then the proportion of fine silver remaining in circulation will be larger than the 86 percent estimated here.

with fine silver coins.[35] Third, the revaluation of 1551 reduced the quantity of circulating medium in terms of face value by roughly 50 percent.[36] The loss of half the volume of currency forced the economy to circulate money more efficiently. Therefore, the public intended to use every available money and were less likely to hoard money (it may be costly to do so).

Last, the appearance of fine silver coins was very different from the debased coins (especially Mary's). There is little doubt that even the ordinary people were able to distinguish fine silver coins from the debased. The lower is the information cost, the more likely it is that money with different qualities can circulate side by side. Based on these factors, the disappearance of 14 percent of total fine silver coins can not imply that Gresham's Law was only valid to a limited extent. However, the disappearance rate of Edward's fine silver coins can be tentatively regarded as a measurement of effectiveness of Gresham's Law: about one third of fine silver coins disappeared from circulation in less than two years.

ii Exchange Rate

In this section, the adjusted par exchange rates will be constructed, and the comparison between it and the actual exchange will be used to measure the effectiveness of Gresham's Law during the Great

[35] Though the issue of fine silver coins since October 1551, the mints (the Tower mint and York) continued to strike small denominations in debased coins (with 33.33 percent fineness). However, a rose was engraved on these base coins which appearance was different from the fine silver coins.

[36] £2,405,000 out of 2,455,000 total circulating medium in July 1551 was debased silver. The revaluation of 1551 resulted in halving the money, in terms of face value, in circulation. Challis, 'The Circulating Medium', op. cit., p. 132.

Debasement. Because merchants' reaction toward the monetary alteration was reflected in the movement of exchange rates, the difference between the actual rates and the theoretical rates will shed some light on how merchants responded to the various standards of coins resulted from the debasements.

As early as the thirteenth century, the bill of exchange was devised to alleviate the costs involved in shipping bulky commodity money, either in the form of bullion or coin, to settle commercial payments or debts.[37] By using bills of exchange, the only need to settle international payments by shipping specie was to cover imbalances of trade, which greatly reduced the transaction costs, i.e. the seigniorage derived from manual currency exchange,[38] and the risks of delay, piracy, and confiscation inherent in transporting specie. English merchants who needed Flemish money, for instance, to import Portuguese spice from Antwerp, could simply buy a bill of exchange with English money in London and redeem it into Flemish currency in Antwerp, whereas those with Flemish money could buy a bill of exchange which would be paid in pounds sterling later in London. The bill of exchange saved the trouble of shipping specie and consequently boosted international trade.

How was the exchange rate of bills decided? Exchange fluctuations

[37]A series of studies by Raymond de Roover comprehensively explain the origination and the mechanism of the bills of exchange. Raymond de Roover, *Gresham on Foreign Exchange* (Cambridge, 1949); idem., *Money, Banking and Credit in Medieval Bruge,* (Cambridge, Massachusetts, 1948), p. 51-75; idem., 'What is dry exchange? A contribution to the study of English Mercantilism', *Business, Banking, and Economic thought in Late Medieval and Early Modern Europe: Selected Studies of Raymond de Roover,* ed. by Julius Kirshner, (University of Chicago Press, 1974), pp. 183-99.

[38] Feavearyear (op. cit., appendix I and II) estimates that the mint charge in England varied from 2.5 to 12 percent on silver coins; from 0.6 to 12 percent on gold coins.

in the mid-sixteenth century were the result of forces operating in the money market. Apart from the supply and demand of bills of exchange in the market, according to de Roover, the principal causes of such fluctuations were: (1) changes in the metallic content of coins either at home or abroad through enhancement or debasement; (2) changes in the balance of trade; (3) manipulation of the money market by governments, and the speculation.[39] For examining the validity of Gresham's Law during the Great Debasement; however, the impact of the mint parity on exchange rates of bills outweighs other factors.[40] The relative price of domestic money in terms of foreign currency is to a large extent determined by the ratio of metallic content of the two currencies. In other words, the exchange rate between two countries reflects the intrinsic value of their coinage. When there is a monetary alteration in either country, ceteris paribus, the exchange rate should adjust to take account of the alteration.

During the Great Debasement - when the metallic content of English silver coins had deteriorated by 83 percent, but the metallic content of the Flemish groat was unchanged between 1527 and 1553[41] - according to the mint parity the exchange rate for one English pound should have

[39] de Roover, *Gresham on Foreign Exchange*, p.128.
[40] Although Gresham tried to manipulate the exchange rates to favour English sterling, his endeavour was short-lived and did not achieve anything. The seasonal fluctuations were very predictable and did not alter the fundamental trend of exchange rates. We are unable to measure the overall English trade balance; however, the trade balance with her main trade partner, the Low Countries, was estimated to be negative and stable. P. A. M. Boele van Hensbroeck, Lodovico Guicciardini, *Descrittione di Tutti i Paesi Bassi, Bibliografische studie,* Bijdragen en Mededelingen Historisch Genootschap Utrecht, I, 1877; W. Brulez, 'The balance of Trade of the Netherlands in the Middle of the 16th Century', *Acta Historiae Neerlandica*,IV, 1970, pp.20-48; Stone, L., 'Elizabethan Overseas Trade', *Economic History Review,* Vol. 2, No. 1, (1949), pp. 30-58.
[41] Although the metallic content of Flemish silver coins remained unchanged, the government enhanced the face value of gold coins in 1548 and 1551.

reached 4s 6d Flemish to reflect the depreciated value of English coins being struck at their time (Table V).[42] However, the London-Antwerp exchange rate only reached its nadir at 12s 9d in July 1551.[43] Although the impact of the Great Debasement on exchange rates is indubitable, it is not enough to explain changes in the exchange rate solely by changes in the mint parity. As Challis points out, it '…was wrong to embrace a purely mechanistic interpretation of exchange movements, linking as he [Unwin] did falling exchanges directly with adulteration of the coinage'.[44] Could the connection between the mint parity and exchange rates be improved by considering merchants' reactions to the various standards of coins? The type of coin used to settle bills of exchange definitely had an impact on the exchange rate, therefore, the difference between the actual exchange rates and the par exchange rates could thus be used to test whether bad money drove out good money during the Great Debasement. If Gresham's Law was valid, then debased coins rapidly became the dominating circulating medium in England during this period, and the exchange rate in London would have declined to an extent fully corresponding to the metallic content of English debased coins. The effectiveness of Gresham's Law can therefore be examined by analyzing the movement of the exchange rates of London-Antwerp.[45]

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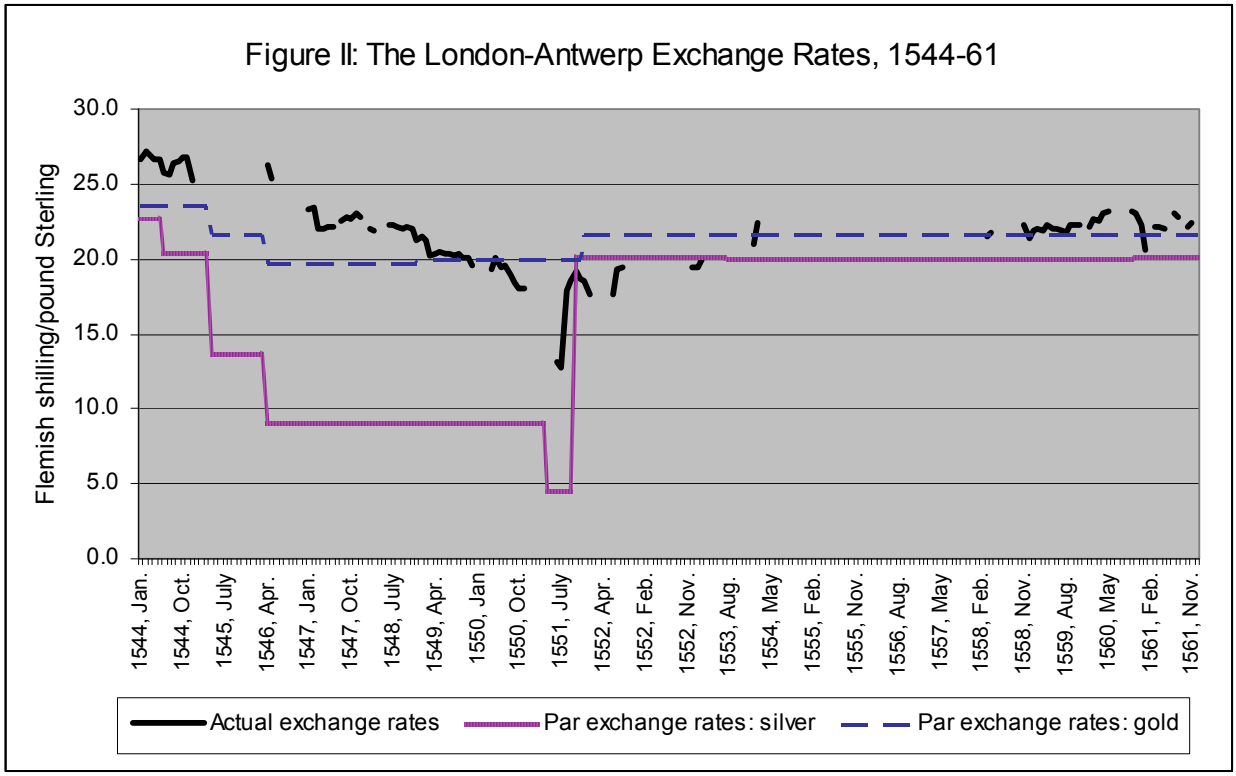
[42] The exchange rate would have reached its nadir at 19s 8d in 1546, if the trade of the bill of exchange had been paid in gold coins. The gold coins issued in 1546 only contained 10.368 grams in one pound sterling, at the meantime, the Flemish gold coins contained 10.55 grams in one Flemish pound. Therefore, the mint parity in terms of gold coins between England and the Low Countries was 19s 8d (without considering the seigniorage and the transport cost).

[43] Gould, op. cit., p. 89. The list of exchange rates is presented in Appendix.

[44] C. E. Challis, 'Currency and the Economy in Mid-Tudor England', *Economic History Review,* Vol. 25, No.2 (1971), pp. 313-22.

[45] The exchange rates used here are from: (1) Gould, *The Great Debasement*, Table IX;



Transactions of bills of exchange were strictly monitored in England, and merchants were required to obtain a license to use bills of exchange.[46] Inevitably the way these merchants handled coins during the debasement had a great impact on the movement of exchange rates. But what kinds of coins were used to settle international payment? Gold or silver? Good money or bad money? Since Europe was a bimetallic economy in the sixteenth century, if the transaction was not through a deposit banker, the bill of exchange could be paid either in silver or gold

(2) T. H. Lloyd, 'Early Elizabethan Investigations into Exchange and the Value of Sterling, 1558-1568', *Economic History Review,* 2000, Table 2; (3) P. H. Ramsay, *The Merchant Adventurers in the First Half of the Sixteenth Century,* Unpublished PhD thesis, Oxford: University of Oxford, 1958, Appendix D.

[46] In 1531 the government issued a proclamation which revived an old statue of 1381 and forbade merchants from making exchanges and re-changes without the king's license. De Roover, *Gresham on Foreign Exchange*, p.181.

coins.[47] Although gold is known to have played an important role in international payment, there is no way to know which metal was actually used. The metal used in the payment of bills of exchange is particularly important for calculating the mint parity in the Great Debasement when gold and silver suffered different degrees of adulteration. During the pre-debasement period, the mint parity of either gold or silver was close to the actual exchange rates of bills.[48] However, as shown in Fig. II, a significant difference existed between these rates.

In 1541 Charles V decreed that bills of exchange and bonds should be settled with a minimum of two-thirds in recognized gold specie in the Low Countries.[49] This silver/gold ratio can be regarded as a proxy in constructing the par exchange rate.[50] Besides the issue of the type of metal used in settling bills of exchange, the standard of Flemish coinage poses another problem in calculating the mint parity. Unlike English Sterling, Flemish money did not have a single fineness standard, but the fineness varied from between denominations. For example, a Double

[47] Hanham, A., *The Celys and Their World* (Cambridge, 1985), pp. 179, 193.
[48] The mint parity during this period was 26.84 Flemish shilling to the pound Sterling for silver coins and 26.07 for gold coins. The exchange rates presented in van der Wee's graph indicate that the exchange rates of bills varied between 26.5 and 27.25 Flemish shillings to one pound sterling. Van der Wee, H., *The Growth of the Antwerp Market and the Europe Economy,* (The Hague: Nijhoff, 1963), Graph 32.
[49] The decree aimed to increase the amount of gold in the Low Countries, but it blockaded the use of credit and delivered a blow to commerce in the Low Countries. And very soon it was effectively allowed to lapse. F. Edler, "The Effect of the Financial Measures of Charles V on the Commerce of Antwerp, 1539-42," *Revue Belge de Philogoie et d'Historie,* Vol. 16, (1937), pp. 671-3; R. De Roover, *Money, Banking and Credit in Medieval Bruges* p. 81. Furthermore, Buckley argues that "the prevalence of bad money led the Flemish […] to stipulate for payment of bills of exchange and repayment of loans in permission money; two-thirds in gold and one-third in silver." H. Buckley, 'Sir Thomas Gresham and the Foreign Exchanges,' *The Economic Journal,* Vol. 34, No. 136, (1924), p. 590.
[50] Gold was commonly used as a medium of exchange for large payments and overseas trade; furthermore, it suffered less adulteration compared to silver during the great debasement (Fig. I). But the increasing circulation of silver coins in mid-sixteenth-century England can not be neglected. Challis, *The Tudor Coinage*, table 3, p. 232. The gold/silver ratio of 2 to 1 seems reasonable.

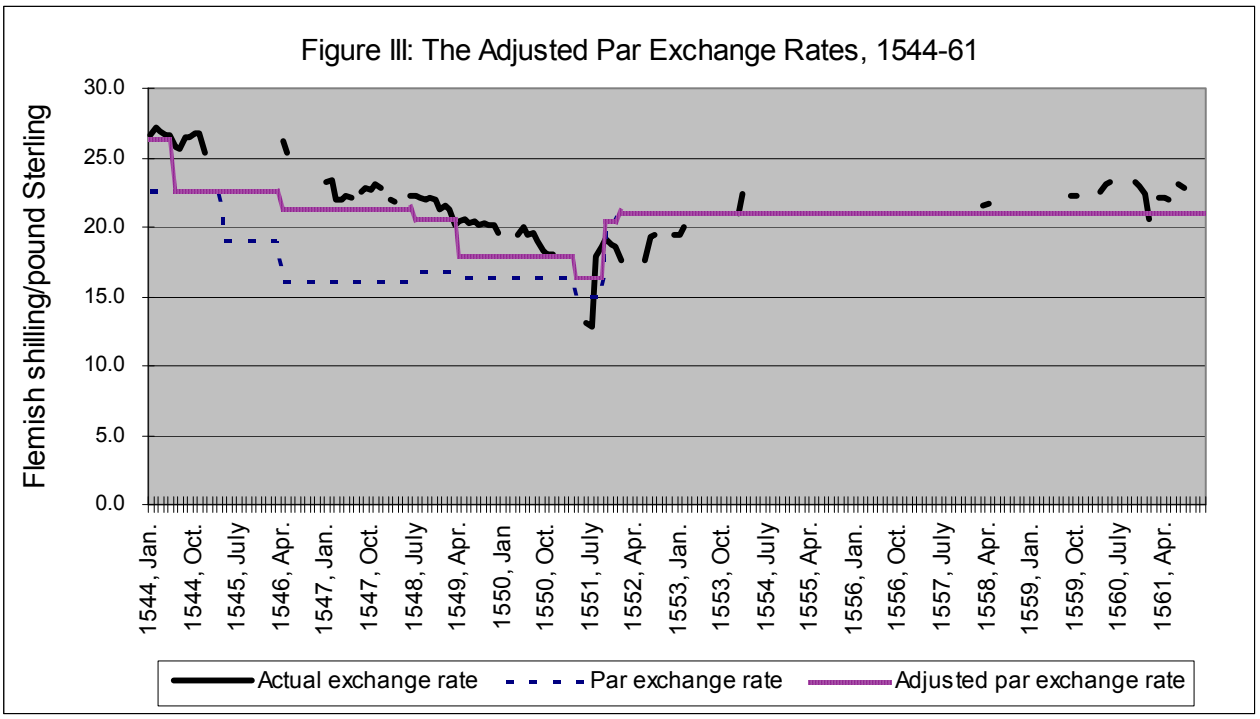
Carolus valued at 6d, had 0.934 fineness, whereas a Carolus with a face value of 3d consisted of 0.457 silver.[51] The difference in fineness could be a result of the production cost, in that it was more expensive to produce small denomination coins than large denomination coins. Therefore, the type of Flemish coin used in settling bills affects the calculation of the mint parity between England and the Low Countries. Because the transaction costs of using coins with larger denominations is lower (it takes less effort to count the number of coins involved in a transaction), it is reasonable to assume here that in the Low Countries bills of exchange were remitted in coins of the largest denomination. Therefore the Double Carolus (the silver coin with the face value of 6d) and Real d'or (the gold coin with the face value of 10s) are chosen to calculate the mint parity between the two countries.

When good coins and base coins were in circulation, as in the case of the Great Debasement, merchants, being well-informed agents, were probably able to distinguish between them (p. 12 f.). In international trade, English merchants and foreign merchants were both well-informed; the debased coins could thus circulate at a discount and good (less debased) coins at a premium. When two parties involved in trade are both well-informed, Gresham's Law, which requires asymmetric information, fails to apply. However, this is a counter-effect. Considering the higher transaction cost involved in dealing with debased coins (i.e. the time consumed in counting and examining a larger number of debased coins,

[51] Pusch, Gottfried, 1932, Staatliche Münz- und Geldpolitik in den Niederlanden unter den burgundischen und habsburgischen Herrschern besonders unter Kaiser Karl V. Val. Höfling, München, p. 48.

and less certainty and confidence in the new debased coins), merchants involved in international trade were inclined to use good (less debased) coins.

The old (good) coins would remain in circulation until the mint price of new (debased) coins was higher than the mint equivalent of old ones, thus merchants would keep using them to settle bills of exchange. Therefore, the *adjusted* par exchange rates are constructed from the less debased coins in circulation, and the gold/silver ratio of 2 to 1 (Table VI). For example, until 1547, the mint price was higher than the mint equivalent of the silver coins issued in 1544 (Table I), therefore merchants are assumed to have used silver coins of 1544 to settle bills of exchange, although the baser silver coins, which had 50 percent fineness, were available from 1545. On the other hand, the par exchange rates are calculated using the last debased coins and the same gold/silver ratio.



As shown in Figure III, the adjusted par exchange rates generally correspond more closely to the actual trend of exchange rates than the par exchange rates; nevertheless, the actual exchange rates were always higher than the adjusted par exchange rates, except in 1551. There are a few aspects of Fig. III that require clarification. First of all, there is a time lag between the actual and the adjusted par exchange rates during the debasement. The time lag was about three years in the early stages of the debasement (before the re-coinage of 1549), and roughly one and half years after the re-coinage of 1549, when the pure silver content was adulterated by a further 33 per cent. After the Great Debasement (1551-3) the actual exchange rate did not immediately rebound from its previous plunge; it took about 20 months to climb back to the level which corresponds the intrinsic value between English and Flemish coins. It took

time for merchants to realize that it was profitable to exchange old coins for debased coins, and through this, old (good) coins gradually disappeared from circulation. This can partially explain the time lapse between the adjusted par exchange rates and the actual exchange rates. The speed of the spillover effect on monetary policy was approximately one and half years in early modern England. Nevertheless, the relatively slow reaction of exchange rates to the monetary shock contradicts contemporary complaints about the lower price being offered for English coins in the Low Countries, just a few months after the initiation of the debasement.[52]

Second, the most substantial difference between the par exchange rates and the adjusted exchange rates appeared between 1547 and the re-coinage of 1549. Although by 1547, the metallic content of debased silver coins had reached 51.84 grams per one pound Sterling, the previous debased silver coins bearing Henry VIII's name which metallic content varied from 111.64 grams to 77.76 grams per one pound Sterling still remained in circulation (Table I). The close correspondence between the adjusted par exchange rates and the actual exchange rates suggests that merchants were inclined to trade with less debased coins.

Third, in the last stage of the Great Debasement (between April and August of 1551) the actual exchange rates were lower than the adjusted par exchange rates and the par exchange rates. The probable explanation is likely to lie in the outflow of gold from 1549 onward when the gold-silver

[52] Feavearyear, op. cit., p.51; Gould, op. cit., p.96.

ratio reached its nadir.[53] As a result, gold started to disappear from circulation in England, therefore, merchants were forced to pay bills of exchange in debased silver coins more often than previously. Furthermore, this period was the most severe event of the Great Debasement: the metallic content of silver coins was 25.92 grams of one pound Sterling which was 17 percent of pre-debasement level. These would cause a precipitous fall in the exchange rate.

Although the relationship between the mint parity and the exchange rate is not one-to-one, the mint parity is the main underlying element of the fluctuation of the exchange rates during the Great Debasement. However, the main determinant of the exchange rates was not that dictated by the mint indenture, but by the money actually used to settle bills of exchange. In consequence, the efficacy of Gresham's Law (having an effect on this component of circulation) had an impact on the degree of the fall in the exchange rate. The effectiveness of Gresham's Law among merchants during the Great Debasement can thus be measured by the deviation between the actual exchange rates and the adjusted par exchange rates. The result, to some extent, corroborates to Rolnick and Weber's model in which, good money - bearing lower transaction costs - could drive out bad money. The closer correspondence between the adjusted par exchange rates and the actual exchange rates indicates that good money (less base coins) incurred lower transaction cost, overwhelming bad money (base coins) in settling the payment of the bill of exchange.

[53] The gold-silver ratio was 9.3 in July 1550. Gould, op. cit., table VI.

Conclusion

Before the appearance of fiduciary money, rulers were haunted by a permanent problem: how to protect their own coinage. Rulers needed to prevent excessive adulteration of coinage to avert the outflow of coins. Neither could they permit too much undervaluation of their currency compared to those of neighbours, as this would attract aggressive counterfeiting and thus reduce seigniorage. Through debasement and enhancement, rulers could adjust their coinage to correspond to their neighbours'. The Great Debasement of 1544-51 was an exceptional case in English monetary history, not just for its solely fiscal motive but for the scale. At least six different kinds of coin were issued during this period. According to Gresham's Law, when different intrinsic values of coins are concurrent in circulation, the low intrinsic value coins drive high intrinsic value coins out of circulation. Two types of evidence have been employed to test the validity of Gresham's Law: Elizabeth's re-coinage and the movement of exchange rates of bills. As shown above, although on the eve of Elizabeth's restoration 86 percent of the total output of fine silver of 1551-8 was still circulating side by side with other debased coins, but due to the influence of the reducing volume of currency, and the termination of debasement, the operation of Gresham's Law was not effective. However, it seems possible to suggest that in 18 months one third of Edward VI's fine silver had been driven out of circulation by debased coins. During the Great Debasement, the adjusted par exchange rates, which based on the currently high intrinsic value of coins, rather than the par exchange rates corresponds closer to the actual exchange rates, though with a time lag.

This implies that international merchants, as being well-informed agents, used good money to settle bills of exchange in order to avoid transaction costs. The results confirm that transaction cost and asymmetric information were essential factors of the operation of Gresham's Law in mid-sixteenth century England.

Appendix

Table I: English silver coins, 1526-1560

Date	Fineness (%)	Grams of pure silver per £ sterling	Mint equivalent (£)	Mint charge (£)	Mint Price (£)
Nov. 1526	0.9250	153.4464	2.4333	0.0549	2.3784
May 1542	0.7583	117.9308	3.1650	0.7650	2.4000
June 1544	0.7500	116.6400	3.2000	0.6000	2.6000
Apr. 1545	0.5000	77.7600	4.8000	2.0000	2.8000
April 1547	0.3333	51.8400	7.2000	4.0000	3.2000
Oct. 1548	0.3333	51.8400	7.2000	3.8000	3.4000
Jan. 1549	0.6667	51.8400	7.2000	not given	not given
Oct. 1549	0.5000	51.8400	7.2000	3.6000	3.6000
Apr 1550	0.5000	51.8400	7.2000	2.9000	4.3000
Aug. 1550	0.5000	51.8400	7.2000	3.2000	4.0000
Apr 1551	0.2500	25.9200	14.4000	8.4000	6.0000
Oct. 1551	0.9208	114.5623	3.2583	0.0547	3.2036
Aug. 1553	0.9166	114.0397	3.2708	0.0776	3.1932
Aug. 1557	0.9166	114.0397	3.2708	0.0799	3.1909
Nov. 1560	0.9250	115.0848	3.2417	0.0773	3.1644

Source: (1) C. H. Challis, *The Tudor Coinage*, (Manchester University Press, 1978), p.171, and Appendix II. (2) Mint equivalent is drawn from J. D. Gould, The Great Debasement, (Oxford, 1970), Table I.
Note: fineness is the metallic content of coinage in terms of percentage. Mint equivalent is the face value of coins made out of one pound of silver. Mint charge is the amount deducted to cover production costs and seigniorage. After the mint charge has been deducted from the mint equivalent, mint price is the amount received by the public for bringing in one pound of silver.

Table II The variation in denominations of English silver coins, 1551-1560

Date of issue	Fineness	Original Mint equivalent (£)	Mint equivalent (£) Aug. 1551-Sept. 1560	Mint equivalent (£) after Sept. 1560	Mint Price (£)
Apr. 1547	0.3333	7.2000	3.6000	2.7000	3.2000
Oct. 1548	0.3333	7.2000	3.6000	2.7000	3.4000
Oct. 1549	0.5000	7.2000	3.6000	2.7000	3.6000
Apr. 1550	0.5000	7.2000	3.6000	2.7000	4.3000
Aug. 1550	0.5000	7.2000	3.6000	2.7000	4.0000
Apr. 1551	0.2500	14.4000	7.2000	2.7000	6.0000
Oct. 1551	0.9208	3.2583	3.2583	3.2583	3.2042
Aug. 1553	0.9166	3.2708	3.2708	3.2708	3.1917
Aug. 1557	0.9166	3.2708	3.2708	3.2708	3.1896
Nov. 1560	0.9250	3.2417			3.1604

Note: original mint equivalent and mint price are drawn from Table I. In the second half of 1551, the face value of debased silver coins was halved; therefore, the mint equivalents of these coins are reduced by the same proportion (column 4). In 1560, the government further reduced the face value of debased coins with 0.25 fineness by 62.5 percent and of the other debased coins by 25 percent (column 5).

Table III Stanley's estimate in 1559

Sovereigns, half-sovereigns, angels, half-angels, and crowns	£100,000
Spanish rials and pistolets and French crowns	£50,000
Fine gold and sterling silver coined under Edward VI	£100,000
Fine gold and sterling silver coined under Mary	£370,000
Base silver coins	£1,200,000
	£1,820,000

Source: J. D. Gould, *The Great Debasement*, (Oxford, 1970), p.55.

Table IV: An estimation of the production of silver and gold coinage, 1551-1558

	Gold	Silver	Total
Edward VI (Mich. 1551-July 1553)	£21,153	£124,179 17s 6d	£145,332 17s 6d
Mary (July 1553-Juy 1556)	£78,634 10s	£216,459 5s	£295,093 15s
Estimated: Mary (July 1553-Nov. 1558)	£116,413 10s	£262,603 5s	£379,016 15s
Total (Mich. 1551-Nov. 1558)	£137,566 10s	£386,783 2s 6d	£524,349 12s 6d

Sources: C. E. Challis and C. J. Harrison, 'A Contemporary Estimate of the Production of Silver and Gold Coinage in England, 1542-1556', *Economic History Review,* 88 (1973), p.831.
Note: row 3 = row 2 + the estimated mint output of 1556-8 (see text pp. 16-7).

Table V: The par exchange rates in silver

Date	Fineness	Face value per lb	Pure silver content (grams/ £ sterling)	Pure silver content (grams/ £ Flemish)	Exchange rates (s) by par
1526	0.9250	45s	153.44		26.84
June 1544	0.7500	48s	116.64		20.40
Apr. 1545	0.5000	48s	77.76		13.60
Apr. 1546	0.3300	48s	51.84		9.04
Apr. 1549	0.5000	72s	51.84	114.32	9.04
Apr. 1551	0.2500	72s	25.92		4.54
Oct 51-Mar 52	0.9208	60s	114.56		20.04
Aug. 1553	0.9166	60s	114.04		19.95
Nov. 1560	0.9250	60s	115.08		20.13

Source: C. H. Challis, *A New History of the Royal Mint*, p.235; Pusch, Gottfried, 1932, Staatliche Münz- und Geldpolitik in den Niederlanden unter den burgundischen und habsburgischen Herrschern besonders unter Kaiser Karl V. Val. Höfling, München.

Table VI: The adjusted par exchange rates

Date	Par exchange rates better silver	Par exchange rates better gold	Adjusted exchange rates (gold :silver = 2:1)
1526	26.84	26.07	26.33
June 1544	20.40	23.55	22.50
Apr. 1546	20.40	21.62	21.21
July 1548	20.40	20.64	20.56
Apr .1549	13.60	20.03	17.89
Oct. 1551-Dec. 1551	20.04	20.53	20.37
Dec. 1551-Aug. 1553	20.04	21.51	21.02
Aug. 1553	19.95	21.51	20.99
Nov. 1560	20.13	21.51	21.05

Source: see Table V.
Note: (1) Par exchange rates in gold see Table VII; (2) The figures for column 2 are drawn from Table V, column 6; (3) For 1526 and 1551-1560, par exchange rates in gold are calculated using the angel (99.48 percent fineness) rather than crown gold (91.66 percent fineness).

Table VII The par exchange rates in gold

Date	Fineness	Face value per lb	Pure gold content (grams/ £)	Pure gold content (grams/ £Flemish)	Exchange rates by par
1526	0.9948	£27	13.752		26.07
	0.9166	£25 2s 6d	13.617		25.81
June 1544	0.9583	£28 16s	12.420	10.55	23.55
Apr 1545	0.9166	£30	11.404		21.62
Apr 1546	0.8333	£30	10.368		19.65
July 1548	0.8333	£30	10.374		20.64
Jan 1549	0.9166	£34	10.062	10.05	20.03
Oct. 1551-Dec. 1551	0.9948	£36	10.314		20.53
	0.9166	£33	10.367		20.64
Dec. 1551	0.9948	£36	10.314	9.59	21.51
	0.9166	£33	10.367		21.62

Source: see Table V.

The Exchange rates of London-Antwerp: 1526-1560

Date	Flemish shilling for one pound Sterling	Date	Flemish shilling for one pound Sterling	Date	Flemish shilling for one pound Sterling
1526, Nov.	33.000	1550, Aug.	18.958	1561, Aug.	22.750
1537, Mar.	26.583	1550, Sept.	18.375	1561, Oct.	22.167
1537, Apr.	26.500	1550, Oct.	18.000	1561, Nov.	22.438
1537, May	26.709	1550, Nov.	18.000	1562, Jan.	22.750
1537, Jun.	26.792	1551, Feb.	16.875	1562, Feb.	23.417
1537, July	26.917	1551, Apr.	15.250	1562, Mar.	23.250
1537, Sept.	26.833	1551, June	13.125	1562, Apr.	22.167
1537, Oct.	27.250	1551, July	12.750	1562, July	22.458
1544, Jan.	26.667	1551, Aug.	17.833	1562, Aug.	20.459
1544, Feb.	27.167	1551, Sept.	18.583	1562, Oct.	22.042
1544, Mar.	26.917	1551, Oct.	19.167	1562, Dec.	22.000
1544, Apr.	26.667	1551, Nov.	18.667	1563, Jan.	21.833
1544, May	26.625	1551, Dec.	18.582	1563, Mar.	21.500
1544, June	25.791	1552, Jan.	17.667	1563, Oct.	21.000
1544, July	25.667	1552, June	17.582	1563, Nov.	21.000
1544, Aug.	26.458	1552, July	19.292	1564, Jan.	21.111
1544, Sept.	26.542	1552, Aug.	19.500	1564, Feb.	21.472
1544, Oct.	26.792	1552, Dec.	19.458	1564, Mar.	20.833
1544, Nov.	26.792	1553, Jan.	19.458	1564, Apr.	20.808
1544, Dec.	25.292	1553, Feb.	19.958	1564, May	21.104
1545, Oct.	25.375	1553, Apr.	20.167	1564, Jun.	22.333
1546, Apr.	26.250	1553, Aug.	22.458	1564, July	22.500
1546, May	25.417	1554, Jan.	20.958	1564, Aug.	22.500
1546, July	24.500	1554, Feb.	22.458	1564, Sept.	21.787
1546, Sept.	25.000	1554, Dec.	21.583	1564, Oct.	22.896
1547, Jan.	23.292	1555, July	21.458	1564, Nov.	23.125
1547, Feb.	23.375	1555, Oct.	21.292	1564, Dec.	23.000
1547, Mar.	22.042	1555, Dec.	21.792	1565, Jan.	23.291
1547, Apr.	22.000	1556, Mar.	21.625	1565, Feb.	23.299
1547, May	22.208	1556, June	22.500	1565, Mar.	23.146
1547, June	22.083	1557, Jan.	20.250	1565, Dec.	23.833
1547, Aug.	22.500	1558, Mar.	21.542	1566, Mar.	23.667

1547, Sept.	22.833	1558, Apr.	21.708	1566, May	23.458
1547, Oct.	22.708	1558, June	22.000	1566, July	23.292
1547, Nov.	23.042	1558, Nov.	22.292	1566, Aug.	22.917
1547, Dec.	22.750	1558, Dec.	21.417	1566, Sept.	23.125
1548, Feb.	22.042	1559, Jan.	21.854	1566, Oct.	22.792
1548, Mar.	21.875	1559, Feb.	22.073	1566, Nov.	23.125
1548, June	22.292	1559, Mar.	21.833	1566, Dec.	22.667
1548, July	22.250	1559, Apr.	22.219	1567, Feb.	22.667
1548, Aug.	22.083	1559, May	21.959	1567, Mar.	22.667
1548, Sept.	22.000	1559, Jun.	21.958	1567, Apr.	22.722
1548, Oct.	22.167	1559, July	21.849	1567, May	22.792
1548, Nov.	22.042	1559, Aug.	21.745	1567, June	22.750
1548, Dec.	21.292	1559, Sept.	22.250	1567, July	23.328
1549, Jan.	21.500	1559, Oct.	22.250	1567, Aug.	23.521
1549, Feb.	21.208	1559, Nov.	22.250	1567, Sept.	23.458
1549, Mar.	20.167	1560, Jan.	22.208	1567, Oct.	23.635
1549, Apr.	20.375	1560, Feb.	22.667	1567, Nov.	23.667
1549, May	20.500	1560, Mar.	22.500	1567, Dec.	23.111
1549, June	20.292	1560, Apr.	23.042	1568, Jan.	23.833
1549, July	20.375	1560, May	23.208	1568, Feb.	23.242
1549, Aug.	20.208	1560, July	22.500	1568, Mar.	23.081
1549, Sept.	20.292	1560, Oct.	23.208	1568, Apr.	23.146
1549, Oct.	20.125	1560, Nov.	23.000	1568, May	23.250
1549, Nov.	20.083	1560, Dec.	22.333	1568, June	23.500
1549, Dec.	19.625	1561, Jan.	20.542	1568, July	23.333
1550, Apr.	19.375	1561, Mar.	22.167	1568, Aug	23.556
1550, May	20.042	1561, Apr.	22.083	1568, Sept.	22.833
1550, June	19.458	1561, May	21.958	1568, Oct.	22.979
1550, July	19.542	1561, July	23.083		

Sources: (1) J. D. Gould, *The Great Debasement,* (Oxford, 1970), Table IX; (2) T. H. Lloyd, 'Early Elizabethan Investigations into Exchange and the Value of Sterling, 1558-1568', *Economic History Review,* 2000, Table 2; (3) P. H. Ramsay, *The Merchant Adventurers in the First Half of the Sixteenth Century,* Unpublished PhD thesis, (University of Oxford, 1958), Appendix D.

Bibliography

Akerlof, G. A. 'The Market for "Lemons": Quality Uncertainty and the Market Mechanism', *The Quarterly Journal of Economics,* Vol. 84, No. 3 (1970), pp. 488-500.

Archbold, W. A. J. 'A Manuscript Treatise on the Coinage by John Pryse, 1553', *The English Historical Review,* Vol. 13, No. 52, (1898), pp. 709-710.

Brulez, W. 'The balance of Trade of the Netherlands in the Middle of the 16th Century', *Acta Historiae Neerlandica*, IV, 1970, pp. 20-48.

Buckley, H. 'Sir Thomas Gresham and the Foreign Exchange', *The Economic Journal,* 34(136), (1924), pp. 589-601.

Challis, C. E. 'The Debasement of the Coinage, 1542-1551', *The Economic History Review,* New Series, 20(3), (1967), pp. 441-466.

----------'The Circulating Medium and the Movement of Prices in Mid-Tudor England', in *The Price Revolution in Sixteenth-Century England*, ed. by Peter H. Ramsey, (Methuem, 1971), pp. 115-46.

----------'Currency and the Economy in Mid-Tudor England', *The Economic History Review,* New Series, 25(2), (1972), pp. 313-322.

---------- *The Tudor Coinage,* Manchester: Manchester University Press, 1978.

---------- *A New History of the Royal Mint,* Cambridge University Press,1992.

Challis, C. E. and Harrison, C. J. 'A Contemporary Estimate of the Production of Silver and Gold Coinage in England, 1542-1556', *The English Historical Review,* 88(349), (1973), pp. 821-835.

Chari, V. V. 'Involuntary Unemployment and Implicit Contracts', *Quarterly Journal of Economics,* Vol.98, (1983), pp. 107-122.

Cipolla, C. M. 'Currency Depreciation in Medieval Europe', *The Economic History Review,* New Series, 15(3), (1963), pp. 413-422.

Dyson, H. ed. A Book Containing all such *Proclamations as were Published during the Raigne of the late Queen Elizabeth,* London: printed by Bonham Norton and Iohn Bill, 1618.

Edler, F. 'The Effect of the Financial Measures of Charles V on the Commerce of Antwerp, 1539-42', *Revue Belge de Philogoie et d'Historie,* Vol. 16, (1973), pp. 665-673.

Feavearyear, A. E. *The Pound Sterling: A History of England Money,* Oxford University Press,1962.

Fetter, F. W. 'Some Neglected Aspects of Gresham's Law' *The Quarterly Journal of Economics,* 46(3), (1932), pp. 480-495.

Gandal, N. and Sussman, N. 'Asymmetric Information and Commodity Money: Tickling the Tolerance in Medieval France', *Journal of Money, Credit and Banking,* 29 (4), (1997), pp. 440-457.

Gould, J. D. *The Great Debasement: Currency and the Economy in Mid-Tudor England,* Oxford University Press, 1970.

Craig, J. *The Mint: A History of the London Mint from A.D. 287 to 1948,* Cambridge University Press, 1953.

Greenfield, R. L. and Rockoff, H. 'Gresham's Law in Nineteenth Century American', *Journal of Money, Credit and Banking,* Vol. 27, No. 4, (1995), pp. 1086-1098.

Hill, C. A. 'Securitization: A Low-Cost Sweetener for Lemon', *Washington University Law Quarterly,* 74 (1996), pp. 1061-1126.

Hughes, P. L. and Larkin, J. F. *Tudor Royal Proclamations,* Volume 1 and 2, New Haven: Yale University Press, 1964-1969.

Lane, F. C. and Mueller, R. C., *Money and Banking in Medieval and Renaissance Venice,* The Johns Hopkins University Press, 1985.

Leland, H. 'Quacks, Lemons and Licensing: A Theory of Minimum Quality Standards', *Journal of Political Economy,* Vol. 87, No. 6 (1979), pp. 1328-46.

Lloyd, T. H. 'Early Elizabethan Investigations into Exchange and the Value of Sterling, 1558-1568', *The economic History Review,* New Series, 53(1), (2000), pp. 60-83.

Miskimin, H. A. *Cash, Credit and Crisis in Europe, 1300-1600,* London: Variorum Reprints, 1989.

Munro, J. H. *Wool. Cloth and Gold,* University of Toronto Press, 1972.

----------*Bullion Flows and Monetary Polities in England and the Low Countries, 1350-1500*, London: Variorum Reprints, 1992

Oman, C. W. C. 'The Tudors and the Currency, 1526-1560', *Transactions of the Royal Historical Society,* New series, 9, (1895), pp. 167-188.

Palliser, D. M. *The Age of Elizabeth: England under the Later Tudors, 1547-1603,* London: Longman, 1992.

Ramsay, P. H. *The Merchanrt Adventurers in the First Half of the Sixteenth Century,* unpublished PhD thesis, Oxford: University of Oxford, 1958.

Read, C. 'Profits on the Recoinage of 1560-1', *The economic History Review,* 6(2), (1936), pp. 186-193.

Rolnick, A. J. and Weber, W. E. 'Gresham's Law or Gresham's Fallacy?', *The Journal of Political Economy,* 94(1), (1986), pp. 185-199.

De Roover, R. *Money, Banking and Credit in Medieval Bruges,* Cambridge Massachusetts, 1948.

----------*Gresham of Foreign Exchange,* Cambridge: Harvard Univ. Press, 1949.

----------*Business, Banking, and Economic Though in Late Medieval and Early Modern Europe: Selected Studies of Raymond de Roover,* ed. by Julius Kirshner, University of Chicago Press, 1974.

Ruding, R. *Annals of the Coinage of Great Britain and Its Dependencies,* volume 1, London: J. Hearne, 1840.

Selgin, G. 'Salvaging Gresham's Law: The Good, the Bad, and the Illegal', *The Journal of Money, credit and Banking,* 28(4), (1996), pp. 637-649.

Stone, L. 'Elizabethan Overseas Trade', *The Economic History Review,* Vol. 2, No. 1 (1949), pp. 30-58.

Van der Wee, H. *The Growth of the Antwerp Market and the European Economy,* The Hague: Nijhoff, 1963.

Velde, F. R.; Weber, W. E. and Wright, R. ‘A Model of Commodity Money, with Applications to Gresham’s Law and the Debasement Puzzle’, *Review of Economic Dynamics,* 2, (1999), pp. 291-323.

Volckart, O. ’”The Big Problem of the Petty Coins”, and How it Could be Solved in the Late Middle Ages,’ *Working Paper* in Economic History, LSE, 2008.

Watson, A. M. ‘Back to Gold and Silver’, *Economic History Review,* Vol. 20, (1967), pp. 1-34.

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