ONLINE APPENDIX A

Estimates of the coinage, net seigniorage income, and potential return to cheating at the Massachusetts mint

Coinage size estimates

Jordan (2002) provides information on the volume of silver consigned for 1671-80, the last decade of the Mint’s operations, a period of unusually low silver coinage (75,000 shillings for the entire decade) because of the Colony’s decision to increase the official rating of the piece of eight from 5 s to 6 s. Jordan estimates that when operating at maximum productive capacity in the 1670s, the MA mint could work up 600 troy ounces of sterling silver into coins over a nine day period. In the 1670s, the constraint on production was the volume of silver consigned; on average, the Mint operated only 18 days a year.[[1]](#footnote-1)

One approach is to build our estimate of the coin stock on productive capacity. If we assume that the mint operated 50 weeks a year at this full capacity output in the 1660s, and at 50% of this full capacity output in the 1650s, we arrive at a 1680 stock of Massachusetts coinage of 2.5 m shillings, or 125,400 Massachusetts pounds. The population of New England in 1670 was 52,000, yielding a per capita coinage of 2.4 pounds Massachusetts, which would have, unrealistically, been the same as England’s.[[2]](#footnote-2)

Alternatively, we build up a more realistic estimate of the size of the coinage from an assumption that per capita coinage in Massachusetts was one half of England’s in 1670, or 1.2 pounds, producing an estimate of the 1680 Massachusetts stock of coin of 82,200 pounds, or 1,644,000 shillings, or 54,800 shillings coined on an average annual basis. This would roughly correspond to an output of 75,000 shillings in the 1670s, 940,000 shillings in the 1660s (if the Mint operated at full capacity 200 days in the year), and 628,000 shillings in the 1650s (two-thirds of the 1660s, in the start-up, learning-by-doing phase). This may be on the high side, which biases our estimates of net seigniorage and the return to cheating in the right direction (gives an upward bias). Estimates of net seigniorage and the potential return to cheating are based on an average annual mint output of 55,000 shillings.

Net seigniorage estimates

Net seigniorage is the mintmaster’s income after minting costs. We have no data on production costs, so we estimate three scenarios, one in which production costs were 45% of gross seigniorage (the same as Potosi’s), one at 60% (assuming the Massachusetts mint was less efficient than Potosi), one (even less efficient) at 80%.[[3]](#footnote-3) The net seigniorage rate in these three scenarios is 4.125%, 3%, and 1.5% respectively. Table A.1 provides estimates of Hull’s net seigniorage per year in these three scenarios, assuming net seigniorage on the coinage was shared equally between Hull and his partner.

Estimates of the potential return to cheating

The return to cheating depended on net seigniorage, since the additional cost of minting “surplus” coins (see below) must be taken into account. Table A.2 provides estimates of the return to cheating for the three scenarios about minting costs in A.1, each with two scenarios on the degree of debasement, and two scenarios for the percentage of coinage debased.

*Degree of debasement*

We assume that the coins would have been debased up to the limit recognizable by sight, that is from 92.5% to 80% fine silver. Reducing fineness boosts the net seigniorage return by increasing the amount of money, valued in the unit of account, that is produced from each ounce of fine silver. In Massachusetts, the Court authorized the mint master to coin one shilling with 72 grains sterling silver and 66.6 grains fine silver (at the 92.5% sterling standard), which equates to coining 6.67 shillings from one ounce of sterling silver and 7.2 shillings from one ounce of fine silver. If instead the 72 grain shilling coin was only 80% fine, then each coin would contain only 57.6 grains of fine silver, and each ounce of fine silver would coin 8.3 shillings: a gain of 1 shilling 1 pence (13 pence) for a 13.5% debasement (from 92.5% to 80%). This produces an approximate rule of thumb that is used in the estimates: for every 1% debasement in fineness, an additional 1 pence of value is created per ounce of fine silver.

*Percentage of coin debased*

If the mint master were to cheat, he would need to decide whether to debase all of the coin, or just some of the coin. Debasing only some of the batches, so that bad coin is mixed in with predominantly good coin, might reduce the probability of detection. Two scenarios are considered, one in which all coin is debased, and one in which only 25% of the coin is debased.

TABLE A.1

Net seigniorage estimates under different assumptions about minting costs

|  |  |  |  |
| --- | --- | --- | --- |
|  | Total net seigniorage over 1652-1682 (MA pounds) | Hull's net seigniorage income accumulated over 1652-82 (MA pounds) | Hull's net seigniorage income accumulated over 1652-82 as % of personal wealth at death |
| Net seigniorage rate = 4.125% | 3391 | 1695 | 0.28 |
|  |  |  |  |
| Net seigniorage = 3.0% | 2466 | 1233 | 0.21 |
|  |  |  |  |
| Net seigniorage = 1.5% | 1233 | 616.5 | 0.10 |

Notes: For each minting cost scenarios, average annual coinage output is 54,800 shillings and average annual gross seigniorage is 4,100 shillings. It is assumed that Hull and Sanderson shared net revenue equally. Hull’s personal wealth at death is 6,000 pounds.

TABLE A.2

The return to cheating

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Net seigniorage return = 4.125% | | Net seigniorage return = 3.0% | | Net seigniorage return = 1.5% | | |  |
|  | Hull's return to cheating accumulated over 1652-82 (MA pounds) | Hull's return to cheating as % of 1652-82 net seigniorage on honest coinage | Hull's return to cheating accumulated over 1652-82 (MA pounds) | Hull's return to cheating as % of 1652-82 net seigniorage on honest coinage | Hull's return to cheating accumulated over 1652-82 (MA pounds) | Hull's return to cheating as % of 1652-82 net seigniorage on honest coinage |
|  |  |  |  |  |  |  |
| 100% of coinage debased 13.5% | 3396 | 2.00 | 2470 | 2.00 | 1235 | 2.00 |
|  |  |  |  |  |  |  |
| 25% of coinage debased 13.5% | 849 | 0.50 | 617 | 0.50 | 309 | 0.50 |

**References**

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England, 1270-1870». *Economic History Review* 71 (2), pp. 373–392.

1. Jordan (2002), p. 115. [↑](#footnote-ref-1)
2. McCusker and Menard (1985, p. 103), Mayhew (1995), Palma (2018). If the West Indies population is included in the per capita estimate, this yields a more realistic estimate of 1.1 pounds Massachusetts per capita, but it is hard to say how intensively the Massachusetts coins were used in the West Indies economies. [↑](#footnote-ref-2)
3. Jordan (2002) has analyzed the accounts of the Hull-Sanderson silver- and goldsmithing “shop”, and finds a number of expenses, including labor, that should have been charged to the mint. [↑](#footnote-ref-3)