

# Colonial Virginia's Paper Money Regime, 1755-1774: Value Decomposition and Performance

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I use forensic accounting techniques to reconstruct colonial Virginia's paper money regime from primary sources. I decompose the value of this money into its expected real-asset present value, its risk discount, and its liquidity premium or "moneyness" value. The value of Virginia's paper money was primarily determined by its real-asset present value. The overall liquidity premium was small. Positive risk discounts occurred in years when treasurer malfeasance was suspected. Virginia's paper money was not a fiat currency. It was a barter asset, with just enough "moneyness" value to make it the preferred medium of exchange for local transactions.

In 1755, Virginia and Georgia became the last of the 13 colonies to emit paper money. After the Seven Years War, Virginia's paper money regime was at the center of the conflict with the Crown over colonial monetary powers. It provided justification for Parliament passing the Currency Act of 1764 (4 Geo III c. 34). The ongoing struggle between the colonies and the Crown over colonial monetary powers was one of the points of contention leading toward revolution. Virginia's paper money regime was also a point of contention within local Virginia politics. Irregular activities by Virginia's treasurer in the 1760s occupied a substantial amount of political attention in the era between the end of Seven Years War and the Revolution. The performance of Virginia's paper money regime is central to the history of the period.<sup>2</sup>

I model and statistically evaluate Virginia's paper money regime using quantitative evidence. Such has not been done before. I also forensically reconstruct the monetary data needed for this approach. The reconstructed data, by itself, is a new contribution to the literature. I apply the Grubb decomposition model for inside monies to Virginia's paper money to track the

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<sup>2</sup> Brock (1975, pp. 465-527); Ernst (1973); Greene and Jellison (1961); *Journal of the Commissioners for Trade and Plantations from January 1759 to December 1763* (1970, pp. 330-5); Labaree (1966, v. 9, pp. 131-53); Mays (1952, v. 1, pp. 174-208, 358-85).

determinants of the paper money's value over time (Celia and Grubb 2016; Grubb 2016, 2014). I measure whether and to what extent this paper money functioned as “money” as opposed to being just a barter asset. I establish the timing and measure the magnitude of the risk attached to this money when monetary troubles were suspected.

Paper money was created by the Virginia legislature and directly spent by that legislature through its treasury. Legislature-issued, colony-specific paper monies were the only paper monies in circulation in colonial America. No public or private incorporated banks issuing paper banknotes backed by fractional specie reserves, with said banknotes redeemable at face value in specie at the issuing bank, existed in colonial America. Prior to emitting paper money, Virginia's media of exchange consisted of barter, typically involving book credit transactions and tobacco—often in the form of claims to tobacco or tobacco notes; personal bills of exchange and promissory notes; and specie coins. The composition of this media is unknown, though specie was considered relatively scarce. Virginia referred to its paper money as *treasury notes*, whereas other colonies commonly referred to their paper monies as *bills of credit*. While treasury notes were the same as bills of credit, I will refer to Virginia's paper money as *notes* rather than *bills* in keeping with Virginia's terminology (Hening 1969, v. 7, p. 353).

The paper proceeds as follows: First, I discuss the institutional structure of Virginia's paper money regime, how the mechanics of paper money emissions and redemptions worked, and provide the forensically reconstructed data needed to statistically analyze regime performance. Second, I present the Grubb decomposition model of monetary performance and apply that model to the data. Third, I statistically evaluate that model using the data. I also compare it with the statistical performance of alternative models. Lastly, I conclude with an assessment of the performance of Virginia's paper money regime.

## **Institutional Structure and Quantitative Measures**

Virginia had the second largest free population of the 13 colonies (Carter, *et al.* 2006, v. 5, p. 652). Why Virginia took so long to initiate its own paper money regime is curious. Part of Virginia's delay may be due to the relative efficiency of its commodity "tobacco" money which was commonly used to execute domestic transactions and pay local taxes. This observation also explains why Maryland, the other tobacco colony, was also a relative late-comer to creating its own paper money regime. Budgetary crises caused by wars typically pushed colonies into a paper money system (Grubb 2016). Virginia did not face such a crisis until the Seven Year's War. The immediate and large spending demands of Virginia's participation in the Seven Year War swamped Virginia's ability to raise enough taxes immediately to meet these expenses (Brock 1975, pp. 466-9, 476).

Colonial governments faced standard budget constraints. Tax receipts had to match spending. When they didn't, colonial governments had to adjust their borrowing and asset positions. For the most part, colonial governments did not have asset positions, such as stocks of gold and land. External markets where colonial governments could borrow and lend were not adequately developed or accessible (Brock 1975, pp. 467-9). Thus, when current tax receipts did not match current spending, colonial governments had to move tax receipts through time to balance budgets.

Virginia did this by issuing treasury notes as a form of paper money (M), see equation (1). Paper money creation was a credit-debt mechanism that matched budget deficits with budget surplus over a multi-year horizon. The balanced budget requirement was cut loose from a strict time unit, such as the fiscal year. It still had to be balanced, but now it could be balanced over a multi-year horizon. Colonial paper money acts included concurrent tax legislation designed to

redeem the notes emitted in the near future. Redeemed notes would be removed from circulation and subsequently destroyed.

$$(1) \quad 0 < (G_j - T_j) = M_j \leq \sum_{t=j+1}^N (T_t - G_t) > 0$$

$M_j$  = new emissions of M (treasury notes) in year j  
 $T$  = taxes  
 $G$  = government spending

To maintain fiscal credibility, future taxes in excess of spending,  $(T_t - G_t) > 0$ , had to be spread over numerous years, especially when  $M_j$  was large. This process allowed a colony to marshal more resources to throw immediately into battle than what could be done by relying only on current tax receipts. Virginia's paper money acts passed during the Seven Years War (1755-1762) stated:

And whereas, by reason of the long time allowed for collecting the duties imposed by this act, (Which, from the distressed circumstances of the people, and the great scarcity of gold and silver coin in this colony, could not be sooner done) the said duties will not be collected in time to answer the purposes [funding troops] hereby intended, *Be it therefore enacted*, That John Robinson, ...treasurer of this colony, ... is hereby authorized, and required to issue and emit so many treasury notes, as will be sufficient for the purposes aforesaid, ... (from the March 1756 act, Hening 1969, v. 7, p. 32, italics in original)

This process imparted a time-discounting dimension to the notes emitted. After 1756, Virginia's notes paid no interest. They were, in effect, zero-coupon bonds.

The typical method of tax-redemption was to set net new taxes to redeem  $M_j$  to be an equal amount per year ( $F_t$ ) over an N-year redemption window, i.e.  $(T_t - G_t)/N = F_t$  for years  $j+1$  through N. While setting redemption taxes at  $F_t$  was the most typical, it was not universal. Often colonial governments enacted variations in  $T_t$  over the N-year redemption window. The Virginia legislature took note redemption and its effect on controlling the value of its paper money seriously. Such is illustrated in the March 1760 paper money act which stated,

And whereas it is of the greatest importance to preserve the credit of the paper currency of this colony, and nothing can contribute more to that end than a due care to satisfy the publick that the paper bills of credit, or treasury-notes, are properly sunk, according to the true intent and meaning of the several acts of assembly passed for emitting the same; and the establishing a regular method for this purpose may prevent difficulties and confusion in settling the publick accounts,... *Be it therefore enacted, by the authority aforesaid*, That Peyton Randolph, esquire, Robert Carter Nicholas, Benjamin Waller, Lewis Burwell and George Wythe, gentleman, or any three of them, be, and they are hereby appointed a committee, to examine at least twice in every year (and oftener, if thereto desired by the treasurer for the time being) all such bills of credit, or treasury-notes, redeemable on the first day of March, one thousand seven hundred and sixty five, as have been or shall be paid into the treasury, in discharge of the duties and taxes imposed by any former act of assembly; and upon receipt of the said bills or notes, the said committee shall give to the treasurer for the time being a certificate of the amount thereof, which shall avail the said treasurer in the settlements of his accounts as effectually, at all intents and purposes, as if he produced the said bills or notes themselves: And the said committee are hereby required and directed, so soon as they have given such certificate, to cause all such bills or notes to be burnt and destroyed. (Hening 1969, v. 7, p. 353, italics in the original)

If taxes were paid in M, then using the  $F_t$  method removed  $M_j$  from circulation at a constant rate over the N-year redemption window. If taxes were paid by other means, such as in tobacco or specie coins, then  $M_j$  would continue in circulation until year N when it would be redeemed at face value and removed from circulation using the accumulated tax receipts in the treasury. The language in the 1756 paper money acts illustrates this redemption structure.

That all such notes, so issued, shall be redeemable on the last day of June one thousand seven hundred and sixty, and shall then be paid by the treasurer... That the several sums of money and tobacco to be collected, by virtue of this act,...shall be,...paid to John Robinson, esquire, treasurer of this colony,... That the money to be raised by the duties imposed by this act, shall stand, be, and remain as a security for the redemption of the said treasury notes so to be issued, and the said John Robinson, treasurer,...is hereby required to apply all such money, as shall come to his hands, by virtue of this act, for, and toward the redemption of such treasury notes, and to no other use or purpose whatsoever. (Hening 1969, v. 7, pp. 19, 29, 32).

All of Virginia's paper money acts had this language. By "money", colonists typically meant specie monies, sometimes referred to as *real money*. The face value of the notes for redemption purposes was fixed in law to be  $1\text{£}_{VA} = 200$  pounds of tobacco =  $1.25\text{£}_S$  [ $\text{£}_{VA}$  = Virginia paper

pounds, £<sub>S</sub> = pounds sterling] (Hening 1969, v. 6, pp. 468-9, 568-9; v. 7, pp. 9-10, 28-9).

Tracking the amount of M in circulation requires knowing both the yearly tax-redemption requirements over the N-year redemption window, and the medium in which these redemption taxes were paid. Evidence from 1769 and 1770 indicate that between 75 and 85 percent of the taxes imposed to redeem notes were paid in notes which were then burnt. Some 15 to 25 percent were paid in specie coins or tobacco claims that were then held in the treasury until the notes' final redemption date was reached after which these specie sums and tobacco claims could be exchanged for notes at the note's face value (Kennedy 1906a, p. 303; 1906b, p. 72).

#### *a. Virginia's Paper Money Acts*

Table 1 compiles the paper money acts passed by the Virginia legislature and lists the key features of each act. Fifteen separate paper money acts that involved net new emissions were passed, with a cumulative total of 484,963£<sub>VA</sub> in net new emissions made between 1755 and 1774. Notes issued under different acts could be distinguished by the acts' emission dates printed on the notes (Newman 2008, pp. 437-57).

Paper money acts began with statements about why monies were required, and in what amounts. Thirteen of the 15 acts stated that the money was required to cover military expenses. Paying for military expenses represented 90 percent of all net new paper monies emitted, and 98 percent of all net new paper monies emitted during the Seven Year's War. Emissions #5 and #15 were used to compensate citizens who lost their tobacco in public warehouse fires. This compensation represented 8 percent of all net new paper monies emitted. Lastly, emission #14 was to be used to pay the expense of negotiating and establishing a boundary with the Cherokee Nation. It represented 2 percent of all net new paper monies emitted.

Paper money acts then elucidated the particulars of how the money would be spent, and

Table 1 Virginia's Paper Money (Treasury Notes) Emissions Based on Statutory Law, 1755-1774

Paper Money Acts	Date Printed on the Notes	New Amount Emitted	Redemption Date	New Taxes, Duties, and Fees Imposed	Taxing Period Imposed
#1 <sup>a</sup>	June 1755	20,000£ <sub>VA</sub>	30 June 1756	poll, land, slave import	June 1755 to Apr. 1756
#2 <sup>a</sup>	11 Dec. 1755	40,000£ <sub>VA</sub>	30 June 1760	poll, land	Apr. 1757 to Apr. 1760
#3 <sup>a</sup>	Mar. 1756	25,000£ <sub>VA</sub>	30 June 1760	poll, land	Apr. 1758 to Apr. 1760
#4 <sup>a</sup>	Mar. 1756	30,000£ <sub>VA</sub>	30 June 1760	poll	Apr. 1758 to Apr. 1760
#5 <sup>b</sup>	Mar. 1756	10,000£ <sub>VA</sub>	15 Dec. 1757	tobacco export	Oct. 1756 to Oct. 1757
#6	8 June 1757	84,963£ <sub>VA</sub>	1 Mar. 1765	poll, land, tobacco export, slave import	Oct. 1757 to July 1765
[#2, #3, and #4 (95,000£ <sub>VA</sub> ) swapped for new #6 notes] <sup>a</sup>					
#7	12 Apr. 1758	32,000£ <sub>VA</sub>	1 Mar. 1765	poll, land	Apr. 1761 to Apr. 1764
#8	12 Oct. 1758	57,000£ <sub>VA</sub>	14 Sept. 1766	poll, land	Apr. 1761 to Apr. 1766
#9	5 Apr. 1759	52,000£ <sub>VA</sub>	20 Apr. 1768	poll, tobacco export	Oct. 1764 to Oct. 1767
#10	21 Nov. 1759	10,000£ <sub>VA</sub>	20 Oct. 1769	tobacco export	Oct. 1767 to Oct. 1769
#11	11 Mar. 1760	20,000£ <sub>VA</sub>	10 Oct. 1768	poll, land	Apr. 1767 to Apr. 1768
#12	24 May 1760	32,000£ <sub>VA</sub>	20 Oct. 1769	poll, land	Apr. 1767 to Apr. 1769
[Rule change 3 Nov. 1761: New redemption date is 20 Oct. 1769 for all notes currently in circulation.] <sup>c</sup>					
#13	7 Apr. 1762	30,000£ <sub>VA</sub>	20 Oct. 1769	poll	Apr. 1764 to Apr. 1769
#14	7 Nov. 1769	10,000£ <sub>VA</sub>	21 Nov. 1771	slave import, tobacco export, carriage, license, and writs	from Oct. 1771 onward
#15	11 July 1771	30,000£ <sub>VA</sub>	10 Dec. 1775	#14 except for slave import	from Oct. 1771 onward
[Rule change 4 Mar. 1773: replace 36,834£ <sub>VA</sub> of #14 and #15 and make their new redemption date 1 June 1774]					

Total Net New Emissions: 484,963£<sub>VA</sub><sup>b</sup>

*Sources:* Hening (1969, v. 6, pp. 461-81, 521-30; v. 7, pp. 9-25, 26-33, 46-54, 69-87, 163-9, 171-9, 255-65, 331-7, 347-58, 357-63, 465-6, 493-502; v. 8, pp. 342-8, 493-503, 647-51); Newman (2008, pp. 437-57).

*Notes:* See Table 2 and the text for details on the taxes, duties, and fees imposed. £<sub>VA</sub> = Virginia paper pounds whose face value for the purpose of Virginia government redemption was set equal to 1.25£<sub>Sterling</sub> (Hening 1969, v. 6, pp. 478-83; McCusker 1978, pp. 206-7).

<sup>a</sup> Emissions #1, #2, #3, and #4 paid 5 percent annual interest. Interest payments not already made were suspended and removed by the act creating emission #6. Emissions #2, #3, and #4 were swapped for emission #6 notes. The accrued interest outstanding to June 1757 was paid by printing extra emission #6 notes amounting to 4,963£<sub>VA</sub> and adding them to the currency swap. Emission #6 consisted of 80,000£<sub>VA</sub> new notes emitted to meet current spending obligations, plus another 4,963£<sub>VA</sub> new notes emitted to cover accrued interest payments, plus 95,000£<sub>VA</sub> notes printed to swap for emissions #2, #3, and #4. See fn. 4 for adjustments to that authorized.

<sup>b</sup> While statutory law only authorized 10,000£<sub>VA</sub> for emission #5, 12,000£<sub>VA</sub> was actually printed and emitted according to the *House of Burgesses* (McIlwaine 1909, p. 490). While statutory law is regarded as superior in authority to legislative statements, the forensic reconstruction of accounts in Appendix B indicates that an additional 2,000£<sub>VA</sub> over that authorized by statute existed. Thus, 12,000£<sub>VA</sub> will be taken as the correct amount for emission #5 in all subsequent analyses. See also Brock (1975, pp. 471, 476-7); Ernst (1973, p. 370).

<sup>c</sup> This act was passed with a suspending clause. It was subsequently laid aside (suspended) by the Board of Trade, 4 February 1763 (Brock 1975, pp. 488-9; Hening 1969, v. 7, p. 466; *Journal of the Commissioners for Trade and Plantations from January 1759 to December 1763*, 1970, pp. 333-4).

how the money would be raised. Regarding spending, these particulars involved such things as military recruitment, fortification construction, and how tobacco losses would be assessed.

Regarding how money would be raised, these particulars established the type of taxes, the tax rates, and the taxing period to be used to raise the money required by the act, see Table 1.

Table 2 presents the tax rates per type of tax per year consolidated across the paper money acts. The evidence in Table 2 is consistent with per-year tax smoothing, once changing tax rates per tax type and shifts between different types of taxes are taken into account. The legislature chose taxing periods, tax rates, and tax types to spread the accumulative tax burden evenly over time in response to the need to pass new paper money acts. This effort is consistent with the legislature maintaining fiscal credibility by holding per year tax burdens within feasible and historically acceptable limits.

Paper money acts ended by addressing the particulars of the paper money emission process. The acts stated that because taxes to pay for the spending required could not be raised in time, treasury notes would be issued to meet this spending. The maximum amount to be emitted, the time period over which these notes could be emitted, and occasionally their denominational structure were enumerated. The first four emissions paid 5 percent annual interest at redemption. No other emissions paid interest between emission and redemption. Other particulars, such as note design, were left to the treasurer.

Every paper money act listed a single date after which the act's notes could be redeemed at the treasury, see Table 1. Redemption was at face value. In each paper money act, the redemption date and the end of the taxing period imposed to raise the money required by that act are a close match. In each act, taxing and redemption are clearly linked. Per act, the amounts of taxes imposed were expected to generate the sums needed to redeem all the notes emitted.

Every paper money acts stated the penalty for counterfeiting and contained a statement about legal tender status of the notes emitted. The first five emissions were made a "soft" legal

Table 2 Consolidated Yearly Taxes and Duties Imposed by Paper Money Acts

Year	Poll tax: shillings per tithable	Land tax: shillings per 100 acres	Slave import duty as a % of sale price	Tobacco export duty: shillings per hogshead	Other taxes	
1755	0 shillings	0 shillings	10%	0 shillings	0 shillings per	
1756	2	1.15	10	3.3	0	
1757	1	1.15	10	3.3	0	
1758	4	2.15	10	2	0	
1759	4	2.15	10	2	0	
1760	4	2.15	0	2	0	
1761	4	4	0	2	0	
1762	4	4	0	2	0	
1763	4	4	0	2	0	
1764	5	4	0	2	0	
1765	4	0	0	2	0	
1766	4	0	0	2	0	
1767	5	1.6	0	2	0	
1768	5	1.6	0	2	0	
1769	4	1.15	0	2	0	
1770	0	0	5	1.3	20	1770-on yearly due: 4-wheeled carriage
1771	0	0	5	4.3	10	2-wheeled carriage
1772	0	0	5	4.3	20	ordinary license
1773	0	0	5	4.3	2.3	writ, subpoena,
1774	0	0	5	4.3		summons

Source: See Table 1 sources.

tender. Citizens were penalized for not accepting the paper money in trade, but it did not impose a value at which citizens had to accept the notes. Emissions #6 through #13 were made a “hard” legal tender. Citizens were penalized not only for not accepting the paper money in trade, but also for not accepting paper money at its specie-equivalent face value.

With the passage of the 1764 Currency Act, emissions #14 and #15 could not be made a legal tender. The legal tender language in these last two acts made the paper money emitted a legal tender for payments by the treasurer to discharge all legal demands brought against Virginia and a legal tender for redemption purposes. However, the paper money passed current

in the colony only between persons willing to so receive such notes in payment.<sup>3</sup>

Table 1 also identifies three rule changes that altered prior paper money acts. Emission #6 included a clause that required all outstanding notes of emissions #2, #3, and #4, along with their accrued interest, to be swapped for emission #6 notes. This swap removed any future interest payments attached to these prior emissions and altered the redemption dates of these prior emissions to that of emission #6 notes.<sup>4</sup> On 3 November 1761, the legislature changed the redemption date for all notes currently in circulation, lengthening the redemption period to 20 October 1769. This rule change, however, was passed with a suspending clause, and the Board of Trade laid it aside (suspended it) on 4 February 1763 (Hening 1969, v. 7. p. 466; *Journal of the Commissioners for Trade and Plantations from January 1759 to December 1763*, 1970, pp. 333-4). Finally, the legislature on 4 March 1773 replaced the notes still outstanding from emissions #14 and #15 with new notes and changed their redemption date to 1 June 1774. This note swap was intended to thwart counterfeiters.

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<sup>3</sup> Why legal tender laws had little effect on note value is explained in Grubb (2016).

<sup>4</sup> Emission #1 had 3,960£<sub>VA</sub> never emitted. Out of the 16,039£<sub>VA</sub> emitted, 15,932£<sub>VA</sub> were redeemed in 1756 and subsequently burned in 1757. What happened to the difference, 108£<sub>VA</sub>, is unknown. I assume it was lost by the public—a one-year loss rate of 0.67 percent should not be surprising. At redemption, 606£<sub>VA</sub> was paid in interest for the one year period that the emission was outstanding. I assume the interest payment was in specie or tobacco claims as no statement to the contrary was recorded. This amount comes to approximately a 3.8 percent interest payment. Why it was not 5 percent as legislated is unknown. For emissions #2, #3, and #4, the accrued interest to June 1757 covered an average of about 1.2 years. A total of 99,963£<sub>VA</sub> of emission #6 notes were authorized to swap for emission #2, #3, and #4 notes in public circulation and pay off the accrued interest to that point. Only 93,604£<sub>VA</sub> of emissions #2, #3, and #4 were emitted into public circulation, thus the interest portion of the amount authorized was 6,359£<sub>VA</sub>.  $6,359£_{VA} / 93,604£_{VA}$  equals a 6.8 percent return over 1.2 years. However, the interest was paid not in specie but in notes with a redemption date that was up to eight years in the future. Discounted back from the end redemption year of emission #6 notes using a 6 percent discount rate, the effective interest paid in 1757 on the 93,604£<sub>VA</sub> of emissions #2, #3, and #4 was only a 4.2 percent return over a 1.2 year period. If emission #6 notes were redeemed at face value in equal portion over this eight year period, then the return on the 93,604£<sub>VA</sub> of emissions #2, #3, and #4 was 5.2 percent over a 1.2 year period. The ending of interest payments after mid-1757 was explained in the paper money act for emission #6. Therein the legislature stated that "...allowing treasury notes to bear interest is found to be very burdensome to the country, and not to have answered the good purposes intended..." (Hening 1969, v. 7, p. 81) The "purposes intended" was to create a circulating paper money and not have the notes hoarded as investments. In 1767, Benjamin Franklin noticed such a problem with the paper money issued in New England that paid interest, namely that it did not serve as a circulating medium of exchange. He observed, "The Bills were intended for a Currency, and the Interest defeated that Intention. For they were gradually hoarded, and disappear'd long before the Expiration of the Term for which they were omitted..." (Labaree 1970, v. 14, p. 36) See Appendix B.

All three rule changes did two things. Notes currently in circulation from different emissions with different final redemption dates had different present values. Such differences made for a cumbersome medium of change. The rule changes made all notes currently in circulation have the same present value by giving them the same final redemption date. The legislature gave the following reason for these rules changes, "...it will be prejudicial to have notes of different value circulating at the same time..." (Hening 1969, v. 7, p. 81) All three rule changes, however, were also an ex post facto altering of the expected asset present value of the notes affected, in most cases reducing that present value from what it was under the original paper money act. The ex post facto reduction of the present value of notes in the 1761 rule change was an important factor leading to it being suspended by the Board of Trade.

Finally, Virginia's notes were issued in small denominations, small enough to make paying yearly tax assessments easy with said notes. For emissions #6, #8, #9, #11, #12, and #13 the denominational structure was fixed by the assembly in each emission's respective paper money act. These emissions represent 77 percent of the total net new paper money emitted. For the other emissions, the assembly let the treasurer choose the denominational structure. Table 3 shows the denominational structure by units and by value for each emission with said information, and for the total for all emissions reported. In addition, Table 3 reports the face value of each denomination of Virginia's paper money in pounds sterling, Spanish silver dollars, and 2012 U.S. dollars equivalents.

Table 3 is consistent with John Hanson II's (1979, 1980a, 1980b) argument that the colonies intentionally issued paper money in small denominations to facilitate the making of change in local transactions.<sup>5</sup> Comparing Table 3 with the yearly tax burdens imposed in Table

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<sup>5</sup> Hanson (1979, p. 284) reports the denominational structure of Virginia's paper money using only data from 1759. He lists no source for this data. Hanson (1980a, p. 414; 1980b, p. 171) dropped Virginia data from his analysis.

Table 3 Denominational Structure of Virginia's Paper Money: Number and Value of Units Issued per Emission

Virginia Notes Issued	Face Value in $\pounds_S$	Face Value in Spanish Silver Dollars	Value in 2012 U.S. Dollars <sup>a</sup>	Emission #6: 1757		Emission #8: 1758		Emission #9: 1759		Emission #11: 1760		Emission #12: 1760		Emission #13: 1762		Totals <sup>c</sup> 1757-1762	
				Units	Value %	Units	Value %	Units	Value %	Units	Value %	Units	Value %	Units	Value %	Units	Value %
0.0500	0.04	0.1818	5.6364	15.7	0.9	15.8	1.8	15.9	1.7	....	....	25.1	2.6	....	....	15.6	1.2
0.0625	0.05	0.2273	7.0455	15.7	1.1	15.8	2.2	15.9	2.1	....	....	25.1	3.3	....	....	15.6	1.5
0.1250	0.10	0.4546	14.0911	14.3	2.1	19.7	5.5	17.9	4.8	33.2	3.3	10.5	2.7	22.5	2.8	16.8	3.2
0.2500	0.20	0.9091	28.1821	14.3	4.2	19.7	11.0	17.9	9.6	33.2	6.7	10.5	5.5	22.9	5.6	16.8	6.3
0.5000	0.40	1.8181	56.3642	14.3	8.3	11.8	13.2	13.4	14.4	....	....	10.5	10.9	17.1	8.3	12.9	9.7
1.0000	0.80	3.6364	112.7284	14.3	16.7	11.8	26.5	13.4	28.8	....	....	10.5	21.9	17.1	16.7	12.9	19.4
2.0000	1.60	7.2728	225.4568	2.9	6.7	1.8	7.9	1.8	7.7	11.2	18.0	2.6	10.6	6.8	13.3	2.8	8.5
3.0000	2.40	10.9092	338.1852	2.9	10.0	1.8	11.9	1.8	11.5	11.2	27.0	2.6	15.9	6.8	20.0	2.8	12.8
5.0000	4.00	18.1820	563.6420	2.9	16.7	1.8	19.9	1.8	19.2	11.2	45.0	2.6	26.6	6.8	33.3	2.8	21.3
10.0000	8.00	36.3640	1,127.2840	2.9	33.3	....	....	....	....	....	....	....	....	....	....	1.1	16.2
				100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Sources: Table 1; Hening (1969, v. 7, pp. 82-3, 175, 259-60, 350, 360-1, 498); McCusker (1978, p. 10).

<sup>a</sup> From <http://eh.net> "measuring worth—relative value of U.S. Dollars" using the 1775 to 2012 CPI conversion algorithm.

<sup>b</sup> The units times value only sum to 56,625 $\pounds_{VA}$  and not the 57,000 $\pounds_{VA}$  authorized for this emission. Whether and how this discrepancy was accommodated is currently unknown.

<sup>c</sup> Total units are 560,107 and the total value is 370,588 $\pounds_{VA}$  in the data covered.

2 indicates that well over 50 percent of the units emitted were in a denomination small enough to pay an individual's yearly taxes without the necessity of resorting to tobacco or specie monies to make change to complete that year's tax payment. Relatively small denominations may have also imparted some liquidity premium to the notes, making them the preferred money for executing domestic transactions.

*b. Forensic Reconstruction of Paper Money Flows*

Evaluating the performance of Virginia's paper money requires knowing the amount of notes in public circulation each year and the amount of notes redeemed (removed) from the public each year. Unfortunately, the treasury accounts that have survived, as reported in the *Journals of the House of Burgesses*, are irregular and inconsistent in their organization, timing of reporting, completeness, and in how they use such critical terms as notes "in circulation" and notes "issued." An extensive forensic accounting exercise, therefore, is required to sort this material out. This involves paying close attention to internal consistency and coherence across accounts, in the language used, and with the statutory acts. Some controlled back-projection and interpolation is also required. The details of this forensic accounting reconstruction are provided in Appendix B. The outcome is reported in Table 4.

Column (1) in Table 4 incorporates three adjustments to the amounts authorized by statutory law. First, one-for-one currency swaps are netted out. Second, amounts never released from the treasury and subsequently burned without ever being emitted are netted out. Lastly, notes not emitted when authorized, but held in the treasury and emitted to the public in a later year, are moved to the year when emitted.

Column (2) in Table 4 incorporates two adjustments. First, notes burned that were not redeemed from the public or were burned as part of a one-for-one currency swap are netted out.

Table 4 Forensic Reconstruction of Virginia's Paper Money Regime, 1755-1775

Year	(1) Net New Notes Emitted to the Public Each Year	(2) Notes Redeemed from the Public to be Burned	(3) Resulting Notes Left in Public Circulation	(4) Accumulated Non-Note Tax Redemption Revenues in the Treasury Earmarked to Redeem Notes at their Final Redemption Date as Legislated (See Table 1)
	£ <sub>VA</sub>	£ <sub>VA</sub>	£ <sub>VA</sub>	£ <sub>VA</sub>
1755	37,179	0	37,179	0
1756	74,336	15,932	95,582	0
1757	96,488	0	192,070	6,482 <sup>a</sup>
1758	71,367	5,518	257,919	4,590
1759	69,648	11,943	315,624	4,590
1760	53,898	30,313	339,209	4,590
1761	5,212	19,262	325,159	2,942
1762	19,750	79,619	265,290	876 <sup>a</sup>
1763	10,625	21,575	254,340	18,344 <sup>b</sup>
1764	2,500	21,575	235,265	36,688
1765	0	21,575	213,690	55,032
1766	0	2,225	211,465	94,702 <sup>b</sup>
1767	0	41,765	169,700	2,348 <sup>c</sup>
1768	0	29,264	140,436	12,631
1769	10,000	18,442	131,994	14,964
1770	0	10,541	121,453	8,561
1771	30,000	10,944	140,509	16,712
1772	0	36,562	103,947	7,366 <sup>c</sup>
1773	0	36,562	67,385	5,554 <sup>d</sup>
1774	0	23,355	44,030	3,742
1775	0 <sup>e</sup>	2,763	41,267	1,930 <sup>d</sup>
Totals	481,002	439,735		

Source: See the sources in Table 1; Kennedy (1906a, pp. xi-xxv, 64-6, 108, 118-20, 124-8, 154-6, 283-5, 303; 1906b, pp. 72, 217-8; 1907, pp. 143, 171, 176-8, 356-7); McIlwaine (1908, pp. 15, 36-7, 115-6, 171-2, 249-50; 1909, pp. 388, 458, 487-90); *William and Marry College Quarterly Historical Magazine* (1912, pp. 227-62).

Notes: See the text and Appendix B for construction.

<sup>a</sup> For 1757-1762, the estimate is for taxes collected to redeem emission #5 only. Taxes in excess of notes receive for other emissions were not stated, nor are they inferred here. Taxes jumped considerable for poll and land taxes in 1758 and 1761, respectively, see Table 2. As these were the principal taxes used to redeem notes, the accumulation of non-note tax funds in treasury likely did not pick up until after 1761.

<sup>b</sup> For 1763-1766, the estimate is based on forecasted tax receipts made in May of 1763. Subtracting estimated note redemption leaves a non-note balance in the treasury. As these sums could not be used to redeem notes until the end maturity date legislated, see Table 1, they are assumed to have accumulated into 1765-6. These revenues are assumed to be those removed from the treasury by John Robinson, treasurer over this period, which he loaned out to himself and his friends. Robinson died 11 May 1766. His estate was required to pay these amounts back to the treasury. This happened slowly over the next decade. Of the amounts Robinson removed from the treasury were 95,828£<sub>VA</sub> of accumulated taxes held for redemption of notes when said notes' circulation time was at an end (see Table 1). In 1766, it was recorded that only 2,218£<sub>VA</sub> was left in the treasury to pass on to the new treasurer after

Robinson death (to use to redeem notes). The closeness of the 95,828£<sub>VA</sub> figure with what would have accumulated in the treasury between 1763 and 1766, namely 94,702£<sub>VA</sub>, provides consistency for this interpretation.

<sup>c</sup> These numbers are taken from the treasury accounts for these years, stated as the sums remaining on hand. They are assumed to be what is on hand for potential current note redemption. Therefore, these numbers are not added or accumulated from year to year.

<sup>d</sup> These numbers are projected estimates based on the last treasury accounts from 1772. They take the taxes received for “old” notes in 1772, adjusted for a downward trend from 1769, and adds to that the taxes received for “new” notes. I assume the specie portion of these taxes was 20 percent. Thus, the total tax number is multiplied by 0.2 to get the numbers reported. These numbers are not added or accumulated over time as I assume that these excess sums are being used to redeem notes. This assumption is consistent with the fact that more notes are being redeemed and burned in these years than there are notes paid in as taxes.

<sup>e</sup> Excludes net new emission from after 1774. See Newman (2008, pp. 444-6).

Second, the timing of when notes were removed from circulation is adjusted such that notes listed as burned in the early months of a given year are counted as being removed from public circulation in the immediately prior year. Typically, taxes were collected in the fall. The account given of notes from these taxes burned, however, was not reported until the next spring. The number in column (3) of Table 4 for year  $t$  is simply the number in column (1) for year  $t-1$ , plus the number in column (1) in year  $t$ , minus the number in column (2) in year  $t$ .

Finally, column (4) of Table 4 estimates the amount of non-note tax revenue, primarily specie, accumulated in the treasury that was to be used to redeem notes at their final legislated redemption date, see Table 1. These amounts are needed, along with the amounts in column (2), to estimate the real-asset present value of notes. In addition, adjustments to these amounts need to be incorporated. For example, John Robinson, the treasurer, removed the amounts that had accumulated from 1763 into 1766 by loaning these sums out to friends. This action was considered irregular and possible malfeasance. It created a scandal and the possibility that notes could not be redeemed when they came due at the treasury. Suspicions that such was going on affected the expected real-asset present value of notes in these years.

When notes became redeemable at the treasury for the tax monies accumulated, they were not always immediately redeemed. The monies held in the treasury for their redemption

continued to be held for that purpose. These notes continued in circulation and, at this point, took on a redeemable-upon-demand quality with 100 percent reserve-backing in the treasury. Such behavior needs to be incorporated into calculating the real-asset present values of the notes.

For example, emission #5 was redeemable at the treasury at the end of 1757. It was not all redeemed, however, until 1766. The tax monies received in 1757 for its redemption continued to be held in the treasury in a dedicated account for the future redemption of emission #5 notes. Robert Carter Nicholas, treasurer after 1766, observed similar behavior in the late 1760s and early 1770s. He explained this behavior by claiming that the public found notes to be the preferred medium of exchange for executing domestic transactions.<sup>6</sup> In effect, the public continued to use notes to execute domestic transactions and let the full specie equivalent that backed it sit in the treasury.

## **Value Decomposition**

### *a. The Grubb Decomposition Model for Inside Monies*

I apply the Grubb decomposition approach to evaluate Virginia's paper money performance (Celia and Grubb 2016; Grubb 2014, 2016). The market exchange value (MEV) of this money is decomposed into its component parts, see equation (2).<sup>7</sup> MEV equals its expected real-asset present value (APV), i.e. its value as just another non-money barter asset; minus a risk discount (RD) that captures any expected excess default risk associated with this asset; plus its liquidity premium (LP) that measures its pure "moneyness" value, i.e. its extra value as a transacting medium of exchange. Positive values for LP measure the willingness of the public to

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<sup>6</sup> *William and Mary College Quarterly Historical Magazine* (Apr. 1912), v. 20, no. 4, pp. 227-62.

<sup>7</sup> This decomposition has some resemblance to the discussions of paper money by Benjamin Franklin in 1729 (Labaree 1959, v. 1, p. 153); by Gouverneur Morris in 1778 (Barlow 2012, pp. 73-76); and by James Madison in 1779 (Hutchinson and Rachal 1962, v. 1, pp. 305-06). As such, it can be considered consistent with how some prominent colonial Americans thought about their paper money. It also has some resemblance to the theory of money presented by John Maynard Keynes in the *General Theory* (1991, pp. 222-44 [chapter 17]) and could be considered an exercise to operationalize and apply that theory.

pay a premium above the money “thing’s” expected real-asset present value, because it serves as a more convenient transacting medium than the next best barter alternative. All components in equation (2) are calculated as a percentage of face value to be in a comparable metric.

$$(2) \quad MEV_t = (APV - RD)_t + LP_t$$

If  $MEV \approx APV$ , with  $(LP - RD) \approx 0$ , then Virginia’s paper money is just a real barter asset with no value as “money” beyond that of the next best barter alternative. If  $MEV \approx (APV - RD)$ , with  $LP \approx 0$ , then Virginia’s paper money is just a risky barter asset. If  $MEV \approx LP$ , with  $(APV - RD) \approx 0$ , then Virginia’s paper money is a pure fiat currency. Colonial paper monies likely operated somewhere between these extremes. Equation (2) can be used to gauge the development and evolution of the monetary institutions and policies in colonial economies.

Legislatures controlled APV and RD. They controlled APV by choosing the redemption structure, and they influenced RD by how they followed through on that redemption structure. LP was determined by the public through the structure of the economy in terms of how the public evaluated and used alternative media of exchange to execute domestic transactions.

Empirical measurement is the difficult part of applying this approach. Theory is easy; application is hard. While I can measure MEV using data on exchange rates, RD and LP cannot be independently measured. In addition, measuring APV entails constructing a counterfactual value of the money “thing,” i.e. its value when not used as money. Given that it is being used as money, constructing this counterfactual and disentangling it from MEV requires attention.

Fortunately, Virginia’s treasury notes were structured as zero-coupon bonds, except for the 1755-6 emissions that were structured as interest-bearing bonds.<sup>8</sup> The notes had legally defined end maturity dates when they were paid off at face value in specie equivalents by

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<sup>8</sup> See fn. 4. Benjamin Franklin (Labaree 1967, v. 11, pp. 13-15), Adam Smith (1937, pp. 310-12), and James Madison (Hutchinson and Rachal 1962, v. 1, pp. 305-06) described colonial bills of credit as zero-coupon bonds.

Virginia's government, and they could be redeemed at face value for tax payment obligations anytime after initial emission. Given an expected redemption time-paths and end maturity dates, payoff values, and an appropriate discount rate, the APV of these notes as non-money tradable bonds can be calculated independent of their MEV.

Moving the variables that can be independently measured to the left-hand side, and the variables that cannot be independently measured to the right-hand side, yields equation (3). In terms of proportions, the ratio  $APV_t/MEV_t$  shows how much of  $MEV_t$  is accounted for by  $APV_t$ , with the residual share being accounted for by  $(LP - RD)_t$ . The gap between  $MEV_t$  and  $APV_t$ , measures the magnitude of  $(LP - RD)_t$ . The possibility that  $LP_t > 0$  and  $RD_t > 0$  at the same time is unlikely (Keynes 1991, pp. 222-44 [chapter 17]). An asset with a high default risk would be unlikely to have an excess liquidity premium, i.e. be the preferred medium of exchange, relative to an asset with a low default risk. Thus, when  $(LP - RD)_t > 0$ , it is primarily due to  $LP_t > 0$ ; and when  $(LP - RD)_t < 0$ , it is primarily due to  $RD_t > 0$ .

$$(3) \quad (MEV_t - APV_t) = (LP - RD)_t$$

#### *b. MEV and APV Data*

To apply equation (2), two data sets are required. I must compile the market exchange value (MEV) of Virginia's notes between 1755 and 1774, and I must calculate the counterfactual expected real-asset present value (APV) of Virginia's notes as non-money bonds. I use the observed market exchange rates between Virginia's notes and bills of exchange paying pounds sterling in London to construct MEV. These exchange rates are primarily from merchant account books and are expressed as the face value amount of Virginia notes needed to buy, in Virginia, a 100 pound sterling bill of exchange drawn on London (McCusker 1978, pp. 205-14).

I adjusted these exchange rates to account for the cost of getting a bill of exchange to

London and getting it liquidated into specie usable in Virginia. I estimated that cost to be 7.09 percent.<sup>9</sup> Thus, the realized par exchange rate of a Virginia note is  $116.14\text{£}_{VA} = 100\text{£}_S$  compared with the legal par exchange rate of  $125\text{£}_{VA} = 100\text{£}_S$  (Hening 1969, v. 6, pp. 478-83). MEV is calculated by dividing this adjusted number (116.14) by the observed exchange rates in McCusker (1978, pp. 211-2). Compared with using the legal par exchange rate, using the realized par rate as the numerator makes MEV a smaller percentage of face value. MEV measures the spot-market conversion in Virginia of Virginia paper pounds into a silver commodity money expressed as a percentage of the face value of Virginia paper pounds. The MEV data are presented in Appendix A Table A1. Given uncertainty over the exact transaction cost underlying the adjustment to the legal par rate, an MEV within in a percentage point of that report in Appendix A Table A1 is certainly possible.

Virginia's paper money had a bearer-bond quality that required an explicit redemption exercise to extinguish the principal expressed on the note's face. Virginia's citizens are assumed to act as if they understood their paper money to be interest-bearing bonds in 1755-6, and zero-coupon bonds thereafter, requiring time-discounting to ascertain their present value (their APV), and to know how to calculate this value.<sup>10</sup> The public is also assumed to know the quantity of notes in circulation ( $M_j$ ) and the amounts redeemed ( $RED_t$ ) each year as shown in Table 4, with  $RED_t$  including the amount of funds (specie) in the treasury that could be used for redemption at face value at the end maturity dates of the notes as shown in Tables 1 and 4.

At a given point in time, notes with different redemption dates would have different

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<sup>9</sup> This information is derived from the exchange rates quoted before bills of credit were ever issued (McCusker 1978, p. 172). In addition, *The Boston Evening Post*, 25 October 1773, estimated the cost of shipping specie between the colonies and London to be 6 percent. It was comprised of 2.5 percent for insurance and brokerage, 2.5 percent for commissions, and 1 percent for freight (Brock 1992, pp. 74, 124). Adding the opportunity cost of time raises the cost to approximately the rate estimated here. The transaction costs paid by the New Jersey government, for moving specie across the Atlantic from 1760 through 1765, was approximately 7.46 percent (Bush 1982, pp. 10-13, 315-16).

<sup>10</sup> E.g. see Labaree (1967, v. 11, pp. 13-15); Ricord (1892, v. 17, p. 159); Smith (1937, pp. 310-12).

APVs. Seemingly identical notes with differing present values (APVs) at the same point in time makes for a cumbersome medium of exchange. Virginia's legislature attempted to solve this problem with redemption rule changes in June 1757, November 1761 (subsequently suspended by the Board of Trade in 1763), and July 1774. These rule changes made all notes currently outstanding on those dates have a new common redemption date and so a common APV.

These rule changes should have made Virginia's paper money an easier medium of exchange to use and so increased its LP. However, these rule changes were also ex post facto reductions of the expected APV of prior emissions. This action should have increased the RD the public attached to these notes. These rule changes were a partial expropriation of the current APV of prior issues in the hands of the public. Whether increases in LP dominated increases in RD in the immediate post-rule change years is shown below.

For the most part, the evidence does not record what notes from which emissions were redeemed when. Occasionally the notes from particular emissions are identified as being burnt on a specific date, but more often redemption evidence lumps notes from all emission currently outstanding together, see Appendix B. In addition, given legal tender laws, notes from any emission currently outstanding could be used to pay any current taxes. For these reasons, I assume that the public responded only to the *expected* redemption of the *average* note currently outstanding. Because the MEV data from McCusker (1978) measures the current market value of the average note in circulation, and does not distinguish between the notes of different emissions, APV is calculated to measure the present value of the average or representative note currently outstanding. Thus, MEV and APV are comparable measures.

Equation (4) shows how the expected APV of the average note in circulation is calculated. The amount of Virginia paper money outstanding in a given year is assumed to be

redeemed by all notes actually redeemed in the immediately following years, including the potential redemption at the end maturity date using accumulated specie in the treasury, until the year when that original amount is fully redeemed. These yearly redemption amounts are divided by the initial amount outstanding from the chosen year to assign a yearly weight to its contribution in the redemption process. The time discounts between the initial year and the redemption year are multiplied by the contribution-weights for their respective years. The time-discount-weight values for each year are summed to get the expected present value of a representative note outstanding for that chosen year. The APV calculation is adjusted for 1755-6 to account for the interest actually paid.<sup>11</sup>

$$(4) \quad APV_j = \sum_{t=j}^T (RED_t/M_j)e^{-rt}$$

Where  $r$  = the discount rate or opportunity cost of capital,  $M_j$  = the face value amount of Virginia paper money outstanding in year  $j$ ,  $RED_t$  = the face value amount of Virginia notes redeemed and retired from circulation each year, including the amount of funds (specie) in the treasury that could be used for redemption at face value at the end maturity dates of the notes, with  $RED_T$  being the amount in the last year  $T$  that satisfies:

$$\sum_{t=j}^T (RED_t/M_j) = 1.$$

No time-series of market-generated interest (discount) rates for any class of assets currently exists for colonial America. Therefore, I use the  $r$  considered normal by colonial contemporaries for assets with relatively low default expectations. In 1748, the Virginia assembly set the legal interest rate for the colony at 5 percent, where it stayed for the rest of the colonial period. However, the legislature indicated that the market rate was above this legal rate (Hening 1969, v. 6, pp. 101-04). In 1764, Benjamin Franklin stated that the rate for discounting well-funded legislature-issued zero-coupon bonds was 5 or 6 percent (Labaree 1967, v. 11, pp. 13-15). The interest rate mentioned most often by colonials for the middle colonies in the second

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<sup>11</sup> See fn. 4.

half of the eighteenth century was 6 percent.<sup>12</sup> Earlier in the century, and perhaps during wars, the rate may have been slightly higher. Given uncertainty over the exact rate, an  $r$  from 5 through 7 percent is used, with 6 percent being my best guess. The APV using discounts rates of 5, 6, and 7 percent are reported in Appendix A Table A1.

APV<sub>*j*</sub> is not mechanically linked to M<sub>*j*</sub>. For any given M<sub>*j*</sub>, APV<sub>*j*</sub> can take on any value between 0 and 100 percent, because the legislature has unrestricted choice over T and RED<sub>*t*</sub>. Given  $r$ , APV<sub>*j*</sub> is under the control of the legislature through its legal design and execution of its paper money laws. M<sub>*j*</sub> factors into APV<sub>*j*</sub> only if M<sub>*j*</sub> influences the behavioral choices of T and RED<sub>*t*</sub> by the legislature. Whether APV<sub>*j*</sub> and M<sub>*j*</sub> are behaviorally related is tested below.

### *c. MEV and APV Through Time*

Figure 1 compares the levels of MEV and APV over time, when APV is discounted at 5, 6, and 7 percent. MEV could be within a percentage point of that drawn due to measurement error in the transacting cost of liquidating bills of exchange drawn on London and turning them into specie usable in Virginia. While 6 percent is my best-guess discount rate, uncertainty over that rate means that 5 or 7 percent could also be that used. Considering the range of possible measurement error in MEV and uncertainty over which discount rate to use for APV, the hypothesis that MEV is primarily and predominately comprised of APV cannot be rejected given the data in Figure 1. Little (LP – RD) figures in to MEV. Virginia treasury notes were not a fiat

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<sup>12</sup> See Barlow (2012, pp. 110, 125, 128); Brock (1975, pp. 260, 328, 332, 435, 462); Catanzariti, *et al*, (1988, v. 7, p. 547); Davis (1964, v. 1, p. 326; v. 2, pp. 38, 68, 83, 99-100, 315, 321; v. 3, p. 168; v. 4); *Documents Relating to the Colonial History of the State of New Jersey* (v. 5, p. 91); Elliot (1843); Homer and Sylla (1991, pp. 274-313); Hutchinson and Rachel (1962, v. 1, p. 308); *Journals of the Continental Congress* (v. 2, pp. 25-26; v. 6, p. 1037; v. 7, pp. 102-03, 158, 168; v. 8, pp. 725-26; v. 9, pp. 955, 989; v. 10, p. 59; v. 11, p. 416; v. 12, pp. 929-30, 932, 1074, 1256; v. 13, pp. 112, 141, 146-47, 441, 497; v. 14, pp. 717, 720, 731-32, 783, 820, 901; v. 15, pp. 1147, 1197, 1210, 1225, 1245-46, 1288, 1319, 1405; v. 16, pp. 264-65, 288; v. 17, pp. 464, 568, 804; v. 18, p. 1017; v. 19, pp. 6, 167; v. 21, p. 903; v. 23, p. 831; v. 24, p. 39; v. 26, p. 32; v. 27, pp. 395-96); Labaree (1959, v. 1, p. 142; 1967, v. 11, pp. 13-15); Nettels (1934, p. 267); *Pennsylvania Gazette* (30 April; 21 and 28 May; 25 June; 2, 16, and 23 July 1777); Smith (1979, v. 4, p. 295; 1980, v. 6, pp. 117-18, 212-13, 228-29, 238-39, 245, 252, 259-62, 270, 277, 295, 346, 368, 372, 386, 400-01, 404; 1981, v. 7, pp. 524, 581, 617, 623, 635, 642-43; 1981, v. 8, p. 25; 1983, v. 10, p. 205; 1985, v. 11, pp. 94, 137-38, 361; 1986, v. 13, pp. 132, 604-05; 1987, v. 14, pp. 51, 463, 500; 1988, v. 15, pp. 377, 396; 1989, v. 16, pp. 307-08, 490, 531; 1990, v. 17, p. 365; 1992, v. 19, p. 139; 1994, v. 21, p. 467).

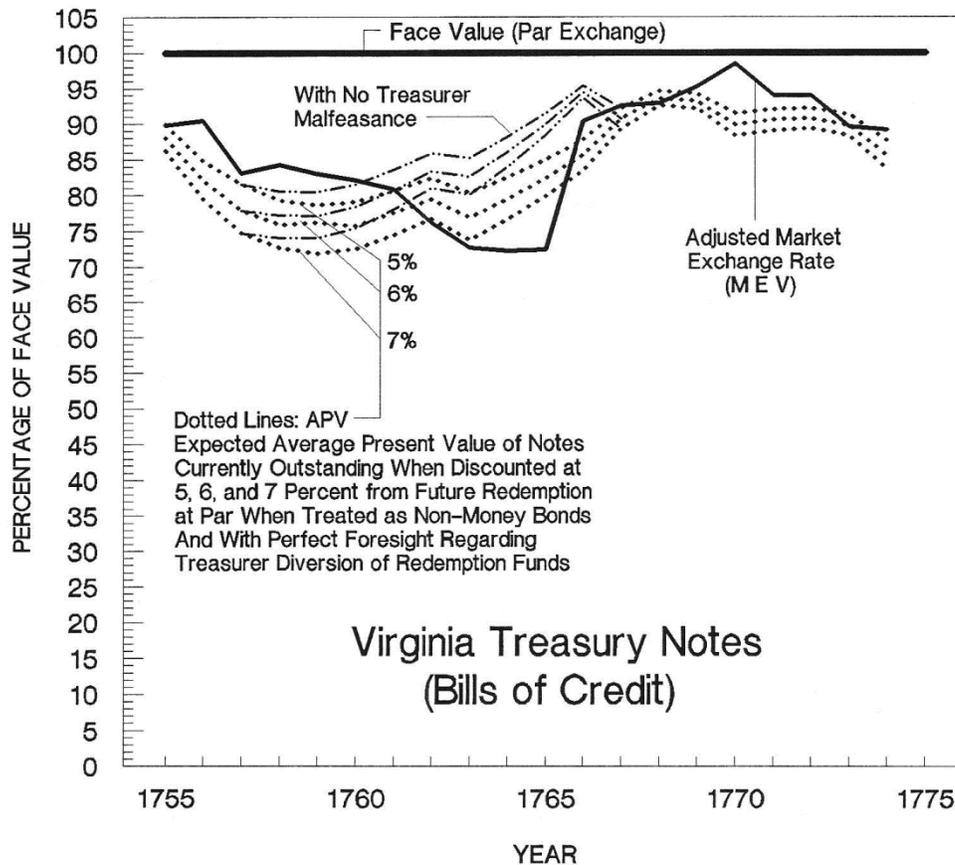


Figure 1. MEV versus APV, 1755-1774

Sources: Appendix Table A1; McCusker (1978, pp. 211-2).

Notes: See the text for construction and sources.

currency. They were predominately a real barter asset.

Using MEV as drawn and the best-guess 6 percent discount rate, over the entire period covered by colonial Virginia's paper money regime APV accounts for 98 percent of MEV, leaving LP to account for only 2 percent of MEV. Within this overall span, three sub-periods are identified.  $MEV > APV$ , implying that  $RD = 0$  and  $LP > 0$ , in the years 1755-1761 and 1766-1774. By contrast,  $MEV < APV$ , implying that  $LP = 0$  and  $RD > 0$ , in the years 1762-1765. In the years 1755-1761, APV still accounts for 93 percent of MEV, leaving LP to account for only 7 percent of MEV. In the years 1766-1774, APV still accounts for 97 percent of MEV, leaving LP to account for only 3 percent of MEV. These years appear to be normal in that no specific

financial crises can be identified. The decline in LP between 1755-1761 and 1766-1774, however, may be due to the intervening years of monetary troubles. Even after the troubles were over, the public was reluctant to ascribe as much “moneyness” value to the notes as they did before 1762.

As such, an LP between 3 and 7 percent can be considered the norm. While relatively small, this LP was enough to make Virginia’s treasury notes the preferred media of exchange for executing domestic transactions. The public was willing to pay somewhere between 3 and 7 percent over the notes’ expected average real-asset present value to possess the notes because the notes had a “moneyness” value over and above the next best barter alternative. This 3 to 7 percent can be considered a measure of the transaction cost gains from using notes, as opposed to book credit, tobacco claims, or specie, to execute domestic transactions.<sup>13</sup>

The sub-period 1762-1765 when  $MEV < APV$ , implying that  $LP = 0$  and  $RD > 0$ , is associated with a financial crisis that preoccupied Virginia politics.<sup>14</sup> John Robinson, treasurer and speaker of the house from 1738 until his death in early 1766, had been suspected of diverting funds accumulating in the treasury, funds earmarked for redeeming notes at their end maturity dates. He loaned these funds, without specific authority to do so, to his friends. In 1766, after his death, it was discovered that just over 95,000£<sub>VA</sub> of these funds had been so diverted.<sup>15</sup> Given the large amount diverted, the suspicions expressed at the time that such was happening seem credible (Ernst 1973, pp. 177, 183, 188; Lee 1825, pp. 22-3; Mays 1952, pp. 175, 181).

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<sup>13</sup> Robert Nicholas Carter, Virginia treasurer after 1766, observed in 1773 that in normal times “Most of the Merchants as well as others, ... preferred them [Virginia’s treasury notes] either to Gold or Silver, as being more convenient for transacting the internal Business of the Country.” *William and Mary College Quarterly Historical Magazine* (Apr. 1912), v. 20, no. 4, p. 235.

<sup>14</sup> Brock (1975, pp. 465-527) does not mention the John Robinson financial scandal. He speculates that the exchange rate crisis of the early 1760s was due to gyrations in tobacco production and troubles in the bills-of-exchange market (Brock 1975, pp. 467-7, 481-2, 485-6).

<sup>15</sup> Scholars have typically claimed that these diverted funds were notes put back in circulation. This claim turns out to be all presumption predicated on erroneous logic. There is no evidence that these diverted funds were notes. The forensic accounting exercise indicates that these diverted funds were predominantly specie, see Appendix B.

Given that a substantial amount of notes in circulation in the early 1760s had their end maturity dates between 1765 and 1769, see Table 1, the public had to be concerned in the early 1760s that the accumulating tax funds in the treasury earmarked to redeem these notes would not be there when so required for redemption. A letter in the *Virginia Gazette*, 17 October 1766, remarked that “Many of us, to our great detriment, have had money paid to us whose day of redemption was elapsed, and which some of our creditors refused to receive from us again, alleging it was no currency; this money, when carried to the Treasury has frequently been refused to be redeemed, under the pretense that the Treasury was empty,...” Fear of delayed redemption led the public to add a RD to the notes in the early 1760s. It also led some to pass the notes off to other who did not yet know the treasury was empty. The data in Figure 1, using the best-guess 6 percent discount rate, indicates that the RD in this period, assuming  $LP = 0$ , averaged 8.7 percent. In other words,  $MEV = APV - RD$ . The notes in this period functioned like a risky barter asset.

Figure 1 illustrates what the APV would have been if there was no diversion of treasury funds, with those funds remaining in the treasury to execute note redemption as legislated. Between 1762 and 1765, using the best-guess 6 percent discount rate, APV would have been 6 percentage points higher. I construct a counterfactual MEV for the years 1762-1765 using this alternative higher APV by assuming  $MEV = APV + LP$ , where the LP is taken from the prior normal years of 1755-1761. In the absence of treasurer malfeasance, MEV would have averaged 86 percent of face value in 1762-1765 as opposed to its actual 73 percent of face value—a 13 percentage point effect on MEV. The exchange rate crisis of the early 1760s can be fully accounted for by the treasurer’s diversion of redemption funds (Ernst 1973, p. 194).

After Robinson died in early 1766 and his actions were fully documented, MEV and

APV rapidly returned to normal patterns. Robinson's estate was required to repay the sums diverted. The slow repayment of these funds along with the collection of tax arrears, and the fact that taxes for redemption were generally in excess of that needed for redemption, meant that funds for future note redemption were accumulating, enough to meet legislated redemption schedules. In addition, substantial quantities of notes were used to pay taxes in the mid-1760s and were burnt in 1767 and 1768, see Table 4. This last phenomenon is consistent with notes temporarily losing their LP in the early to mid-1760s and so not being retained as money by the public compared with being used to pay current tax assessments.

*d. The 1773 Counterfeiting Scare*

Early in 1773, notes of the 1769 and 1771 emissions were discovered to have been counterfeited "...in so ingenious and dangerous a manner that it is difficult to distinguish the forged from the good bills,..." (Hening 1969, v. 8, p. 648; Kennedy 1905, pp. viii-xi, 7, 9-10, 26-7) The assembly moved swiftly to mitigate the impact. They required all notes from emissions #14 and #15 still outstanding to be swapped for new notes in 1773 and hunted down the counterfeiters (Hening 1969, v. 8, pp. 647-51; Kennedy 1905, pp. viii-xi, 7, 9-10, 15-16, 18-20, 23-4, 27, 29-32, 35, 264). If the public expected the actions of the assembly to be ineffectual, they would be expected to discount the notes severely, i.e. generate a  $RD > 0$ , to account for the risk that not all notes could now be redeemed as legislatively promised and that their notes might be rejected in trade or for redemption at the treasury because they might be counterfeit (Ernst 1973, pp. 331-4).

Figure 1, however, shows that this counterfeiting scare, while a topic of public discussion and legislative action, had little impact on the value of the notes in circulation. Using the best-guess 6 percent discount rate, MEV always exceeds APV between 1770 and 1775. No  $RD > 0$

appears in this period. At best, there is a narrowing of the MEV to APV gap from 1770 through 1774, but a declining LP over this period could as easily be due to the prospects of a coming revolution rather than to the impact of counterfeiting.

This result is important because stories of counterfeiting have given the impression that colonial bills of credit were problematic monies or even worthless monies (Ernst 1973, pp. 331-4; Scott 1957). The evidence in Figure 1 indicates that counterfeiting was largely without economic impact on the value and performance of Virginia's paper money. While this is the first systematic quantitative measure of the impact of a counterfeiting episode on the value of colonial paper money, it still raises the possibility that counterfeiting is an over dramatized topic. Colonial governments had the tools to mitigate the impact of counterfeiting almost completely and employed them when necessary. Believe in stories of counterfeiting of colonial paper monies, but not necessarily in any supposed impact of such counterfeiting.

### **Statistical Properties**

#### *a. MEV and APV Time Series Properties*

Table 5 reports the time series statistical properties of MEV and APV, using the best-guess 6 percent discount rate for APV. MEV is a trend stationary series, with a structural break at 1766. APV is a stationary series with a structural break at 1766.<sup>16</sup> Both have short half-lives to shocks. MEV and APV are also co-integrated. Thus, estimating APV's effect on MEV is a valid exercise. Panel C in Table 5 reports that effect.  $APV_t$  has a statistically significant positive effect on  $MEV_t$  with a relatively large coefficient magnitude. Statistically, APV and MEV are closely associated. MEV tracks APV through time.

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<sup>16</sup> The structural break at 1766 coincides with the change in treasurers and the end to the diversion of note-redemption funds by the earlier treasurer. Moving the structural break forward or backward a year reduces the statistical fit, i.e. 1766 is a local maximum for regression fit.

Table 5 Stationarity and Co-integration Tests, 1755-1774

<i>Panel A.</i> MEV stationarity test: $(MEV_t - MEV_{t-1}) =$				Lags	<i>N</i>	Adjusted <i>R</i> <sup>2</sup>	<i>F</i>	Half-life in years
1339.1400*** (433.5551)	- 0.5955(MEV <sub>t-1</sub> )*** (0.1110)	- 0.7341(YEAR)*** (0.2450)	+ 17.0178(D)*** (3.1831)	0	19	0.67	13.75***	0.77
<i>Panel B.</i> APV6 stationarity test: $(APV6_t - APV6_{t-1}) =$								
45.6019*** (11.5467)	- 0.5851(APV6 <sub>t-1</sub> )*** (0.1461)	+ 7.1589(D)*** (1.8596)		0	19	0.45	8.43***	0.79
<i>Panel C.</i> MEV <sub>t</sub> versus APV6 <sub>t</sub> : $MEV_t =$								
-6.6175 (13.2748)	+ 0.5591(APV6 <sub>t</sub> )** (0.1974)	+ z <sub>t</sub>		1	19	0.74	26.35***	
Co-integration test: $[z_t - z_{t-1}] =$								
	-0.1898 (0.9746)	- 1.0193(z <sub>t-1</sub> )*** (0.2446)		0	18	0.49	17.37***	

Sources: Figure 1; Appendix A Table A1.

Notes: Data are annual. Standard errors are in parentheses under their respective coefficients. “Lags” refers to lagged dependent variables included to removal serial correlation (coefficients not reported). D is a structural break dummy variable capturing the change in treasurers and so the end of the diversion of redemption funds, see the text. D = 1 for years 1766-1775 and zero otherwise. The D selected yields a local maximum regression fit. If the initial year for D is moved one year forward or one year backward from that reported here, the regression fit is reduced. z<sub>t</sub> = regression error term. Dickey-Fuller critical values are used for the (t-1) independent variables, see Enders (1995, p. 419). For regressions in Panels A and B, Durbin’s Alternative Tests for autocorrelation failed to reject the hypothesis of no serial correlation above the 0.1 level. For the regression in Panel C, serial correlation was corrected by including one lag of the dependent variable (coefficients not reported). This corrected regression was tested with Durbin’s Alternative Test for autocorrelation which failed to reject the hypothesis of no serial correlation above the 0.1 level. The half-life to shocks are calculated using the following equation:  $[-\ln(2)/\ln(1 + a_1)]$ , where a<sub>1</sub> is the coefficient on the (t-1) independent variable. See Mark (2001, p. 32).

\*\*\* Statistical significance above the 0.01 level.

\*\* Statistical significance above the 0.05 level.

\* Statistical significance above the 0.1 level.

### *b. Alternative Models of Paper Money Performance*

The quantity theory of money has not been statistically applied to Virginia’s paper money regime before (Brock 1975, p. 476). Table 6 provides this application. The specification is adapted from West (1978, p. 4) so that the results have some comparability with quantity-theoretic estimates done for other colonies.<sup>17</sup> No statistically systematic relationships between

<sup>17</sup> The classical quantity theory of money, at least a prominent version, takes the equation-of-exchange identity,  $MV = PY$ , as expressed in growth rates,  $\ln(M) + \ln(V) = \ln(P) + \ln(Y)$ , and by assuming that  $\ln(V)$  and  $\ln(Y)$  are long-run constants transforms it into the quantity “theory” of money [ $\ln(M) + \text{some constant} = \ln(P) + \text{some constant}$ ] or [ $\ln(P) = \text{some constant} + \ln(M)$ ]; where M = the money supply, V = the velocity of that money’s circulation, P = prices in that money, and Y = traded real output (Bordo 1987; Fisher 1912). West (1978) set M equal to the paper

Table 6

## The Quantity Theory of Money and Virginia Paper Money, 1755-1774

		Lags	<i>N</i>	Adjusted <i>R</i> <sup>2</sup>	<i>F</i>
$\ln(P_t) = 4.6366^{***} + 0.0084\ln(M_t)$	(0.4921) (0.0411)	0	20	0.00	0.04
$\ln(P_t) = 4.8898^{***} - 0.0939\ln(M_t) + 0.08196\ln(M_{t-1})$	(0.5888) (0.0819) (0.0785)	0	19	0.00	0.68
$\ln(P_t) = 5.3623^{***} + 0.0733\ln(M_t) - 0.2130\ln(M_{t-1}) + 0.0898\ln(M_{t-2})$	(0.7173) (0.1927) (0.3373) (0.1527)	0	18	0.00	0.39

Sources: Appendix A Table A1; Carter, *et al* (2006, v. 5, pp. 682-7).

Notes: Data are annual. Standard errors are in parentheses under their respective coefficients. Durbin's Alternative Test for autocorrelation failed to reject the hypothesis of no serial correlation above the 0.1 level in all regressions. P is an unweighted price index composed of York and Rappahannock River Basins tobacco prices, York River corn prices, and James River wheat prices, with 1755= 100. The raw average price for 1755 is 0.83. Using only tobacco prices yields even weaker results.

\*\*\* Statistical significance above the 0.01 level.

\*\* Statistical significance above the 0.05 level.

\* Statistical significance above the 0.1 level.

prices and the quantities of paper money in circulation exist for Virginia. The results are the same as those found by West (1978) for South Carolina, Pennsylvania, and New York. This finding is known as the colonial monetary puzzle.

Table 7 reports the results from applying the quantity theory of money using MEV as the measure of value in place of P, and then using the counterfactual APV as the measure of value in place of P. Under a quantity-theoretic approach, an increase in the amount of paper money (M), other things equal, should lead to an increase in prices, including an increase in the price of sterling bills of exchange. An increase in the average sterling bill-of-exchange exchange rate, given that it is used as the denominator to calculate MEV, would cause MEV to fall. Thus, changes in MEV should be negatively associated with changes in M. Table 8, Panel A, shows no statistically systematic relationship between MEV and the quantities of paper money in circulation for Virginia—the same results as for P.

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money supply and estimated  $\ln(P) = \text{some constant} + \ln(M)$ , including one and two-year lags of M to capture delayed effects of M on P. He estimated the model separately for South Carolina, Pennsylvania, New York, and Massachusetts. He found no relationship between prices and the quantity of paper money in the first three colonies.

Table 7 MEV, APV, and the Quantity of Paper Money, 1755-1774

<i>Panel A.</i> The Quantity Theory of Money using MEV as the “price”:				Adjusted			
				Lags	<i>N</i>	<i>R</i> <sup>2</sup>	<i>F</i>
$\ln(\text{MEV}_t) = 1.7051$	-	$0.0304\ln(M_t)$		1	19	0.62	15.61 <sup>***</sup>
(1.0761)		(0.0321)					
<i>Panel B.</i> The Quantity Theory of Money using the Counterfactual APV as the “price”:							
$\ln(\text{APV}_6) = -1.2449$	-	$0.0139\ln(M_t)$	+	$0.0657\ln(M_{t-1})$ <sup>***</sup>	1	19	0.89 50.25 <sup>***</sup>
(0.8355)		(0.02247)		(0.0179)			

*Sources:* Appendix A Table A1.

*Notes:* Data are annual. Standard errors are in parentheses under their respective coefficients. For regressions in Panels A and B, serial correlation was corrected by including one lag of the dependent variable (coefficients not reported). These corrected regressions were tested with Durbin’s Alternative Test for autocorrelation which failed to reject the hypothesis of no serial correlation above the 0.1 level. Additional lagged M variables were tried, but they were statistically insignificant and so were removed from the regression specification.

<sup>\*\*\*</sup> Statistical significance above the 0.01 level.

<sup>\*\*</sup> Statistical significance above the 0.05 level.

<sup>\*</sup> Statistical significance above the 0.1 level.

By contrast, Table 7, Panel B, shows that using APV, with the best-guess 6 percent discount rate, in place of P in the quantity theory of money formulation produces a strong statistical relationship. That the counterfactual measure of money’s value (APV) is more closely related to the quantity of paper money than either P or MEV is telling. The Grubb decomposition model triumphs again over the simply quantity theory of money for statistically explaining movements in the value and quantity of colonial paper money. To understand the quantity-theoretic performance of colonial paper money you need to measure its counterfactual value as non-money.

### Conclusions

Colonial paper money is a Gordian knot. I have untied that knot. The Grubb decomposition model of inside money explains the level and movement in the value of Virginia paper money better than what has been done previously, either by alternative model estimations or by anecdotal story-telling. These are not marginal improvements, but quantum leaps in both conceptualization and modeling statistical performance. Virginia paper money was

predominately a real barter asset with its real-asset present value explaining most of the level and movement in its observed market value. It functioned predominately as a zero-coupon bond and not a fiat currency. It did, however, have a small liquidity premium in normal years, enough to make it the preferred medium of exchange for domestic transactions. In addition, in years with monetary troubles, a.k.a. redemption worries, the paper money experienced a moderate risk discount added to its real-asset present value. Counterfeiting, however, was not one of those worries. The legislature had the tools and used them to effectively mitigate and stop the effect of counterfeiting on the value of its paper money. The value and performance of colonial Virginia's paper money are consistently and coherently explained conceptually and statistically by the Grubb decomposition model for inside monies.

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Appendix A Table A1 Data Used in the Figures and Regressions

Year	MEV	APV5	APV5 <sup>a</sup>	APV6	APV6 <sup>a</sup>	APV7	APV7 <sup>a</sup>	M	TP	P	Pop
1755	89.77	89.89		88.04		86.22		37,179£ <sub>VA</sub>	100.0	100.0	164,369
1756	90.42	84.82		82.11		79.49		95,582	105.9	98.8	171,326
1757	83.13	81.60		77.85		74.70		192,070	117.6	109.6	178,284
1758	84.21	79.32	80.52	75.88	77.20	72.62	74.05	257,919	129.9	118.1	185,241
1759	82.97	78.62	80.48	76.14	77.19	71.85	74.07	315,624	105.3	103.6	192,199
1760	82.12	79.08	81.55	75.70	78.43	72.51	75.47	339,209	117.6	114.5	199,156
1761	80.81	80.66	83.57	77.47	80.74	74.48	78.06	325,159	116.6	113.3	205,182
1762	76.21	82.38	85.85	79.45	83.39	76.71	81.05	265,290	117.6	118.1	211,207
1763	72.64	80.26	85.25	76.92	82.62	73.77	80.11	254,340	129.9	126.5	217,233
1764	72.26	82.48	88.20	79.45	86.04	76.58	83.97	235,265	88.2	94.0	223,258
1765	72.42	85.01	91.57	82.37	90.01	79.83	88.48	213,690	107.0	109.6	229,284
1766	90.40	87.79	95.37	85.57	94.50	83.43	93.65	211,465	128.3	124.1	235,309
1767	92.51	92.15		90.70		89.30		169,700	101.6	102.4	241,335
1768	92.92	94.54		93.52		92.52		140,436	133.2	127.7	247,360
1769	95.22	94.24		93.17		92.13		131,994	111.8	112.0	253,386
1770	98.42	91.45		89.86		88.30		121,453	149.7	141.0	259,411
1771	93.96	91.98		90.51		89.05		140,509	131.6	127.7	265,212
1772	93.97	92.11		90.72		89.38		103,947	131.0	131.3	271,013
1773	89.51	91.20		89.71		88.28		67,385	95.7	100.0	276,814
1774	89.13	87.60		85.51		83.57		44,030	126.7	124.1	282,615

Sources: See text; Table 4; Appendix B; Carter, *et al* (2006, v. 5, pp. 652, 682-7).

Notes: See text for definitions and construction. The number after APV refers to the discount rate used. Pop is only the white population, with linear interpolated values between decadal benchmarks. TP is the average for York and Rappahannock River Basins tobacco prices with 1755 = 100. The raw price is 1.87 in 1755. P is a price index using TP plus York River corn and James River wheat prices with 1755= 100. The raw average price for 1755 is 0.83.

<sup>a</sup> Counterfactual APV with no suspected treasurer malfeasance. The other APV columns assume perfect foresight regarding treasurer diversion of redemption funds.

Appendix B **A Forensic Accounting Reconstruction of the Data Comprising Colonial Virginia's Paper Money Regime, 1755-1774**

**Mysterious Data**

The *Historical Statistics* (Carter, et al. 2006, v. 5, pp. 692-6) is the current go-to place for data on the amounts of colonial Virginia paper money in circulation. If you track back through the citations and sources listed, the hypothesis that these numbers are made up cannot be rejected. They are not observations, even though they are seemingly presented as such. They are not estimates or interpolations, as that would indicate that some methodology or calculating construction was used, and none is offered. Where these numbers come from is a mystery.

In the *Historical Statistics*, the numbers for Virginia are taken from Brock (1992, p. 116). John J. McCusker compiled the numbers in the *Historical Statistics*, and while he cites several sources, the numbers are identical to those in Brock (1992, p. 116) and not to those in any other source.<sup>18</sup> Of the sources cited, only Brock (1992, p. 116) and Ernst (1972, p. 370) report numbers on the amount of Virginia notes in circulation. Brock (1992, p. 116) cites Ernst (1973, pp. 7 and 356). However, no such numbers exist in Ernst on those pages. Ernst (1973, p. 370) does report some numbers for the amounts of Virginia paper money in circulation, but for only 9 of the 20 years covered by Brock. These numbers are also not the same as those in Brock (1992, p. 116) or in the *Historical Statistics*. McCusker concluded that “Brock (1992), p. 115, seems to have interpolated some of his data but this is not made explicit.” —a generous assessment at best (Carter et al. 2006, v. 5, p. 695).

Brock (1992, p. 116) was not published by Brock, but by Ron Michener well after Brock's death using Brock's surviving notes. A close look at Brock (1975, pp. 476-7 [original 1941]) shows that Brock had created these number on Virginia's notes in circulation prior to

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<sup>18</sup> McCusker mistakenly cites Brock (1992, p. 115) whereas the numbers are actually on p. 116.

1941, as he graphed these numbers on those pages. He did not, however, present the actual numerical values. Brock (1975, p. 475) describes the graph as “Some idea” of the sums outstanding and not as an estimate or as observations of the sums outstanding.

I assume the numbers in Brock (1992, p. 116), as well as in Ernst (1973, p. 370), are not totally fabricated, but came from some investigation of evidence in the primary sources. Three primary sources are used in my forensic reconstruction of the data, namely the statutory paper money acts (Hening 1969); the treasury accounts as recorded in the *Journals of the House of Burgesses* (Kennedy 1906a, pp. 64-6, 108, 118-20, 124-8, 154-6, 283-5, 303; 1906b, pp. 72, 217-8; 1907, pp. 143, 171, 176-8, 356-7; McIlwaine 1908, pp. 15, 36-7, 115-6, 171-2, 249-50; 1909, pp. 388, 458, 487-90); and the letters published in the *Virginia Gazette* by the post-1765 treasurer Robert Carter Nicholas (*William and Marry College Quarterly Historical Magazine* Apr. 1912, v. 20, no. 4, pp. 227-62). Brock and Ernst clearly consulted these three primary sources to construct their numbers. The mystery of how they used and interpreted these sources is sorted out here.

While the statutory paper money acts appear to offer rather straight forward data that can be just pick out and reported, there are subtle issues of interpretation that can lead scholars astray. More significantly, the statutory paper money acts by themselves do not yield the amounts of paper money in circulation. Information from the treasury accounts must be added. Alas, the treasury accounts are incomplete, disorganized, irregularly reported, chaotic and inconsistent in presentation structure, and unclear in the use of common terminology. For example, what is meant in the treasury reports by the term “issued” and the term “in circulation” is not what we commonly understand by such words today.

An extensive forensic accounting reconstruction of these accounts is required to make

sense of them—which is what is provided below. The forensic reconstruction also puts key terminologies used in the treasury accounts into their proper historical context, thereby deciphering their usage by contemporaries. Forensic accounting uses existent records to reconstruct the accounts of interest to a standard sufficient to meet legal criteria. Given that the records used are legislative, that standard is appropriate. This reconstruction relies on tracking internal consistencies and coherences across the existent records, and paying close attention to the execution details embedded in the relevant laws.<sup>19</sup>

While we may never know how Brock and Ernst created their numbers, my forensic reconstruction of Virginia’s paper money regime shows what Brock and Ernst likely did, along with what they likely missed. In the process, additional information beyond the amount of paper money authorized by statute and the amount in circulation will be recovered, namely the amount of paper money actually emitted to the public, the amount of paper money actually redeemed from the public, and the amount of non-note redemption funds held in the treasury. The forensic reconstruction process also shows where the data on paper money are reasonably solid and where the data are fragile, in other words it will give scholars a feel for the error variance around the paper money data in the historical record. Finally, the data reconstruction leads to a reinterpretation of the John Robinson scandal.

### **Preliminary Preview**

Figure B1 presents my forensic reconstruction of the amounts of Virginia’s notes in public circulation along with those numbers presented by Brock and Ernst. Figure 1B shows that my reconstruction is reasonably close to the numbers provided by Brock and Ernst. If my forensically reconstructed data are rejected, including its component parts discussed below, then

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<sup>19</sup> For general information on forensic accounting, see Crumbley, Heitger, and Smith (2013); <http://www.forensicaccounting.com>.

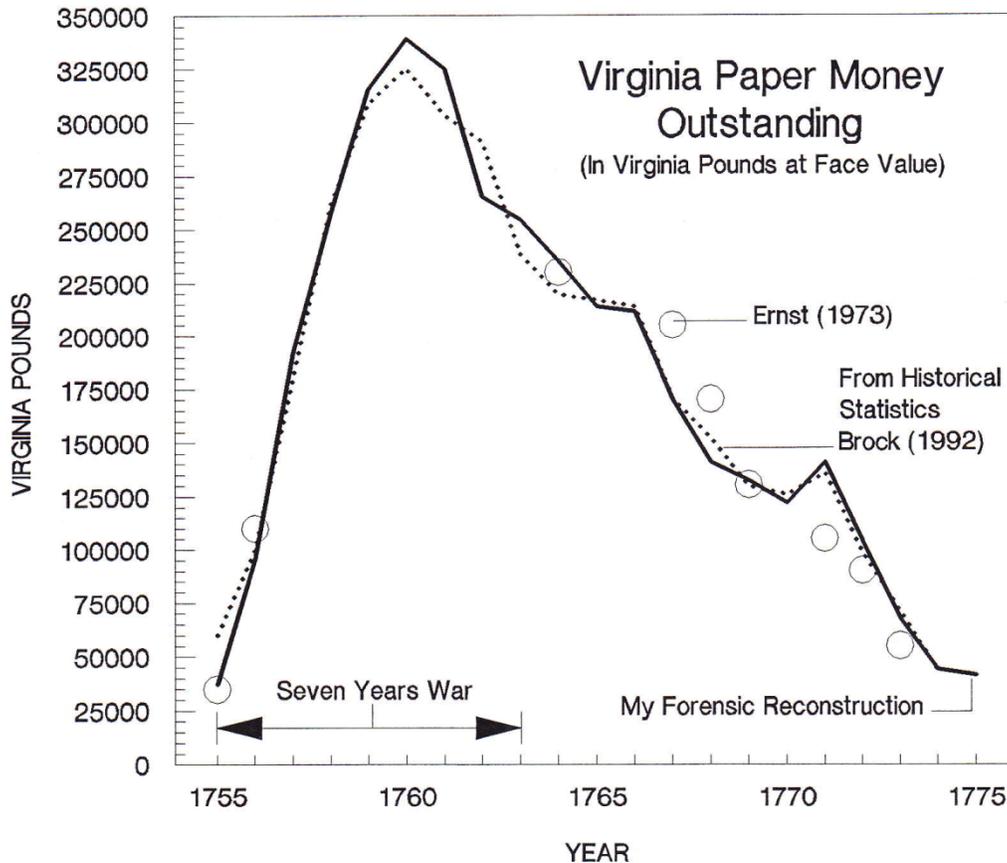


Figure B1. The Quantity of Virginia Paper Money Outstanding

Sources: Table 3; Carter, *et al* (2006, v. 5, p. 693); Ernst (1973, p. 370).

the data presented by Ernst and Brock, a.k.a. in the *Historical Statistics*, must also be rejected. Such a rejection would mean no usable data on this topic exists.

While the overall pattern between my reconstruction and that of Brock and Ernst is reasonably close, Table B1 shows that in some years the percentage deviations of Brock's numbers and Ernst's numbers from my forensically reconstructed numbers are substantial. As such, my forensic reconstruction makes important corrections to the Brock and Ernst data. The substantial deviations of Brock and Ernst from my reconstructed data in Table B1 are due to oversights by these scholars when looking at the primary sources.

Brock substantially overstates the amount in circulation in 1755. He missed the fact that

Table B1 Amount of Virginia Notes in Circulation, 1755-1774: Various Sources

Year	(1)	(2)	(3)	(4)	Percentage Deviation of--	
	<i>Historical Statistics</i> <sup>a</sup>	Brock (1992) <sup>c</sup>	Ernst (1973) <sup>e</sup>	My Forensic Reconstruction	Column (2) from (4)	Column (3) from (4)
	£ <sub>VA</sub>	£ <sub>VA</sub>	£ <sub>VA</sub>	£ <sub>VA</sub>		
1755	60,000	60,000	35,000	37,179	61.38%	-5.86%
1756	100,000	99,963	110,000	95,582	4.58	15.08
1757	180,000	179,962		192,070	-6.30	
1758	261,500	261,523		257,919	1.40	
1759	308,800	308,789		315,624	-2.17	
1760	325,000	325,044		339,209	-4.18	
1761	303,400	303,360		325,159	-6.70	
1762	291,100	291,107		265,290	9.73	
1763	238,400 <sup>b</sup>	238,439 <sup>d</sup>		254,340	-6.25	
1764	219,500 <sup>b</sup>	219,508 <sup>d</sup>	230,000	235,265	-6.70	-2.24
1765	216,600 <sup>b</sup>	216,640 <sup>d</sup>		213,690	1.38	
1766	213,800	213,771		211,465	1.09	
1767	170,400	170,420	205,000	169,700	0.42	20.80
1768	151,400	151,408	170,000	140,436	7.81	21.05
1769	129,900	129,875	130,000	131,994	-1.61	-1.51
1770	125,400	125,426		121,453	3.27	
1771	135,300 <sup>b</sup>	135,305 <sup>d</sup>	105,000	140,509	-3.70	-25.27
1772	98,300	98,336	90,000	103,947	-5.40	-13.42
1773	70,700	70,695	55,000	67,385	4.91	-18.38
1774	43,400	43,377		44,030	-1.48	

Sources: Carter, et al. (2006, v. 5, p. 693); Ernst (1973, p. 370); Table B5 below.

Notes: £<sub>VA</sub> = Virginia paper pounds at face value.

<sup>a</sup> Rounded to the nearest 100.

<sup>b</sup> Identified as interpolated values.

<sup>c</sup> End of year values are reported.

<sup>d</sup> Place in brackets with no explanation as to why.

<sup>e</sup> Rounded to the nearest 5,000.

3,960£<sub>VA</sub> authorized to be emitted in 1755 was recorded in the treasury accounts as never emitted, and missed the fact that 18,861£<sub>VA</sub> authorized to be emitted in 1755 was recorded in the treasury accounts as not emitted in 1755, but in a subsequent year. By contrast, Ernst must have incorporated these facts as he gets the amount for 1755 correct, within the rounding exercise he employs. The minor deviations of Brock from my reconstructed data thereafter are mostly the result of timing placements regarding when amounts reported as emitted and redeemed were actually put into and taken out of circulation.

The substantial deviations of Ernst from my reconstructed data in Table B1 are the result of several oversights by Ernst. While Ernst must have consulted the treasury accounts, he simply reports the numbers found rather than interpreting their meaning. For example, he reports a number for 1756 that assumes that no redemptions took place in 1756. The redemption and removal of the first emission was scheduled for mid-1756. Its redemption was not reported in the treasury accounts until 1757. Ernst must have assumed, given the reporting year, that none was redeemed in 1756. Most taxes to redeem notes, as Ernst himself points out (Ernst 1973, p. 186), were collected in the fall, with total collections not reported until the next spring. Therefore, it is unlikely that this emission was not primarily redeemed in 1756.

Ernst's numbers in Table B1 for 1767-1769 and 1772-1773 come directly from statements in the treasury accounts about the amount of notes in circulation.<sup>20</sup> Again, Ernst simply reports the numbers he ran across. Such reporting results in three errors of interpretation. First, these statements were typically made early in the year and thus refer to notes removed in the latter part of the prior year. Thus, these statements are off by one year and the amounts reported should be placed in the prior year. Second, the treasury accounts explicitly refer to these amounts in circulation as being only for "old" notes, meaning notes issued before 1769. They do not include the 40,000£<sub>VA</sub> "new" notes emitted in 1769 and 1771. Thus, the amounts Ernst lists after 1769 are biased low. Finally, the treasury accounts construct these numbers by taking all notes printed and then subtracting all notes burned. To the extent that this construction fails to subtract notes sitting idle in the treasury, unburned and un-emitted, it overstates the amounts actually in public circulation, especially pre-1769. Thus, pre-1769, Ernst's numbers are biased high.

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<sup>20</sup> I have no idea what the sources are for his numbers for 1764 and 1771.

What follows is my forensic reconstruction of the data using the primary sources. It will show in detail what Brock, and to a lesser extent Ernst, must have done to create their data, and will show where they went astray. It also gives scholars a sense of what aspects of the information that make up this estimation process are more exact to observation and where the data are highly constructed and thus possessing some error variance and fragility. I proceed from the most solid and trustworthy evidence in the primary sources through the forensically reconstructed data that relies directly on that solid and trustworthy evidence to the most fragile or “constructed” data that relies on reasonable inference, back-projection, and interpolation. This is done so scholars can get a sense of the size and location of the error variance in measurement and so what data they can trust as exact and what data they should take only with a margin of error and what that error margin might be.

### **The Forensic Reconstruction of Colonial Virginia’s Paper Money Accounts**

Ultimately, the number desired is the amount of paper money in public circulation each year. It is the amount of paper money in circulation, i.e. in public hands, that influences behavior and so influences historical processes and outcomes. Such numbers, however, are not recorded in the surviving records of colonial Virginia. You cannot just go to a source and copy down such data. The few times that colonial Virginia documents mention amounts of paper money in circulation they did not mean what is commonly understood as being “in circulation.” As such, this data has to be constructed out of the information that has survived. To find the amounts of paper money in circulation each year, you need to find or estimate the amounts of new paper money emitted into public hands each year and subtract from that the amounts of paper money removed from the public each year, and then chart the total accumulation or de-accumulation of paper money over time as a result of this emission-redemption process.

*a. New Emissions Authorized by Statutory Law*

The data construction process starts with identifying how much new paper money was emitted each year by the legislature. Such information can be derived from the statutory laws that authorized paper money emissions. While this information comes from the most complete surviving primary source we have, it still is not free from scholarly misinterpretation. Simply copying down data in this source can lead you astray. The statutory laws on paper emissions report total paper money authorized to be printed and total paper money authorized to be emitted. They are not the same totals. The difference for Virginia comes from one-for-one swaps of new paper money for old. Such one-for-one swaps do not affect the total amount of paper money in public circulation. To get to the total amount of paper money in public circulation, information on net new emissions paper money rather than total printings of paper money is needed.

Table B2 lists the 16 paper money acts, their legislative session dates, and the total printed versus net new emissions of paper money for each act. These two numbers are the same for each act except for emissions #6 and #16. Emission #6 included 95,000£<sub>VA</sub> to swap one-for-one with emissions #2, #3, and #4. Emission #16 was all to be swapped one-for-one with what was left outstanding from emissions #14 and #15. These amounts must be removed to get the total net new emissions authorized.

Table B2 shows that Ernst (1973, p. 370) reported total printings not net new emissions. Given that most readers assume that the numbers reported are net new emissions, as those are the only relevant numbers to behavioral outcomes, Ernst's data overstates total net new emissions by 27 percent. A similar judgment can be made of the data reports in the 1912 *William and Mary College Quarterly Historical Magazine*. By contrast, the data reported by Brock (1975, pp. 476-7) is for net new emissions and not total printings. Brock, however, does not report emissions

Table B2 Virginia's Paper Money Acts in Statutory Law, 1755-1774

Paper Money Acts	Session Month and Year Enacted	Amounts Authorized by Statutory Law		Legislated Redemption Date	Amounts as Reported in:		
		To be Printed	Net New Emissions		Ernst (1973)	Brock (1941)	<i>William and Mary Quarterly</i> (1912)
		£ <sub>VA</sub>	£ <sub>VA</sub>		£ <sub>VA</sub>	£ <sub>VA</sub>	£ <sub>VA</sub>
#1	May 1755	20,000	20,000	30 June 1756	20,000	20,000	20,000
#2	Aug. 1755	40,000	40,000	30 June 1760	40,000	40,000	40,000
#3	Mar. 1756	25,000	25,000	30 June 1760	25,000	25,000	25,000
#4	Mar. 1756	30,000	30,000	30 June 1760	30,000	30,000	30,000
#5	Mar. 1756	10,000 <sup>a</sup>	10,000 <sup>a</sup>	15 Dec. 1757	12,000 <sup>a</sup>	12,000 <sup>a</sup>	10,000 <sup>a</sup>
#6	Apr. 1757	179,963	84,963	1 Mar. 1765	179,963	80,000	179,963
#7	Mar. 1758	32,000	32,000	1 Mar. 1765	32,000	32,000	32,000
#8	Sept. 1758	57,000	57,000	14 Sept. 1766	57,000	57,000	57,000
#9	Feb. 1759	52,000	52,000	20 Apr. 1768	52,000	52,000	57,000 <sup>b</sup>
#10	Nov. 1759	10,000	10,000	20 Oct. 1769	10,000	10,000	10,000
#11	Mar. 1760	20,000	20,000	10 Oct. 1768	20,000	20,000	20,000
#12	May 1760	32,000	32,000	20 Oct. 1769	32,000	32,000	32,000
#13	Mar. 1762	30,000	30,000	20 Oct. 1769	30,000	30,000	30,000
#14	Nov. 1769	10,000	10,000	21 Nov. 1771	10,000		10,000
#15	July 1771	30,000	30,000	10 Dec. 1775	30,000		30,000
#16	Mar. 1773	36,834	0	1 June 1774	36,834		36,834
Total		614,797	482,963		616,797	440,000	619,797 <sup>b</sup>

Sources: Brock (1975, pp. 476-7); Ernst (1973, p. 370); Hening (1969, v. 6, pp. 461-81, 521-30; v. 7, pp. 9-25, 26-33, 46-54, 69-87, 163-9, 171-9, 255-65, 331-7, 347-58, 357-63, 493-502; v. 8, pp. 342-8, 493-503, 647-51); *William and Mary College Quarterly Historical Magazine* (Apr. 1912), v. 20, no. 4, pp. 261-2.

Notes: £<sub>VA</sub> = Virginia paper pounds at face value.

<sup>a</sup> While statutory law only authorized 10,000£<sub>VA</sub> for emission #5, 12,000£<sub>VA</sub> was actually printed and emitted according to the *House of Burgesses* (McIlwaine 1909, p. 490). While statutory law is regarded as superior in authority to legislative statements, the forensic reconstruction of accounts indicates that an additional 2,000£<sub>VA</sub> over that authorized by statutory law shows up in the treasurer's accounts for accumulated emissions over this period. This extra 2,000£<sub>VA</sub> will be assumed to belong to emission #5. Thus, 12,000£<sub>VA</sub> will be taken as the correct amount for emission #5.

<sup>b</sup> This source lists 614,797£<sub>VA</sub> as the total, which would be consistent with a typo existing in this source's statement about emission #9, with the 7 bring a typo for a 2.

after 1762 and excludes 4,963£<sub>VA</sub> from emission #6, erroneously counting that amount as part of the one-for-one currency swap rather than as part of the new emission. The 4,963£<sub>VA</sub> amount were new emission #6 notes used to pay the accrued interest on emissions #2, #3, and #4 when those notes were swapped for emission #6 notes. They are part of the net new emission of emission #6. As such, Brock understates total net new emissions by 9 percent.

One last adjustment has to be done with the net new emissions authorized in Table B2.

While statutory law only authorized 10,000£<sub>VA</sub> for emission #5, 12,000£<sub>VA</sub> was actually printed and emitted according to the *House of Burgesses* (McIlwaine 1909, p. 490). While statutory law is regarded as superior in authority to legislative statements, treasurer accounts corroborate this alternative total. On three different occasions across two different treasurers, the treasury accounts says that 539,963£<sub>VA</sub> were emitted from 1755 through 1762 (Kennedy 1906a, pp. 119, 155; *William and Mary College Quarterly Historical Magazine* Apr. 1912, v. 20, 1912, p. 234). Summing the authorized numbers in Table B2 indicates that these treasury accounts are reporting total printings as the amounts “issued” and not net new emission.

The summing of authorized amounts printed in Table B2 is 2,000£<sub>VA</sub> less than that reported in the treasury accounts for that period. The only mention of this extra 2,000£<sub>VA</sub> is in regard to emission #5 (McIlwaine 1909, p. 490). Given this corroboration and coherence across the existent records, 12,000£<sub>VA</sub> will be taken as the correct amount for emission #5 (see also Table B6 below). Both Ernst and Brock report emission #5 as being for 12,000£<sub>VA</sub> rather than the 10,000£<sub>VA</sub> as authorized by statutory law. These two scholars must have been examining the treasury accounts as reported in the *Journals of the House of Burgesses* to construct their data on paper money, as that source is the only place the 12,000£<sub>VA</sub> figure can be found.

*b. Net New Emission Actually Put Into Public Circulation*

In the absence of contrary evidence in the treasury accounts, I assume that notes went into public circulation in the year they were authorized by legislative statute. The dates printed on the notes averaged only one month later than the assembly session authorizing the respective notes (Newman 2008, pp. 437-43). Given this observation and the fact that new authorizations came yearly and often sub-yearly before 1761, it is a reasonable assumption.

Table B3 uses the information stated in the treasury accounts to make two adjustments to turn the net new amounts authorized into the net new emissions actually put into public circulation. First, the treasury accounts state that certain authorized amounts from emissions #1 and #2 were never spent out of the treasury, but sat there, and were eventually burned without ever being emitted. Column (2) of Table B3 lists those sums and the authorized emissions from which they must be subtracted.

The amount identified for emission #2, however, must be added back in 1757. For emissions #2, #3, and #4, a total of 99,963£<sub>VA</sub> of emission #6 notes were authorized to be swapped for emission #2, #3, and #4 notes in public circulation and to pay off the accrued interest on those notes to that point. Only 93,604£<sub>VA</sub> of emissions #2, #3, and #4 were emitted into public circulation, thus the interest portion of the amount authorized was 6,359£<sub>VA</sub>. In effect, the “missing” un-emitted notes from emission #2 are added back in to the total emitted via interest payments above the 93,604£<sub>VA</sub> currency swap. In other words, emission #6 authorized 179,963£<sub>VA</sub> notes which consisted of 80,000£<sub>VA</sub> of new emissions plus 93,604£<sub>VA</sub> in one-for-one currency swaps for notes outstanding from emissions #2, #3, and #4 plus 6,359£<sub>VA</sub> in interest payments. The 1,396£<sub>VA</sub> notes never emitted added to the 93,604£<sub>VA</sub> notes actually emitted equals the 95,000£<sub>VA</sub> originally authorized, which in turn when subtracted from the emission #6 total authorization of 179,963£<sub>VA</sub> equals 84,963£<sub>VA</sub> net new emissions going into public hands.

The treasury accounts also list sums that were sitting in the treasury unspent from particular emissions for some time after their initial authorization. Given that the treasury accounts never refer to these sums as being destroyed without being emitted, I assume that they were spent into public circulation at some later date. Column (3) in Table B3 lists these amounts as stated in the treasury accounts, subtracts these amounts from the amounts authorized in their

Table B3 Net New Emissions Actually Put Into Public Circulation, 1755-1774

Year	(1) Net New Amounts Authorized		(2) Minus Amounts Never Emitted to the Public		(3) Plus and Minus When Emitted to the Public		Year	(4) Net New Emissions Actually Put Into Public Circulation £ <sub>VA</sub>	(5) Accumulation If None Were Removed £ <sub>VA</sub>
	Em #	£ <sub>VA</sub>	Em #	£ <sub>VA</sub>	Em #	£ <sub>VA</sub>			
1755	1	20,000	1	-3,960					
	2	40,000	2	-1,396	2	-17,465	1755	37,179	37,179
1756	3	25,000			2	+17,465			
	4	30,000			4	-10,129			
	5	12,000					1756	74,336	111,515
1757	6	84,963	2	+1,396	4	+10,129	1757	96,488	208,003
1758	7	32,000							
	8	57,000			7-8	-17,633 <sup>b</sup>	1758	71,367	279,370
1759	9	52,000			9	-2,378 <sup>a</sup>			
	10	10,000			10	-457 <sup>a</sup>			
					8	+10,483	1759	69,648	349,018
1760	11	20,000			11	-914 <sup>a</sup>			
	12	32,000			12	-1,463 <sup>a</sup>			
					7- 8	+4,275 <sup>b</sup>	1760	53,898	402,916
1761					9-12	+5,212 <sup>a</sup>	1761	5,212	408,128
1762	13	30,000			13	-10,250	1762	19,750	427,878
1763					13	+10,250			
					8	+375	1763	10,625	438,503
1764					7-8	+2,500 <sup>b</sup>	1764	2,500	441,003
1765							1765		441,003
1766							1766		441,003
1767							1767		441,003
1768							1768		441,003
1769	14	10,000					1769	10,000	451,003
1770							1770		451,003
1771	15	30,000					1771	30,000	481,003
1772							1772		481,003
1773							1773		481,003
1774							1774		481,003
Total		484,963		-3,960		0		481,003	

Sources: Table B2; Kennedy (1906a, pp. xi-xxv, 64-6, 108, 118-20, 124-8, 154-6, 283-5, 303; 1906b, pp. 72, 217-8; 1907, pp. 143, 171, 176-8, 356-7); McIlwaine (1908, pp. 15, 36-7, 115-6, 171-2, 249-50; 1909, pp. 388, 458, 487-90); *William and Marry College Quarterly Historical Magazine* (Apr. 1912), v. 20, no. 4, pp. 227-62.

Notes: See text for construction. Em # = paper money acts or emission numbers as listed in Table B2. £<sub>VA</sub> = Virginia paper pounds at face value. Shillings and pence are rounded to the nearest pound.

<sup>a</sup> The +5,212£<sub>VA</sub> in 1761 from emissions #9, #10, #11, and #12 pro-rated in subtraction across those emissions because which emission this added amount should be subtracted from was not indicated.

<sup>b</sup> 6,775£<sub>VA</sub> of emissions #7 and #8 were designated to fund the Rangers (a military unit) and the Commissioner on Indian Affairs. This amount was reported as still held in the treasury for this purpose into 1760, when 4,275£<sub>VA</sub> was no longer mentioned as being so held. I assume that 3,275£<sub>VA</sub> was released that year to fund the Rangers and 1,000£<sub>VA</sub> to fund the Commissioner on Indian Affairs, as 2,500£<sub>VA</sub> was still reported as held in the treasury to fund the Commissioner on Indian Affairs in the years after 1761. This 2,500£<sub>VA</sub> shows up again in 1766 as part of the monies the treasurer, John Robinson, diverted out of the treasury as loans to his friends. Exactly what year this 2,500£<sub>VA</sub> was put into circulation by Robinson is unknown. It is arbitrarily placed in 1764 as a best guess.

respective emission year, and then adds these amounts back in the year where it seems reasonable to assume they were spent into public circulation.

For the most part, the numbers, along with the year when each is subtracted, are direct observations from the treasury accounts. The year when they are added back in, however, must be inferred as it is not directly stated in the treasury accounts. The method for placement assumes that following the last mention of a sum still sitting idle in the treasury, if that mention was early in the year, I assume it went into circulation in the last year it was mentioned. If it was last mentioned late in the year, then I assume it went into circulation in the following year. This is particularly sound for the years when new emissions were frequent.<sup>21</sup> It is unlikely that prior emission notes would be still sitting idle in the treasury when the need for more new note was manifest. The only exception would be for notes in dedicated accounts, such as notes to pay the Rangers and to pay the Commissioner of Indian Affairs. At this stage, the data construction process has moved from direct observations to controlled conjectures. Some error variance in the path of net new notes put into public circulation is introduced here.

Column (4) of Table B3 incorporates the two adjustments to the net new emissions authorized to produce the time-path of the net new emissions actually put into public circulation. Column (5) sums the accumulation of these emissions under the assumption that none were ever removed from circulation. It simply provides the maximum ceiling possible for total notes in circulation. Any analysis that leads to more than that listed in column (5) would not be credible.

### *c. Redemption and Removal of Notes from Public Circulation*

To derive the amount of notes in public circulation, notes removed from public

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<sup>21</sup> Trying to prorate the introduction of these notes by month, say for some months at the end of a year and then some in the months after the New Year, was not attempted here. The spending by the treasury each month is unknown, and to guess at its prorated flow would be pure speculation. So it was not attempted.

circulation must be subtracted from the net new notes put into public circulation. Table B4 provides an estimate of the notes removed from public circulation. The treasury accounts provide some direct evidence on notes removed from public circulation and then burned, but the accounts are incomplete. Some back-projection and interpolation of amounts in some years are required. The methods for doing this varies depending on the type of information provided in the treasury accounts. In addition, the treasury accounts that indicate that notes were removed and burned are not consist in the language and method for indicating such. Some liberties of interpretation are required. At this point, we have moved the farthest away from direct observation and thereby introduced the most potential error variance into the time path of net new notes put into public circulation.

Column (1) of Table B4 reports the direct evidence from the treasury accounts at the time it was reported in the *House of Burgesses* of the amount of notes burned. Several subtle interpretations, however, must be used to make sense of this evidence. First, statements about total notes burned to date, such as on 7 April 1768, cannot be directly used because they refer to total notes printed and not notes removed from public circulation (Kennedy 1906a, p. 155). Burning notes taken in as one-for-one swaps for new notes has no effect on total notes in public circulation.

Second, notes removed and burned from emission #5 must be indirectly inferred. After 1757, i.e. after emission #5 was to be fully redeemed, the treasury accounts state the amount of funds remaining in a dedicated account to fully redeem emission #5 notes as they were brought in for redemption. I assume that the difference between the amounts of emission #5 emitted, 12,000£<sub>VA</sub>, and the sum remaining in the treasury account for its redemption measures the amount of emission #5 notes redeemed and burned to that date.

Table B4 Net New Emissions Redeemed and Removed from Public Circulation, 1755-1775

Year	(1) When Net New Notes Redeemed from the Public were Reported as Burned		(2) When These Notes were Likely Removed from Public Circulation		(3) Total Net New Notes Removed from the Public Per Year	
	Em #	£ <sub>VA</sub>	Em #	£ <sub>VA</sub>	Year	£ <sub>VA</sub>
1755		0		0	1755	0
1756		0	1	15,932 <sup>a</sup>	1756	15,932 <sup>a</sup>
1757	1	15,932 <sup>a</sup>		0	1757	0
1758	5	5,518	5	5,518	1758	5,518
1759	5	1,891	5	1,891		
			6&7	10,052	1759	11,943
1760	6&7	30,731	6&7	30,313	1760	30,313
1761	6&7	20,426	6&7	17,614		
	5	1,648	5	1,648	1761	19,262
1762	6&7	23,244	6&7	16,422		
	5	2,066	5	2,066		
	8-13	11,256	8-13	11,256		
			---	49,875	1762	79,619
1763	---	49,875	---	21,575	1763	21,575
1764		?	---	21,575	1764	21,575
1765		?	---	21,575	1765	21,757
1766		?	---	2,225	1766	2,225
1767	---	2,225	---	41,765	1767	41,765
1768	---	41,765	---	29,264	1768	29,264
1769	---	39,906	---	18,442	1769	18,442
1770	---	7,800			1770	10,541
1771					1771	10,944
1772					1772	36,562
1773					1773	36,562
1774					1774	23,355
1775					1775	2,763
Total						

*Sources:* See the sources listed for Table B3.

*Notes:* See the note to Table B3 and the text for construction. After 1762, redemption accounts do not report which emissions were being burnt. Only net new emissions redeemed and burned are counted. Notes never emitted into public circulation that were subsequently burned are not counted. Old notes burned as a result of a one-for-one currency swap for new notes are not counted.

<sup>a</sup> Emission #1 had 3,961£<sub>VA</sub> never emitted. Out of the 16,039£<sub>VA</sub> emitted, 15,932£<sub>VA</sub> were redeemed in 1756 and subsequently burned in 1757. What happened to the difference, 107£<sub>VA</sub>, is unknown. I assume it was lost by the public. At redemption, 606£<sub>VA</sub> was paid in interest for the one year period that the emission was outstanding. I assume the interest payment was in specie or tobacco claims and not notes as no statement to the contrary was recorded.

Column (2) of Table B4 makes several further adjustments to the data in column (1).

First, column (2) makes a placement adjustment. Again, the treasury accounts as reported in the

*Journals of the House of Burgesses* were typically made early in the year and so refer to

redemptions made in the prior year. Most redemption taxes were collected in the fall, and so notes reported in the *Journals of the House of Burgesses* as burned based on past treasury accounts most likely were removed via tax payments in the prior year. As such, the amounts stated in the treasury accounts of notes burned in the early part of the year are move to the immediately prior year in terms of when they were removed from public circulation. The amounts stated in the treasury accounts of notes burned in the latter part of the year are assumed to have been removed from public circulation in that same year.

Second, missing accounts for the years 1764 through 1766 are filled in via back-projection and interpolation. I assume that any time the treasury accounts mention a sum of notes burned in a given year, that that sum is the complete amount removed and burned that year. So only years when nothing is mention must have their amounts estimated. In the last three years of John Robinson's tenure as treasurer, he had been treasurer since 1738 and died in 1766, little information was recorded regarding the treasury accounts.

The redemption amounts for these three years are back-projected and interpolated values based on the difference between redemptions up through 1762 estimated in Table B4, and the 1768 treasury report of the total accumulated notes burnt between 1755 and 1 April 1767. The treasury accounts report an accumulated total of 326,192£<sub>VA</sub> notes burned before 1 April 1767. This number is out of all notes printed, not all notes emitted into public circulation. Thus, it must be reduced by notes burned that were not net new emissions to the public. This reduction includes 5,357£<sub>VA</sub> never spent out of treasury and the 93,604£<sub>VA</sub> that were emission #6 one-for-one currency swaps for emission #2, #3, and #4 notes (the swapped notes being presumably burned, though no direct statements of such were made in the treasury accounts). The amount of notes redeemed from the public and burned up through 1762 is estimated above to be

162,587£<sub>VA</sub>. We have a statement of notes burned in 1767 that were from removals in 1766, so only three years, 1763, 1764, and 1765, need to be filled by this estimate. The calculation is:  $326,192 - 5,357 - 93,524 - 162,587 = 64,724$ ;  $64,724/3 = 21,575$  for each of these years.

Two additional back-projected, prorated interpolation exercises are needed to finish constructing the data on note removals for the period after 1769. Column (3) of Table B4 reports the outcome of these exercises, along with the resulting fully reconstructed time path of net new notes removed from the public each year for 1755 into 1775. The amounts of net new emissions removed in the years 1770 and 1771 are estimated as follows: The difference between the *House of Burgesses* treasury account of the notes in circulation between 1768 and 1771 is  $(127,714 - 88,190) = 39,524$ . The amount reported as redeemed in 1769 is subtracted to yield  $(39,524 - 18,442) = 21,082$  for redemptions in 1770 and 1771. This number is pro-rated (divided in half) and because these are for “old” notes only, the amounts of “new” notes directly mentioned as redeemed in the treasury accounts for these years are added to those sums.

The amounts of net new emissions removed in the years 1772 into 1775 are estimated as follows: The difference between the *House of Burgesses* treasury account of notes in circulation between 1771 and 1772 is  $(88,190 - 54,391) = 33,799$ . The implied redemption of “new” notes in 1772 in the paper money act #16 is 2,763  $(3,166 - 403)$  redeemed in 1771). These two numbers are added to get the total redeemed in 1772. I assume that the same amounts were redeemed in 1773. The same amounts of “new” notes are assumed to be redeemed in 1774 and in 1775. The amount of “old” notes redeemed in 1774 is taken as the remainder of “old” notes after subtracting out their 1773 redemption, i.e.  $54,391 - 33,799 = 20,592$ . As such, I assume no “old” notes remain in circulation after 1774, and only “new” notes remain in circulation after 1774.

*d. The Resulting Time Path of Notes in Public Circulation*

Table B5 subtracts the estimated net new notes removed from the public from the estimated net new notes actually put into public circulation to get the time path of notes remaining in public circulation each year. These amounts are slightly different from the treasury account statements of the amounts in circulation, because these statements specifically refer only to “old” notes in circulation, and because their construction takes total notes ever printed and subtracts total notes ever burned. To the extent that notes sitting idle in the treasury, never emitted or not yet burned, are included in this construction, the treasury accounts miss-state the amounts in public circulation. Alternative assumptions, back-projects, and interpolations are certainly possible, and so alternative estimates of the amount of notes in public circulation could be plausible. However, any deviation from that done here would either cause the coherent fabric of the forensically consistent and interlocking patterns to unravel or require less plausible assumptions.

### **Specie in the Treasury**

Were redemption taxes paid in notes or in specie? The treasury accounts provide some evidence to answer this question. The clearest statement in the treasury accounts was made on 15 June 1770 (Kennedy 1906b, p. 72, italics in the original).

*It appears to your Committee, that the Balance in the Treasurer’s Hands of Cash received of the several Collectors for Taxes appropriated to the Redemption of the old Treasury Notes [those issued before 1769], amount to Ten Thousand Three Hundred and Twenty-six Pounds Eleven Shillings, of which they have burnt and destroyed Seven Thousand Eight hundred Pounds, and have left in the Treasury, on that Account, in Specie, a Balance of Two Thousand Five Hundred and Twenty-six Pounds Eleven Shillings to be exchanged for old Treasury Notes.*

A redemption tax of 10,327£<sub>VA</sub> was collected, of which 2,527£<sub>VA</sub> was in specie that was explicitly set aside in a dedicated account to be used to redeem notes brought to the treasury. The rest of the tax payments were burnt, implying that those tax payments were made in notes.

Table B5 Virginia Notes in Public Circulation, 1755-1775

Year	(1) Net New Emissions Actually Put into Public Circulation £ <sub>VA</sub>	(2) Net New Notes Removed from the Public £ <sub>VA</sub>	(3) Resulting Notes in Public Circulation £ <sub>VA</sub>	(4) From <i>House of Burgesses</i> and Treasurer Statements of Notes in Circulation <sup>a</sup> £ <sub>VA</sub>
1755	37,179	0	37,179	
1756	74,336	15,932	95,582	
1757	96,488	0	192,070	
1758	71,367	5,518	257,919	
1759	69,648	11,943	315,624	
1760	53,898	30,313	339,209	
1761	5,212	19,262	325,159	
1762	19,750	79,619	265,290	
1763	10,625	21,575	254,340	
1764	2,500	21,575	235,265	
1765	0	21,575	213,690	
1766	0	2,225	211,465	206,727
1767	0	41,765	169,700	170,420
1768	0	29,264	140,436	127,714
1769	10,000	18,442	131,994	
1770	0	10,541	121,453	
1771	30,000	10,944	140,509	88,190
1772	0	36,562	103,947	54,391
1773	0	36,562	67,385	
1774	0	23,355	44,030	
1775	0	2,763	41,267	
Totals	481,003	439,735		

*Sources:* Tables B3 and B4; for primary sources see the source note to Table B2 and B3.

*Notes:* See the notes to Table B3. *Resulting Notes in Public Circulation* takes the number in column (3) in year  $t$  and adds the number in column (1) in year  $t+1$  and then subtracts the number in column (2) in year  $t+1$  to get the number in column (3) for year  $t+1$ . 1775 does not include new emissions made later in that year (Newman 2008, pp. 444-6).

<sup>a</sup> These are statements about the amount of notes in circulation in the treasury accounts as reported in the *Journal of the House of Burgesses* or by the treasurer Robert Carter Nicholas in letters. These statements explicitly refer only to “old” note, i.e. those emitted before 1769, and not to “new” notes, i.e. those emitted after 1768. These statements were also made early in the year and relied on information on notes burned that were received in taxes from late in the previous year. Thus, the year for these numbers is moved one forward from when reported to reflect when notes were actually taxed out of circulation, rather than when they were subsequently burned. The sources calculate these numbers by taking the total notes ever printed to that point and then subtracting from that total the total notes ever burned to that point and to some extent notes still in the treasury. Not enough information is given in the treasury accounts to directly reconstruct these numbers from their component parts.

Therefore, 76 percent of this tax was paid in notes, and 24 percent was paid in specie.

The above statement sets an interpretative standard for similar statements in the treasury accounts that are not as specifically clear. In particular, redemption taxes received that were burnt must have been paid in notes, and redemption taxes received but not burnt must have been

paid in specie. These tax sums in specie must have been held in a separate account and earmarked to redeem notes brought to the treasury that had reach their legislated maturity date.

Applying this interpretative standard indicates of the 12,642£<sub>VA</sub> redemption taxes received on 30 November 1769, 10,642£<sub>VA</sub> were paid in notes that were burned, leaving 2,000£<sub>VA</sub> paid in specie (Kennedy 1906a, p. 303). Therefore, 84 percent of this tax was paid in notes, and 16 percent was paid in specie. The treasury account of 23 November 1769, regarding the prior year, indicates that of the 42,067£<sub>VA</sub> redemption taxes collected, 29,264£<sub>VA</sub> were paid in notes that were burned, leaving 12,800£<sub>VA</sub> paid in specie (Kennedy 1906a, p. 284). Therefore, 70 percent of this tax was paid in notes, and 30 percent was paid in specie. Finally, the implied note versus specie payment of the redemption tax designated to redeem emission #5 at the end of 1757 is 46 percent of the tax was paid in notes and 54 percent in specie, see Table B6.

The above analysis establishes that redemption taxes generated specie sums that were to be held in the treasury until the final redemption date legislated for each paper money act, at which time holders of those notes could cash them in at face value for the specie held in the treasury for that purpose. However, at the final redemption date holders of the respective notes did not rush to the treasury to exchange them for specie. The notes continued in circulation and note holders could cash them in at the treasury at their leisure. Robert Nicholas Carter, Virginia treasurer after 1766, noted this behavior, “Most of the Merchants as well as others, ... preferred them [Virginia’s treasury notes] either to Gold or Silver, as being more convenient for transacting the internal Business of the Country.” (*William and Mary College Quarterly Historical Magazine* Apr. 1912, v. 20, no. 4, p. 235)

Table B6 illustrates this behavior for emission #5, the only emission that is uniquely specified throughout the treasury accounts. While the taxes to redeem all of emission #5 appear

Table B6 Non-Note Redemption Funds in the Treasury

Year	Tax Funds Reported in the Treasury for Redeeming Emission #5 Notes Still Out £ <sub>VA</sub>	Implied Emission #5 Notes Redeemed and Burnt Each Year £ <sub>VA</sub>	Estimated Accumulation of Non-Note Tax Redemption Revenues in the Treasury Earmarked to Redeem Notes at their Final Respective Legislated Redemption Dates £ <sub>VA</sub>
1755			0
1756			0
1757			6,482
1758	6,482	5,518	4,590
1759	4,590	1,892	4,590
1760			4,590
1761	2,942	1,648	2,942
1762	876	2,066	876
1763			18,344
1764			36,688
1765	412	464	55,032
1766	305	107	94,702
1767			2,348
1768			12,631
1769			14,964
1770			8,561
1771			16,712
1772			7,366
1773			5,554
1774			3,742
1775			1,930
Totals		11,695	

*Source:* See the sources in Table B2 and B3; Kennedy (1906a, pp. xi-xxv, 64-6, 108, 118-20, 124-8, 154-6, 283-5, 303; 1906b, pp. 72, 217-8; 1907, pp. 143, 171, 176-8, 356-7); McIlwaine (1908, pp. 15, 36-7, 115-6, 171-2, 249-50; 1909, pp. 388, 458, 487-90); *William and Marry College Quarterly Historical Magazine* (1912, pp. 227-62).

*Notes:* See the text for construction.

to have been fully paid at the end of 1757 as legislatively required, 54 percent of that payment was in specie. That specie sum sat in the treasury in a dedicated account and was used to redeem emission #5 notes brought into the treasury slowly over the next nine years. What happened to the last remaining 305£<sub>VA</sub> in specie in this account after 1766 is unknown. The treasury accounts speculate that the public likely lost some notes, thus accounting for the lack of full redemption. A

note loss rate of 2.5 percent would not be unthinkable. Virginia had no provision to exchange torn or damaged notes for new replacements. The total amount of notes of emission #5 redeemed by 1766 was 11,695£<sub>VA</sub> which corroborates that emission #5 was for 12,000£<sub>VA</sub> as surmised above rather than for the 10,000£<sub>VA</sub> as stated by statutory law, see Table B2.

Table B6 also provides an estimate of the amounts of specie accumulated in note-redemption funds in the treasury over time. These numbers for 1755 through 1762 come from the amounts held to redeem emission #5. These numbers are adjusted by moving treasury account statements of said from early in a year to the prior year to account for when the action actually occurred. These amounts are likely an understatement as redemption taxes related to other emissions were likely being paid, but the treasury accounts do not provide enough information to create a sound estimate.

For 1763-1766, this estimate is based on forecasted tax receipts made in May of 1763. Subtracting estimated note redemption leaves a specie balance in the treasury. As these sums could not be used to redeem notes until the maturity date legislated, see Table B2, they are assumed to have accumulated into 1765-6. These numbers are likely biased high due to tax arrears. If it is assumed that tax arrears are of the same magnitude as the unknown sums accumulated before 1763, then the numbers for 1763-1766 are a reasonably accurate estimate. In 1761, the land tax levied to redeem notes was increased by 86 percent, and in 1758 the poll tax levied to redeem notes was increased by 300 percent.<sup>22</sup> These tax increases and the time it took to get citizens caught up on tax arrears caused by these sharp tax increases are consistent with a substantial accumulation of specie redemption funds in the treasury after 1762. How these accumulated funds were used figures into the John Robinson scandal discussed below.

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<sup>22</sup> Hening (1969, v. 6, pp. 461-81, 521-30; v. 7, pp. 9-25, 26-33, 46-54, 69-87, 163-9, 171-9, 255-65, 331-7, 347-58, 357-63, 493-502; v. 8, pp. 342-8, 493-503, 647-51).

The numbers for 1767-1772 are taken from the treasury accounts for these years. They were stated as the sums remaining on hand. They are assumed to be what is on hand for potential current note redemption. Therefore, these numbers are not added or accumulated from year to year. When stated early in the year, they are placed in the prior year to reflect when the action was actually executed.

The numbers for 1773-1775 are projected estimates based on the last treasury account from 1772. The estimate takes the taxes received for “old” notes in 1772, adjusted for a downward trend from 1769, and adds to that the taxes received for “new” notes. I assume the specie portion of these taxes was 20 percent. Thus, the total tax number is multiplied by 0.2 to get the specie funds available in the treasury for note redemption. These numbers are not added or accumulated over time as I assume that these sums were being used to redeem notes. This assumption is consistent with the fact that more notes are being redeemed and burned in these years than there are notes paid in as taxes.

### **Reassessing Aspects of the John Robinson Scandal**

John Robinson was the speaker of the *House of Burgesses* and treasurer of the colony from 1738 until his death 11 May 1766. The last years of his administration involved a financial scandal that occupied Virginia’s political and legal system for a half decade. It led to the separation of the speaker of the *House of Burgesses* from the office of treasurer. The scandal involved the diversion of funds out of the treasury, without direct authorization from the legislature, into loans to Robinson’s friends. The accounting made on 12 December 1766 indicates that Robinson diverted out of the treasury 95,828£<sub>VA</sub> in accumulated taxes received that were earmarked to redeem notes, 2,500£<sub>VA</sub> in notes in a fund reserved for the Commissioner on Indian Affairs, and 3,389£<sub>VA</sub> “on the public account”, for a total of 101,717£<sub>VA</sub>. Estimates of the

amounts of paper money in public circulation are affected by this diversion (Ernst 1973, pp. 174-96; Kennedy 1906a, pp. x-xxvi, 64-6; Mays 1952, pp. 174-208; Mays 1967, pp. 24-74).

Two issues involving this scandal are reassessed here. Were the funds diverted notes or specie and when did the diversion take place? Scholars have typically assumed these diverted funds were notes put back in circulation and the diversions began in the mid-1750s (Ernst 1973, pp. 188-96; Kennedy 1906a, p. x; Lee 1825, p. 22; Mays 1952, pp. 185-6). These claims turn out to be presumptions based on questionable logic. For example, Mays (1952, pp. 185-6) assumes the diverted funds were notes because he assumes there was no specie in the colony. Therefore, all taxes must have been paid in notes and so no specie funds could be in the treasury. As shown above, the treasury accounts indicate that 16 to 54 percent of note-redemption taxes were paid in specie. As such, a considerable accumulation of specie funds earmarked for future note redemption must have been building up in the treasury.

Ernst (1973, pp. 188-9) quotes Robert Carter Nicholas, the incoming treasurer after Robinson and an ardent anti-paper proponent, regarding the fund-diversion crisis that money “squeezed from the people for their taxes instead of being sunk at our Treasury as it ought to have been, was thrown back into circulation.” Even in this quote, it is unclear whether Nicholas means notes or specie being thrown back into circulation—though Ernst assumes it meant notes. Ernst points out that Nicholas’s conclusion was a deduction, not an observation. Nicholas reasoned that the only thing that could cause the exchange rate to deteriorate was too much paper money in circulation. Therefore, the diverted funds must have been notes put back in circulation. Ernst (1973, p. 189) concluded that “In Nicholas’s mind at least the theory of money had plainly triumphed over reality...” The exchange rate could have deteriorated just as easily due to the prospect of the non-redemption of notes due to the diversion of specie funds earmarked for note

redemption out of the treasury. Yet, Ernst (1973, pp. 193-5) seems to accept that the diverted funds were notes even though he cannot square that conclusion with his finding that the notes in circulation were not expanding, but were instead sharply contracting at that time.

No direct evidence from the period exists stating that these diverted funds were notes, except for the 2,500£<sub>VA</sub> in notes in a fund reserved for the Commissioner on Indian Affairs. A close reading of the primary sources and the secondary sources indicates that no one ever really says in what money the diverted funds were denominated. Ernst (1973, pp. 174-96) never quiet commits to or directly says in what money the diverted funds were denominated, though a less than careful reading could induce a leap to the conclusion that it was notes. In the letters of Edmund Pendleton, the executor of John Robinson's estate, no mention is ever made that the diverted funds were notes (Mays 1967). In the treasury accounts no mention is made in what money the diverted funds were denominated. In the primary evidence offered by Kennedy (1906a, pp. x-xxvi) no mention is made in what money the diverted funds were denominated.

The only direct statement that the diverted funds were notes, that I could find, is in the *Memoir of the Life of Richard Henry Lee* (Lee 1825, p. 22), "...he [John Robinson] had been induced to lend to many members of the House of Burgesses, the government bills which had been redeemed, and ought to have been destroyed." This statement was written in 1825 by Richard Henry Lee's grandson. It is not a memoir penned by Richard Henry Lee himself, nor is the above statement in the memoir ascribed to anyone. Its source is unknown. The hypothesis that it is just a long-after-the-fact supposition by a grandson cannot be rejected.

The diversion was likely concentrated in the last years of Robinson's tenure as treasure, from 1763 into 1766, and was not a long running activity dating back into the 1750s. The last meaningful treasury account in the *Journals of the House of Burgesses* before Robinson's death

was in May of 1763. It is fairly comprehensive (Kennedy 1907, pp. 177-8). By contrast, the next report in May of 1765 is relatively sketchy. The two most important note-redemption taxes were increased substantially just before 1763. The poll tax increased 300 percent in 1758 and the land tax by 86 percent in 1761.<sup>23</sup> Given the yearly tax collection cycle and the collection of tax arrears caused by the difficulty of immediately meeting these increased taxes, meant that the early 1760s likely saw a substantial increase in funds coming into the treasury, a portion of which would have been specie.

The treasury account of May 1763 indicates that sizable amounts of notes from emissions #6 through #12 were being paid in taxes and were burned in each year from 1760 into early 1763 (Kennedy 1907, pp. 177-8; Table B4). The treasury account was silent on the specie portion of the taxes collected—both on how much had accumulated and where it was. Notes received in tax payments before their end maturity were being burned, and in significant amounts. It is information on the specie portion of the tax payments that is missing.

Between 1763 and 1766, if the notes burned according to the forensic reconstruction of the treasury accounts in Table B4 are subtracted from the tax obligations slated for note redemption estimated in the treasury accounts, the difference would be the specie portion of the tax payments. That specie portion between 1763 and 1766 accumulates to 94,702£<sub>VA</sub>, see Table B6. By early 1766, Robinson had removed from the treasury 95,828£<sub>VA</sub> of accumulated taxes held for redemption of notes when said notes' circulation time was at an end, see Table B2. In 1766, it was recorded that only 2,218£<sub>VA</sub> was left in the treasury to pass on to the new treasurer after Robinson death (a sum to be used to redeem notes, thus this amount is assumed to be specie as notes could not redeem notes). The closeness of the 95,828£<sub>VA</sub> figure with what would have

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<sup>23</sup> Hening (1969, v. 6, pp. 461-81, 521-30; v. 7, pp. 9-25, 26-33, 46-54, 69-87, 163-9, 171-9, 255-65, 331-7, 347-58, 357-63, 493-502; v. 8, pp. 342-8, 493-503, 647-51).

accumulated in the treasury between 1763 and 1766, namely 94,702£<sub>VA</sub>, provides consistency for this interpretation, namely that the funds diverted by Robinson were primarily specie and tobacco monies, and that this diversion occurred primarily in 1763-1766.

Finally, a fund diversion of 95,828£<sub>VA</sub> in notes cannot be made consist with any of the statements in the later treasury accounts, those made after Robinson's death, regarding total notes in circulation. The only way they could be made consistent would be if there existed an unprecedented, massive, un-documented, and un-commented on redemption of notes in the early to mid-1760s in excess of that already mentioned in the treasury accounts. This inconsistency, in a forensic accounting sense, implies that the funds diverted were unlikely to be notes. Lastly, both Brock (1992, p. 116) and Ernst (1972, p. 370) must have implicitly or unknowingly assumed that the diverted funds were specie and not notes. The forensic accounting reconstruction of how they derived the amount of notes in circulation cannot yield their outcomes unless the assumption is made that the diverted funds were not notes.