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Gold, Silver, and Grain

Money and Prices in the Book of Mormon

Shinji Takagi

In this paper, I discuss, from the perspective of a monetary economist, the operational aspects of the system of fixed prices for gold, silver, and all kinds of grain described in the Book of Mormon (Alma 11:3–19), based on internal evidence, economic logic, and historical precedents from antiquity. Previous authors have noted several unique features of the Nephite system, which was purportedly created by king Mosiah in the early first century BC. For example, John Welch, approaching the system strictly as one of weights and measures, argued that, in this otherwise binary system (in which denomination increases by a multiple of 2), the addition of nonbinary denominations (antion for 1.5; limnah and onti for 7) facilitated dealings in fractional weights.¹ Richard Smith, approaching the Nephite 1-2-4-7 system as one of coinage, noted its efficiency in terms of economizing on the number of coins required for a purchase.² Irrespective of the intrinsic merits of such arguments,³

1. Welch also explored the etymology of some of the denominational names, finding their possible roots in Akkadian, Assyrian, Egyptian, and Hebrew, with appropriate meanings. John W. Welch, “Weighing and Measuring in the Worlds of the Book of Mormon,” *Journal of Book of Mormon Studies* 8, no. 2 (1999): 41–44.

2. Smith further observed that the same numerical system was used for a common type of punched card. Richard Pearson Smith, “The Nephite Monetary System,” *Improvement Era* 57, no. 5 (1954): 316–17.

3. My own speculation is that the addition of limnah (senine \times 7) and onti (senum \times 7) was a response to the need to create a standard small-denomination loan contract in which annual interest was 14.3 percent (a large-denomination loan contract whose interest payment exceeded the smallest denomination coin did not necessarily require a special coin). The interest rate of 14.3 percent is in line with what is well attested in known

for the purposes of this paper, I instead focus more on how the system might have worked in practice.

An aspect of how the system may have worked relates to whether it involved coinage. The extant Latter-day Saint literature has reached a consensus, not by examination but by assertion, that no coinage was involved because it is supposed that coinage was unknown during Lehi's lifetime.⁴ In part motivated by a desire to preempt a potential accusation of anachronism, the consensus view has held that the reference to precious metals in Alma 11 is a description of weighted but uncoined metals and that the word "coinage" in the chapter heading was not part of the original text of the Book of Mormon. The Church of Jesus Christ of Latter-day Saints evidently accepted this argument and subsequently replaced the heading "Nephite coinage" in the 1981 edition with "The Nephite monetary system" in the current online and print editions. I will argue that such a change was not warranted. It is extremely unlikely that coinage was unknown in Lehi's time; even if it had been unknown, it would not follow that something akin to coinage did not develop over the first four centuries of Nephite civilization.

Another aspect of how the system might have worked relates to the economic viability of a system in which the relative prices of gold, silver, and all kinds of grain are fixed. There cannot be any disagreement that such a system would not work in a capitalistic, market economy. A centrally planned economy, with pervasive government intervention, might

ancient economies. For example, typical "landed" (as opposed to maritime) loans carried an interest rate of 12 percent in Classical Greece, while the legal maximum in early Imperial Rome was also 12 percent (though interest rates varied in practice). Léopold Migeotte, *The Economy of the Greek Cities: From the Archaic Period to the Early Roman Empire* (Berkeley: University of California Press, 2009), 126; Alain Bresson, *The Making of the Ancient Greek Economy: Institutions, Markets, and Growth in the City-States* (Princeton, N.J.: Princeton University Press, 2016), 279; Peter Temin, *The Roman Market Economy* (Princeton, N.J.: Princeton University Press, 2013), 170. I maintain the view that the primitive nature of legal institutions probably did not support a contract much longer than a year, especially for small-denomination personal loans. For the basis of this conjecture, see Shinji Takagi, "Fostering Capital Markets in a Bank-Based Financial System: A Review of Major Conceptual Issues," *Asian Development Review* 19, no. 1 (2002): 68–99.

4. Most of this literature is apologetic. See, for example, Steven Danderson, "Nephite Money and 'Coinage,'" FAIR, January 17, 2008, <https://www.fairmormon.org/blog/2008/01/17/nephite-money-and-coinage>; Michael R. Ash, interview by Julianne Dehlin Hatton on *Of Faith and Reason: 80 Evidences Supporting the Prophet Joseph Smith*, FAIR, March 1, 2015, <https://www.fairmormon.org/blog/2015/03/01/faith-and-reason-40-nephite-money-2>; and "Money and the Book of Mormon," FAIR Answers Wiki, https://www.fairmormon.org/answers/Book_of_Mormon/Money.

be able to operate such a system for a while, but distortions will inevitably emerge as economic agents find it against their nature to give up willingly what, in their estimation, is more valuable for what is less. Economic anthropologists may argue that ancients did not have the same profit motives as their contemporary counterparts, but, as the following discussion will demonstrate, recent scholarship has all but refuted such a characterization of ancient economies. Irrespective of any short-term viability, a system of fixed prices across a group of goods could not have persisted for a long time. I will argue below that the Nephite system can best be described not as an economic institution, but as an accounting framework in which agricultural products were assessed for tax, census, or other administrative purposes.

Finally, the fixed relative price of gold and silver must be evaluated separately. The monetary use of two metals was the dominant standard from antiquity to the early nineteenth century AD (when Britain adopted the gold standard), including in the United States of the early nineteenth century where Joseph Smith lived. The Nephite system is therefore in line with historical experience. What is unique was the fixed “parity” (or “mint ratio”) between gold and silver. Rarely do we find in ancient societies a bimetallic standard in which the mint ratio was fixed. When the mint ratio is fixed, the simultaneous use of two metals as money becomes highly unstable because the market price is bound to move away from the fixed parity. If, for example, the market price of gold increases relative to silver, gold becomes undervalued as money, and it may either go out of circulation (a phenomenon known as Gresham’s Law) or circulate at a premium over silver. Debasement of gold has historically been the most common response to such a situation. I will argue that Nephite bimetallicism probably did not last very long while at the same time exploring conditions under which such a monetary standard may have been more durable.

The rest of the paper is organized as follows. Section I addresses the question of whether coinage was known during Lehi’s lifetime. Section II considers the question of whether the Nephite system of weights (used for gold and silver) was unitary or double, while section III assesses whether the Nephite metallic weights were small enough to be carried by hand. Sections IV and V move to the question of how the Nephite system might have worked in practice, focusing, respectively, on the system of fixed prices for precious metals and various kinds of grain and on the bimetallic monetary standard based on the use of gold and silver. Finally, section VI presents a conclusion.

I. Was Coinage Known in Lehi's Time?

The investigation of whether coinage was known in Lehi's time (that is, the seventh century BC) must be informed by the following two considerations. First, the English word *coin* and its contemporary foreign equivalents are of relatively recent origin⁵ and do not have counterparts in ancient languages, including biblical Hebrew, classical Greek, and Latin.⁶ It would therefore be an anachronism indeed to find the word *coin* in the Book of Mormon, but no anachronism would be present even if we find a reference to coin-like money, because what we now call coins were used in antiquity. Second, an economist would define coinage differently than might a numismatist. To an economist, any state-authenticated metallic object that is standardized in weight and whose value is determined by counting (as opposed to weighing) would qualify as a coin. For this metallic object to meet the numismatist's definition, however, it may have to go further. Typically, the numismatist would consider an *ancient* coin to be flat and roundish, generally produced by a process of striking with a die placed or hammered forcefully on either side.⁷ It is according to this numismatic definition that most history books date the invention of coinage to the mid-to-late seventh century BC, when coins were first struck in Lydia in western Asia Minor. According to this narrative, coinage then quickly spread throughout the Aegean from the early sixth century BC and then to the Persian Empire.⁸ The supposition that coins were likely unknown to Lehi is based on this standard narrative of Western numismatic history.

Such a narrative does not sufficiently acknowledge the invention of coinage in China, which had likely predated the Lydian invention, possibly by hundreds of years. To be sure, ancient Chinese coins were not struck but cast (in a mold) and used almost exclusively base metals (such as bronze, copper, or even iron). Neither did they use royal inscriptions, which makes it difficult to date them. This explains why a wide range

5. According to the Merriam-Webster dictionary, the English noun "coin" (with a meaning of corner, cornerstone, quoin) is not attested before the fourteenth century AD.

6. The Hebrew word (קֶנֶס) and the Greek word (ἀργύριον) that are typically translated as money in English simply meant silver without specifying whether it was coined. Likewise, *argentum* (also in the sense of silver), *pecunia* (property or wealth), and *moneta* were Latin words meaning money without specifying whether it was coined.

7. Peter Thonemann, *The Hellenistic World: Using Coins as Sources* (Cambridge: Cambridge University Press, 2015), 199–200.

8. Glyn Davies, *A History of Money*, 3rd ed. (Cardiff: University of Wales Press, 2002), 64–65.

of dates has been suggested for the invention of coinage in China, from the seventh century BC (roughly contemporaneous with the Anatolian invention) to the twelfth century BC. A virtual scholarly consensus appears to be that, in any case, China was the first civilization to use coins.⁹ The ancient world was connected through trade and migration, making it difficult to believe that the *numismatic* idea of coinage did not spread to the rest of the world for hundreds of years. But the *economic* idea of coinage may have developed even earlier.

Miriam Balmuth conceptualizes the invention of coinage as a natural merging of two ancient conventions. First, metal by weight had been used in the ancient Mediterranean and Near East, both as a means of payment and as a store of value, going back perhaps to the second or third millennium BC. It is not difficult to imagine that, at some point, smaller, more standardized pieces began to appear as money, though they were still weighed on each occasion. In ancient Israel, for example, there was common use of pieces of silver of equal size even during the pre-exilic period.¹⁰ Second, stone seals had long been used as a means of making marks of identification. When such seals were applied to metallic pieces serving as money, coinage was born. According to Balmuth, an eighth-century BC cash hoard has been found in northern Syria, containing silver bullion, silver ingots, and silver discs inscribed in Aramaic with the name of a local magistrate.¹¹ The appearance of such stamped ingots in Babylonia (silver) and Assyria (lead) might have been even earlier, in the late third and the late second millennium BC, respectively.¹²

Authentication of weight (or monetary value) is what makes a coin. In a world of metallic money circulating at (close to) intrinsic value, the authentication of weight must be credible if a piece of metal is to pass as a coin. Weight might credibly be authenticated, to varying degrees, by a royal palace, a religious sanctuary, or even a merchant of wealth and renown. Understandably, the most common certifier in antiquity was a sovereign or a polis. Coins issued under such authority generally did

9. Davies, *History of Money*, 56–57.

10. Paul Einzig, *Primitive Money: In Its Ethnological, Historical, and Economic Aspects* (London: Eyre and Spottiswoode, 1951), 222. Coinage was formally introduced after the return of the Jews from the captivity (537 BC).

11. Miriam S. Balmuth, “The Critical Moment: The Transition from Currency to Coinage in the Eastern Mediterranean,” *World Archaeology* 6, no. 3 (February 1975): 293–97. See also Sidney Smith, “A Pre-Greek Coinage in the Near East?” *The Numismatic Chronicle and Journal of the Royal Numismatic Society* 2 (1922): 176.

12. Einzig, *Primitive Money*, 212–15.

not circulate beyond the issuer's own borders because its credibility usually did not travel very far. Conversely, any coin could circulate freely within the issuer's own borders as legal tender at the specified value by decree or fiat. In some cases, a sovereign or a polis could develop sufficient credibility to give its coins wider acceptance. In the classical period of Greek history, the Athenian tetradrachm (known as the "Owl") circulated throughout the Aegean and beyond, because the Athenian mint had established the reputation of its coinage as being of consistent weight and exceptional fineness.

These considerations suggest that all coins—even metallic ones circulating at intrinsic value—are fundamentally fiduciary.¹³ Metallic monetary pieces become coins when they are used in commercial transaction by counting, and not by weighing, by virtue of the credibility of the authentication by the issuer. Weight matters only to the extent that it helps establish that credibility, but coins' metallic content is always less than their notional metallic value (for example, in fifth-century BC Athens, the difference was on average about 5 percent). The difference, necessary given the costs of production and the need to accommodate measuring error, incidental variation, and the like, represents the fiduciary value of the coin.¹⁴ If the Nephite economy indeed possessed coinage, whatever type it may have been, it implies the existence of a credible government capable of governing its own territory.

II. Was the Nephite Weight Standard Unitary?

In considering ancient metallic money, it is important to understand that its weight simultaneously carried the function of a denomination. For example, a drachm (a weight denomination widely used throughout

13. The fiduciary nature of coinage is well illustrated by the very first coins struck in Asia Minor, the electrum coins of Lydia. Electrum is an alloy of gold and silver, which existed in abundance in that part of the world. Because the proportions of gold and silver varied in the natural alloy (as well as in the coins), and the proportions could not easily be ascertained, these coins could not have circulated at metallic value. The only way to ensure their acceptance as money under these circumstances was for the sovereign to certify their value. Remarkably, but also understandably, these coins were in fact diluted with additional silver in the minting process to make sure that their metallic value remained well below their notional value. The highly fiduciary nature of electrum coins generally limited the geographical area of their circulation to the boundaries of the issuer. Robert W. Wallace, "The Origin of Electrum Coinage," *American Journal of Archaeology* 91, no. 3 (1987): 385–95. See also Thomas Figueira, *The Power of Money: Coinage and Politics in the Athenian Empire* (Philadelphia: University of Pennsylvania Press, 1998), 93–96.

14. Figueira, *Power of Money*, 25, 242–43.

the Aegean) was a weight of about 4.3 grams, but it was also a denomination—the price of a clay jar might be expressed as two gold drachms or equivalently (at the market ratio of 14:1) 28 silver drachms, requiring the buyer to hand over to the seller a right combination of coins to make up that value (for example, two gold drachm coins; seven silver tetradrachm coins). This was quite different from how prices are quoted in contemporary economies. For example, the dollar is an abstract unit of account and does not serve as money; it is only the unit with which the values of monetary instruments (for example, demand deposits, stocks, bonds, electronic transfers) are expressed. Hence, a gold dollar is equivalent to a silver dollar (because the dollar is not a weight, but a unit of account). Anciently, the unit of account function did not exist separately from the other functions of a monetary instrument, though it is important for us to make a conceptual separation between them.

In the Nephite system, it appears as though, unlike the situation in ancient Greece (that is, a drachm was used for both gold and silver), gold and silver carried separate denominational names. For example, Alma 11:3 seems to imply that a senine was a gold denomination and a gold weight; and a senum was a silver denomination and a silver weight of equivalent value. Are we then to understand, as the extant LDS literature implicitly assumes,¹⁵ that gold and silver were on different weight scales? This is not necessarily the case for two reasons. First, gold was likely much more valuable than silver, so the silver weights were much heavier than the gold weights. That is to say, the value of a senum of gold was a multiple of a senum of silver, and a senum of gold was therefore too valuable to circulate, at least for everyday transactions. This made the senum practically the exclusive weight for silver. In this interpretation, certain denominational names appear only for gold (or silver), not because they are weights specific to gold (or silver), but because they are lighter (or heavier) weights typically used for gold (or silver). Second, alternatively, gold and silver might have earlier been on different scales, but the fixed mint ratio virtually dictates that they were now on the same weight scale (or, at least, gold and silver denominations could be placed on the same scale). Mosiah's reform, by fixing the mint ratio, may have unified the weight standard for gold and silver, as Welch seems to intimate.¹⁶

15. Robert F. Smith, "Table of Relative Values," *Journal of Book of Mormon Studies* 8, no. 2 (1999): 46.

16. Welch's point is more general. By observing the changing standards of the previous generations, he argues that Mosiah brought stability to "this fluid condition" through standardization. Welch, "Weighing and Measuring," 39–40.

A standard of weights and measures need not be unitary to be viable. The United States is a prosperous economy in which (at least) two incompatible systems, imperial and metric, are used simultaneously. In fact, it was quite common in ancient societies to employ multiple standards. In ancient Israel, for example, there were no fewer than three weight systems in concurrent use, including the Egyptian system, the Babylonian system, and a binary system (in which denomination increases by a multiple of 2) that may have originated in the Aegean.¹⁷ In fourth-century BC Macedonia, under Philip II, gold and silver were on two separate weight standards (it was Alexander the Great who unified the standard for both gold and silver).¹⁸ During the Hellenistic period, a number of polities issued coinage for domestic circulation and for international commerce on separate standards.¹⁹ Not only were there multiple standards in concurrent use, but standards could also change from time to time, for political and economic reasons. Several poleis abandoned the Attic standard, for example, when the Athenian empire collapsed; Philip II switched to the Corinthian standard in part because it was adopted by the Chalcidian League.²⁰

Ease of exchange appears to be the dominant economic reason when it comes to the adoption of multiple standards for coinage.²¹ If the gold-silver ratio was an integer, a unitary standard might work perfectly (a gold coin could be easily divisible into an integer number of silver coins). But if the gold-silver ratio involved a fraction, having multiple standards could under certain situations facilitate an exchange of silver coinage for gold. For example, if the gold-silver ratio was $13\frac{1}{3}:1$, the number of silver drachms exchangeable for a gold stater would be $26\frac{2}{3}$

17. David Hendin, "Current Viewpoints on Ancient Jewish Coinage: A Bibliographic Essay," *Currents in Biblical Research* 11, no. 2 (2013): 247.

18. James A. Schell, "Observations on the Metrology of the Precious Metal Coinage of Philip II of Macedon: The 'Thraco-Macedonian' Standard or the Corinthian Standard?" *American Journal of Numismatics* 12 (2000): 1–2, 7.

19. S. Kremydi, "Coinage and Finance," in *Brill's Companion to Ancient Macedon: Studies in the Archaeology and History of Macedon, 650 BC–300 AD*, ed. Robin J. Lane Fox (Leiden: Brill, 2011), 162–63.

20. Schell, "Observations," 2.

21. For large-value transactions involving different coinages, the choice of standards made little difference. Traders and merchants knew very well their relative values, and it was only a matter of exchanging one type of coin for another through money changers upon payment of a commission. Hoard evidence suggests that coins of various weight standards in reality circulated freely throughout the ancient world. Sitta von Reden, *Money in Classical Antiquity* (Cambridge: Cambridge University Press, 2010), 67.

if both were on the same Attic standard; the same Attic gold coin would exchange for an even 8 silver pentadrachms if silver was on the Corinthian standard. But if the gold-silver ratio declined to 12:1, it would make more sense to place both gold and silver coinages on the Attic standard, because that would make a gold stater equal to an even 6 tetradrachms.²² In like manner, the Nephites too must have altered their weights and measures “according to the minds and the circumstances of the people, in every generation” (Alma 11:4).

If we assume that the weight standard was unitary, it becomes straightforward to reconstruct the Nephite weight scale (table 1, columns 1 and 2). Here, I have additionally assumed that the gold denominations (senine, seon, shum) were on the lower end, and the silver denominations (senum, annor, ezrom) were on the higher end, of the relevant weight scale, given the likely higher value of gold per weight; Leah, shiblum, and shiblon were fractional silver denominations; denominations were continuous, unbroken, and exhaustive on the relevant range of the scale; and the system was binary (that is, denomination increased by a multiple of 2), except for the add-on, nonbinary denominations (antion, limnah, and onti), at least over this range. A remarkable revelation from this exercise is that the implied gold-silver mint ratio of 16:1 falls within the well-attested range observed during much of the several millennia of recorded human history: 13½:1 (Persia) and 14:1–10:1 (Aegean), 7th–5th centuries BC;²³ 12:1 (Rome), 1st–3rd centuries AD;²⁴ 10.5:1–12.3:1 (Japan), early 16th to early 18th centuries AD;²⁵ and 16:1–15:1 (United States), 19th century AD.²⁶

22. Schell, “Observations,” 6–7.

23. Davies, *History of Money*, 85; Wesley E. Thompson, “Gold and Silver Ratios at Athens during the Fifth Century,” *The Numismatic Chronicle and Journal of the Royal Numismatic Society*, 7th ser., 4 (1964): 103, 105.

24. Dominic Rathbone, “Earnings and Costs: Living Standards and the Roman Economy (First to Third Centuries AD),” in *Quantifying the Roman Economy: Methods and Problems*, ed. Alan Bowman and Andrew Wilson (New York: Oxford University Press, 2009), 302.

25. That is, prior to the opening of the country in 1859. Teruaki Fujii, “Kin-gin Kahei Sosei to Kōkan Sōba kara Suiteishita Edoki no Kahei Sozai Jikin Kakaku,” *Ōsaka Shiritsu Daigaku Keiei Kenkyū* 68, no. 4 (2018): 39.

26. Milton Friedman, “Bimetallism Revisited,” *Journal of Economic Perspectives* 4, no. 4 (1990): 86, 88. The range of 16:1–15:1 reflects the considerably expanded stock of silver since the discovery of America, at which time the ratio was about 11:1. Francis A. Walker, *International Bimetallism* (New York: Henry Holt, 1897), 55–56.

**Table 1. The Nephite Binary Metallic Weight Scale
(With the implied gold-silver mint ratio of 16:1)**

Denominations	In units of senine	Hypothetical notional weights (in grams)			Silver weights in gold equivalents, where relevant
		Gold senine as equivalent in weight to Attic one-twelfth stater	Silver senum as equivalent in weight to Attic tetradrachm	Silver senum as equivalent in weight to Persian siglos	
Senine	1	0.72	1.1	0.3	
Seon (=Leah)	2	1.4	2.2	0.7	
Shum (=Shiblum)	4	2.9	4.3	1.4	
Shiblon	8	5.8	8.6	2.7	
Senum	16	11.5	17.2	5.4	Senine
Amnor	32	23.0	34.4	10.8	Seon
Ezrom	64	46.1	68.8	21.6	Shum
<i>Memorandum: nonbinary, add-on denominations</i>					
Antion	1.5	1.1	1.6	0.5	
Limnah	7	5.0	7.5	2.4	
Onti	112	80.6	120.4	37.8	Limnah

Note: Weights are all approximate, given as an illustration. They are hypothetically constructed by assuming alternatively that (1) the smallest gold coin (senine) is similar in function and weight to the Attic one-twelfth stater and (2) the silver senum is the standard coinage similar in function and weight to either the Attic tetradrachm or the Persian siglos.

Source: Author's conjecture based on Alma 11:3–19.

III. Did the Nephites Have Coinage?

In this section, I address the question of whether the Nephites used coinage by considering, rather convolutedly, whether at least some of the metallic weights mentioned were light enough to be carried by hand, irrespective of their shape or inscriptional features. To do so, I make a series of conjectures, starting with where on the weight scale the metallic weights of Alma 11 may have been located. In the ancient Near East, going back to the late Bronze Age, the largest weight denomination was known as the talent, which, while differing somewhat from place to place, roughly amounted to 28–30 kg, the maximum load an adult male could carry.²⁷ If we assume that the Nephites inherited a similar convention, it would be untenable to argue that the metallic weights in Alma 11 were located on the higher end of the weight scale. To do so would imply that those weights were not fine enough to be useful for most human activities (for example, the scale from *senine* to *ezrom* might then correspond to 0.469, 0.938, 1.875, 3.75, 7.5, 15, 30 kg).²⁸

Moreover, if the *ezrom* was the equivalent of the talent, why did the Nephites invent the *onti*, which is heavier by 1.75 times? On the other hand, if the *onti* was the equivalent of the talent, the whole binary system would break down. Further, if the *ezrom* or the *onti* was the largest denomination, the smallest weight would have been 234–469 grams for gold, and 469–938 grams for silver. At the recent prices of around \$60 and \$1 per gram, these would be now worth \$14,040–\$28,140 and \$469–\$938, respectively. Irrespective of Nephite society's prevailing wage, income, or price level, these weights, even as ingots, were likely too large a denomination, not just for everyday transactions but also for high-value transactions. The only reasonable conclusion is that the metallic weights described in Alma 11 represented the lower end of the scale. Binary denominational progression likely applied only to this range.²⁹

27. Hendin, "Current Viewpoints," 247.

28. We could make a less extreme argument by replacing the talent with the mina, the next largest weight denomination of about 500 g. Weight progression on an upper range, for example, from 125 g to 250 g, and then to 500 g, is again not very useful for most human activities.

29. This conjecture is based on the widely observed ancient convention in the Near East where the talent was divided into 60 minae, and the mina into 60 shekels. It is possible that the Nephite scale was formally sexagesimal and that the weight denominations in Alma 11 were the conventional names for metallic money and used only for convenience (for example, dime or penny for U.S. coinage). Binary denominational progression makes sense only for lighter weights.

What might have been the actual weights of these metallic pieces? If we assume that ancients shared similar lifestyles and technologies, in my view, we can think of two possible approaches to anchoring the range of the weights. First, ancient technology and the intrinsic value of gold likely dictated the size of the smallest gold coin, in this case, the gold *senine*. In ancient Greece, even though the precise weight differed from polis to polis depending on the particular standard in use, the smallest gold coin in the fourth century BC was not far different from the Attic one-twelfth stater of about 0.72 g. Any smaller coin, even if technically feasible, would have been impractical, given the risk of loss. Second, given that anything below the *senum* was likely a fractional weight, we may consider the *senum* as the standard silver coin, similar in function and weight to the Attic tetradrachm (about 17.2 g) or the Persian siglos (about 5.4 g), two of the most widely circulating coinages for international trade in antiquity.³⁰ Whichever coinage we use as the benchmark, we come up with a broadly similar order of magnitude for the metallic weights (see table 1, columns 3, 4, and 5). If this exercise is accepted as valid, the six *onties* of silver Zeezrom offered to tempt Amulek to deny the existence of a Supreme Being in the Book of Mormon (Alma 11:22) weighed something like 225–720 grams (approximately 0.5–1.6 pounds), not an implausible quantity under such circumstances.

These conjectures would lead to a further conjecture on which of these metallic weights represented circulating coinage (table 2). From this table, silver *annor*, *ezron*, and *onti* denominations are excluded because, weighing up to 120 g, they were probably too heavy to be circulating widely (by comparison, the U.S. quarter weighs 5.67 grams; the U.S. nickel 5 grams; the U.S. dime 2.268 grams). The *ezron* and the *onti* may well have been denominations for ingots used mainly to store value. Rather, larger-value transactions were the domain of lighter gold coinage. It is well attested in the ancient Near East that, even after the invention of coinage, heavier bullion continued to be used side by side with lighter coinage.³¹

30. In ancient Athens, a silver tetradrachm was sufficient to support a man for twelve days. According to Alma 11:3, a judge was paid one *senum* of silver for one day of work. If the rough equivalence of the tetradrachm and the *senum* is accepted, this was not an unreasonable sum of money a professional might make in a day. See chapter 1, “The King’s Money,” in Alfred R. Bellinger, *Essays on the Coinage of Alexander the Great* (New York: American Numismatic Society, 1963).

31. Von Reden, *Money in Classical Antiquity*, 22.



Reverse of a silver tetradrachm, commonly known as the “Owl,” from Athens, ca. 480–420 BC. Weighing about 17.2 g, it widely circulated throughout the Aegean and beyond. “Tetradrachm Athens 480–420 BC MBA Lyon” by Jastrow, https://commons.wikimedia.org/wiki/File:Tetradrachm_Athens_480-420BC_MBA_Lyon.jpg, licensed under Creative Commons Attribution 2.5 Generic license. Desaturated and background removed.



Persian silver siglos. Initially weighing about 5.4 g, the weight was later increased to about 5.6 g. It mainly circulated in Asia Minor. “PERSIA, Achaemenid Empire. temp. Darios I. Circa 520–505 BC,” by Classical Numismatic Group, Inc., [https://commons.wikimedia.org/wiki/File:PERSIA_Achaemenid_Empire. temp. Darios I. Circa 520–505 BC.jpg](https://commons.wikimedia.org/wiki/File:PERSIA_Achaemenid_Empire_temp_Darios_I_Circa_520-505_BC.jpg), licensed under Creative Commons Attribution-Share Alike 3.0 Unported license. Desaturated.

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Table 2. Circulating Nephite Coinage

Denominations	Illustrative weights (in grams)	Values in units of senine/senum
<i>Gold</i>	<i>Silver</i>	
Leah	0.7–2.2	$\frac{1}{8}$
Shiblum	1.4–4.3	$\frac{1}{4}$
Shiblon	2.7–8.6	$\frac{1}{2}$
Senine	Senum	0.3–1.1 (gold) 5.4–17.2 (silver)
1		
Antion	0.5–1.6	$\frac{1}{12}$
Seon	0.7–2.2	$\frac{1}{6}$
Shum	1.4–4.3	$\frac{1}{3}$
Limnah	2.4–7.5	$\frac{1}{2}$

Source: author’s conjecture based on Alma 11:3–19.

On the other hand, the weights on the lower end (such as the senine and the leah), likely weighing around or less than 2 g, were clearly meant to be carried by hand. The Book of Mormon, describing the possessions people carried with them as they traveled, mentions “all their grain of every kind, and their gold, and their silver, and all their precious things” (3 Ne. 6:2). If by precious things are meant jewelries, bullion, and ingots, gold and silver must mean coinage, suggesting that coinage was held commonly, if not widely, among households. Further, the 1-2-4-7 system itself implies that gold and silver were exchanged by counting, not by weighing. Use of bullion and ingots as money would not have required a special provision for dealing with fractional weights or economizing on the number of pieces to be used. It is then unreasonable not to designate such small metallic pieces of uniform weight as coins.

IV. How Did Fixed Prices for Grain Work?

Alma 11:7 describes an unusual feature of the Nephite system in which a weight of precious metal was set equal in value to a measure of every kind of grain. That is to say, the monetary values of all sorts of grain, perhaps including wheat, barley, and corn, were somehow fixed by decree. As strange as such a system may appear to contemporary readers, it is well attested that ancient societies often instituted an accounting system in which the valuation of typically grain, but also cattle, was fixed in relation to a weight of metal. Welch mentions the law code of Mesopotamia (Eshmunna) in the early second millennium BC, in which one kor of barley was set equal to one shekel of silver.³² There are many other examples. Under Hittite law, the price of a plough ox was set at 12 shekels of silver. In ancient Egypt, a worker’s monthly wage was 5½ sacks of cereal or 11 debens of copper,³³ and an ox was purchased for 120 debens of copper.³⁴ In ancient Athens, several laws ascribed to Solon in the early sixth century BC contained a provision under which one medimnos of grain was set equivalent to one sheep or one drachma of silver.³⁵

The prominence given to grain in Alma 11 is in line with ancient practice. At least from the third millennium BC, metal and grain both served side by side as a medium of exchange and as a unit of account. Paul Einzig, observing that the Babylonians defined the shekel weight

32. Welch, “Weighing and Measuring,” 41.

33. Hendin, “Current Viewpoints,” 248.

34. Einzig, *Primitive Money*, 203, 206.

35. Von Reden, *Money in Classical Antiquity*, 37.

of silver as 180 grains of barley, speculated that barley might have preceded silver as money.³⁶ Copper, gold, and silver were long used as units of account, for sure, but some scholars question if they were used as widely as media of exchange. Far more common as monetary media was grain, even after the introduction of coinage, including in first millennium AD Southeast Asia where rice served such a role.³⁷ In ancient Babylon and Egypt, the monetary role of grain derived from the centralization of grain harvest in state granaries, and banking involved taking grain as deposits and using deposit receipts to make payments to third parties.³⁸ It is likely that Nephite society was highly agrarian, and similar granaries possibly existed as the royal treasury to store grain collected as tax.

That such a system was attested in antiquity is one thing, but how such a system might have operated is a different matter. One does not have to be an economist to wonder how the government could fix the prices of all goods against each other and expect the economy to function at all. A centrally planned economy under an autocratic government may be able to maintain fixed prices with a threat of penalty. During the twentieth century, the socialist experiment by the Soviet Union and its satellite states seemed to work for some time but eventually failed. If a system of administered prices deviates (as it inevitably does) from what is dictated by society's preferences and technology, distortions begin to develop until the system collapses—as it fails to deliver what people want to buy in the desired quantities. A system of fixed prices cannot be a viable economic institution in the long run.

A group of economic anthropologists, known as substantivists, may object to such a neoclassical view of the possible working of administered prices in primitive societies by appealing to the importance of social institutions (such as status and customs) in determining economic behavior. Substantivism was first articulated in its current form by Karl Polanyi in 1944³⁹ as a reaction to the formalist position that had

36. Einzig, *Primitive Money*, 211.

37. Robert Wicks speculates that “rice, or some other uniform commodity” was used as an everyday medium of exchange in the marketplace, with silver and gold coinages reserved for large-value ritualistic purposes, in the ninth-century Java. Robert S. Wicks, “Monetary Developments in Java between the Ninth and Sixteenth Centuries: A Numismatic Perspective,” *Indonesia* 42 (1986): 64–65.

38. Davies, *History of Money*, 52, 54; Einzig, *Primitive Money*, 209–10, 214.

39. Karl Polanyi, *The Great Transformation: The Political and Economic Origins of Our Time* (New York: Farrar and Rinehart, 1944), 43, 46, 58.

become the dominant paradigm of the first half of the twentieth century; it was then eloquently advanced by Moses Finley in his seminal 1973 work, *The Ancient Economy*.⁴⁰ The formalist position considers that ancient economies can be approached in essentially the same way as modern economies, with the analytical tools of modern economics. In contrast, the substantivist position, based largely on literary (and not material) evidence, considers ancient economies to be primitive in their operations, lacking functioning markets, work incentives, and profit motives.⁴¹ Since economic behavior was embedded in social conventions, they might claim that, in our context, ancients would be perfectly willing to live with prices determined by their monarch, magistrate, or tribal leader.

While substantivism must contain some element of truth, recent scholarship in economic history and classical studies, supported by increasing archaeological and other scientific evidence, has virtually refuted the notion that functioning markets and profit motives were absent in ancient economies. For the Near East, for example, against the substantivist view that trade was entirely conducted by the state at fixed prices and private-sector activity was almost nonexistent, Assyriologists have found trade to be a private affair, aimed at private profits; the role of private enterprise was especially relevant during the Middle Bronze Age.⁴² The Book of Mormon itself describes the activities of the people in the late first century BC as enjoying “free intercourse one with another, to buy and to sell, and to get gain, according to their desire” (Hel. 6:8), while attesting to the presence of “many merchants in the land” who evidently were boasting of “their exceedingly great riches” (3 Ne. 6:10–11). And, as a result of great prosperity, the people began to

40. Moses I. Finley, *The Ancient Economy* (Berkeley: University of California Press, 1973), 34, 50, 60–61.

41. For an analytical overview of the formalist-substantive controversy, see David Kaplan, “The Formalist-Substantive Controversy in Economic Anthropology: Reflections on Its Wider Implications,” *Southwestern Journal of Anthropology* 24, no. 3 (1968): 228–51; J. I. Pratts, “Synthesis, or a New Problematic in Economic Anthropology,” *Theory and Society* 11, no. 2 (1982): 205–28.

42. Mario Liverani, “The Near East: The Bronze Age,” in *The Ancient Economy: Evidence and Models*, ed. J. G. Manning and Ian Morris (Stanford: Stanford University Press, 2005), 52–53. For ancient Rome, see, for example, Alan Bowman and Andrew Wilson, eds., *Quantifying the Roman Economy: Methods and Problems* (New York: Oxford University Press, 2009); and Temin, *Roman Market Economy*. For ancient Greece, see, for example, Bresson, *Making of the Ancient Greek Economy*.

“set their hearts upon their riches . . . [and] to seek to get gain” (Hel. 6:17; see also 3 Ne. 6:15).

The nature of the Nephite system of fixed prices may be surmised from the fact that quality considerations played no role: a measure of one kind of grain was set equal to the same measure of another kind of grain. This indicates that exchange was not the system’s purpose. The system was likely meant to assign a legal or accounting value to agricultural products. The function of monetary values in such a system is not unlike that of monetary values assigned to wrongful acts by casuistic laws in the Covenant Code—for example, thirty shekels of silver for a manservant or a maidservant accidentally killed by an ox (Ex. 21:32). Obviously, the purpose of such a code could not have been to stipulate the prices at which market transactions in slaves should take place.⁴³ A male slave and a female slave (irrespective of their gender, age, health condition, physical strength, or intellectual capacity) command the same value in the Covenant Code, just as a measure of barley had the same value as the same measure of wheat in the Nephite system; barley is barley, whether the quality is high or low. It must be clear that the system was not meant to perform the economic function of allocating scarce resources among competing ends.

What was the purpose of such a system, if not economic? A number of possibilities can be inferred from ancient precedents. Welch, speaking of the laws of Eshmunna, states that one of the motives was to “set the penalties for damages or the daily rates for renting different means of transport” and perhaps also to set “a standard daily wage” in the public sector.⁴⁴ Likewise, one of the purposes of the Solonic legislation may have been to assess agrarian wealth in metallic terms; a similar system in

43. The price of a slave, when there is a market, must be related to the present discounted value of the future streams of surpluses the owner expects to claim over subsistence. In twenty-first-century BC Mesopotamia, for example, even though the average price of a male slave was 10 shekels of silver (and 5–6 shekels for a female), extant records indicate that he could command as much as 55 shekels, depending on the skill he possessed. Male slaves generally commanded higher market prices than female slaves in Imperial Rome as well, but the relative price of male to female slaves may have reversed during the Middle Ages. Hans Neumann, “Slavery in Private Households toward the End of the Third Millennium B.C.,” in *Slaves and Households in the Near East*, ed. Laura Culbertson (Chicago: The Oriental Institute of the University of Chicago, 2011), 23, 26; Kyle Harper, “Slave Prices in Late Antiquity (and in the Very Long Term),” *Historia: Zeitschrift für Alte Geschichte* 59, no. 2 (2010): 219, 236.

44. Welch, “Weighing and Measuring,” 41.

Rome might have been to convert agricultural products into monetary census qualifications upon which army recruitment was based.⁴⁵ It is well attested in ancient societies where coinage was being introduced that the first payments to be monetized were typically religious (“ritualistic”) and tax (“redistributive”).⁴⁶

Such a system, however, did not prevent the formation of market prices for the commodities involved for exchange purposes. Ancient sources suggest that the prices of cattle and grain fluctuated in market transactions despite their supposed fixed values. Examples include the Hittite system in which the price of an ox was set equal to a weight of silver,⁴⁷ the Ptolemaic system in which the prices of grain were fixed in relation to precious metals,⁴⁸ and the Babylonian system in which a weight of silver was set equal to a measure of grain. In Babylonia, the market price of grain in terms of silver rose by more than 150 percent through the course of the third millennium BC, while the increase was as much as 600–1,400 percent from the mid-seventh to the fifth century BC.⁴⁹ In like manner, the Nephite administrative system must have been separate from the functioning markets where various kinds of grain were traded based on fluctuating prices. Otherwise, how can we explain the people buying and selling evidently in many markets across the land, with “the chief market” in the city of Zarahemla (Hel. 6:8; 7:10)?

45. Von Reden, *Money in Classical Antiquity*, 49.

46. Wicks, “Monetary Developments in Java,” 46, 64–65.

47. Hendin, “Current Viewpoints,” 248.

48. Von Reden, *Money in Classical Antiquity*, 46.

49. Einzig, *Primitive Money*, 213. Noteworthy in this context is paragraph 108 of the code of Hammurabi, which states, “If a woman innkeeper should refuse to accept grain for the price of beer but accepts (only) silver . . . , they shall charge and convict the woman innkeeper” (trans. Martha Tobi Roth). This should not be interpreted as suggesting that parity between a measure of grain and a weight of silver was somehow enforced subject to the penalty of law. Mesopotamian law codes were not authoritative sources of law by which judges ruled on cases but were instead scholastic “idealizations of . . . wrongs and penalties in social behavior” used as a “pedagogical tool” in scribal schools. The Hammurabi code only shows how difficult it was for individuals to accept a relative price of two goods that was out of line with economic reality. Martha Tobi Roth, *Law Collections from Mesopotamia and Asia Minor* (Atlanta: Scholars Press, 1997), 101; Norman Yoffee, “The Meanings of Law in Ancient Mesopotamia,” in *Wissenskultur im Alten Orient: Weltanschauung, Wissenschaften, Techniken, Technologien*, ed. H. Neumann (Wiesbaden: Harrassowitz Verlag, 2012), 88; and Raymond Westbrook, *Laws from the Tigris to the Tiber: The Writings of Raymond Westbrook, Volume 2: Cuneiform and Biblical Sources*, ed. Bruce Wells and Rachel Magdalene (Winona Lake, Ind.: Eisenbrauns, 2009), 306.

V. How Did Nephite Bimetallism Work?

The fixed mint ratio between gold and silver has a modern counterpart in nineteenth-century American and French bimetallism. Disagreement exists on the precise definition of bimetallism, which is a monetary standard based on the use of two metals, usually gold and silver. Some view bimetallism loosely as any monetary standard involving the legal use of two metals, while others see it strictly as a standard involving two metals *plus* a fixed mint ratio between the two. My preferred definition is the second because if the mint ratio is not fixed, the price of either metal seen from the other behaves like any other good, rendering the operation of such a monetary standard no different from that of monometallism (such as the gold standard). Even though bimetallism, loosely defined, has been the most dominant monetary standard throughout several millennia of recorded history, rarely do we find in antiquity a monetary standard in which the price of gold was fixed in terms of silver.⁵⁰ In this respect, the Nephite system was unique.

It is both by design and by logic that the mint ratio between gold and silver is fixed under modern bimetallism. As discussed earlier in some detail, in a modern economy, a monetary instrument does not serve as a unit of account because this function has been separated out of its other functions. This separation, and the creation of a common unit of account, occurred in the West sometime between the seventeenth and the eighteenth centuries AD.⁵¹ As a result, the dollar is not money but a

50. Milton Friedman's statement in his celebrated article on bimetallism (that "a legal rate of exchange between silver and gold" was "sometimes" not specified) not only is inaccurate and misleading but also fails to recognize the fundamental difference in the nature and operation of the two alternative versions of "bimetallism." Friedman, "Bimetallism Revisited," 85.

51. According to Angela Redish, the unit of account function became fully separated (at least in Europe) in the seventeenth century AD. Angela Redish, *Bimetallism: An Economic and Historical Analysis* (Cambridge: Cambridge University Press, 2000), 7–8. Gilles Bransbourg, on the other hand, argues that a common value system developed in Europe in the later eighteenth century AD. Gilles Bransbourg, "Fides et Pecunia Numerata Part II: The Currencies of the Roman Republic," *American Journal of Numismatics* 25 (2013): 183–85. While neither of these authors provides a basis for her or his assertion, the ambiguity of the dating is likely related to the fluidity of the European monetary conditions in the early modern era when a variety of debased coins circulated widely. In Britain, for example, a mint ratio was established for the guinea (2/89 of a troy pound of gold) at 20 shillings of silver in 1663, but it was not acted upon or enforced. It was only with a proclamation of December 1717 that a mint ratio for the guinea (at 21 shillings of silver) began to be enforced. Walker, *International Bimetallism*, 66–67, 77.

unit of account in which a monetary instrument is denominated. In an economy like this, a gold dollar can only be equivalent to a silver dollar, implying that the mint ratio is fixed by logic.

This was not the case in ancient economies. Lacking a common unit of account, ancient economies expressed prices in terms of alternative media of exchange. Suppose that a plow is priced as 2 gold drachms or 30 silver drachms (at the prevailing market exchange rate of 15:1), and that the price of gold falls to 10:1. The same merchant might then reprice the plow as 20 silver drachms (by keeping the same gold price) or 3 gold drachms (by keeping the silver price), among other possibilities. Because one unit of account is allowed to fluctuate against the other, fluctuations in the relative price of gold and silver are easily accommodated in such a system. No instability emerges.

Once a common and independent unit of account is introduced (and the mint ratio is thus fixed by logic), bimetallism can become a highly unstable monetary standard. Suppose that, when the mint ratio is fixed at 10:1, the market price moves to 15:1. That is, gold appreciates relative to silver by a third. Because the mint ratio undervalues (overvalues) the market valuation of gold (silver), one of the following three things might happen. First, gold would cease to circulate as money because it is more valuable as a commodity than as money, and only silver would circulate as money. This is known as Gresham's Law, whereby "bad money drives out good" (bad money refers to the overvalued metal). Second, both would remain in circulation, but gold (silver) would command a premium (discount) when used as money (a seller of goods demands more units when the payment is made in silver than when it is made in gold). Third, some combination of the two outcomes may ensue, with the undervalued metal both commanding a premium and partially going out of circulation.

Which one of these outcomes prevails would depend on (1) the extent to which the mint ratio is binding in private transactions, (2) the costs of paying a premium for using the undervalued money, and (3) the share of the undervalued coinage in the total supply of money. If the mint ratio is enforced, Gresham's Law is more likely to be the outcome. If the mint ratio is not enforced, on the other hand, gold is more likely to circulate at a premium provided that the costs of paying the premium are sufficiently small.⁵² Finally, when there is a shortage of coinage, it is more likely that

52. If the costs of paying a premium are larger for small denomination coins, they may go out of circulation while large denomination coins remain in circulation at a

both overvalued and undervalued coins will circulate, though with a premium (discount) for the undervalued (overvalued) metal.⁵³ Early U.S. monetary history has been subject to various interpretations,⁵⁴ but nineteenth-century American bimetallism was undoubtedly a highly unstable monetary standard in which the composition of the money supply moved in response to the changing market prices of gold and silver, as explained below.

The instability of bimetallism is intrinsic to the inevitable incompatibility of a mint ratio with a market ratio when the monetary values of gold and silver are fixed in terms of a common unit of account. In the United States, when the market price of gold rose from the 1791 mint ratio of 15:1, silver became the dominant coinage and remained so until 1834 when the mint ratio was revised to 16:1. Yet at the prevailing market price of 15½:1, a difference remained, which caused gold to become the dominant coinage (though both silver and gold continued to circulate).⁵⁵ In the early 1850s, the scarcity of silver coinage led to a premium on silver and caused an increasing number of fractional notes to circulate. In 1853, this forced the U.S. government to reduce the standard weight of fractional silver coins and limited their legal tender status, an action generally considered to be the beginning of the end of American bimetallism.⁵⁶

Given the fixed mint ratio, how did Nephite bimetallism work? Two possibilities may be conjectured from ancient and modern monetary history. First, as was the case with its modern counterparts, the Nephite

premium. Arthur J. Rolnick and Warren E. Weber, "Gresham's Law or Gresham's Fallacy?" *Journal of Political Economy* 94, no. 1 (1986): 186, 195–96.

53. Frank Whitson Fetter argues that only an excess supply of money (and not the badness of money) determines if any money goes out of circulation. Gresham's Law simply explains which money is taken out of circulation when there are two or more monies of different commodity values. Frank Whitson Fetter, "Some Neglected Aspects of Gresham's Law," *Quarterly Journal of Economics* 46, no. 3 (1932): 487, 495.

54. For example, paper notes ("greenbacks") issued during 1862–1879 to help finance the Civil War have been interpreted either as having caused a premium on gold or as having driven gold coins out of circulation. Which of these alternative interpretations is correct hinges on what is meant by a premium on gold (coins or bullion). Rolnick and Weber, "Gresham's Law," 187–90, 193; Robert L. Greenfield and Hugh Rockoff, "Gresham's Law in Nineteenth-Century America," *Journal of Money, Credit, and Banking* 27, no. 4 (1995): 1091–97.

55. Friedman, "Bimetallism Revisited," 88; Greenfield and Rockoff, "Gresham's Law," 1092.

56. David A. Martin, "1853: The End of Bimetallism in the United States," *Journal of Economic History* 33, no. 4 (1973): 825–44.

bimetallic standard may have exhibited frequent instability and may have collapsed relatively quickly, perhaps degrading into a monometallic standard (over a sufficiently long period of time, it is almost a truism that any system would ultimately collapse—so the question is not whether but how soon). The alignment of the mint ratio with the market price needed for bimetallic stability is not “knife-edge,” given the costs of converting the undervalued coins into specie and selling the specie on the market. These costs define the upper and lower “gold-silver price ratio points” between which the market ratio could vary without causing instability.⁵⁷ Bimetallism comes under strain only when the change in the market price of gold relative to silver becomes sufficiently large to create an exploitable difference.

My reading of the Book of Mormon suggests two possible triggering events that might have led to the collapse of Nephite bimetallism (other than the war and the natural calamities that destroyed much of the civilization). One is the apparent abundance of gold relative to silver, if Helaman 6:11 (“there was all manner of gold in both these lands, and of silver”) can be read as indicating the predominance in production of gold over silver. Another possible triggering event might have been the expanding trade (“free intercourse one with another”) between the Nephites and the Lamanites (Hel. 6:8). The prosperity described in these passages must mean that, given the likely absence of significant technological progress, the two economies that had previously been relatively closed to each other integrated to form a larger market, allowing a greater specialization of labor (what economists call Smithian growth, as opposed to Promethean growth, which requires continuing technological improvement). When two economies with different gold-silver ratios integrate, bimetallism is bound to undergo profound change.

The Book of Mormon states that some fifty years after the reign of Mosiah, his laws “had become corrupted” (Hel. 4:22). If we set aside the moral aspect of this statement, one of the many possible meanings of this passage may be that the market price had deviated so far from the mint ratio that the monetary standard created by Mosiah collapsed. In the realm of economics, this must have had more to do with the natural working of economic laws than moral decay. The singular reference to the senine (which is a gold denomination) in 3 Nephi 12:26, in contrast to the earlier conjoint reference to the senine and the senum (a silver

57. Friedman, “Bimetallism Revisited,” 89–90.

denomination) in Alma 11:3, may be an indication that, with a fall in the relative price of gold, the Nephite monetary standard had transformed by this time from bimetallism to monometalism based on gold.

Second, as an alternative scenario of Nephite monetary history, bimetallism may have lasted for a sustained period of time. A rare example of bona fide bimetallism from antiquity can be used to explore such possibilities. The Persian (Achaemenid) Empire fixed and maintained its gold-silver mint ratio at $13\frac{1}{3}:1$ from sometime between the early 510s and circa 490 until its defeat at the hands of Alexander the Great in 330 BC.⁵⁸ The question is how Persia could maintain the same mint ratio for so long. It may be that bimetallism degenerated into a gold standard, such that the fixed mint ratio was only notional and not effectively enforced.⁵⁹ During the fourth century BC, the relative price in the Aegean declined in favor of silver to 12:1 (and further down to 10:1). This kept the gold coins within Persia and may have created pressure on the silver coins to go out of circulation.⁶⁰ Persia's principal silver coin, the siglos, never became dominant in the western territory in Asia Minor, where poleis continued to mint their own silver coinage.

As another possibility, Persia's royal palace may have acted as the residual buyer and supplier of precious metals to maintain the official parity. That the Persian treasury held a massive inventory of precious metals is well attested. C. C. Patterson estimates that the amount of silver Alexander plundered from the Persian treasury from 333 to 330 BC and subsequently released into circulation was about 2,200 metric tons (that is, about twice the size of world silver stocks at the beginning of the seventh century BC).⁶¹ François de Callataÿ places the estimate at some 180,000 Attic talents, the equivalent of 468 tons of gold or 4,680 tons

58. That is, 40 units of silver for 3 units of gold in weight. The initial relative price, when coinage was first introduced from Asia Minor, was 13:1. Michael Vickers, "Early Greek Coinage, a Reassessment," *Numismatic Chronicle* 145 (1985): 8–9.

59. Such was the case, for example, in Edo-period Japan, where the mint ratio of one gold *ryō* to 60 silver *momme* was nominally maintained from the early eighteenth to the mid-nineteenth centuries AD. This was never enforced, however, allowing the conversion rate to be determined in the market. E. S. Crawcour and Kozo Yamamura, "The Tokugawa Monetary System: 1787–1868," *Economic Development and Cultural Change* 18, no. 4 (1970): 492.

60. Davies, *History of Money*, 85; Orestes H. Zervos and M. Jessop Price, "The Earliest Coins of Alexander the Great," *Numismatic Chronicle* 142 (1982): 166–90.

61. C. C. Patterson, "Silver Stocks and Losses in Ancient and Medieval Times," *Economic History Review* 25, no. 2 (1972): 221–22.

of silver.⁶² Between 333 and 290 BCE, Alexander's royal mint may have produced some 60 million tetradrachms, 66 million drachms, and 12 million gold staters, a little more than the aggregate revenue of the fifth-century Athenian empire throughout its entire seventy-three-year existence.⁶³ With an inventory like this, it is conceivable that Persia could maintain its official gold-silver parity for a long time.

In the case of the Nephite economy, other factors may have contributed to the long-term sustainability of its bimetallic standard by limiting the development or effective functioning of the private market for precious metals. First, gold and silver production might have been a government monopoly, as was the case in a number of ancient societies,⁶⁴ which may have helped stabilize market prices. This may explain why the Romans could maintain their fixed mint ratio for a long time, during the republic period (one silver denarius for ten bronze asses),⁶⁵ as well as during the imperial period (one gold aureus to 25 silver denarii).⁶⁶ Second, precious metals might have been so valuable as to make the market too thin for efficient price discovery and formation. In such a market, the official mint ratio could have served to anchor market prices. A thin market for precious metals would be consistent with a possibly limited monetization of the agrarian economy, as intimated by the apparent absence of base metal subsidiary coinage (typically used for small-denomination transactions) and the existence of an elaborate grain accounting system.⁶⁷ Most transactions may have taken place not by coinage but by grain receipts or even by barter.

62. François de Callatay, "Royal Hellenistic Coinages: From Alexander to Mithradates," *The Oxford Handbook of Greek and Roman Coinage*, ed. William E. Metcalf (New York: Oxford University Press, 2012), 178; Von Reden, *Money in Classical Antiquity*, 81–82.

63. Thonemann, *Hellenistic World*, 14–16.

64. Kremydi, "Coinage and Finance," 160.

65. Bransbourg, "Fides et Pecunia Numerata," 185.

66. Christopher Howgego, "Some Numismatic Approaches to Quantifying the Roman Economy," in Bowman and Wilson, *Quantifying the Roman Economy*, 293; Rathbone, "Earnings and Costs," 302.

67. Anciently, the introduction of fiduciary, subsidiary coinage typically occurred several centuries after the introduction of silver or gold coinage, when monetization of the economy was sufficiently advanced. In ancient Greece, small-denomination, fiduciary bronze coins (actually made of copper alloys), first introduced from the late fifth to the early fourth centuries, began to circulate widely during the Hellenistic period. Gary Reger, "Hellenistic Greece and Western Asia Minor," in *The Cambridge Economic History of the Greco-Roman World*, ed. Walter Scheidel, Ian Morris, and Richard Saller (Cambridge: Cambridge University Press, 2007), 470. In Java, silver and gold coinages remained high-valued and were mainly used for ritualized transactions, and broad

VI. Conclusion

In this paper, I have discussed the operational aspects of the Nephite system of fixed prices for gold, silver, and all kinds of grain (Alma 11:3–19), based on internal evidence, economic logic, and historical precedents from antiquity. I have argued, among other things, that most of the metallic weights described in Alma 11 were sufficiently light and were clearly intended for handling by hand. These weighted metals therefore had all the economic characteristics of coinage, making it appropriate to designate them as coins. Further, once it is accepted that denominations were binary and the weight scale was unitary for both gold and silver, internal logic implies that the gold-silver mint ratio was 16:1. Remarkably, this falls within the well-attested range of gold-silver prices observed over several millennia of recorded human history.

The Nephite system appears unusual in fixing the relative prices for precious metals and all kinds of grain, but it has a number of historical precedents in ancient societies. The clue to its noneconomic nature can be surmised from the lack of any role quality considerations play in the valuation of agricultural products. I have argued, based on similar systems from antiquity, that the system of fixed prices was likely not an economic institution but an accounting framework in which the monetary values of agricultural products were assessed for tax, census, or other administrative purposes. The Nephite system was also unusual in fixing the relative price of gold against silver. Rarely do we find a bimetallic monetary standard with a fixed gold-silver parity in antiquity. Such a system is known to be unstable, and I am inclined to think that it soon degenerated into monometalism based on gold. If such a bimetallic standard was durable at all, it must be that the market for precious metals was limited either by a government monopoly over production or by thin trading attributable to the society's agrarian and largely nonmonetized nature.

Given these informed albeit speculative conjectures about the operation of the secular institution described in Alma 11, one must be careful not to be hasty in concluding that it did not involve coinage. It is extremely unlikely that the economic, if not numismatic, concept of coinage was unknown during Lehi's lifetime, and even if coinage had been unknown, it would not necessarily follow that monetary metals

monetization of everyday transactions did not take place until the turn of the fourteenth century AD, when Chinese base metal coins began to circulate. Wicks, "Monetary Developments in Java," 44, 63.

did not assume the economic functions of coinage over the first four centuries of Nephite civilization. The heading change made in Alma 11 from “Nephite coinage” to “The Nephite monetary system” was not only unwarranted but also inappropriate from the standpoint of the generally accepted nomenclature of monetary economics. The term “monetary system,” which usually refers to a set of laws, regulations, and institutions involved in a nation’s payment system, is too elaborate a concept to apply to an ancient society with primitive institutions, especially when so little information is provided.

An objection may be lodged to considering Alma 11 as the description of a coinage system on the basis of scanty archaeological evidence that coinage existed in ancient America. But such an objection is equally applicable to considering the same passage as a description of bullion and ingots as money. Ancient cash hoards in the eastern Mediterranean and Near East typically contain both coins and ingots. It is almost certain that precious metals were used as money in ancient American civilizations, whatever form they took. When the Spanish conquistadores arrived, they found Mexicans regularly using gold dust as money.⁶⁸ It may well be that, in the future, ancient hoards containing coins and ingots will be excavated somewhere in the Americas. For the time being, the best answer I can give is that the Nephite economy was agrarian and largely nonmonetized, restricting the circulation of coins, if any, and limiting their use largely to urban, commercial transactions.

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68. Davies, *History of Money*, 48.