

THE COINAGES AND MONETARY POLICIES
OF HENRY VIII (r 1509–47)

Coinage debasements
The coinage changes of Henry VIII

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The infamy of Henry VIII's Great Debasement, which began in 1542 and was continued by his successors for another six years after his death, until 1553, has obscured the previous monetary changes of his reign, especially the two linked debasements of 1526. Certainly the Great Debasement was by far the most severe ever experienced in English monetary history and was one of the worst experienced in early-modern Europe.¹ The 1526 debasements and related monetary changes are of interest not only to economic historians but also to readers of the *Correspondence of Erasmus*, since many of the letters discuss financial transactions that were affected by them.

Coinage Debasements

Coinage debasement is a complex, arcane, and confusing topic for most readers, and indeed for most historians. Put simply, however, we may say that it meant a reduction of the fine precious metals contents, silver or gold, represented in the unit of money-of-account. That generally also meant (though not always) a physical diminution of the precious metal contents in the affected coins. Thus the nature and consequences of coinage debasements depended on the relationship between coins and moneys-of-account, that is, the accounting system used to reckon prices, values, wages, other payments, receipts of income, and so forth.

THE RELATIONSHIP BETWEEN COINS AND MONEYS-OF-ACCOUNT

The English money-of-account, closely based on the monetary system that Charlemagne's government had established between 794 and 802, was the

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¹ The four classic accounts of Henry VIII's debasements, are, in chronological order: Frederick C. Dietz *English Government Finance, 1485-1558* University of Illinois Studies in the Social Sciences ix (Urbana, Ill 1920) 137-59, 175-91; Sir Albert Feavearyear *The Pound Sterling: A History of English Money* 2nd ed revised by E. Victor Morgan (Oxford 1963) 46-86; C.E. Challis 'The Debasement of the Coinage, 1542-1551' *Economic History Review* 2nd series 20/3 (December 1967) 441-66; and J.D. Gould *The Great Debasement: Currency and the Economy in Mid-Tudor England* (Oxford 1970). See also Christopher E. Challis and C.H. Harrison 'A Contemporary Estimate of the Production of Gold and Silver Coinage in England, 1542-1556' *English Historical Review* 88 no 349 (October 1973) 821-35; C.E. Challis *The Tudor Coinage* (Manchester and New York 1978); C.E. Challis 'Lord Hastings to the Great Silver Recoinage, 1464-1699' in *A New History of the Royal Mint* ed C.E. Challis (Cambridge and New York 1992) 179-397; and C.E. Challis *Currency and the Economy in Tudor and Early Stuart England* Historical Association pamphlets no 4 (London 1989).

pound sterling.² This particular money-of-account, with 12 pence (d) to the shilling (s), and 20 shillings to the pound (and thus 240 pence to the pound), remained the most prevalent in western Europe until the French Revolution. The new Carolingian pound, as a money-of-account, was worth one pound of silver in the corresponding new Carolingian weight (displacing the old Roman pound), which contained 12 ounces (489.506 grams).³

The only coins struck were, however, the silver penny and its subdivisions (half and quarter pennies, and even smaller coins). Larger denomination, full-bodied silver coins, those that Carlo Cipolla called *moneta grossa* – known as *grossi* in Italy and *gros* in France – were not struck until the later twelfth century, accompanying a major inflationary expansion in European silver mining.⁴ Many of these *grossi* and the French *gros tournois* (of 1266) represented the shilling: that is, they were worth 12 pence in the local money-of-account. In England, the first coin larger than the penny did

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- 2 'Money and Coinage of the Age of Erasmus' CWE 1 328–9, 330–1, 347 Appendix E.
- 3 See Etienne Fournial *Histoire monétaire de l'Occident médiéval* (Paris 1970) 24–7, whose arguments are quite complex. The new Carolingian pound weight of 489.506 grams was designed to be 1.5 times the weight of the old Roman pound of 12 ounces (or 18 Roman ounces), which, according to Fournial, had once weighed 327.453 grams but had diminished slightly to 326.337 grams by the ninth century. These weights have been challenged by other numismatists (by even more complex arguments), who offer alternative weights for the Carolingian pound: 408.0 grams, 411.36 grams, 459.36 grams, and 483.33 grams. For a summary, see Willem Blockmans 'Le poids des deniers carolingiens' *Revue belge de numismatique et de sigillographie* 119 (1973) 179–81. In support of Fournial's view is the fact that the later *livre de Paris* (16 ounces) also weighed exactly 489.506 grams; and the *marc de Troyes*, the mint weight used in France and most of the Low Countries, with half its weight (8 ounces), weighed 244.753 grams. For these weights, and documentary analyses, see John Munro 'A Maze of Medieval Monetary Metrology: Determining Mint Weights in Flanders, France and England from the Economics of Counterfeiting, 1388–1469' *The Journal of European Economic History* 29/1 (Spring 2000) 173–99.
- 4 Subdivisions were as small as the Flemish mite = $\frac{1}{24}$ th of a penny. The first *grossi* were issued in Genoa in or about 1172 (worth 4d); then in Venice in 1192 (worth 26 *denari*); in Florence, in 1237 (*fiorino*); in Milan, about 1250; in France, with Louis IX's great monetary reform of 1266 (silver *gros tournois* = 12d *tournois*); in Flanders, from 1275 (the *groot*, imitating the *gros tournois*); and in England, from 1279 (the *groat* = 4d sterling). See Carlo Cipolla *Money, Prices, and Civilization in the Mediterranean World: Fifth to Seventeenth Century* (New York 1967) 14–15 (quotation), 42–51; Peter Spufford *Money and its Use in Medieval Europe* (Cambridge and New York 1988) 109–62 and 404–6 Appendix 1; Fournial *Histoire monétaire* (n3 above) 78–80.

not appear until Edward I's recoinage of 1279: the groat, worth only 4d sterling.⁵ The shilling coin (worth 12d) did not appear, at least as a regular issue, until the reign of Henry VIII: the *testoon* of May 1542 (issued with the commencement of the Great Debasement).⁶

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5 Nicholas J. Mayhew 'From Regional to Central Minting, 1158–1464' in *A New History of the Royal Mint* ed C.E. Challis (Cambridge and New York 1992) 120–8

6 Also known as 'teston,' 'tester,' and 'sovereign groat.' When the testoon was first issued is still the subject of much vexatious dispute. Several monetary historians have contended that the initial issues took place in or about 1504, under Henry VII (r 1485–1509); see Feavearyear *Pound Sterling* (n1 above) 439 Appendix III.ii; W.J.W. Potter and E.J. Winstanley 'The Coinage of Henry VII' *British Numismatic Journal* 30 (1961) 262–301, 31 (1962) 109–24, especially 109–112 ('shillings'), and 32 (1963) 140–60; and E.J. Winstanley 'The Sovereign Groat of Henry VII' in R.A.G. Carson *Mints, Dies, and Currency: Essays Dedicated to the Memory of Albert Baldwin* (London 1971) 161–4 (very inconclusive: the coin in question may be a fraud). See also Challis *Tudor Coinage* (n1 above), 48–9, 60–1. While admitting that there is no documentary evidence for its issue under Henry VII, Challis states that 'it does seem reasonable to suppose that the three "sovereign type" denominations – the penny, groat, and sovereign [shilling] – stemmed from the decision to introduce new designs in 1489,' when indeed the gold sovereign, worth 20s or £1, was first struck (Tower Mint indenture of 28 October 1489, which mentions no silver coins at all). Arguing in favour of this thesis on numismatic grounds, while also citing dubious evidence from some chroniclers (Robert Fabyan, Polidoro Virgilio, Raphael Holinshed), Challis presents a photograph of a silver testoon, purportedly issued under Henry VII, dating from c 1504 (48 fig 13). The first problem for such a dating is that two royal proclamations on coinage, issued on 5 July 1504 and 27 April 1505, do not mention any such coins worth 12d, but only groats (4d), half groats (2d), and pennies (1d); and the same is true of four later monetary ordinances, issued on 25 May 1522, 24 November 1522, 6 and 8 July 1525. They are all published in *Tudor Royal Proclamations* ed Paul L. Hughes and James F. Larkin 2 vols (New Haven and London 1964) I: *The Early Tudors (1485–1553)* no 54 (pages 60–1); no 57 (pages 70–1); no 88 (page 136); no 95 (page 141); no 102 (page 145); no 103 (page 146). The second problem is that no mint indentures (instructions) of Henry VII issued from the time of the gold sovereign of 1489 make any mention of silver coins worth 1s. The Tower mint indenture of 22 November 1505 lists only groats (4d), and coins worth 2d (half groats), 1d, ½d, and ¼d (farthings), as do all the subsequent mint indentures before the Great Debasement. Thus the first extant mint document to list specific issues of the 'testoon' or shilling coin is the Tower Mint indenture of 16 May 1542. Since this coin was issued at the commencement of the Great Debasement, the testoon was struck not of sterling silver but of 9 oz 5 dwt fineness. See Christopher E. Challis 'Appendix 2: Mint Contracts, 1279–1817' in *A New History of the Royal Mint* ed C.E. Challis (Cambridge and New York 1992) 717–21. (Challis gives a fineness of 9 oz 2 dwt; but see 450–1 and nn65–72 below). The first

The relationship between the silver coinage and the Carolingian-style moneys-of-account that so commonly appear in the correspondence of Erasmus – for example, the English pound sterling, the French *livre tournois*, the Flemish *pond groot* (*livre gros*) – is a simple one. The silver penny coin always equalled in value one penny (d) in the local money-of-account, so that the value of one pound in the local money-of-account always equalled the value of 240 currently circulating silver pennies (*deniers*), irrespective of the changes in their silver contents that had resulted from centuries of debasements.⁷

METHODS OF COINAGE DEBASEMENT IN MEDIEVAL AND EARLY MODERN EUROPE

A coinage debasement, whether for silver or for gold, was implemented by one or more of three techniques: 1/ a reduction in fineness, so that less silver or gold and consequently more base metal (usually copper) composed the coin's alloy; 2/ a reduction in weight; and 3/ an increase in the nominal or money-of-account value of the coin. An increase in the nominal value of a gold coin – of the English gold noble, for example, from 6s 8d (80d) to 7s 4d (88d) – constituted a debasement in that a lesser quantity of precious metal (in this case, fewer grams of gold) was represented in the unit of money-of-account.

The third method was applied to silver coinages only rarely in continental Europe, and never in England. Because most silver coinages were rigidly tied to their respective moneys-of-account, so that, as just indicated, the penny coin always represented one penny (d) in the money-of-account, increases in nominal coin values were necessarily applied only to those high-value silver coins whose silver contents remained unchanged when the penny coin and its subdivisions were subjected to debasements that

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mention of 'testons' in Hughes and Larkin *Tudor Royal Proclamations* 1 is no 302 (page 420) for 10 April 1548: 'calling in testons because of counterfeiting.'
⁷ Peter Spufford 'Coinage and Currency' in *Cambridge Economic History of Europe* ed M.M. Postan et al III: *Economic Organization and Policies in the Middle Ages* (Cambridge 1963) 576–602; Spufford *Money and Its Use* (n4 above) 411–14 Appendix 2, 'Money of Account'; Hans Van Werveke 'Monnaie de compte et monnaie réelle' *Revue belge de philologie et d'histoire* 13 (1943) 123–52, reprinted in Hans Van Werveke *Miscellanea mediaevalia: Verspreide opstellen over economische en sociale geschiedenis van de middeleeuwen* (Ghent 1968) 133–58; Herman Van der Wee *The Growth of the Antwerp Market and the European Economy, 14th to 16th Centuries* 3 vols (The Hague 1963) I: *Statistics* part 1, chapter 3: 'Money and the History of Prices' (pages 107–36).

reduced their fine silver contents.⁸ The same was true for gold coins when their precious metal contents remained unchanged, especially following a debasement of the silver coinage. When silver coins were debased, the relative or exchange values of the gold coins almost always increased, as market forces drove up their values, which were expressed in the silver-based money-of-account. Princes then had no alternative but to raise the money-of-account values, or exchange rates, on their gold coins in order to maintain the same equilibrium between the mint's value and the market values for precious metals, so that merchants would not export gold coins and bullion to foreign markets.

For English silver coins, therefore, we may focus on the first two methods – reductions in fineness and in weight – both of which necessarily increased the number of coins of a given denomination struck from a pound weight of pure silver. The English term 'debasement' indicates an adulteration of the coin's fineness, a change in the ratio of the two components in its alloy, silver and copper. All coins contained at least some copper to serve as a hardening agent in order to provide greater durability and thus to reduce wear and tear on the silver or gold, both very soft metals. Most medieval and early modern princes could not resist the temptation to add more copper to their coins, thus reducing their silver or gold contents. Before and after the Great Debasement of Henry VIII and Edward VI, the English monarchy provided a rare exception to continental practices. Indeed, the purity or fineness of England's silver coins remained among the best in Europe, as 'sterling silver,' with 11 ounces 2 dwt (pennyweight) of silver and 18 dwt of copper, for a total of 12 Troy ounces, so that the silver fineness or purity was 92.50 per cent.⁹ Historically, that

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- 8 An early and prime example was the fate of Louis IX's *gros tournois*, struck from 1266 with commercially fine silver (*argent-le-roy* = 23/24 or 95.833 per cent pure silver), worth 12d *tournois*, during Philip IV's debasements of the petty silver *deniers*, from 1295. The *gros* itself was then left untouched so that its relative value (relatively higher silver contents) rose, as did its nominal value, from 12d to 20d by 1301. See Fournial *Histoire monétaire* 87–9.
- 9 According to Mayhew 'Central Minting' (n5 above) 109–10 and nn79–81, English mint documents provide proof that pennies and groats were struck from sterling silver, with 18 dwt copper, as early as 1279–80. But these documents, published in *The De Moneta of Nicholas Oresme and English Mint Documents: Translated from the Latin* ed Charles Johnson (London 1956) do not precisely confirm that statement. Thus the *Tractatus Nove Moneta* of c 1280 (page 66) states that English 'Sterlings' contain 18.5 dwt of copper (*de cupro pondus xviii sterlingorum et oboli*); and the *De cuneo et monetario* (The St Edmundsbury Trial Plate) of c 1280 states (page 86) that 'the pound must contain 11 oz 2¼ dwt of fine silver (*de fin argent xi unces, ii esterlings, et j ferling*), and the rest alloy

became the official 'standard' of silver fineness. The only prior and temporary exception had taken place in 1335, when Edward III's government reduced the fineness to 10 ounces of silver (83.333 per cent fine), and then only for halfpennies (no full pennies were struck). The Great Debasement thus marked the second and final exception, when the penny's fineness was reduced, ultimately, to just 3 ounces of silver (25.00 per cent fine) in April and October 1551, and again, finally, in June 1553 (Table 1 part 1 below).¹⁰

For gold coins, the English fineness standard was the almost universal one of 24 carats, with subdivisions in grains. From the introduction of the gold florin in December 1343, and then of its replacement, the gold noble, in July 1344, English gold coins were as fine as any others – as fine indeed as the Florentine florins and Venetian ducats – at 23.875 carats (99.479 per cent pure).¹¹ Only with Henry VIII's monetary changes of 1526 was that standard reduced for gold coins: initially, to 22 carats (91.667 per cent fine). Debasements of both coinages by such reductions in fineness were far more common in medieval and early modern Italy, the Low Countries, Spain, and France, where the more appropriate term was *affaiblissement* (French) or *indebolimento* (Italian), meaning enfeebling or weakening the coinage, and were more commonly undertaken concurrently with reductions in the coin's weight.

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(ie 17.75 dwt copper). See also Johnson's introduction xxvii and n2. For the silver mint standard in France and the Low Countries (*argent-le-roy*) see nn3 and 8 above, and also CWE 1 312, 330.

¹⁰ Challis 'Mint Contracts' (n6 above) 700 (July 1335) and 728 (June 1553)

¹¹ See CWE 1 313, 314, 316, 325–6. There was no European uniformity in using grains to indicate gold fineness, not even in England, where grains were reckoned either out of 4 or out of 12. Thus the fineness for gold nobles at 23 carats 3.5 grains (out of 4) was often also given as 23 carats 10.5 grains, both meaning 23.875 carats. J.D. Gould, in his *Great Debasement* (n1 above) 12 Table II (on the gold coinages of 1526–60), failed to recognize this anomaly, incorrectly believing that all gold grains were reckoned in terms of a total of 12, and thus providing an incorrect lower fineness for coins described as 23 carats 3.5 grains. Italian florins and ducats were never struck with a full 24 carats, but were comparable to English nobles, for, as noted in the text, all coins required at least some copper as the requisite hardening agent. See Mario Bernocchi *Le monete della Repubblica fiorentina* 5 vols (Florence 1974) III: *Documentazione* 55–75, 110–20 (tables of fineness 1252–1531, when the *fiorino d'oro* was last struck). See also Frederic C. Lane and Reinhold C. Mueller *Money and Banking in Medieval and Renaissance Venice* (Baltimore and London 1985–97) I: *Coins and Monies of Account* 229–30: usually 'better than 23³/₄ carats,' and thus often better in fineness than many Florentine florins.

In England, the standard mint weight, from the era of William the Conqueror to the monetary changes of Henry VIII in 1526, was the Tower Pound, which weighed 11.25 Troy ounces (349.914 grams) and contained 5400 Troy grains (480 grains to the ounce).¹² The earliest reliable documents for English silver coinage come from the reign of Henry III (r 1216–73), with more or less continuous mint accounts from 1235.¹³ These and other documents indicate that 242 silver pennies were then struck from the Tower Pound – close to the Carolingian standard of 240 to the pound – so that each penny weighed 22.314 Troy grains (1.446 grams). With a fineness of sterling silver, it contained 1.337 grams of pure silver. In England as in most European countries, the historic monetary pattern was a periodic but continuous loss of the penny's silver contents. The final English silver coin issued (in February 1817), with the standard sterling silver fineness, had a weight of 7.273 Troy grains (0.471 grams), and thus it contained only 0.436 grams of fine silver.¹⁴ Hence, over almost six centuries the English silver penny lost almost two-thirds – 64.95 per cent – of its fine silver contents.

That six-century reduction in silver contents was in fact considerably less than that incurred during the Henrician Great Debasement of 1542–53, which finally removed 83.10 per cent of the penny's silver contents.¹⁵ Seven years after the Great Debasement had ceased (June 1553; see Table 1 part 1 below), Elizabeth I imposed a *renforcement* or 'strengthening' and partial restoration in the renowned Recoinage of November 1560. The traditional

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¹² CWE 1 332

¹³ Christopher E. Blunt and John D. Brand 'Mint Output of Henry III' *The British Numismatic Journal* 3rd series 39 (1970) 61–5, for London and Canterbury, including some partial accounts from July 1220. See also Mayhew 'Central Minting' (n5 above) 99–107.

¹⁴ Feavearyear *Pound Sterling* (n1 above) 439 Appendix III.ii; Blunt and Brand 'Henry III' (n13 above); Challis 'Mint Contracts' (n6 above) Appendix II

¹⁵ Between May 1542 and April 1551 the silver content of the English penny was reduced from 0.639 gram fine silver (as established by the recoinage of November 1526) to just 0.108 gram. In October 1551 the silver contents were restored to 0.477 gram, then reduced to 0.216 gram in December 1551. In June 1553 they were increased to 0.259 gram, in August 1553 to 0.475 gram, and then slightly increased again to 0.480 gram with the Elizabethan Recoinage of November 1560. The silver coinage then remained untouched for four decades, when, in July 1601, its fine silver content was reduced to 0.464 gram. Thereafter, the silver penny remained unchanged until the final debasement, of 6 February 1817, by which the penny's pure silver content was diminished to 0.436 gram. See Challis 'Mint Contracts' (n6 above) 721–58 and Table 1; Feavearyear *Pound Sterling* (n1 above) 435 Appendix I; 439 Appendix III.ii. See Table 1 part 2 below.

monetary standard of sterling silver (11 oz 2 dwt) was fully restored (from 3 oz of silver in June 1553, and then from 11 oz of silver in August 1553), but the silver penny's weight was restored to just 8.000 Troy grains (0.518 gram), much less than the 10.667 grain weight (0.691 gram) prescribed for Henry VIII's silver coinages from 1526 to 1542. Thus, combining changes in both weight and fineness, we find that Elizabeth's reformed coinage of 1560 contained only 75.12 per cent as much silver as did Henry VIII's coins from 1526 to the onset of the Great Debasement: 0.480 gram vs 0.639 gram pure silver. From the 1560 Elizabethan Recoinage to the final silver coinage issued in 1817, the penny lost only 9.17 per cent of its pure silver contents.¹⁶

That loss may usefully be compared with the 11.11 per cent reduction in the penny's fine silver contents that took place with Henry VIII's debasement of the silver coinage (but not his first debasement), in November 1526. As large as that may appear to be, it was much less than the 20.00 per cent reduction in fine metal contents that Edward IV had imposed in the previous silver debasement, of August 1464, and obviously far less than the 83.10 per cent reduction experienced during the Great Debasement of 1542–53.¹⁷

THE MOTIVATIONS FOR COINAGE DEBASEMENTS

The first major difference between the 1526 debasements and the Great Debasement of 1542–53 was the former's very modest reduction in the penny's fine silver contents (11.11 per cent) and the drastic, indeed unprecedented, reductions in the latter debasement (83.10 per cent), though the differences in the debasements of gold were more modest (see Tables 1 and 2 below). The second major difference was in what motivated them. The 1526 debasements were undertaken as a purely defensive monetary policy, designed to protect the English money supply and the economic viability of the royal mints. In sharp contrast, the Great Debasement was implemented and maintained for eleven years as an aggressive fiscal policy, designed to increase the king's mint profits.

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16 Challis 'Mint Contracts' (n6 above) Appendix II; Feavearyear *Pound Sterling* (n1 above) 439 Appendix III.ii

17 See Table 1 part 1 below. For Edward IV's debasement and the associated monetary changes of 1464–5, see John H. Munro Wool, *Cloth and Gold: The Struggle for Bullion in Anglo-Burgundian Trade, 1340–1478* Centre d'Histoire Économique et Sociale (Brussels and Toronto 1973) 157–63; Christopher E. Blunt and C.A. Whitton 'The Coinages of Edward IV' *British Numismatic Journal* 5 (1948) 53–6; Nicholas Mayhew 'The Monetary Background to the Yorkist Recoinage of 1464–1471' *British Numismatic Journal* 44 (1974) 62–73.

1/ Aggressive fiscal policies and inflation

One of the most powerful incentives for medieval and early modern coinage debasements was the lust for greater mint revenues, derived from the ruler's princely prerogative to exact a seigniorage tax on minting. In an era when many princes found that their feudal incomes were severely limited (often by custom) and taxes difficult to impose and collect, seigniorage revenues often provided them with very substantial incomes.¹⁸ As the fourteenth-century French philosopher Nicholas Oresme contended in his famous treatise *De Moneta*:

I am of the opinion that the main and final cause why the prince pretends to the power of altering the coinage is the profit or gain from which he can get from it; it would otherwise be vain to make so many and so great changes . . . Although all injustice is in a way contrary to nature, yet to make a profit from altering the coinage is specifically an unnatural act of injustice.¹⁹

Oresme, it should be noted, never admitted the possibility that some debasements were defensive in nature (for reasons to be explained later); nor did he observe that the necessity underlying most debasements now regarded as 'aggressive' was financing warfare (including defence).²⁰

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- 18 See Hans Van Werveke 'Currency Manipulation in the Middle Ages: The Case of Louis de Male, Count of Flanders' *Transactions of the Royal Historical Society* 4th series 31 (1949) 115–27, reprinted in Hans Van Werveke *Miscellanea mediaevalia* (n7 above) 255–67; Arthur J. Rolnick, François R. Velde, and Warren E. Weber 'The Debasement Puzzle: An Essay on Medieval Monetary History' *Journal of Economic History* 56/4 (December 1996) 789–808; Munro *Wool, Cloth, and Gold* (n17 above) 11–41 Appendix I, 202–08 Tables F–I. See also nn20–1 below.
- 19 Quotations from the editor's translations in Johnson *De Moneta* (n9 above) chapter 15 page 24 (first quotation) and chapter 16 page 25 (second quotation). The official title of Oresme's treatise is *Tractatus de origine, natura, jure, et mutationibus monetarum*. On the importance of Oresme (c 1320–82) see Johnson ix–xviii; Spufford *Money and Its Use* (n4 above) 295–305.
- 20 Johnson *De Moneta* (n9 above) xi makes the point that a common motive for debasement was 'the wear of current coin,' although this was not mentioned by Oresme. See 437–40 below for the explanation. For the link between warfare and coinage debasements – beginning with Philip IV of France (r 1285–1314) – see Spufford *Money and Its Use* (n4 above) 289–318; and John Munro 'Coinage Debasements in Burgundian Flanders, 1384–1482: Monetary or Fiscal Policies?' in *Comparative Perspectives on History and Historians: Essays in Memory of Bryce Lyon (1920–2007)* ed David Nicholas, James Murray, and Bernard Bacharach (Kalamazoo, Mich) in press.

The medieval opposition to such aggressive coinage debasements stemmed from the all too visible consequences: rising prices – that is, inflation – and the consequent loss of purchasing power, especially for those living on fixed incomes. While wage earners almost always suffered from inflation, the most vocal, or rather the most effective, opponents of debasements were the landed nobility, whose rents and feudal dues were chiefly defined, by the later Middle Ages, in money-of-account, rather than in kind (harvest shares) and labour services. Some historians argue that inflation resulted from the combined responses of those producers, tradesmen, and merchants who sought to compensate for the loss of precious metals received in the debased coin by raising prices. But most economists, rightly noting that debasements increased the quantity of coins (of a given denomination), contend that inflation resulted instead from the increase in the money supply.

My own recent research indicates, however, that inflation, if almost always the inevitable result of coinage debasements, was never proportional to the extent of the debasement, or indeed as much as the monetary mathematics and the traditional Quantity Theory of Money would indicate. First, the common notion that, say, a ten per cent debasement would lead to a ten per cent increase in the coinage supply is fallacious, because it ignores the reciprocal nature of the two changes involved: that is, the reduction of the quantity of precious metal, silver or gold, in the money-of-account units (the penny, shilling, and pound) and the increase in the money-of-account value of the coinage struck from a pound of fine silver or gold.

The mathematical formula to express this reciprocal relationship is $\Delta T = [1/(1-x)] - 1$. In this formula, the letter *T* is the *traite*: the total money-of-account value of the coins struck from a pound of pure gold or silver, as the case may be.²¹ The Greek letter Δ means the percentage rate of change in that *traite* value; and the letter *x* represents the percentage reduction in the gold or silver contents of the pound sterling (or, for silver, in the penny coin linked to the penny and pound in money-of-account). If we take the ex-

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21 The alternative term 'mint equivalent' was first introduced in Gould *Great Debasement* (n1 above) 13 and has been used by many other Anglophone monetary historians since then. But the term used in all of the mint accounts of late medieval and early modern Low Countries is *traite*. The formula for computing its value is: $traite = N.V/F$ = number (*N*) of coins struck per pound times the coin's official face value (*V*) divided by the percentage fineness (*F*) of the coins. The comparable French term was *ped de la monnaie*. See Fournial *Histoire monétaire* (n3 above) 30–1 (with a much more complex formula).

ample of Henry VIII's silver debasement of November 1526, which reduced the fine silver contents of the penny by 11.111 per cent (one-ninth), and use that number in this equation, we find that: $[1/(1-0.111)]^{-1} = 0.125$, or 12.50 per cent. That means that the *traite* or total coined value of a Troy pound of silver increased by 12.50 per cent, a calculation that is verified in Tables 1 and 2 below.

This silver debasement probably did not, however, produce a corresponding 12.50 per cent increase in the aggregate English money supply, for several reasons. If the bimetallic mint ratio was not correspondingly adjusted – and it was not, in November 1526 – such a debasement would have led to some outflow of the gold coinage. At the same time, the debasement may not have succeeded in reminting all the former issues of silver coins, some of which may have been hoarded or exported. Furthermore, the effects of these coinage changes, and related economic changes (see below) on the supply of credit, an important component of the money supply, cannot possibly be calculated.

Nor may we assume, even if the aggregate money supply had increased by 12.50 per cent, that such an increase would have led to a proportional increase in the price level, as the traditional Quantity Theory of Money indicates. Any inflationary increase in the money supply may have been offset, to some degree, by both a reduction in the velocity or 'turnover' of the circulating units of money (coins and credit instruments) and by any subsequent increase in the volume of production and trade, especially in response to rising prices. Those changing relationships can be seen in the formula for the revised Quantity Theory of Money, $M.V = P.y$, in which the four components are calculated in annual aggregate 'national' terms. M is the aggregate value of the money supply, V is the income velocity of money circulation (the rate of turnover for a unit of money), y is the net value of total national output (and thus total national income), and P is the price level, usually measured by the Consumer Price Index (CPI), as the best measure of inflation.²²

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22 The letter Y is the Keynesian symbol for the value of the Net National Product or Net National Income, in the formula $Y = C + I + G + (X - M)$; it represents the sum of total consumption (C), government expenditures (G), investment (I), and the difference between the values of exports and imports ($X - M$). Lowercase y is Y deflated by the CPI. For a further analysis of debasement and inflation, see Munro *Wool, Cloth, and Gold* (n17 above) 11–41; Munro 'Coinage Debasements' (n20 above); Spufford *Money and Its Use* (n4 above) 289–318 ('The Scourge of Debasement').

The CPI used here for England is the well-known Phelps Brown and Hopkins 'Basket of Consumables' Index, with the base 100 calculated as the average of all prices in the basket for the period 1451–75.²³ In the case of the Great Debasement – if we allow three years for the monetary changes to have taken their full effect – the rise in the CPI that followed the overall reduction of 83.10 per cent of the penny's fine silver contents was 123.04 per cent: from the CPI index number of 163.21 in 1541 to the CPI of 364.03 in 1556. But the mathematical formula for the reciprocal relationship between a debasement and the rise in prices (discussed 433 above) produces a far higher expected inflation of 491.72 per cent. If we measure the inflation by five-year averages (quinquennial means), beginning with the quinquennium preceding the Great Debasement, we find that the CPI rose from a mean of 153.69 in 1536–50 to one of just 272.12 in 1551–5, an increase of only 77.06 per cent. This historical observation, contradicting a common view that any potential mercantile gains from debasement were eliminated by inflation,²⁴ helps to explain why so many debasements were successful in achieving their fiscal motives.

The mint master or 'moneyer' may also have had an incentive to promote debasements in that he could have augmented his revenues from the 'brassage' levy, the fee or tax that allowed the 'moneyer' to realize a profit, as the residual amount after recovering his costs: for wages, copper and other materials, mint dies and other tools.²⁵ But much evidence from not

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- 23 E.H. Phelps Brown and S.V. Hopkins 'Seven Centuries of the Prices of Consumables Compared with Builders' Wage-Rates' *Economica*, *Economica* 23/92 (November 1956) 296–314, reprinted in E.H. Phelps Brown and Sheila V. Hopkins *A Perspective of Wages and Prices* (London 1981) 13–59. For a recent recalculation of all of their index numbers from their working papers, now located in the British Library of Economic and Political Science (LSE Archives), Phelps Brown Papers, Box 1a.324. see the Excel file online at: <http://www.economics.utoronto.ca/munro5/ResearchData.html>. The index numbers used here, based in part on the money-of-account values of the annual baskets, are from that file.
- 24 Rolnick, Velde, and Weber 'The Debasement Puzzle' (n18 above) especially 803–4. They rely principally on assertions in Harry Miskimin *Money, Prices, and Foreign Exchange in Fourteenth-Century France* Yale Studies in Economics 15 (New Haven 1963) 53–82 (especially 81–2), based on wheat prices, an analysis that fails to provide adequate proof for the view that inflation was normally proportional to the extent of coinage debasements and that such inflation ensued quickly after such debasements.
- 25 The capital costs of constructing and maintaining the mint were, however, normally borne by the ruler. Sometimes the ruler 'farmed' or sold the right to

just English but a wide range of continental records strongly indicates that in an 'aggressive' debasement the ruler's fiscal motives prevailed over those of the mint masters.

How debasements achieved these fiscal goals is rather complex. In essence, a properly designed debasement attracted more bullion to the mints by offering merchants a greater quantity of coins having the same nominal value than that received before the debasement. That 'offer' is known as the mint price, that is, the price that the mint pays to merchants who deliver bullion for coinage. In accounting terms, it is the total money-of-account value of the coins struck from a pound weight of pure silver (or gold), that is, the *traite* value (see 433 above), minus the total money-of-account value of the mint charges (the combined fees for seigniorage and brassage).

No debasement could have succeeded without such an increase in the mint price (in nominal or money-of-account values). Implicit in that condition is the requirement that the merchant had to receive coins with initially a greater purchasing power than that previously offered by the domestic mints and currently offered by competing foreign mints as well. So long as the merchants spent all those coins before the almost inevitable, if never proportionate, inflation ensued they would reap substantial profits. To the extent that inflation did ensue, the public paid the price – in what economists rightly call the seigniorage tax – for the gains reaped by the merchants and the prince. Since the prices of necessities – food, clothing, shelter – generally rose the most during such inflations, the poorer strata of society suffered the most.²⁶

Most successful 'aggressive' debasements did result in dramatically increased mint outputs: first by requiring merchants to surrender their old

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operate the mint to such 'moneyers,' but evidently not in medieval England. See Philip Grierson *Numismatics* (Oxford 1975); *Later Medieval Mints: Organisation, Administration, and Techniques* ed Nicholas J. Mayhew and Peter Spufford, Eighth Oxford Symposium on Coinage and Monetary History, British Archaeological Reports International Series no 389 (Oxford 1988); Munro *Wool, Cloth, and Gold* (n17 above) 1–41.

²⁶ The value of the debased coins that the merchant received also had to compensate him for the mintage fees on older coins delivered to the mint. See the Flemish evidence in Munro 'Coinage Debasements' (n20 above), and also in John Munro 'The Usury Doctrine and Urban Public Finances in Late-Medieval Flanders (1220–1550): Rentes (Annuities), Excise Taxes, and Income Transfers from the Poor to the Rich' in *La fiscalità nell'economia Europea, secoli XIII–XVIII / Fiscal Systems in the European Economy from the 13th to the 18th Centuries* ed Simonetta Cavaciocchi, Fondazione Istituto Internazionale di Storia Economica 'Francesco Datini,' Atti delle 'Settimane de Studi' e altri convegni no 39 (Florence 2008) 973–1026.

(and better) coins for recoinage, indeed by demonetizing them;²⁷ and second, by offering them such substantial gains from spending debased coins that they brought other, new, and often foreign sources of bullion to the ruler's mints. Obviously, the increased flow of bullion into the mint and thus its increased coinage outputs provided the prince with his chief source of gain, by augmenting his seigniorage revenues even if the rates remained unchanged. Most princes also sought a further gain by increasing their seigniorage rate; but higher rates necessarily lowered the mint price, thus reducing the incentive to bring bullion to the mint. A fundamental test to determine whether or not a debasement was aggressive (fiscal motive) or defensive (monetary motive) was whether or not the seigniorage or combined mint fees increased as a percentage of the bullion's value when coined (see Tables 1 and 2 below).

2/ Defensive monetary policies and Gresham's Law

The most obvious 'defensive' motive that many princes cited for debasement was protection against a neighbour's aggressive debasements, and in particular against what is known as Gresham's Law. As just noted, most successful aggressive debasements depended on luring not just domestic but foreign bullion and coins to the aggressor's mint. Such tactics proved all the more successful if the aggressor minted debased imitations of its neighbours' coins, and England had long been beset by influxes of debased counterfeit sterling coins, and even debased gold nobles.²⁸ If merchants succeeded in

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27 Most medieval and early modern monetary ordinances implementing a debasement required, under penalty of law, the surrender of old coins, which were thus *demonetized*, to be reminted. But the fact that an old, pre-debasement penny would continue to circulate only as a penny, with the same value of 1d, meant that anyone spending old (good) pennies instead of spending new (debased) pennies would lose value: the potential loss in not receiving more 'bad' pennies for the old 'good' pennies. The merchant's alternative was to melt down the old coins as bullion and hoard them, or to export them to foreign mints or markets as bullion, in either case driving them out of circulation. See nn29–30 below on Gresham's Law.

28 Nicholas J. Mayhew 'The Circulation and Imitation of Sterlings in the Low Countries' in *Coinage in the Low Countries (800–1500): The Third Oxford Symposium on Coinage and Monetary History* ed Nicholas J. Mayhew, British Archaeological Reports, BAR International Series 54 (Oxford 1979) 54–68; Feavearyear *Pound Sterling* (n1 above) 12–20; John Munro 'An Aspect of Medieval Public Finance: The Profits of Counterfeiting in the Fifteenth-Century Low Countries' *Revue belge de numismatique et de sigillographie* 118 (1972) 127–48, reprinted in John Munro *Bullion Flows and Monetary Policies in England and the Low Countries, 1350–1500* Variorum Collected Studies series cs 355 (Aldershot, Hampshire

spending counterfeit coins at the same face value as 'good' coins, they would then cull the good coins from circulation and export them, often melted down as bullion, to the offending mints abroad. Hence the essence of Gresham's Law: 'Bad money drives out good.'²⁹ That 'law', a commonplace observation attributed to the Tudor financial agent and diplomat Thomas Gresham (c 1519–79), was well known to fourteenth-century mint officials and was cited in most French and Flemish debasement ordinances, which were, of course, always presented as purely 'defensive' measures.³⁰ In the long run, the domestic consequence of Gresham's Law was a continuous deterioration of the circulating standard, that is, the mean (average) precious metal contents of the domestic coinage stock.

Such coinage deterioration was further exacerbated by both normal 'wear and tear' in circulation over many years and by the nefarious but all too common practices of 'clipping' and 'sweating' the coins. 'Clipping' was undertaken by using shears to cut off small pieces from the coin's normally imperfect edges; 'sweating' was undertaken by rapidly shaking a group of coins together inside a leather bag. Friction would remove some surface metal and cause it to adhere to the leather, and the metal could then be scraped and removed from the bag.

The success of these techniques was based on the crudity of medieval minting using the techniques of 'hammered coinages.' First, the moneyer placed the coin 'blank,' a disk cut from a thin sheet of alloyed metal, on the reverse die (bottom), and then he used the obverse die (top) as a hammer to imprint the required designs or inscriptions on each side of the blank. The hammered coin was then trimmed with shears to give it the approximate shape of a circle. The result was that no two 'good' coins were identical, nor were they observably different from bad 'clipped' or 'sweated' coins.³¹

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and Brookfield, Vt 1992) essay no II; Munro 'A Maze of Medieval Monetary Metrology' (n3 above) 173–99.

29 See John Munro 'Gresham's Law' in *The Oxford Encyclopedia of Economic History* ed Joel Mokyr et al 5 vols (Oxford and New York 2003) II 480–1.

30 Munro *Wool, Cloth, and Gold* (n17 above) 28, 33, 35, 40, 44, 58, 60, 74, 87, 101, 150, 161, 169, 179; Munro 'Coinage Debasements' (n20 above). The principles of Gresham's Law can also be found in treatises of the Polish scientist Nicholas Copernicus (1473–1543), but not in the original texts of Oresme's *De Moneta*. As noted in Johnson *De Moneta* (n9 above) xii, the text in question has been added later, possibly by Flemish mint officials.

31 In 1662 the Royal Mint adopted the water-powered screw press, which created more perfectly circular coins with milled edges that could not be so readily clipped, sweated, or counterfeited; but these problems were not finally resolved until the adoption of Boulton's steam-powered coin press, developed

Several historians have estimated that England's medieval and early modern silver coinages lost about one per cent of their fine metal contents a year from a combination of counterfeiting, 'clipping,' 'sweating,' and normal wear and tear in circulation (not including unretrieved hoards, shipwrecks, etc). Nicholas Mayhew, with a more conservative estimate (0.2 per cent per annum), contended that during every decade in the fourteenth century 'seven tons of silver vanished into thin air.'³² For the viability of the prince's mint, the true economic significance of continuous physical deterioration of the coinage from all such causes has to be understood in terms of the difference between the value of precious metals as bullion and as coins.³³

Official, legal-tender coins could circulate only so long as they commanded an *agio* or premium in value over their bullion contents; and only so long as current coin issues commanded that *agio* would merchants continue to deliver bullion to the mint. This premium normally equalled the

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between 1787 and 1810. See Thomas J. Sargent and François R. Velde *The Big Problem of Small Change* (Princeton and Oxford 2002) 53–64, 273–90. Continental experiments with mechanized screw presses and cylinder coin presses began in sixteenth-century France. Far higher costs of production explain why they did not readily supplant hammered coinage. In England, screw-press milled coins and hammered coins coexisted after 1662, and up to the Great Recoinage of 1696. See also Angela Redish 'The Evolution of the Gold Standard in England' *Journal of Economic History* 50/4 (December 1990) 789–805; George Selgin 'The Institutional Roots of Great Britain's "Big Problem of Small Change"' *European Review of Economic History* 14/2 (August 2010) 205–34.

32 For the higher estimate, see C.C. Patterson 'Silver Stocks and Losses in Ancient and Medieval Times' *Economic History Review* 2nd series 25/2 (May 1972) 205–35. For the lower estimates, see Sir John Craig *The Mint: A History of the London Mint from AD 287 to 1948* (Cambridge and New York 1953) xvi, 60; and Nicholas J. Mayhew 'Numismatic Evidence and Falling Prices in the Fourteenth Century' *Economic History Review* 2nd series 27/1 (February 1974) 1–15. See also Philip Grierson 'Coin Wear and the Frequency Table' *Numismatic Chronicle* 7th series 4 (1964) iii–xii, republished in Philip Grierson *Later Medieval Numismatics (11th–16th centuries): Selected Studies* Variorum Reprints no 19 (London 1979). He adds the factor of chemical erosion to precious-metal losses in circulation.

33 For the following arguments, see Feavearyear *Pound Sterling* (n1 above) 10–20; John Munro 'Bullionism and the Bill of Exchange in England, 1272–1663: A Study in Monetary Management and Popular Prejudice' in *The Dawn of Modern Banking* ed Fredi Chiappelli, Center for Medieval and Renaissance Studies, University of California (New Haven and London 1979) 169–239, reprinted in John Munro *Bullion Flows and Monetary Policies in England and the Low Countries, 1350–1500* Variorum Collected Studies series CS 355 (Aldershot, Hampshire and Brookfield, Vt 1992) essay no IV.

combined values of the mint charges (brassage and seigniorage). It was economically justified by the greater exchange value of coins over bullion in obviating the significant transaction costs involved in weighing and assaying bullion, including non-legal tender coins, to ascertain their true intrinsic precious metals contents. That cost-saving benefit in turn allowed coins, with the prince's official stamp or insignia, to circulate by tale, that is, at face value, and not by their bullion value.

When the currently circulating coins had suffered a continuous, observable diminution in their average silver contents, merchants responded to that loss by discounting the entire coinage: not by refusing to accept coins by tale, but by bidding up prices, including the market price of silver bullion, in money-of-account terms, thereby reducing and finally eliminating the necessary premium on coinage.³⁴ In similar fashion, the bullion contents in any newly minted coins of the official standard would have enjoyed a relatively higher value, similarly eliminating the *agio*, so that, in accordance with Gresham's Law, those newly minted coins would have been culled from circulation and exported (or hoarded) as bullion.

Under these adverse circumstances, princes had no alternative but to reduce the fine silver (or gold) contents of newly minted coins to the currently prevailing inferior standard of the circulating coins. They had to engage in a purely defensive coinage debasement, with low mintage fees as well, lest precious metals be lost to foreign mints and their own mints become idle. That chronic phenomenon explains why virtually all European coinages experienced long-term, continuous debasements until the era of precious-metal commodity moneys came to an end in modern times.

The coinage changes of Henry VIII

The two debasements of 1526 were defensive in nature. They must be understood, first, in the light of an unusual monetary ordinance that Henry

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34 To accept coins by 'tale' (face value), rather than by weight and fineness, with high measurement costs, was to recognize the commercial advantage of coins over bullion, especially the savings in transaction costs. The arguments in Rolnick, Velde, and Weber 'Debasement Puzzle' (n18 above) 800-1, to the effect that coins were accepted only by weight (and presumably fineness), and not by tale, are completely untenable, and not supported by any known monetary historian other than Miskimin (see n24 above). For a more modified view, by one of this article's co-authors, see Sargent and Velde *Big Problem of Small Change* (n31 above) 16-19, 22, 322. For royal statutes requiring acceptance of coins by tale, except those very badly impaired, see nn53-4 below.

had issued on 25 May 1522, one that abrogated a long-standing ban on foreign gold coins.³⁵ It permitted the free, legal-tender circulation of the most internationally prominent gold coins: 'ducats' (presumably both Venetian ducats and Florentine florins) and French 'crowns' (*écus à la couronne* and *écus à la couronne au soleil*).³⁶ A similar ordinance of 24 November 1522 authorized the legal-tender circulation of certain imperial gold coins: the *carolus* florin and some other unnamed 'base florins' (presumably both the Burgundian-Hapsburg Philippus florins and imperial Rhenish florins).³⁷ Possibly the ordinances on foreign gold coins were a requirement of Henry VIII's current if temporary anti-French alliance with the Hapsburg emperor,

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- 35 For English prohibitions dating from 1275 against the importation of foreign coins, see Munro 'Bullionism and the Bill of Exchange in England' (n33 above) 216–20 Appendix A. That ban may not have been complete, for a statute of January 1504 (19 Henry VII c 5), had granted or recognized the legal-tender status of 'coyne of other landys nowe currant in this Realme for grotes or for foure pence [4d]' that were not clipped or impaired. See Great Britain, Records Commission *Statutes of the Realm* ed T.E. Tomlins, J. Raithby, et al 6 vols (London 1810–22) II 650.
- 36 Hughes and Larkin *Tudor Royal Proclamations* (n6 above) I no 88 (page 136). The Italian ducats and florins were given an exchange rate of 4s 6d sterling; they contained 3.536 to 3.559 grams of fine gold; the *écus au soleil* were given a rate of 4s 4d sterling; they contained 3.296 grams of fine gold; the *écus à la couronne*, a rate of 4s 0d sterling; they contained 3.275 grams of fine gold. See CWE 1 336 Appendix A; Challis *Tudor Coinage* (n1 above) 68; and Table 3 below.
- 37 Hughes and Larkin *Tudor Royal Proclamations* (n6 above) I no 95 (page 141). The exchange rates for Italian ducats and florins and French *écus* were confirmed at the rates given in the previous ordinance (in n36 above). The Hapsburg coin of 'fine gold,' called the *carolus*, was given a rate of 6s 10d sterling, which seems very high for the Carolus florin, which, furthermore, had a fineness of only 14 carats gold (at this time worth just 42d *groot* Flemish). Perhaps the ordinance meant the *real d'or*, of 23 carats 9.5 grains = 23.792 carats gold, containing 5.275 grams fine gold, and worth three times as much: 127d or 10s 7d *groot* Flemish. Thus the unnamed 'base florins' may refer to the actual *Carolus* florin, first struck in February 1521, at 14 carats, containing 1.700 grams fine gold, and the imperial Rhenish florins (of the Four Electors) of 18 carats 6 grains = 18.50 carats, containing 2.527 grams fine gold. These 'florins' were granted exchange rates of 2s 1d sterling and 3s 3d, respectively. The rate for the Rhenish florin, at 39 sterling, is confirmed in Erasmus' correspondence with his banker, Erasmus Schets, in Ep 1681, dated 17 March 1526 and Ep 1758, dated 2 October 1526. For a confirmation of the rate for the Carolus florin, at 25d sterling, see CWE 12 646–51 Table 3, especially 650. See also CWE 12 697–9 Table 17; CWE 8 349–50 Tables A and B; and CWE 1 314–18 and 338–39 Appendix A.

Charles v.³⁸ Those official rates for these foreign gold coins were reconfirmed in royal ordinances of 6 and 8 July 1525,³⁹ but the legal-tender status of foreign gold coins did not survive the second debasement of 1526.

HENRY VIII'S DEBASEMENT OF AUGUST 1526: GOLD AND THE GOLD COINAGES

An unusual, and indeed unprecedented, feature of Henry VIII's first debasement, imposed on 22 August 1526, was that it involved only the gold coinage, and was not, as had always been the case in the past, combined with a debasement of silver. This debasement did not prescribe any physical change in the coins, but a revaluation that was (for reasons explained earlier) nevertheless a genuine debasement (see 427 above). That revaluation was the result of recommendations from a royal commission, established on 24 July 1526, under the leadership of Henry's chief minister, Thomas Cardinal Wolsey (1475–1530), with instructions 'for increasing the sterling value of the coinage to an equality with the rates of foreign currency.'⁴⁰

The August 1526 ordinance required three steps to achieve this objective.⁴¹ The first was an increase in the value of all existing English gold denominations by ten per cent: the gold sovereign (1489), issued as the 'pound' coin, rose in value from 20s od (240d) to 22s od (264d) sterling; the ryal or rose noble, from 10s od (120d) to 11s od (132d); the angel-noble, from the traditional 6s 8d (80d) to 7s 4d (88d). The second was, not surprisingly, a less than commensurate increase in the value of legal-tender foreign gold coins: Italian ducats and florins from 4s 6d (54d) to 4s 8d (56d), an increase of 3.70 per cent, and the French *écus au soleil* from 4s 4d (52d) to 4s 6d (54d), an increase of 3.85 per cent. No mention was made of the other recently current

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38 J.D. Mackie *The Earlier Tudors, 1485–1558* (Oxford 1957) 308–12 (treaties of 25 August and 24 November 1522). By 1523, England was at war with France, but the Anglo-Hapsburg alliance effectively ended with England's truce with France, 15 August 1525; see Hughes and Larkin *Tudor Royal Proclamations* (n6 above) I no 104 (page 147).

39 Hughes and Larkin *Tudor Royal Proclamations* (n6 above) I no 102 (page 145); no 103 (page 146)

40 *Letters and Papers, Foreign and Domestic, of the Reign of Henry VIII Preserved in the Public Record Office, the British Museum, and Elsewhere in England* ed J.S. Brewer, J. Gairdner, and R.H. Brodie, 36 vols (London 1862–1932) 4 part 1 (1870) no 2338 (page 1046)

41 Hughes and Larkin *Tudor Royal Proclamations* (n 6 above) I no 111 (pages 156–8); and Challis 'Mint Contracts' (n6 above) 720; Challis *Tudor Coinage* (n1 above) 67–9

gold coins. The third and most striking step was the introduction of a new English gold coin, the 'crown of the rose,' to have the 'like fineness, poise, and goodness' of the current French 'crown of the sun,' the *écu à la couronne au soleil*, and the same value (4s 6d).

Neither the fineness nor the weight of the new crown was otherwise specified. Its fineness was presumably, however, not that of the *écu*, 23 carats (95.833 per cent pure), but the same as that of all subsequent issues of English crowns, 22 carats (91.667 per cent pure).⁴² The weight is more problematic, in the absence of any documentary evidence. Albert Feavearyear (1963) offered the first of two estimates: 54 grains (3.499 grams).⁴³ Ignoring that estimate, Christopher Challis (1967, 1978, 1992) offered a lower one of just 51 grains (3.305 grams).⁴⁴ Feavearyear's estimate is to be preferred on the grounds of logic: exactly 100 coins of 54 Troy grains could have been struck from a Tower Pound of 5400 Troy grains, whereas 51 Troy grains would have yielded the awkward number of 105.882 coins. Since the new crown was intended to supplant the French *écu au soleil*, Feavearyear's estimated weight is again more convincing because it is closer to that of the current French *écu* (as struck from July 1519), 3.439 grams. While the new English crown would have been very slightly heavier than the *écu*, its inferior fineness meant that it contained less fine gold: 3.208 grams (according to Feavearyear's weight estimate) vs 3.296 grams in the *écu* (Table 2 part 2, Table 3 below).⁴⁵ Challis's weight estimate would have meant a fine gold content of only 3.029 grams fine gold, far too low to allow the English crown to serve as an acceptable substitute for the *écu*.

In speculating on the origins of the August gold debasement, and the introduction of the English crown, Feavearyear contended that financing

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42 Hughes and Larkin *Tudor Royal Proclamations* (n 6 above) I no 111 (page 157). See also the text in *Letters and Papers . . . of Henry VIII* (n40 above) 4 part 2 (1872) no 2423 (page 1085), for the royal proclamation of 22 August 1526 that 'a new coin is about to be made in England, called the crown of the rose, of the same weight and value,' 4s 6d, as that of the French 'crown of the sun.' See the text above and nn43-4 below.

43 Feavearyear *Pound Sterling* (n1 above) 438 Appendix III

44 Challis *Tudor Coinage* (n1 above) 311 Appendix III; Challis 'Mint Contracts' (n6 above) 720

45 For the 1519 *écu au soleil*, see Adrian Blanchet and Adolphe Dieudonné *Manuel de numismatique française* 2 vols (Paris: 1916; reissued 1988) II: *Monnaies royales françaises depuis Hugues Capet jusqu'à la Révolution* chapter 20 page 314. Note that the weight and gold contents of the *écu au soleil* given in CWE 1 336 Appendix A are for the earlier version of 1475 (3.369 grams).

England's two-year war with France (1523–5) had required excessive precious-metal exports and very substantial loans from Flemish and Italian bankers, both of which had led to a fall in exchange rates and thus to a sharp rise in the market value of ducats and other foreign gold coins. According to this author, English merchants were then accepting ducats for as much as 5s 2d, well above the 4s 8d rate set in the August ordinance.⁴⁶

The recent rise in the value of gold was a far more widespread and far more profound phenomenon than Feavearyear had indicated. Evidence for free-market gold prices at Antwerp during this period show that the value of gold had risen from a very stable £91.979 *groot* Flemish per kilogram in the period 1500 to 1511 to £95.785 *groot* Flemish per kilogram by 1520, by which time it had exceeded the official Hapsburg mint price (rising from 96.84 per cent to 100.85 per cent). Then it rose far more rapidly: to £112.461 *groot* Flemish per kilogram by 1525 (109.23 per cent of the official mint price), an increase of 17.23 per cent in just five years.⁴⁷ Such circumstances had already forced King Francis I of France to debase (revalue) his gold coinage in May and again in July 1519; and Emperor Charles V to do the same for the Low Countries' coinages in February 1521 (when he introduced the *Carolus* florin), and to raise the gold rates again in August 1521.⁴⁸ It is thus significant to observe, in Henry VIII's August 1526 ordinance, that

in Flanders as in France, the price of money and gold . . . is so much enhanced in the valuation thereof that not only strange [foreign] golds, as crowns and ducats, but also the gold of this realm, as nobles, half nobles, and royals, by merchants as well strangers resorting hither . . . for the great gain and lucre that they find thereby daily, be transported and carried out of this realm to no little impoverishing thereof, and finally to the total exhausting and drawing out of all the coins out of the same, unless speedy remedy be provided in that behalf . . .⁴⁹

This is a traditional, pre-Gresham exposition of Gresham's Law.⁵⁰

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46 Feavearyear *Pound Sterling* (n1 above) 48–9

47 See *CWE* 12 644–5 Table 2; and Van der Wee *Antwerp Market* (n7 above) I 133–4 Table 16.

48 For France, see n45 above; for the Hapsburg Low Countries see *CWE* 8 348–50 Tables A and B.

49 Hughes and Larkin *Tudor Royal Proclamations* (n6 above) I no 111 (page 156)

50 Virtually the same rendition of Gresham's Law was used to justify Henry VIII's aggressive, profit-seeking debasement of 16 May 1544. See Hughes and Larkin *Tudor Royal Proclamations* I no 228 (page 327).

What was responsible for this rise in the relative value of gold (an increase in the bimetallic ratio)? There are only two possible reasons: either the gold supply had contracted or the silver supply had expanded. In either case, gold would have become relatively more expensive, as demonstrated when its value was given in any silver-based money-of-account. The answer is clearly the latter, in the light of the South German-Central European silver mining boom that had commenced in the 1460s and reached its peak in the late 1530s. As contended in earlier publications, that mining boom was produced by radical technological innovations in both mechanical and chemical engineering, which were devised in response to the deflationary 'silver famines' of the mid-fifteenth century. This region's mined output of pure silver more than quadrupled: from an annual mean of 12,973.44 kg in 1471–5 (when data first become available) to an annual mean peak of 55,703.84 kg in 1536–40 (minimum estimates based on available if incomplete data). The major event of this era was the opening of the vast Joachimsthal mines in Bohemia in 1516, which in 1521–5 produced an annual mean output of 9,703.24 kg of fine silver.⁵¹

As a reflection of this rise in the market's bimetallic ratio, that is, with the fall in the relative value of silver, the August 1526 ordinance raised the official Tower mint ratio in favour of gold from 11.158:1, which Edward IV had established in March 1465, to 12.274:1.⁵²

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51 John Munro 'The Monetary Origins of the "Price Revolution": South German Silver Mining, Merchant-Banking, and Venetian Commerce, 1470–1540' in *Global Connections and Monetary History, 1470–1800* ed Dennis Flynn, Arturo Giráldez, and Richard von Glahn (Aldershot, Hampshire and Brookfield, Vt 2003) 1–34, especially 8–9 Table 1.3. See also John Munro 'The Central European Mining Boom, Mint Outputs, and Prices in the Low Countries and England, 1450–1550' in *Money, Coins, and Commerce: Essays in the Monetary History of Asia and Europe (From Antiquity to Modern Times)* ed Eddy H.G. Van Cauwenberghe, *Studies in Social and Economic History* (Leuven 1991) 119–83; John Nef 'Silver Production in Central Europe, 1450–1618' *Journal of Political Economy* 49 (1941) 575–91; John Nef 'Mining and Metallurgy in Medieval Civilisation' in *The Cambridge Economic History of Europe 2: Trade and Industry in the Middle Ages* 2nd rev ed, ed M.M. Postan and E.E. Rich (Cambridge 1987) 691–761 (1st ed published in 1952). From Joachimsthal is derived the German monetary term *thaler*, the Dutch *daalder*, and the American *dollar*.

52 Computed from data in Tables 1 and 2 below. The bimetallic ratio expressed here is the ratio of the *traite* or coined value of a pound (or kilogram) of silver to the *traite* coined value of a pound (or kilogram) of gold. Since gold coins were valued in the silver-based sterling money-of-account, the only way to express a falling value of silver was by an increase in the money-of-account

HENRY VIII'S GOLD AND SILVER DEBASEMENTS OF NOVEMBER 1526
Henry VIII's government evidently soon decided that these monetary measures were insufficient. On 5 November 1526 Henry VIII issued a new monetary ordinance (repeating the version of Gresham's Law in the August 1526 ordinance), with four components to achieve the previously announced objective to 'provide an equality with the rates of foreign currency,' and hence to obviate 'Gresham's Law': another increase in the value of current English gold coins; the issue of new, higher valued English gold coins; the denial of legal-tender status to foreign gold coins; and previously mentioned debasement of the silver coinage (see 431 above).⁵³

The value of current English gold coins was raised by another 2.27 per cent, for an over all increase of 12.50 per cent (one-eighth). Thus the value of the gold sovereign was raised to 22s 6d; that of the ryal or rose noble to 11s 3d; and that of the angel-noble to 7s 6d (see Table 2 part 2, Table 3 below).

The first new gold coin was the crown of the double rose, struck at 22 carats fineness, with a weight of 57.313 Troy grains (heavier than the former rose crown), and a pure gold content of 3.404 grams; it was given a value of 5s od sterling or 60d (compared to 4s 6d for the former single-rose crown). Half crowns were also struck, with proportional weights and values (2s 6d). The other new gold coin was the St George noble, which received the old noble's traditional value of 6s 8d sterling (three to the pound sterling) and its traditional fineness of 23.875 carats, but with a weight of only 71.111 Troy grains, thus containing 4.584 grams fine gold. Half nobles, with proportional weights and values, were also struck.⁵⁴

The denial of legal-tender status to foreign gold coins, so that they no longer enjoyed fixed legal exchange rates, was based on the valid observation that so many 'ducats' were being struck, in various continental principalities, 'of divers fineness and weights' – that is, of inferior quality – that many people, 'not being expert in knowledge of the fineness . . . might take great loss and be deceived therein.' No mention was made of

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value of the gold coins – by a rise in the value of the sovereign, for example, from 20s to 22s sterling.

53 Hughes and Larkin *Tudor Royal Proclamations* (n6 above) I no 112 (pages 158–63). For the wide variety of ducats and florins, see *CWE* 1 314 and 339 Appendix A, Table D; and John Munro 'Money and Coinage: Western Europe' in *Europe 1450 to 1789: Encyclopedia of the Early Modern World* ed Jonathan Dewald et al (New York 2004) IV 174–84.

54 See also Challis 'Mint Contracts' (n6 above) 720; Challis *Tudor Coinage* (n1 above) 68–71.

the French gold coins, but clearly Henry VIII's government under Cardinal Wolsey would not have allowed them to compete with the new English double-rose crowns. Henceforth, all 'ducats as other coins of gold of outward parts not named' were to be treated as bullion, to be sold or traded 'at such value as the payer and receiver of them can agree' or delivered 'unto the King's mint' for recoinage. This provision was both novel and significant, since in the past royal ordinances had forbidden any free-market exchanges in foreign coins and stipulated that all such coins be delivered to the mint as bullion.⁵⁵ Equally remarkable was another provision permitting the Burgundian-Hapsburg silver 'carolus' or 'double placks' (struck from 1521) to 'be current in receipts and payments for 4d sterling the piece, as they now be.'⁵⁶

The defensive nature of this first debasement, of the gold coinage, is revealed by the very modest increase in the official values of the gold coinages, which, according to the available evidence (given above) was still less than the current rise in the market prices for gold, at home and abroad. Further proof that the 1526 debasement of the gold coinages was purely defensive can be found in the exceptionally modest rate of mintage fees (Table 2 part 3 below): just 0.51 per cent, on all gold coins. The fees had declined from a rate of 12.00 per cent in Edward IV's initial gold debasement of August 1464, to a more modest fee of 4.63 per cent in Edward's second debasement of March 1465, and to a rate of 0.56 per cent set in November 1492, when the Tower mintage fees were last changed. The principle adopted was simple:

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55 Hughes and Larkin *Tudor Royal Proclamations* (n6 above) I no 112 (page 161). On 27 March 1538, however, Henry VIII again permitted the legal-tender circulation of ducats, at 5s 0d sterling, of *écus au soleil*, at 4s 8d, and of other French *écus* (crowns) at 4s 0d sterling; *ibidem* no 178 (pages 261–2). See also Munro 'Bullionism and the Bill of Exchange' (n33 above) 187–96, 216–20 Appendix A; John Munro 'Billon – Billoen – Billio: From Bullion to Base Coinage' *Revue belge de philologie et d'histoire / Belgisch tijdschrift voor filologie en geschiedenis* 52 (1974) 293–305; reprinted in John Munro *Bullion Flows and Monetary Policies in England and the Low Countries, 1350–1500* Variorum Collected Studies series CS 355 (Aldershot, Hampshire and Brookfield, Vt 1992) essay no III.

56 Hughes and Larkin *Tudor Royal Proclamations* (n6 above) I no 112 (page 160). See also CWE 8 349–50 Tables A and B. Presumably the coin meant was the *réal* or 'double carolus' struck at almost *argent-le-roy* fineness (93.40 per cent pure), containing 2.875 grams pure silver, compared to the 2.556 grams of pure silver in the new English 4d groat. That privilege was not granted to the other Burgundian-Hapsburg silver coins, all of inferior fineness. The ordinance recommended, however, that all these Burgundian-Hapsburg coins be surrendered to the king's mint.

low mintage fees permitted a higher mint price, which should have attracted more gold bullion to the royal mints.

As Table 2 part 2 below also indicates, the two gold debasements, as measured by the diminution of grams of fine gold in the pound sterling, amounted to 9.091 per cent in August 1526 and a further 2.222 per cent in November 1526, for an overall reduction of 11.111 per cent. The seeming paradox that such a debasement led to a 12.50 per cent increase in the value of gold coins can now be readily resolved by the previously discussed formula relating debasements to reciprocal changes in money-of-account values (see 433 above): $\Delta T = [1/(1-x)] - 1$, so that $[1/(1-0.111)] - 1 = 0.125$, or 12.50 per cent.

As indicated earlier, this second debasement, of November 1526, involved not just gold, but also the silver coinages. It reduced their pure silver contents, by weight alone – retaining the traditional sterling silver fineness – by one-ninth: 11.111 per cent (Table 1 part 1 below). We can more readily understand its purely defensive nature when we realize that more than sixty years had passed since the last silver debasement and recoinage of August 1464, under Edward IV, during which time all the previously discussed circumstances – ‘clipping,’ ‘sweating,’ counterfeit coin imports, and the operations of Gresham’s Law – had combined to diminish the average silver contents of currently circulating coins, undoubtedly by well more than ten per cent. Indeed, as early as 1504, Henry VII’s Parliament had contended, in enacting a statute on the coinage, that

his Coyne, and specially of Sylver, is sore ympeyred as well by clipping therof as counterfettyng of the same and by bryngyng into this Realme of the Coyne of Ireland, by occasion wherof gret rumour and variance daly incresith amongis his subjettis for takyng & refusyng of the same.

The statute declared that all legal-tender coins, ‘beyng Sylver and not clyped, mynesshed, or otherwyse empeyred, except for reasonable weryng, albeit they be cracked,’ were to be ‘curraunt through all the seid Realme for the somme as they were coyned for’ (that is, at face value, ‘by tale’).⁵⁷ Such complaints and corresponding measures can be found in subsequent royal proclamations, up to the 1526 debasements.⁵⁸

A further test revealing the purely defensive nature of the silver debasement of November 1526 is once more the mintage fees, set at the ex-

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⁵⁷ *Statutes of the Realm* (n35 above) II 650, statute 19 Henry VII c 5

⁵⁸ Hughes and Larkin *Tudor Royal Proclamations* (n6 above) I no 54 (pages 60–1, no 88 (page 136), no 95 (page 141), nos 102–03 (pages 145–7)

ceptionally low rate of 2.22 per cent (Table 1 part 3 below).⁵⁹ In contrast, when Edward IV debased the silver coinage in 1464, he had exacted a high mintage fee of 12.00 per cent, one that indicates that even though his debasement had also been the first in over fifty years (since 1411–12), it was primarily an aggressive, profit-seeking measure. Over the next three decades, however, Edward IV and then Henry VII were forced to lower the mintage fees, by stages – to 2.67 per cent by 1492 – in order to raise the mint price and thus to attract more bullion.

BIMETALLIC MINT RATIOS AND THE NEW TROY POUND

Remarkably, when we compare the gold and silver coinages that Henry VIII struck in his debasements of August and November 1526 with the previous coinage issues, those that Edward IV had struck in his debasements of 1464–5, we find that the overall percentage debasement of Henry's gold coinages (that is, the total reduction in the gold contents of the pound sterling in money-of-account) was precisely identical to the percentage debasement of the silver coinage (that is, the reduction in the penny's silver contents): 11.111 per cent for each of the two coinages. Consequently, the November 1526 mint ordinances nullified the previous change in the bimetallic ratio (to 12.274, in August 1526), thereby restoring the ratio that Edward IV had established in March 1465, that is, 11.158:1 (see 445 above). While the bimetallic ratios were slightly altered during the rapid and often drastic changes the Great Debasement of 1542–53, that same ratio of 11.158:1 was re-established with Elizabeth I's Recoinage of November 1560, and it remained unchanged until the new coinages of 1601.⁶⁰

This is one of the most puzzling features of the 1526 debasements, for the first one had been undertaken, in August, with the intention of altering the mint ratio more in favour of gold in order to retain gold in England. The bimetallic mint ratio is, in fact, an aspect of Gresham's Law. For if the official mint ratio undervalues one metal and thus overvalues the other metal in relation to market and foreign mint ratios, the relatively cheaper metal (here, silver) will drive out the other (gold). Or more simply, merchants will choose to have each metal coined in the mints that offer higher values. Along

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59 Only the total mintage fees are supplied in this table, because most of the English Tower mint accounts and mint indentures provide only that total, not separate rates for brassage and seigniorage.

60 Calculations of the official bimetallic mint ratios, based on mint data supplied in Challis 'Mint Contracts' (n6 above) 720–57, indicate a rise from 12.109 in 1601 to 13.363 in 1612, to 13.348 in 1623, to 14.485 in 1660, to 15.210 in 1718 (remaining at this level until 1815).

with the undisputed importance of the Central European silver-copper mining boom, and then, from the 1550s, of the even greater silver inflows from Spanish America, England's unaltered bimetallic mint ratio helps to explain why England, which had minted predominantly gold before 1526, came to mint predominantly silver thereafter, especially as the market ratio continued to rise in favour of gold.⁶¹ In 1521–5 silver constituted only 38.96 per cent of the total value of English mint outputs; in 1531–5, 68.41 per cent; and in the second half of the century, silver accounted, on average, for 82.84 per cent of the total value of steadily mounting mint outputs (even well after the end of the Great Debasement).⁶²

Another significant feature of the mint and monetary ordinances of November 1526 was the change from the traditional, historic Tower Pound, containing 11.25 Troy ounces (5400 Troy grains = 349.914 grams), to the Troy pound, with 12.00 Troy ounces (5760 Troy grains = 373.242 grams).⁶³ Possibly such a change, relatively minor though it may have been, helped to obscure the extent of the coinage debasements. In the tables for this study, all of the pre-1526 monetary and mint data have been converted from the Tower pound to the Troy pound, to permit direct comparisons of the monetary changes from 1464.

THE GREAT DEBASEMENT OF 1542–53: SOME NEW OBSERVATIONS

From November 1526, England's gold and silver coinages, mintage fees, and mint prices remained unchanged until the onset of Henry VIII's Great Debasement in May 1542. Since Erasmus died almost six years earlier, in July 1536, the Great Debasement cannot be the focus of this study. But there remains, surprisingly, considerable confusion about when it began as a profit-

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61 See John Munro 'South German Silver, European Textiles, and Venetian Trade with the Levant and Ottoman Empire, c. 1370 to c. 1720: A Non-Mercantilist Approach to the Balance of Payments Problem' in *Relazioni economiche tra Europa e mondo islamico, secoli XIII-XVIII / Europe's Economic Relations with the Islamic World, 13th–18th Centuries* ed Simonetta Cavaciocchi, Fondazione Istituto Internazionale di Storia Economica 'Francesco Datini,' Atti delle 'Settimana di Studi' e altri convegni no 38 (Florence 2007) 907–62; K.N. Chaudhuri 'Treasure and Trade Balances: the East India Company's Export Trade, 1660–1720' *Economic History Review* 2nd series 21 (December 1968) 480–502.

62 See Munro 'Monetary Origins' (n51 above) 22–3 Table 1.6. For the Central European silver mining outputs, see 8 Table 1.3; for the outputs of the Spanish American silver mines and for imports of silver into Seville, see 4–5 Table 1.2.

63 CWE 1 332. The Troy pound was first mentioned in a parliamentary statute of 1414: 2 Henry IV Stat 2 c 4, concerning the Goldsmiths, in *Statutes of the Realm* (n35 above) II 188.

seeking enterprise: in 1542 or in 1544. That debate needs to be resolved. Furthermore, the significance of the 1526 monetary changes as a purely defensive debasement can be better understood by demonstrating that the aggressive, profit-seeking aspects of the Great Debasement were present from very onset of the coinage changes, in May 1542.

The best known authorities on the Great Debasement are Frederick Dietz, Albert Feavearyear, Christopher Challis, and J.D. Gould.⁶⁴ Gould evidently followed Dietz in contending that the initial change in the silver coinage, undertaken from 16 May 1542, was relatively minor. In their incorrect view, it reduced the silver fineness from the traditional sterling silver standard of 11 oz 2 dwt to 10 oz (with 2 oz of copper).⁶⁵ Dietz explicitly stated that 'this debasement was not a financial expedient; it was defensible on purely economic grounds, as a necessary measure to prevent the export of gold and silver from England.'⁶⁶ Gould states that this 'first debasement ... offered no incentive to remint silver coins of the 1526-42 issue, except on Government account.'⁶⁷

Gould's statement, published in 1970, surprisingly ignored earlier criticisms of Dietz's views published in Feavearyear's *Pound Sterling* (1963) and in Challis's 'Debasement of the Coinage' (1967).⁶⁸ Gould evidently also ignored the relevant mint documents. To be sure, the mint ordinance does seem to indicate a new silver fineness of 10 oz. As Feavearyear notes, however, the mint instructions (indenture) for this date explicitly state that the new silver coinage was to be 'of the standard of 10 oz sterling silver and 2 oz of allaye' – that is, not 10 oz of pure silver, but silver of only 92.50 per cent purity.⁶⁹ For some inexplicable reason, however, Feavearyear then

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64 See the sources cited in n1 above.

65 Gould *Great Debasement* (n1 above) 11 Table 1, text on page 43; Dietz *English Government Finance* (n1 above) 175

66 Dietz *English Government Finance* (n1 above) 175-6. That incorrect view was endorsed in Mackie *Earlier Tudors* [n38 above] 412. The only partial justification for Dietz's statement is that (according to Feavearyear *Pound Sterling* [n1 above] 51) the current market price for silver was 3s 8½d per ounce, compared to a mint price of 3s 8d, by the 1526 indenture. Nevertheless, all the evidence presented here indicates that this debasement was aggressive, and marked the true beginning of the Great Debasement.

67 Gould *Great Debasement* (n1 above) 43

68 Feavearyear *Pound Sterling* (n1 above) 50-2; Challis 'Debasement' (n1 above) 441-66, especially 442. There is no justification, however, for Feavearyear's assertion that 'the silver money was not coined according to the [mint] indenture.'

69 See Feavearyear *Pound Sterling* (n1 above) 52. The quotation, however, is from *Letters and Papers ... of Henry VIII* (n40 above) 19 part 1 (1903) li (Preface):

concluded that pure silver fineness was 'only 8.3 oz in the pound' (69.167 per cent fine), an impossibly low estimate, whose calculation is not explained.⁷⁰ Since sterling silver already contained 18 dwt (of 20) copper (7.5 per cent of 12 oz), this mixture, by one calculation – simply by adding 2 oz of copper and displacing 2 oz of silver, for a total of 2 oz 18 dwt copper – would have produced an alloy of 24.167 per cent copper and thus only 75.833 per cent pure silver, that is, with a silver fineness of 9 oz 2 dwt copper.⁷¹ Alternatively, 10 oz of sterling silver plus 2 oz copper could be seen as 77.0833 per cent pure silver, that is, $11.10/12.0 * 10/12 = 0.925 * 0.8333 = 0.770833$, which converts to a measure of 9 oz 5 dwt fine silver.

Challis, who treated the mint documents with far more care than either Dietz or Feavearyear, stated that both interpretations are possible, suggesting that the mint instructions may have been deliberately ambiguous to disguise the extent of the debasement. He chose the first estimate, of 9 oz 2 dwt silver, one that he retained in all his subsequent publications on Tudor coinage.⁷² But this lower estimate is far too close to that established in the next step of the Great Debasement, implemented on 28 May 1544, which reduced the fineness to 9 oz pure silver (75.00 per cent pure) – a fineness, it must be noted, substantially higher than Feavearyear's inexplicable estimate for the 1542 debasement.

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'Note on the Debasement of the Currency,' declaration of the account of Sir Martin Bowes and Thomas Skipwith. Feavearyear's citation of this source is inaccurate.

70 Feavearyear *Pound Sterling* (n1 above) 52. He notes, from the mint document *Letters and Papers . . . of Henry VIII* 19 part 1 (n69 above) lii (34 Henry VIII), that 5,513 Troy lb of copper alloy were used to strike 22,053 Troy lb of the debased coinage, an amount equal to 25 per cent of the total, thus indicating a fineness of at least 9 oz fine silver.

71 Challis, 'Debasement' (n1 above) 442, citing another mint document (National Archives [Public Record Office], Exchequer, E101/303/8): 'every pound weight of these moneys of silver aforesaide shall holde tenne ounces of sterling silver and two ounces of alloye in every pownde weight of troy aforesaide. That is to say to hold two ounces of alloye more in the pound weight of troy thanne doothe the sterling money . . . before the date of this indenture.' See also Challis *Tudor Coinage* (n1 above) 83–5, and 312 Appendix III; Challis 'Mint Contracts' (n6 above) 721. As Challis notes, the Great Debasement was preceded by debasements of the Irish silver coinages in March 1536 and July 1540.

72 Challis 'Debasement' 442–3, *Tudor Coinage* 83–6, 312 (mint indenture), and 'Lord Hastings to the Great Silver Recoinage' 288 (all n1 above); and Challis 'Mint Contracts' (n6 above) 721

The major problem with Challis's lower estimate for the 1542 coinage, as may be seen in Table 1 part 3 below (penultimate column), is the adverse mint price calculated for that fineness, for it is *higher* than that offered in the next debasement, of May 1544. In other words, the 1544 mint price would have been uncompetitively *lower* than the 1542 mint price: £2.619 sterling for a Troy pound of pure silver in 1544 vs £2.637 per pound Troy in 1542. But the mint price calculated for the second estimate, a 1542 coinage of 9 oz 5 dwt, would have been suitably lower than that subsequently offered in 1544: £2.619 lb sterling for a Troy pound of pure silver in 1544 vs £2.595 lb sterling in 1542. The 'golden rule,' so to speak, for the success of any coinage debasement is that the mint price for bullion offered to merchants for any newly debased coinage had to be higher than that offered by the previous mint indenture, and also higher than the current market price for bullion.⁷³ If we accept the second and higher estimate for the fine silver contents of the 1542 coinage, we can see from Table 1 part 1 below that the Great Debasement had begun, in May 1542, with a reduction of 21.88 per cent in the silver contents of the penny (coin) and pound sterling (money-of-account), almost double the reduction imposed on the 1526 coinage (and also greater than that in Edward IV's 1464 debasement). The 1542 debasement of the gold coinage, as indicated in Table 2 part 1 below, was a more modest 9.69 per cent: that is, a reduction from 13.752 grams to 12.420 grams of fine gold in the pound money-of-account based on the gold sovereign, the rose noble, and the angel-noble.

Further evidence that the Great Debasement had commenced as early as May 1542 as a profit-seeking, aggressive, fiscal enterprise, and not as a merely defensive measure, can be found in the mintage fees. For silver, as Table 1 part 3 below demonstrates, the total mintage fees prescribed in 1542 were 16.67 per cent of the metal coined (per Troy pound of silver), compared to just 2.22 per cent in the defensive debasement of 1526. By the fourth debasement, of April 1545, the mintage fees on silver had risen to 61.11 per cent; and thereafter, until 15 April 1551, they remained above 50 per cent with only one exception (45.83 per cent in July 1550 debasement).

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⁷³ See 436 above. That dictum does not hold with the reverse coinage change, a *renforcement*. As Table 1 part 3 below also indicates, the mint price offered merchants with Elizabeth I's Recoinage of November 1560, at the equivalent of £3.162 for a Troy pound of pure silver, was lower than that previously offered, £3.191 (with debased coinage). That explains why a *renforcement* was so much more difficult to achieve than a debasement, requiring an effective ban and demonetization of all previous coin issues.

After the Great Debasement for silver effectively ceased in June 1553, the mintage fees suddenly and precipitously dropped to just 2.50 per cent, and did not change with the Elizabethan Recoinage of November 1560.

For the several debasements of the gold coinages (for which the worst degree of fineness, in 1546–7, was 20 carats = 83.33 per cent fine), the mintage fees were more modest than those for silver, though still high enough to justify labelling them as aggressive. As Table 2 part 3 below indicates, for the first debasement, of May 1542, the mintage fees exacted were 4.17 per cent of the gold metal coined, compared to just 0.51 per cent charged in the 1526 gold coinages (that is, 8.2 times higher). Those mintage fees peaked at exactly 15.00 per cent of the gold metal coined in 1546, fell to just 3.33 per cent in 1547–8, temporarily rose to 5.73 per cent in 1550, but then fell to 0.38 per cent in 1551. From the end of the Great Debasement in 1553 up to and including the Elizabethan Recoinage of November 1560, the mintage fees were a commendably modest 0.56 per cent for coins of traditional purity, 23.875 carats, and 0.61 per cent for those of what became the permanent alternative standard of 22 carats (91.167 per cent fine), including crowns and, later, guineas.⁷⁴

There is no mystery about the causes of the Great Debasement: the fiscal necessity of financing Henry VIII's many wars, especially those with France, when other royal revenues, including those gained from land sales following the dissolution of the monasteries (1536–40), had been virtually exhausted.⁷⁵ According to Challis's estimates, now widely accepted, the net profits from the Great Debasement (from the mints of Canterbury, Southwark, York, and London Tower I and Tower II, but excluding the Irish mints) amounted to at least £1,157,407 sterling, as recorded in the accounts of the Under-Treasurers, and a further profit £94,418.913 (again excluding the Irish mints), as indicated in the accounts of the accounts of the High Treasurer. If the Irish mints are included, the total mint profits from July 1542 to Michaelmas 1551 amount to about £1,285,000.⁷⁶

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74 From October 1551, gold sovereigns, angel-nobles, and rose nobles ('ryals') were struck in two finenesses, 23.875 and 22.00 carats, but crowns were struck at only 22 carats. The last gold coins to be struck at 23.875 carats were issued in July 1660; and thereafter only coins of 22 carats were issued; Challis 'Mint Contracts' (n6 above) 720–58.

75 See Joyce Youings *The Dissolution of the Monasteries* Historical Problems series no 14 (London 1971); Mackie *Earlier Tudors* (n38 above) 370–401. For the costs of war with France and Scotland, see Dietz *English Government Finance* (n1 above) 137–59, 178–84; Mackie *Earlier Tudors* 405–11.

76 Challis 'Debasement' (n1 above) 452–3 Tables 3 and 5, and 457–66 Appendix

The singular importance of these mint profits can be better appreciated by comparing them with Challis's estimates of total revenues from taxation for the period 1544–51 (excluding clerical 'first fruits and tenths'): £976,000, to which may be added another £1,048,255 from rents and sales of crown lands (1544–54). But even that total, of all revenues, did not match estimated military expenditures for this period – about £3.5 million sterling – so that Henry VIII was forced to engage in extensive foreign borrowing, principally in the Low Countries.⁷⁷

Even though the Great Debasement began after Erasmus' death, a correct understanding of its major features provides us with the proper perspective on the earlier monetary changes of Henry VIII in 1526 and also those of Edward IV in 1464–5. By comparing both sets of Henry VIII's monetary changes with those of Edward IV (see 431, 445, 447–9, 453 above), we can see that the Great Debasement was not the only 'aggressive' debasement

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Table 6 (detailed accounts for each mint, and each minting period). These figures are vastly greater than Feavearyear's total estimate of the profits: just £227,378.5875, in *Pound Sterling* (n1 above) 62. But these statistics cover only the years 1542–7 and (according to Challis) are based on only a small sample of the accounts. Dietz *English Government Finance* (n1 above) 177, 180, 191 had offered a far higher total estimate of the debasement profits than did Feavearyear, but nevertheless a lower estimate than that supplied by Challis. According to Dietz, the sum of £363,000 was acquired under Henry VIII (1544–7); another £537,000 under Edward VI (1547–January 1551), 'more than the revenues from the court of Augmentation for the same period'; and finally, another £114,500 in mint profits, from 1 Jan to 31 July 1551 – for a total net profit of £1,014,500 sterling. For Dietz's estimates of total revenues and expenditures in this period, see 215–28 Appendix Tables I–VII. See Challis 'Debasement' 454 for a critique of Dietz' statistics on the debasement profits. Gould *The Great Debasement* (n1 above) 187 states that his book 'has eschewed comment on the fiscal aspect of the debasement of the coinage,' since he accepts Challis's statistics, differing only on those concerning the conversion of testoons in 1548 (see 187–98 Appendix E). For Challis's convincing reply and defence of his calculations, see 'The Conversion of Testoons: a Restatement' *British Numismatic Journal* 50 (1980) 67–80; and Challis *Tudor Coinage* (n1 above) 96–100. For another perspective on total mint outputs and profits, but surprisingly only for the period of 1544–51, see Challis 'Lord Hastings to the Great Silver Recoinage' (n1 above) 232–44. For this period, Challis estimates that the Great Debasement produced a silver coinage output of 1,091,666.375 Troy pounds, with a face value of £3,015,895.125, and a gold coinage output of 44,015.656 Troy pounds, with a face value of £1,323,281. See also Challis and Harrison 'Estimate of the Production of Gold and Silver Coinage' (n1 above) 821–35.

⁷⁷ Challis 'Debasement' (n1 above) 454–5 (without explaining why the comparison periods are not identical); Mackie *Earlier Tudors* (n38 above) 412–13

in English monetary history, as is so often contended. Furthermore, we can gain a far better understanding of Henry VIII's two earlier debasements of 1526, so neglected by historians, but so important in this period of Erasmus' life and career, as purely defensive monetary changes, to be properly compared with the English debasements of 1351 and 1411, though not those of 1464-5.⁷⁸

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⁷⁸ For the earlier English debasements of 1351 and 1411, see John Munro 'Mint Policies, Ratios, and Outputs in England and the Low Countries, 1335-1420: Some Reflections on New Data' *The Numismatic Chronicle* 141 (1981) 71-116, reprinted in John Munro *Bullion Flows and Monetary Policies in England and the Low Countries, 1350-1500* Variorum Collected Studies series CS 355 (Aldershot, Hampshire and Brookfield, Vt 1992) essay no v; Munro *Wool, Cloth, and Gold* (n17 above) 11-41, 58-63, 160-73; Munro 'Maze of Medieval Monetary Metrology' (n3 above) 173-9.

TABLE 1

ENGLISH SILVER COINAGES: FROM 1464 (EDWARD IV) TO 1560 (ELIZABETH I)
Composition of the silver penny, with mint charges and mint prices based on the Troy pound

PART 1: FINENESS AND WEIGHT

date of penny	fineness of silver coin			weight of silver penny		
	ounces (out of 12 oz)	penny-weight (out of 20 dwt)	per cent fine	number per Troy pound ^a	weight in Troy grains ^b	weight in grams
1464 Aug 13	11	2	92.50	480.00	12.000	0.778
1465 Mar 6	11	2	92.50	480.00	12.000	0.778
1466 Sep 29	11	2	92.50	480.00	12.000	0.778
1467 Sep 29	11	2	92.50	480.00	12.000	0.778
1470 Oct 23	11	2	92.50	480.00	12.000	0.778
1471 Apr 14	11	2	92.50	480.00	12.000	0.778
1492 Nov 20	11	2	92.50	480.00	12.000	0.778
1526 Nov 5	11	2	92.50	540.00	10.667	0.691
1542 May 16 ^c						
(Gould)	10	0	83.33	576.00	10.000	0.648
(Challis)	9	2	75.83	576.00	10.000	0.648
(Munro)	9	5	77.08	576.00	10.000	0.648
1544 May 28	9	0	75.00	576.00	10.000	0.648
1545 Mar 27	6	0	50.00	576.00	10.000	0.648
1546 Apr 1	4	0	33.33	576.00	10.000	0.648
1547 Apr 5	4	0	33.33	576.00	10.000	0.648
	4	0	33.33	576.00	10.000	0.648
1548 Feb 16	4	0	33.33	576.00	10.000	0.648
1549 Jan 24	8	0	66.67	1152.00	5.000	0.324
1549 Apr 12	6	0	50.00	864.00	6.667	0.432
	6	0	50.00	864.00	6.667	0.432

TABLE 1 (continued)

ENGLISH SILVER COINAGES: FROM 1464 (EDWARD IV) TO 1560 (ELIZABETH I)
Composition of the silver penny, with mint charges and mint prices based on the Troy pound

PART 1: FINENESS AND WEIGHT (continued)

date of penny	fineness of silver coin			weight of silver penny		
	ounces (out of 12 oz)	penny-weight (out of 20 dwt)	per cent fine	number per Troy pound ^a	weight in Troy grains ^b	weight in grams
1550 Feb 1	4	0	33.33	576.00	10.000	0.648
1550 July	6	0	50.00	864.00	6.667	0.432
	6	0	50.00	864.00	6.667	0.432
1551 Apr 14	3	0	25.00	864.00	6.667	0.432
1551 Oct 5	11	1	92.08	720.00	8.000	0.518
1551 Dec 17	4	0	33.33	576.00	10.000	0.648
1553 June 11	4	0	33.33	480.00	12.000	0.778
	3	0	25.00	480.00	12.000	0.778
1553 Aug 20	11	0	91.67	720.00	8.000	0.518
1557 June 28	11	0	91.67	720.00	8.000	0.518
1558 Dec 31	11	0	91.67	720.00	8.000	0.518
1560 Nov 8	11	2	92.50	720.00	8.000	0.518

NOTES

a Troy pound cut to 5760 Troy grains = 373.242 grams

b Troy grain = 0.648 grams

c The fineness of the silver penny, as debased and struck in May 1542, is given according to the estimates of Gould *The Great Debasement*, Challis 'Mint Contracts' (see the list of sources 476 below), and my own best estimate.

TABLE 1 (continued)

PART 2: PURE SILVER CONTENTS AND VALUES							
date of penny	grams pure silver in d	per cent change in silver contents	grams pure silver in £	silver index (1526 = 100)	traite value of Troy lb silver ^a		
					given alloy in £ sterling	given alloy in shillings	0.925 fine in £ sterling
1464 Aug 13	0.719	-20.00	172.624	112.50	2.000	40.000	2.000
1465 Mar 6	0.719	0.00	172.624	112.50	2.000	40.000	2.000
1466 Sep 29	0.719	0.00	172.624	112.50	2.000	40.000	2.000
1467 Sep 29	0.719	0.00	172.624	112.50	2.000	40.000	2.000
1470 Oct 23	0.719	0.00	172.624	112.50	2.000	40.000	2.000
1471 Apr 14	0.719	0.00	172.624	112.50	2.000	40.000	2.000
1492 Nov 20	0.719	0.00	172.624	112.50	2.000	40.000	2.000
1526 Nov 5	0.639	-11.11	153.444	100.00	2.250	45.000	2.250
1542 May 16 ^b							
(Gould)	0.540	-15.54	129.598	84.46	2.400	48.000	2.880
(Challis)	0.491	-23.14	117.934	76.86	2.400	48.000	2.880
(Munro)	0.499	-21.88	119.878	78.13	2.400	48.000	2.880
1544 May 28	0.486	-2.70	116.638	76.01	2.400	48.000	2.960
1545 Mar 27	0.324	-33.33	77.759	50.68	2.400	48.000	4.440
1546 Apr 1	0.216	-33.33	51.839	33.78	2.400	48.000	6.660
1547 Apr 5	0.216	0.00	51.839	33.78	2.400	48.000	6.660
	0.216	0.00	51.839	33.78	2.400	48.000	6.660
1548 Feb 16	0.216	0.00	51.839	33.78	2.400	48.000	6.660
1549 Jan 24	0.216	0.00	51.839	33.78	4.800	96.000	6.660
1549 Apr 12	0.216	0.00	51.839	33.78	3.600	72.000	6.660
	0.216	0.00	51.839	33.78	3.600	72.000	6.660
1550 Feb 1	0.216	0.00	51.839	33.78	2.400	48.000	6.660
1550 July	0.216	0.00	51.839	33.78	3.600	72.000	6.660
	0.216	0.00	51.839	33.78	3.600	72.000	6.660

TABLE 1 (continued)

ENGLISH SILVER COINAGES: FROM 1464 (EDWARD IV) TO 1560 (ELIZABETH I)
Composition of the silver penny, with mint charges and mint prices based on the Troy pound

PART 2: PURE SILVER CONTENTS AND VALUES (continued)

date of penny	grams pure silver in d	per cent change in silver contents	grams pure silver in £	silver index (1526 = 100)	traite value of Troy lb silver		
					given alloy in £ sterling	given alloy in shillings	0.925 fine in £ sterling
1551 Apr 14	0.108	-50.00	25.920	16.89	3.600	72.000	13.320
1551 Oct 5	0.477	342.00	114.565	74.66	3.000	60.000	3.013
1551 Dec 17	0.216	-54.75	51.839	33.78	2.400	48.000	6.660
1553 June 11	0.259	20.00	62.207	40.54	2.000	40.000	5.550
	0.259	20.00	62.207	40.54	2.000	40.000	5.550
1553 Aug 20	0.475	83.33	114.046	74.32	3.000	60.000	3.027
1557 June 28	0.475	0.00	114.046	74.32	3.000	60.000	3.027
1558 Dec 31	0.475	0.00	114.046	74.32	3.000	60.000	3.027
1560 Nov 8	0.480	0.91	115.083	75.00	3.000	60.000	3.000

NOTES

a See 433 n21 above.

b See Table 1 part 1 note c.

TABLE 1 (continued)

ENGLISH SILVER COINAGES: FROM 1464 (EDWARD IV) TO 1560 (ELIZABETH I)
Composition of the silver penny, with mint charges and mint prices based on the Troy pound

PART 3: MINT CHARGES AND MINT PRICES FOR SILVER

date of penny	specified silver alloy						pure silver			
	traite value of Troy lb in £ sterling	total mint charges in £ sterling	per cent of total struck	mint price for bullion in £ sterling	per cent of total struck	traite value of Troy lb in £ sterling	total mint charges in £ sterling	per cent of total struck	mint price for bullion in £ sterling	per cent of traite value
1464 Aug 13	2.000	0.240	12.00	1.760	88.00	2.162	0.259	12.00	1.903	88.00
1466 Sep 29	2.000	0.231	11.56	1.769	88.44	2.162	0.250	11.56	1.912	88.44
1467 Sep 29	2.000	0.142	7.11	1.858	92.89	2.162	0.154	7.11	2.008	92.89
1470 Oct 23	2.000	0.107	5.33	1.893	94.67	2.162	0.115	5.33	2.047	94.67
1471 Apr 14	2.000	0.080	4.00	1.920	96.00	2.162	0.086	4.00	2.076	96.00
1492 Nov 20	2.000	0.053	2.67	1.947	97.33	2.162	0.058	2.67	2.105	97.33
1526 Nov 5	2.250	0.050	2.22	2.200	97.78	2.432	0.054	2.22	2.378	97.78
1542 May 16 ^a (Gould)	2.400	0.400	16.67	2.000	83.33	2.880	0.480	16.67	2.400	83.33
(Challis)	2.400	0.400	16.67	2.000	83.33	3.165	0.527	16.67	2.637	83.33
(Munro)	2.400	0.400	16.67	2.000	83.33	3.114	0.519	16.67	2.595	83.33
1544 May 28	2.400	0.435	18.14	1.965	81.86	3.200	0.581	18.14	2.619	81.86

TABLE 1 (continued)

ENGLISH SILVER COINAGES: FROM 1464 (EDWARD IV) TO 1560 (ELIZABETH I)
Composition of the silver penny, with mint charges and mint prices based on the Troy pound

PART 3: MINT CHARGES AND MINT PRICES FOR SILVER (continued)

date of penny	specified silver alloy				pure silver					
	traite value in £ sterling	total mint charges in £ sterling	per cent of total struck	mint price for bullion in £ sterling	per cent of total struck	traite value in £ sterling	total mint charges in £ sterling	per cent of total struck	mint price for bullion in £ sterling	per cent of traite value
1545 Mar 27	2.400	1.000	41.67	1.400	58.33	4.800	2.000	41.67	2.800	58.33
1546 Apr 1	2.400	1.467	61.11	0.933	38.89	7.200	4.400	61.11	2.800	38.89
1547 Apr 5	2.400	1.333	55.56	1.067	44.44	7.200	4.000	55.56	3.200	44.44
	2.400	1.267	52.78	1.133	47.22	7.200	3.800	52.78	3.400	47.22
1548 Feb 16	2.400	n/a	n/a	n/a	n/a	7.200	n/a	n/a	n/a	n/a
1549 Jan 24	4.800	n/a	n/a	n/a	n/a	7.200	n/a	n/a	n/a	n/a
1549 Apr 12	3.600	1.900	52.78	1.700	47.22	7.200	3.800	52.78	3.400	47.22
	3.600	1.800	50.00	1.800	50.00	7.200	3.600	50.00	3.600	50.00
1550 Feb 1	2.400	n/a	n/a	n/a	n/a	7.200	n/a	n/a	n/a	n/a
1550 July	3.600	1.600	44.44	2.000	55.56	7.200	3.200	44.44	4.000	55.56
	3.600	1.650	45.83	1.950	54.17	7.200	3.300	45.83	3.900	54.17
1551 Apr 14	3.600	2.100	58.33	1.500	41.67	14.400	8.400	58.33	6.000	41.67
1551 Oct 5	3.000	0.050	1.67	2.950	98.33	3.258	0.054	1.67	3.204	98.33
1551 Dec 17	2.400	n/a	n/a	n/a	n/a	7.200	n/a	n/a	n/a	n/a

TABLE 1 (continued)

PART 3: MINT CHARGES AND MINT PRICES FOR SILVER (continued)											
date of penny	specified silver alloy						pure silver				
	traite value of Troy lb in £ sterling	total mint charges in £ sterling	per cent of total struck	mint price for bullion in £ sterling	per cent of total struck	per cent of total struck	traite value of Troy lb in £ sterling	total mint charges in £ sterling	per cent of total struck	mint price for bullion in £ sterling	per cent of traite value
1553 June 11	2.000	n/a	n/a	n/a	n/a	n/a	7.200	n/a	n/a	n/a	n/a
1553 Aug 20	2.0000	n/a	n/a	n/a	n/a	n/a	7.200	n/a	n/a	n/a	n/a
1557 June 28	3.000	0.073	2.43	2.927	97.57	2.43	3.273	0.080	3.193	97.57	97.57
1558 Dec 31	3.000	0.075	2.50	2.925	97.50	2.50	3.273	0.082	3.191	97.50	97.50
1560 Nov 8	3.000	n/a	n/a	n/a	n/a	n/a	3.243	0.081	3.162	2.50	97.50

NOTES

Data not available in mint ordinances and mint accounts are marked 'n/a.'

a See Table 1 part 1 note c.

TABLE 2

ENGLISH GOLD COINAGES: FROM 1464 (EDWARD IV) TO 1560 (ELIZABETH I)
Composition of gold coins, with mint charges and mint prices based on the Troy pound

PART 1: FINENESS AND WEIGHT

date name of coin	fineness of gold coin			weight of gold coin		
	carats (out of 24)	grains (out of 4)	per cent fine	number per Troy pound ^a	weight in Troy grains ^b	weight in grams
1464 Aug 13 noble	23	3.50	99.48	53.33	108.000	6.998
1465 Mar 6 ryal, rose noble	23	3.50	99.48	48.00	120.000	7.776
angel-noble	23	3.50	99.48	72.00	80.000	5.184
1469 Mar 2 ryal, rose noble	23	3.50	99.48	48.00	120.000	7.776
angel-noble	23	3.50	99.48	72.00	80.000	5.184
1471 Mar 6 ryal, rose noble	23	3.50	99.48	48.00	120.000	7.776
angel-noble	23	3.50	99.48	72.00	80.000	5.184
1477 Feb 3 ryal, rose noble	23	3.50	99.48	48.00	120.000	7.776
angel-noble	23	3.50	99.48	72.00	80.000	5.184
1489 Oct 28 sovereign	23	3.50	99.48	24.00	240.000	15.552
1492 Nov 20 ryal, rose noble	23	3.50	99.48	48.00	120.000	7.776
angel-noble	23	3.50	99.48	72.00	80.000	5.184
sovereign	23	3.50	99.48	24.00	240.000	15.552
1526 Aug 22 sovereign	23	3.50	99.48	24.00	240.000	15.552
ryal, rose noble	23	3.50	99.48	48.00	120.000	7.776
angel-noble	23	3.50	99.48	72.00	80.000	5.184
crown: rose	22	0.00	91.67	106.67	54.000	3.499
1526 Nov 5 sovereign	23	3.50	99.48	24.00	240.000	15.552
ryal, rose noble	23	3.50	99.48	48.00	120.000	7.776
angel-noble	23	3.50	99.48	72.00	80.000	5.184
St George noble	23	3.50	99.48	81.00	71.111	4.608
double-rose crown	22	0.00	91.67	100.50	57.313	3.714
half-crown	22	0.00	91.67	201.00	28.657	1.857
1542 May 16 sovereign	23	0.00	95.83	28.80	200.000	12.960
ryal, rose noble	23	0.00	95.83	57.60	100.000	6.480
angel-noble	23	0.00	95.83	72.00	80.000	5.184
1544 May 28 sovereign	23	0.00	95.83	28.80	200.000	12.960
ryal, rose noble	23	0.00	95.83	57.60	100.000	6.480

TABLE 2 (continued)

PART 1: FINENESS AND WEIGHT (continued)

date name of coin	fineness of gold coin			weight of gold coin		
	carats (out of 24)	grains (out of 4)	per cent fine	number per Troy pound ^a	weight in Troy grains ^b	weight in grams
1544 May 28 (continued)						
angel-noble	23	0.00	95.83	72.00	80.000	5.184
1545 Mar 27						
sovereign	22	0.00	91.67	30.00	192.000	12.441
ryal, rose noble	22	0.00	91.67	60.00	96.000	6.221
angel-noble	22	0.00	91.67	75.00	76.800	4.977
1545 April						
sovereign	22	0.00	91.67	30.00	192.000	12.441
ryal, rose noble	22	0.00	91.67	60.00	96.000	6.221
angel-noble	22	0.00	91.67	75.00	76.800	4.977
1546 Apr 1						
sovereign	20	0.00	83.33	30.00	192.000	12.441
ryal, rose noble	20	0.00	83.33	60.00	96.000	6.221
angel-noble	20	0.00	83.33	75.00	76.800	4.977
crown	20	0.00	83.33	120.00	48.000	3.110
half-crown	20	0.00	83.33	240.00	24.000	1.555
1546 Apr 1						
sovereign	20	0.00	83.33	30.00	192.000	12.441
ryal, rose noble	20	0.00	83.33	60.00	96.000	6.221
angel-noble	20	0.00	83.33	75.00	76.800	4.977
crown	20	0.00	83.33	120.00	48.000	3.110
half-crown	20	0.00	83.33	240.00	24.000	1.555
1547 April						
sovereign	20	0.00	83.33	30.00	192.000	12.441
ryal, rose noble	20	0.00	83.33	60.00	96.000	6.221
angel-noble	20	0.00	83.33	75.00	76.800	4.977
crown	20	0.00	83.33	120.00	48.000	3.110
half-crown	20	0.00	83.33	240.00	24.000	1.555
1548 Feb 16						
sovereign	20	0.00	83.33	30.00	192.000	12.441
1549 Jan 24						
sovereign	22	0.00	91.67	34.00	169.412	10.978
ryal, rose noble	22	0.00	91.67	68.00	84.706	5.489
crown	22	0.00	91.67	136.00	42.353	2.744
half-crown	22	0.00	91.67	272.00	21.176	1.372
1550 Dec 18						
sovereign	23	3.50	99.48	24.00	240.000	15.552
ryal, rose noble	23	3.50	99.48	48.00	120.000	7.776
angel-noble	23	3.50	99.48	72.00	80.000	5.184

TABLE 2 (continued)

ENGLISH GOLD COINAGES: FROM 1464 (EDWARD IV) TO 1560 (ELIZABETH I)
Composition of gold coins, with mint charges and mint prices based on the Troy pound

PART 1: FINENESS AND WEIGHT (continued)

date name of coin	fineness of gold coin			weight of gold coin		
	carats (out of 24)	grains (out of 4)	per cent fine	number per Troy pound ^a	weight in Troy grains ^b	weight in grams
1551 Oct 5						
sovereign	23	3.50	99.48	24.00	240.000	15.552
angel-noble	23	3.50	99.48	72.00	80.000	5.184
sovereign	22	0.00	91.67	33.00	174.545	11.310
ryal, rose noble	22	0.00	91.67	66.00	87.273	5.655
crown	22	0.00	91.67	132.00	43.636	2.828
1553 Aug 20						
sovereign	23	3.50	99.48	24.00	240.000	15.552
ryal, rose noble	23	3.50	99.48	48.00	120.000	7.776
angel-noble	23	3.50	99.48	72.00	80.000	5.184
1557 Aug 5						
angel-noble	23	3.50	99.48	72.00	80.000	5.184
1558 Apr 30						
sovereign	23	3.50	99.48	24.00	240.000	15.552
angel-noble	23	3.50	99.48	72.00	80.000	5.184
sovereign	22	0.00	91.67	33.00	174.545	11.310
ryal, rose noble	22	0.00	91.67	66.00	87.273	5.655
crown	22	0.00	91.67	132.00	43.636	2.828
1559 Jan						
sovereign	23	3.50	99.48	24.00	240.000	15.552
ryal, rose noble	23	3.50	99.48	48.00	120.000	7.776
angel-noble	23	3.50	99.48	72.00	80.000	5.184
sovereign	22	0.00	91.67	33.00	174.545	11.310
angel-noble	22	0.00	91.67	66.00	87.273	5.655
crown	22	0.00	91.67	132.00	43.636	2.828
1560 Nov 8						
sovereign	23	3.50	99.48	24.00	240.000	15.552
ryal, rose noble	23	3.50	99.48	48.00	120.000	7.776
angel-noble	23	3.50	99.48	72.00	80.000	5.184
sovereign	22	0.00	91.67	33.00	174.545	11.310
angel-noble	22	0.00	91.67	66.00	87.273	5.655
crown	22	0.00	91.67	132.00	43.636	2.828

NOTES

a Troy pound cut to 5760 Troy grains = 373.242 grams

b Troy grain = 0.648 grams

TABLE 2 (continued)

PART 2: PURE GOLD CONTENTS AND VALUES							
date	grams of pure gold		per cent change in gold contents	gold index (1526 = 100)	official value of coin		traite value of Troy lb in £ sterling
	in coin	in £ sterling			shillings & pence	in £ sterling	
1464 Aug 13							
noble	6.962	16.708	-20.00	118.800	8s 4d	0.417	22.222
1465 Mar 6							
ryal, rose noble	7.735	15.471	-7.41	110.000	10s od	0.500	24.000
angel-noble	5.157	15.471	-7.41	110.000	6s 8d	0.333	24.000
1469 Mar 2							
ryal, rose noble	7.735	15.471	0.00	110.000	10s od	0.500	24.000
angel-noble	5.157	15.471	0.00	110.000	6s 8d	0.333	24.000
1471 Mar 6							
ryal, rose noble	7.735	15.471	0.00	110.000	10s od	0.500	24.000
angel-noble	5.157	15.471	0.00	110.000	6s 8d	0.333	24.000
1477 Feb 3							
ryal, rose noble	7.735	15.471	0.00	110.000	10s od	0.500	24.000
angel-noble	5.157	15.471	0.00	110.000	6s 8d	0.333	24.000
1489 Oct 28							
sovereign	15.471	15.471	0.00	110.000	20s od	1.000	24.000
1492 Nov 20							
ryal, rose noble	7.735	15.471	0.00	110.000	10s od	0.500	24.000
angel-noble	5.157	15.471	0.00	110.000	6s 8d	0.333	24.000
sovereign	15.471	15.471	0.00	110.000	20s od	1.000	24.000
1526 Aug 22							
sovereign	15.471	14.064	-9.09	100.000	22s od	1.100	26.400
ryal, rose noble	7.735	14.064	-9.09	100.000	11s od	0.550	26.400
angel-noble	5.157	14.064	-9.09	100.000	7s 4d	0.367	26.400
crown: rose	3.208	14.256	-7.85	101.361	4s 6d	0.225	24.000
1526 Nov 5							
sovereign	15.471	13.752	-2.22	97.778	22s 6d	1.125	27.000
ryal, rose noble	7.735	13.752	-2.22	97.778	11s 3d	0.563	27.000
angel-noble	5.157	13.752	-2.22	97.778	7s 6d	0.375	27.000
St George noble	4.584	13.752	-2.22	97.778	6s 8d	0.333	27.000
double-rose crown	3.404	13.617	-4.48	96.823	5s od	0.250	25.125
half-crown	1.702	13.617	-4.48	96.823	2s 6d	0.125	25.125
1542 May 16							
sovereign	12.420	12.420	-9.69	88.307	20s od	1.000	28.800
ryal, rose noble	6.210	12.420	-9.69	88.307	10s od	0.500	28.800
angel-noble	4.968	12.420	-9.69	88.307	8s od	0.400	28.800
1544 May 28							
sovereign	12.420	12.420	0.00	88.307	20s od	1.000	28.800
ryal, rose noble	6.210	12.420	0.00	88.307	10s od	0.500	28.800

TABLE 2 (continued)

ENGLISH GOLD COINAGES: FROM 1464 (EDWARD IV) TO 1560 (ELIZABETH I)
Composition of gold coins, with mint charges and mint prices based on the Troy pound

PART 2: PURE GOLD CONTENTS AND VALUES (continued)

date	grams of pure gold		per cent change in gold contents	gold index (1526 = 100)	official value of coin		traite value of Troy lb in £ sterling
	in coin	in £ sterling			shillings & pence	in £ sterling	
1544 May 28 (continued)							
angel-noble	4.968	12.420	0.00	88.307	8s od	0.400	28.800
1545 Mar 27							
sovereign	11.405	11.405	-8.17	81.089	20s od	1.000	30.000
ryal, rose noble	5.702	11.405	-8.17	81.089	10s od	0.500	30.000
angel-noble	4.562	11.405	-8.17	81.089	8s od	0.400	30.000
1545 April							
sovereign	11.405	11.405	0.00	81.089	20s od	1.000	30.000
ryal, rose noble	5.702	11.405	0.00	81.089	10s od	0.500	30.000
angel-noble	4.562	11.405	0.00	81.089	8s od	0.400	30.000
1546 Apr 1							
sovereign	10.368	10.368	-9.09	73.717	20s od	1.000	30.000
ryal, rose noble	5.184	10.368	-9.09	73.717	10s od	0.500	30.000
angel-noble	4.147	10.368	-9.09	73.717	8s od	0.400	30.000
crown	2.592	10.368	-9.09	73.717	5s od	0.250	30.000
half-crown	1.296	10.368	-9.09	73.717	2s 6d	0.125	30.000
1546 Apr 1							
sovereign	10.368	10.368	0.00	73.717	20s od	1.000	30.000
ryal, rose noble	5.184	10.368	0.00	73.717	10s od	0.500	30.000
angel-noble	4.147	10.368	0.00	73.717	8s od	0.400	30.000
crown	2.592	10.368	0.00	73.717	5s od	0.250	30.000
half-crown	1.296	10.368	0.00	73.717	2s 6d	0.125	30.000
1547 April							
sovereign	10.368	10.368	0.00	73.717	20s od	1.000	30.000
ryal, rose noble	5.184	10.368	0.00	73.717	10s od	0.500	30.000
angel-noble	4.147	10.368	0.00	73.717	8s od	0.400	30.000
crown	2.592	10.368	0.00	73.717	5s od	0.250	30.000
half-crown	1.296	10.368	0.00	73.717	2s 6d	0.125	30.000
1548 Feb 16							
sovereign	10.368	10.368	0.00	73.717	20s od	1.000	30.000
1549 Jan 24							
sovereign	10.063	10.063	-2.94	71.549	20s od	1.000	34.000
ryal, rose noble	5.031	10.063	-2.94	71.549	10s od	0.500	34.000
crown	2.516	10.063	-2.94	71.549	5s od	0.250	34.000
half-crown	1.258	10.063	-2.94	71.549	2s 6d	0.125	34.000
1550 Dec 18							
sovereign	15.471	12.892	28.12	91.667	24s od	1.200	28.800
ryal, rose noble	7.735	12.892	28.12	91.667	12s od	0.600	28.800
angel-noble	5.157	12.892	28.12	91.667	8s od	0.400	28.800

TABLE 2 (continued)

PART 2: PURE GOLD CONTENTS AND VALUES (continued)

date name of coin	grams of pure gold		per cent change in gold contents	gold index (1526 = 100)	official value of coin		traite value of Troy lb in £ sterling
	in coin	in £ sterling			shillings & pence	in £ sterling	
1551 Oct 5							
sovereign	15.471	10.314	-20.00	73.333	30s od	1.500	36.000
angel-noble	5.157	10.314	-20.00	73.333	10s od	0.500	36.000
sovereign	10.368	10.368	-19.58	73.717	20s od	1.000	33.000
ryal, rose noble	5.184	10.368	-19.58	73.717	10s od	0.500	33.000
crown	2.592	10.368	-19.58	73.717	5s od	0.250	33.000
1553 Aug 20							
sovereign	15.471	10.314	0.00	73.333	30s od	1.500	36.000
ryal, rose noble	7.735	10.314	0.00	73.333	15s od	0.750	36.000
angel-noble	5.157	10.314	0.00	73.333	10s od	0.500	36.000
1557 Aug 5							
angel-noble	5.157	10.314	0.00	73.333	10s od	0.500	36.000
1558 Apr 30							
sovereign	15.471	10.314	0.00	73.333	30s od	1.500	36.000
angel-noble	5.157	10.314	0.00	73.333	10s od	0.500	36.000
sovereign	10.368	10.368	0.52	73.717	20s od	1.000	33.000
ryal, rose noble	5.184	10.368	0.52	73.717	10s od	0.500	33.000
crown	2.592	10.368	0.52	73.717	5s od	0.250	33.000
1559 Jan							
sovereign	15.471	10.314	0.00	73.333	30s od	1.500	36.000
ryal, rose noble	7.735	10.314	0.00	73.333	15s od	0.750	36.000
angel-noble	5.157	10.368	0.00	73.717	10s od	0.500	36.000
sovereign	10.368	10.368	0.00	73.717	20s od	1.000	33.000
angel-noble	5.184	10.368	0.00	73.717	10s od	0.500	33.000
crown	2.592	10.368	0.00	73.717	5s od	0.250	33.000
1560 Nov 8							
sovereign	15.471	10.314	0.00	73.333	30s od	1.500	36.000
ryal, rose noble	7.735	10.314	0.00	73.333	15s od	0.750	36.000
angel-noble	5.157	10.314	0.00	73.333	10s od	0.500	36.000
sovereign	10.368	10.368	0.00	73.717	20s od	1.000	33.000
angel-noble	5.184	10.368	0.00	73.717	10s od	0.500	33.000
crown	2.592	10.368	0.00	73.717	5s od	0.250	33.000

TABLE 2 (continued)

ENGLISH GOLD COINAGES: FROM 1464 (EDWARD IV) TO 1560 (ELIZABETH I)
Composition of gold coins, with mint charges and mint prices based on the Troy pound

PART 3: MINT CHARGES AND MINT PRICES FOR GOLD

date	name of coin	current gold alloy				24 carat gold (fine)				
		traite value of Troy lb in £ sterling	total mint charges in £ sterling	per cent of total struck	mint price for bullion in £ sterling	per cent of total struck	total mint charges in £ sterling	per cent of total struck	mint price for bullion in £ sterling	per cent of traite value
1464 Aug 13	sovereign	22.222	2.667	12.00	19.556	88.00	22.339	12.00	19.658	88.00
1465 Mar 6	royal, rose noble	24.000	1.111	4.63	22.889	95.37	24.126	4.63	23.009	95.37
	angel-noble	24.000	1.111	4.63	22.889	95.37	24.126	4.63	23.009	95.37
1469 Mar 2	royal, rose noble	24.000	0.773	3.22	23.227	96.78	24.126	3.22	23.348	96.78
	angel-noble	24.000	0.773	3.22	23.227	96.78	24.126	3.22	23.348	96.78
1471 Mar 6	royal, rose noble	24.000	0.560	2.33	23.440	97.67	24.126	2.33	23.563	97.67
	angel-noble	24.000	0.560	2.33	23.440	97.67	24.126	2.33	23.563	97.67
1477 Feb 3	royal, rose noble	24.000	0.400	1.67	23.600	98.33	24.126	1.67	23.724	98.33
	angel-noble	24.000	0.400	1.67	23.600	98.33	24.126	1.67	23.724	98.33
1489 Oct 28	sovereign	24.000	n/a	n/a	n/a	n/a	24.126	n/a	n/a	n/a
1492 Nov 20	royal, rose noble	24.000	0.133	0.56	23.867	99.44	24.126	0.56	23.992	99.44
	angel-noble	24.000	0.133	0.56	23.867	99.44	24.126	0.56	23.992	99.44
	sovereign	24.000	0.133	0.56	23.867	99.44	24.126	0.56	23.992	99.44

TABLE 2 (continued)

		current gold alloy						24 carat gold (fine)										
date	name of coin	traite value	total mint	per cent	mint price	per cent	traite value	total mint	per cent	mint price	per cent	traite value	total mint	per cent	mint price	per cent		
		of Troy lb in £ sterling	charges in £ sterling	of total struck	for bullion in £ sterling	of total struck	of Troy lb in £ sterling	charges in £ sterling	of total struck	for bullion in £ sterling	of total struck	of Troy lb in £ sterling	charges in £ sterling	of total struck	for bullion in £ sterling	of Troy lb in £ sterling	charges in £ sterling	of total struck
1526 Aug 22	sovereign	26.400	n/a	n/a	n/a	n/a	26.538	n/a	n/a	n/a	n/a	26.538	n/a	n/a	n/a	n/a	n/a	n/a
	royal, rose noble	26.400	n/a	n/a	n/a	n/a	26.538	n/a	n/a	n/a	n/a	26.538	n/a	n/a	n/a	n/a	n/a	n/a
	angel-noble	26.400	n/a	n/a	n/a	n/a	26.538	n/a	n/a	n/a	n/a	26.538	n/a	n/a	n/a	n/a	n/a	n/a
	crown: rose	24.000	n/a	n/a	n/a	n/a	26.182	n/a	n/a	n/a	n/a	26.182	n/a	n/a	n/a	n/a	n/a	n/a
1526 Nov 5	sovereign	27.000	0.138	0.51	26.863	99.49	27.141	0.138	0.51	27.003	99.49	27.141	0.138	0.51	27.003	99.49	27.141	0.138
	royal, rose noble	27.000	0.138	0.51	26.863	99.49	27.141	0.138	0.51	27.003	99.49	27.141	0.138	0.51	27.003	99.49	27.141	0.138
	angel-noble	27.000	0.138	0.51	26.863	99.49	27.141	0.138	0.51	27.003	99.49	27.141	0.138	0.51	27.003	99.49	27.141	0.138
	St George noble	27.000	0.138	0.51	26.863	99.49	27.141	0.138	0.51	27.003	99.49	27.141	0.138	0.51	27.003	99.49	27.141	0.138
	double-rose crown	25.125	0.150	0.60	24.975	99.40	27.409	0.164	0.60	27.245	99.40	27.409	0.164	0.60	27.245	99.40	27.409	0.164
	half-crown	25.125	0.150	0.60	24.975	99.40	27.409	0.164	0.60	27.245	99.40	27.409	0.164	0.60	27.245	99.40	27.409	0.164
1542 May 16	sovereign	28.800	1.200	4.17	27.600	95.83	30.052	1.252	4.17	28.800	95.83	30.052	1.252	4.17	28.800	95.83	30.052	1.252
	royal, rose noble	28.800	1.200	4.17	27.600	95.83	30.052	1.252	4.17	28.800	95.83	30.052	1.252	4.17	28.800	95.83	30.052	1.252
	angel-noble	28.800	1.200	4.17	27.600	95.83	30.052	1.252	4.17	28.800	95.83	30.052	1.252	4.17	28.800	95.83	30.052	1.252
1544 May 28	sovereign	28.800	1.200	4.17	27.600	95.83	30.052	1.252	4.17	28.800	95.83	30.052	1.252	4.17	28.800	95.83	30.052	1.252
	royal, rose noble	28.800	1.200	4.17	27.600	95.83	30.052	1.252	4.17	28.800	95.83	30.052	1.252	4.17	28.800	95.83	30.052	1.252
	angel-noble	28.800	1.200	4.17	27.600	95.83	30.052	1.252	4.17	28.800	95.83	30.052	1.252	4.17	28.800	95.83	30.052	1.252

TABLE 2 (continued)

ENGLISH GOLD COINAGES: FROM 1464 (EDWARD IV) TO 1560 (ELIZABETH I)
Composition of gold coins, with mint charges and mint prices based on the Troy pound

PART 3: MINT CHARGES AND MINT PRICES FOR GOLD (continued)

date	name of coin	current gold alloy				24 carat gold (fine)				
		traite value of Troy lb in £ sterling	total mint charges in £ sterling	per cent of total struck	mint price for bullion in £ sterling	per cent of total struck	total mint charges in £ sterling	per cent of total struck	mint price for bullion in £ sterling	per cent of traite value
1545 Mar 27	sovereign	30.000	2.500	8.33	27.500	91.67	2.727	8.33	30.000	91.67
	royal, rose noble	30.000	2.500	8.33	27.500	91.67	2.727	8.33	30.000	91.67
	angel-noble	30.000	2.500	8.33	27.500	91.67	2.727	8.33	30.000	91.67
1545 April	sovereign	30.000	1.950	6.50	28.050	93.50	2.127	6.50	30.600	93.50
	royal, rose noble	30.000	1.950	6.50	28.050	93.50	2.127	6.50	30.600	93.50
	angel-noble	30.000	1.950	6.50	28.050	93.50	2.127	6.50	30.600	93.50
1546 Apr 1	sovereign	30.000	4.500	15.00	25.500	85.00	5.400	15.00	30.600	85.00
	royal, rose noble	30.000	4.500	15.00	25.500	85.00	5.400	15.00	30.600	85.00
	angel-noble	30.000	4.500	15.00	25.500	85.00	5.400	15.00	30.600	85.00
	crown	30.000	4.500	15.00	25.500	85.00	5.400	15.00	30.600	85.00
	half-crown	30.000	4.500	15.00	25.500	85.00	5.400	15.00	30.600	85.00
1546 Apr 1	sovereign	30.000	4.000	13.33	26.000	86.67	4.800	13.33	31.200	86.67
	royal, rose noble	30.000	4.000	13.33	26.000	86.67	4.800	13.33	31.200	86.67
	angel-noble	30.000	4.000	13.33	26.000	86.67	4.800	13.33	31.200	86.67
	crown	30.000	4.000	13.33	26.000	86.67	4.800	13.33	31.200	86.67
	half-crown	30.000	4.000	13.33	26.000	86.67	4.800	13.33	31.200	86.67

TABLE 2 (continued)

date		current gold alloy						24 carat gold (fine)						
		traite value of Troy lb in £ sterling	total mint charges in £ sterling	per cent of total struck	mint price for bullion in £ sterling	per cent of total struck	traite value of Troy lb in £ sterling	total mint charges in £ sterling	per cent of total struck	mint price for bullion in £ sterling	per cent of traite value			
1547	April													
	sovereign	30.000	1.000	3.33	29.000	96.67	36.000	1.200	3.33	34.800	96.67			
	royal, rose noble	30.000	1.000	3.33	29.000	96.67	36.000	1.200	3.33	34.800	96.67			
	angel-noble	30.000	1.000	3.33	29.000	96.67	36.000	1.200	3.33	34.800	96.67			
	crown	30.000	1.000	3.33	29.000	96.67	36.000	1.200	3.33	34.800	96.67			
	half-crown	30.000	1.000	3.33	29.000	96.67	36.000	1.200	3.33	34.800	96.67			
1548	Feb 16													
	sovereign	30.000	1.000	3.33	29.000	96.67	36.000	1.200	3.33	34.800	96.67			
1549	Jan 24													
	sovereign	34.000	1.000	2.94	33.000	97.06	37.091	1.091	2.94	36.000	97.06			
	royal, rose noble	34.000	1.000	2.94	33.000	97.06	37.091	1.091	2.94	36.000	97.06			
	crown	34.000	1.000	2.94	33.000	97.06	37.091	1.091	2.94	36.000	97.06			
	half-crown	34.000	1.000	2.94	33.000	97.06	37.091	1.091	2.94	36.000	97.06			
1550	Dec 18													
	sovereign	28.800	1.650	5.73	27.150	94.27	28.951	1.659	5.73	27.292	94.27			
	royal, rose noble	28.800	1.650	5.73	27.150	94.27	28.951	1.659	5.73	27.292	94.27			
	angel-noble	28.800	1.650	5.73	27.150	94.27	28.951	1.659	5.73	27.292	94.27			

TABLE 2 (continued)

ENGLISH GOLD COINAGES: FROM 1464 (EDWARD IV) TO 1560 (ELIZABETH I)
Composition of gold coins, with mint charges and mint prices based on the Troy pound

PART 3: MINT CHARGES AND MINT PRICES FOR GOLD (continued)

date	name of coin	current gold alloy				24 carat gold (fine)				
		traite value of Troy lb in £ sterling	total mint charges in £ sterling	per cent of total struck	mint price for bullion in £ sterling	per cent of total struck	total mint charges in £ sterling	per cent of total struck	mint price for bullion in £ sterling	per cent of traite value
1551 Oct 5	sovereign	36.000	0.138	0.38	35.863	99.62	0.138	0.38	36.050	99.62
	angel-noble	36.000	0.138	0.38	35.863	99.62	0.138	0.38	36.050	99.62
	sovereign	33.000	0.150	0.45	32.850	99.55	0.164	0.45	35.836	99.55
	royal, rose noble	33.000	0.150	0.45	32.850	99.55	0.164	0.45	35.836	99.55
	crown	33.000	0.150	0.45	32.850	99.55	0.164	0.45	35.836	99.55
1553 Aug 20	sovereign	36.000	0.200	0.56	35.800	99.44	0.201	0.56	35.987	99.44
	royal, rose noble	36.000	0.200	0.56	35.800	99.44	0.201	0.56	35.987	99.44
	angel-noble	36.000	0.200	0.56	35.800	99.44	0.201	0.56	35.987	99.44
1557 Aug 5	angel-noble	36.000	0.200	0.56	35.800	99.44	0.201	0.56	35.987	99.44
1558 Apr 30	sovereign	36.000	0.200	0.56	35.800	99.44	0.201	0.56	35.987	99.44
	angel-noble	36.000	0.200	0.56	35.800	99.44	0.201	0.56	35.987	99.44
	sovereign	33.000	0.200	0.61	32.800	99.39	0.218	0.61	35.782	99.39
	royal, rose noble	33.000	0.200	0.61	32.800	99.39	0.218	0.61	35.782	99.39
	crown	33.000	0.200	0.61	32.800	99.39	0.218	0.61	35.782	99.39

PART 3: MINT CHARGES AND MINT PRICES FOR GOLD (continued)

date	name of coin	current gold alloy				24 carat gold (fine)					
		traite value of Troy lb in £ sterling	total mint charges in £ sterling	per cent of total struck	mint price for bullion in £ sterling	per cent of total struck	traite value of Troy lb in £ sterling	total mint charges in £ sterling	per cent of total struck	mint price for bullion in £ sterling	per cent of traite value
1559 Jan	sovereign	36.000	0.200	0.56	35.800	99.44	36.188	0.201	0.56	35.987	99.44
	royal, rose noble	36.000	0.200	0.56	35.800	99.44	36.188	0.201	0.56	35.987	99.44
	angel-noble	36.000	0.200	0.56	35.800	99.44	36.188	0.201	0.56	35.987	99.44
	sovereign	33.000	0.200	0.61	32.800	99.39	36.000	0.218	0.61	35.782	99.39
	angel-noble	33.000	0.200	0.61	32.800	99.39	36.000	0.218	0.61	35.782	99.39
	crown	33.000	0.200	0.61	32.800	99.39	36.000	0.218	0.61	35.782	99.39
1560 Nov 8	sovereign	36.000	0.200	0.56	35.800	99.44	36.188	0.201	0.56	35.987	99.44
	royal, rose noble	36.000	0.200	0.56	35.800	99.44	36.188	0.201	0.56	35.987	99.44
	angel-noble	36.000	0.200	0.56	35.800	99.44	36.188	0.201	0.56	35.987	99.44
	sovereign	33.000	0.200	0.61	32.800	99.39	36.000	0.218	0.61	35.782	99.39
	angel-noble	33.000	0.200	0.61	32.800	99.39	36.000	0.218	0.61	35.782	99.39
	crown	33.000	0.200	0.61	32.800	99.39	36.000	0.218	0.61	35.782	99.39

NOTES

Data not available in mint ordinances and mint accounts are marked 'n/a.'

TABLE 3

OFFICIAL ENGLISH COINAGE RATES FOR GOLD COINS IN THE 1520S

name of coin	22 May 1522		24 Nov 1522		6 July 1525	
	grams fine gold	value in shil- lings & pence = total pence	grams fine gold	value in shil- lings & pence = total pence	grams fine gold	value in shil- lings & pence = total pence
FOREIGN COINS						
ducat and florin	3.559	4s 6d = 54d	3.559	4s 6d = 54d	3.559	4s 6d = 54d
écu au soleil	3.296	4s 4d = 52d	3.296	4s 4d = 52d	3.296	4s 4d = 52d
écu à la couronne	3.275	4s od = 48d	3.275	4s od = 48d	3.275	4s od = 48d
réal d'or	5.275		5.275	6s 10d = 82d	5.275	6s 10d = 82d
Carolus florin	1.700		1.700	2s 1d = 25d	1.700	2s 1d = 25d
Rhenish florin	2.527		2.527	3s 3d = 39d	2.527	3s 3d = 39d
ENGLISH COINS						
sovereign	15.471	20s od = 240d	15.471	20s od = 240d	15.471	20s od = 260d
ryal, or rose noble	7.735	10s od = 120d	7.735	10s od = 120d	7.735	
angel-noble	5.157	6s 8d = 80d	5.157	6s 8d = 80d	5.157	6s 8d = 80d
crown						
St George noble						

name of coin	22 Aug 1526			5 Nov 1526		
	grams fine gold	value in shil- lings & pence = total pence	per cent change	grams fine gold	value in shil- lings & pence = total pence	per cent change
FOREIGN COINS						
ducat and florin	3.559	4s 8d = 56d	3.70	3.559		
écu au soleil	3.296	4s 6d = 54d	3.85	3.296		
écu à la couronne	3.275			3.275		
réal d'or	5.275			5.275		
Carolus florin	1.700			1.700		
Rhenish florin	2.527			2.527		
ENGLISH COINS						
sovereign	15.471	22s od = 264d	10.00	15.471	22s 6d = 270d	2.27
ryal, or rose noble	7.735	11s od = 132d	10.00	7.735	11s 3d = 135d	2.27
angel-noble	5.157	7s 4d = 88d	10.00	5.157	7s 6d = 90d	2.27
crown	3.208	4s 6d = 54d		3.404	5s od = 60d	11.11
St George noble				4.584	6s 8d = 80d	

SOURCES FOR TABLES 1-3

Christopher E. Challis 'Appendix 2: Mint contracts, 1279-1817' in *A New History of the Royal Mint* ed C.E. Challis (Cambridge and New York 1992) 699-758

J.D. Gould *The Great Debasement: Currency and the Economy in Mid-Tudor England* (Oxford 1970) 11-12, Tables I and II

Tudor Royal Proclamations ed Paul L. Hughes and James F. Larkin 2 vols (New Haven and London 1964) I *The Early Tudors (1485-1553)*