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The Heyday of the Gold Standard, 1820-1930

1869 June 28

Establishing and Maintaining the Gold Currency: 'Report addressed to the Chancellor of the Exchequer by the Master of the Mint and Colonel Smith, late Master of the Calcutta Mint, on the Mintage necessary to cover the Expenses of Establishing and Maintaining the Gold Currency'.

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1. What would it cost, first to manufacture a sovereign, and afterwards to keep it in good condition for all time? The coin is always losing weight by wear, while it passes from hand to hand, and ends by becoming light (after three quarters of a grain have been lost), and is no longer legally current. The individual piece has thus a limited existence, and it must be withdrawn and replaced by a new sovereign of full weight; that again by another in due time; and so on. Now, for what present payment could this succession be maintained? What is the contract price to cover the first construction, and all future restoration? To this interesting question the answer to be given is that 100 sovereigns could be put into circulation and kept always in proper condition for the sum of one pound eight shillings and a penny halfpenny (*1l.8s.1½d.*) paid when the coin was first issued.
2. It will be seen at once how important this datum becomes, if the project be entertained of making the gold coinage of the country self-supporting. It defines the amount of an endowment that would have to be provided, in some way or other, for the permanent maintenance of the coin.
3. The charge stated of *1l.8s.1½d.* on 100 sovereigns is deduced from several considerations; the cost of producing a single sovereign at the Mint, the total number of gold coins that are believed to be in circulation within the United Kingdom, and the length of time that the sovereigns and half sovereigns last, before becoming light and legally uncurrent.
4. The cost at which a sovereign is produced varies considerably with the number turned out from the Mint within the course of the year. Taking the present annual average production of 5 million sovereigns, the cost of each sovereign is found to be 0.72 of a penny, or nearly three farthings; while for a production of 25 millions in a year the cost is found to fall to 0.31 penny. For an annual amount approaching to 10 millions, the amount which we have particularly to consider, the cost may be safely taken at about 0.5 penny, or one halfpenny on each sovereign. This will come, on the amount of gold coinage (5 millions) at present required to be issued, to *10,416l.13s.4d.*
5. This estimate, taken from the experience of the British Mint, of one halfpenny per pound, is almost identical with 2.1 per mille, which is the charge fixed for coining gold in the Mints of France.

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6. The expense of an annual renewal of coins that have become light by wear, and have ceased to be legally current, has also to be taken into account. This will depend on the number that annually become light. The quantity of gold coin at present circulating in the United Kingdom is generally estimated at about 80 millions, an estimate which has lately received a valuable confirmation from the researches of Professor Jevons. The observations also recorded by Mr. Jevons respecting the loss by wear on sovereigns of various ages, indicate considerable regularity in wear, and that sovereigns fall below the legal weight, on an average, after a circulation of 18 years, and half-sovereigns in 10 years. It is to be presumed, then, that a sovereign which appears by its date to be 18 years old, ought to be withdrawn as being light. If such a regulation was carried into effect, one-eighteenth part of the whole gold currency would be withdrawn annually. On a coinage amounting to 80 millions, the proportion in question would amount to 4,444,444 sovereigns.

7. It must, however, be observed here, that the coinage of 80 millions is made up of 68 millions of whole sovereigns, of which 1-18th part have to be renewed annually, and 24 millions of half-sovereigns, 1-10th part of which have also to be renewed. The annual coinage thus due to renewal would amount to 3,777,777 sovereigns and 2,400,000 half-sovereigns, which would cost, at a half-penny each, 12,870*l.*7*s.*5*d.*

8. The loss of metal by wear, which would require to be replaced on re-coining old pieces, is the heaviest item of expenditure. The preceding charges apply only to the mechanical work of coining.

9. Mr. Jevon's experiments and observations furnish the best data we possess for estimating the annual loss by wear on 100 sovereigns. It is 8.371 pence. This is a loss of 0.08371 penny on each sovereign. The number in circulation being again taken at 80 millions, this gives an annual loss on the whole gold currency, amounting to 27,903*l.*6*s.*8*d.*

10. The above is calculated upon the assumption that the whole 80 millions consists of sovereigns; but, if the additional wear upon the half-sovereigns is allowed for, the annual loss would be increased, according to Mr. Jevons, to 35,000*l.*

11. These three items are the principal, if not the only, grounds upon which a Mint charge can be properly based. They are—

	£.	s.	d.
i. First coinage, say 4,000,000 bullion at ½ <i>d.</i> or 0.21 per cent.	8,400	0	0
ii. Annual renewal	3,777,777		
	at ½ <i>d.</i>	7,870	7
		4.88	
	2,400,000	ditto	5,000
		—————	
	12,870	7	4.88

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iii. Loss by wear	sovereigns	22,000	0	0				
	half ditto	13,000	0	0				
						35,000	0	0
	10,177,77							
	7					56,270	7	5

12. What does this amount to on our estimated annual coinage of about 10 millions, made up of 4 millions of first coinage, and 6 millions of renewal? It is 1.40676 (1.8s. 1½d.) per cent.

13. The amount of mintage charge which the calculations appear to justify is not far short of 1½ per cent. on the value of the gold coined, and it will be observed that the estimate here made is somewhat lower than the one subjoined which is founded on abstract mathematical calculation. It may be explained that the latter assumes that coins once sent into circulation never leave it, which may be more or less true with a protected currency; but there will never cease to be coins which drop out of circulation annually, owing to shipwrecks, fires, melting losses, &c., and which thereby tend to reduce the number to be renewed.

14. On the other hand, there is a circumstance which, if allowance is made for it, would increase the charge, namely, the number of sovereigns, estimated at about 30 millions, which circulate in foreign countries, and part of which, when they become light, are likely to return again to the United Kingdom, and occasion loss in their renewal.

15. Treating the question rigorously as an actuary's problem in assurance, it becomes necessary to ascertain what sum of money set aside to-day will be sufficient, part to pay the immediate expense of first coinage at 0.21 per cent., and the remainder to pay for re-coinage at the end of every 18 years, besides the requisite sum to make good the intervening 18 years' abrasion of the coin, reckoned at 4.3 grains of gold per 100 sovereigns per annum, and thus amounting to 0.62787. per cent. at the end of that time.

The immediate payment, then, is 0.21/., and the further payment at the end of every 18 years perpetually (0.62787 + 0.21 =) 0.83787. per cent.; and to calculate the sum proper to be invested to meet the regular periodical payment of 0.83787., it must be observed that, by the well-known formula

$$\frac{1}{(1+rx)^n - 1}$$

(where n represents the years of interval, viz. 18 for sovereigns, and 10 years for half sovereigns, and $r = .03$, or 3 per cent. interest) the sum of money requisite at 3 per cent. to meet payments of 1/., every 18 years is 1.4236231/.; consequently the sum necessary to provide for the periodical payments of 0.83787/., must be (is 1.4236231 × 0.83787 =) 1.92811/., which, added to the immediate expense of the

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first coinage (0.21*l.* per cent.), makes the total charge to the Government 1.402811*l.* per cent. for bullion coined into sovereigns only.

In like manner, with respect to the half-sovereigns, the sum of money requisite at 3 per cent. to meet payments of 1*l.* every 10 years is 2.90765*l.*, and the loss by wear of each half-sovereign allowed for by Mr. Jevons is .512 grains in 10 years, or .8306698*l.* on the 100*l.* value; consequently, in order to ascertain the sum to be set aside to meet this loss, and also the re-coinage at the end of every tenth year, we must add the 8306698*l.* to 0.21*l.*, making 1.0406698*l.*, and multiply by 2.90765, thus making 3.02389354*l.*, the sum to be set aside for every 100*l.* value; again, adding to this the expense of *first* coinage at 0.21*l.* per cent., the total expense to be incurred becomes 3.2358935*l.* per cent. for half-sovereigns only.

From the above it appears that the endowment necessary to be provided for the first coinage and permanent maintenance of—

Sovereigns is	1 <i>l.</i> 8 <i>s.</i> 1½ <i>d.</i> , or 1.402811 <i>l.</i> per cent.; and
Half-sovereigns	3 <i>l.</i> 4 <i>s.</i> 8 <i>d.</i> , or 3.2358935 <i>l.</i> per cent.

But the proportions of the sovereigns and half-sovereigns in our currency being as 68-80ths and 12-80ths, it follows that 68-80ths of 1.402811*l.* added to 12-80ths of 3.2358935*l.* will be the whole sum required to be set aside to meet the future expenses of our mixed currency.

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Now 68-80ths	of 1.402811/.	=	1.192390/.	
and 12-80ths	of 3.235893/.	=	0.485384/.	

	Total		1.1677774/.	per cent., or 1l. 13s. 6d. for every 100/.

These results are based upon the mere bullion by itself, and are quite independent of all other considerations.

Thomas Graham, Master of the Mint.

J. T. Smith, late Master of the Calcutta Mint.

6 April 1869.

Source: Great Britain, Parliamentary Papers, House of Commons, 1868-1869, 285, vol. 34.