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The Journal of Political Economy, Vol. 98, No. 6 (Dec., 1990), 1159-1194.

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The Crime of 1873

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The U.S. Coinage Act of 1873 eliminated provision for the free coinage of silver. That act cast the die for a gold standard. The conventional view is that "the act of 1873 was a piece of good fortune." This paper indicates that it was the opposite—a mistake that had highly adverse consequences. This is a judgment about 1873, not 1896. By 1896, when William Jennings Bryan ran for president on a "free-silver ticket," it was too late to undo the damage. Bryan was trying to close the barn door after the horse had been stolen.

I am persuaded history will write it [the act of 1873] down as the greatest legislative crime and the most stupendous conspiracy against the welfare of the people of the United States and of Europe which this or any other age has witnessed. [SENATOR JOHN H. REAGAN 1890]

[The demonetization of silver] was the crime of the nineteenth century. [SENATOR WILLIAM M. STEWART 1889]

In 1873 we find a simple legal recognition of that [the demonetization of silver] which had been the immediate result of the act of 1853. [JAMES LAURENCE LAUGHLIN 1886]

I am indebted for helpful comments on earlier drafts to Michael D. Bordo, Conrad Braun, Phillip Cagan, Joe Cobb, Harold Hough, David Laidler, Hugh Rockoff, and, as always and especially, to Anna J. Schwartz. In addition, David D. Friedman made a number of helpful suggestions and Rose D. Friedman critically reviewed and helped revise the penultimate draft. Finally, an anonymous referee made a number of very helpful suggestions for revision.

[*Journal of Political Economy*, 1990, vol. 98, no. 6]

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You shall not press down upon the brow of labor this crown of thorns. You shall not crucify mankind upon a cross of gold. [WILLIAM JENNINGS BRYAN 1896]

The act of 1873 was a piece of good fortune, which saved our financial credit and protected the honor of the State. It is a work of legislation for which we can not now be too thankful. [JAMES LAURENCE LAUGHLIN 1886]

The Coinage Act of 1873, to which these quotations refer, was passed by a vote of 110 to 13 in the House and 36 to 14 in the Senate after lengthy, though superficial, committee hearings and floor debate. It attracted little attention at the time even from members of Congress (including Senator Stewart) who voted for it yet who later attacked it in vitriolic terms as a "grave wrong," a "conspiracy" perpetrated by "corrupt bargains," a "blunder which . . . is worse than a crime," a "great legislative fraud," and, finally, "the crime of 1873" (see Barnett 1964, pp. 178–81).¹

How did this apparently innocuous legislative measure evoke such strong and contrasting reactions from leading scholars, businessmen, and politicians over so long a period? How did it become a central issue in a presidential campaign conducted more than two decades after its passage? Was it a crime, in any sense of the term? What were its actual consequences? To answer these questions requires some background in monetary history and theory.

I. The Background

The U.S. Constitution gives Congress the power "to coin money, regulate the value thereof, and of foreign coin" and prohibited the states from making "anything but gold and silver coin a tender in payment of debts." In initially exercising this power, the Congress, following the recommendation of Alexander Hamilton, passed the Coinage Act of April 2, 1792. That act defined the basic monetary unit of the United States as the dollar and defined subsidiary coinage on a decimal basis (the cent, "half disme" [later, the nickel], the "disme" [later, the dime], quarter, etc.). It further defined the dollar as equal to 371.25 grains of pure silver and the \$10 eagle as equal to 24.70 grains of pure gold, authorized *free coinage* of *both* silver and gold at the

¹ According to O'Leary (1960, p. 390), "The first person to use the word 'crime' was George M. Weston, the secretary of the United States Monetary Commission of 1876 . . . in his special report, attached to the full report of the commission" published in 1877. Barnett (1964, p. 180) attributes the first use of the full phrase "the crime of 1873" to Senator Henry M. Teller of Colorado on July 10, 1890.

specified ratio of 15 to 1, and specified the fraction of alloy to be combined with pure metal in striking the coins.²

I have italicized two terms that are critical to understanding the "crime of '73." "Free coinage" is critical because it gave practical content to a specie standard by providing that the government mint would convert specie that individuals chose to bring to the mint into legal tender currency denominated in "dollars" (initially solely in the form of coins; later in paper certificates as well) at the stated metallic equivalent. "Both" is critical because it effectively established the United States on a bimetallic standard, that is, a monetary standard that authorized free coinage, and hence the use as money, of either of two metals, silver or gold. These two provisions were equivalent to saying that the government would buy all silver or gold offered to it at prices of \$1.2929... per troy ounce of pure silver and \$19.3939... per troy ounce of fine gold, that is, 15 times as much for an ounce of gold as for an ounce of silver; whence the "ratio of 15 to 1."³

Though either silver or gold could legally be used as money, in practice only silver was so used until 1834. The reason was simple: There was and is a market for silver and gold outside the U.S. Mint: for jewelry, industrial use, coinage by other countries, and so forth. In 1792, the ratio of the market price of gold to the price of silver was almost exactly 15 to 1, the ratio Hamilton recommended. But shortly thereafter, the world price ratio went above 15 to 1 and stayed there (see Jastram 1981, pp. 63–69). As a result, anyone who had gold and wanted to convert it to money would do better by exchanging the gold for silver at the market ratio and taking the silver to the mint than by taking the gold directly to the mint.

To put the matter in another way, if the mint were a two-way street at a 15 to 1 ratio, an obvious get-rich scheme would be to bring 15 ounces of silver to the mint, get 1 ounce of gold, sell the ounce of gold on the market and with the proceeds buy more than 15 ounces of silver, pocket the profit, and keep going. Clearly the mint would soon

² The act of 1792 stated that "bullion so brought [to be coined at the legal rates] shall be assayed and coined as speedily as may be after the receipt thereof, and that free of expense to the person or persons by whom the same shall have been brought" (Jastram 1981, p. 63). Hence, coinage was "free" in a dual sense: open to all in unlimited amount and without charge. The provision that no charge should be made for coinage is exceptional. Typically, a small charge, called "seigniorage," is made for the cost of coining. However, the so-called seigniorage charge has sometimes been manipulated and used for purposes other than repaying the cost of coinage, e.g., by ancient "seigniors" (lords) for revenue or by President Franklin Delano Roosevelt as a device for pegging the price of silver.

³ The continuing decimals (.2929..., .3939...) arise because an ounce troy equals 480 grains. Given that a dollar was defined as equivalent to 371.25 grains of pure silver or 24.75 grains of fine gold, 1 ounce of silver was worth 480 divided by 371.25, or \$1.2929..., and 1 ounce of gold, 480 divided by 24.75, or \$19.3939....

be overflowing with silver and out of gold. That is why the mint's commitment under a bimetallic standard is solely to buy silver or gold (i.e., coin freely), though it may, at its discretion, also sell (redeem) either or both metals. The end result was that the United States was effectively on a silver standard from 1792 to 1834. Gold was not used for money at par value, only at a premium. It was too valuable for that purpose. Gresham's law was in full operation: cheap money drove out dear money.⁴

In 1834, new coinage legislation was introduced in recognition of the changed world market gold-silver price ratio, which by then was about 15.625 to 1. This ratio was repeatedly recommended by the Select Committee on Coins of the House of Representatives from 1832 to 1834, supposedly in the desire "to do something for gold," which had not long before been discovered in Virginia, North Carolina, South Carolina, and Georgia and "had become of genuine importance to the four southern states" (O'Leary 1937, p. 83). However, rather suddenly, the select committee changed its recommendation to a ratio of 16 to 1, not to do something *for* gold—though it certainly did—but to do something *against* Nicholas Biddle's Bank of the United States.⁵ This was at the height of the famous "bank war" between President Andrew Jackson and Biddle, which finally resulted in the failure of the bank to obtain a new charter when its original federal charter expired in 1836. As O'Leary put it, the ratio of 16 to 1 was "a golden club . . . used by Jackson and his supporters to belabor their hated enemy, the Bank" (p. 84). The unsatisfactory state of the currency—a mixture of U.S. and foreign silver coins plus paper money issued by state banks, some of doubtful quality—had made the notes issued by the bank a favored medium of exchange. The act of 1834 was expected to weaken the bank by making gold coins an effective substitute for its notes.

Two points are noteworthy about this episode. First, in 1834, "16 to 1" was a golden club; in the 1890s, "16 to 1" was a silver club. Second, in both cases it was wielded by much the same political constituency against much the same political constituency: the largely rural, small-business, lower-class southern and western supporters of Jackson in 1834 and of William Jennings Bryan in 1896 against the bankers,

⁴ For precision, the "law" must be stated far more specifically, as Rolnick and Weber (1986) point out.

⁵ Though the ratio is described as "16 to 1," that is an approximation. In the 1834 act, the weight of the gold dollar was set at 23.2 grains of pure gold, which gave a gold-silver ratio trivially higher than 16 to 1. The act was amended in 1837 to make the weight equal to 23.22, which gives a ratio trivially below 16 to 1. The reason for the change was to make the percentage of alloy in the minted coin equal to precisely 10 percent. A good source for the early coinage laws of the United States is National Executive Silver Committee (1890). See also U.S. Commission on the Role of Gold (1982, vol. 1, chap. 2).

financiers, big business, and urban upper classes of the East and Northeast.

In any event, the adoption of the 16 to 1 ratio—that is, of an official price of \$20.671835... (= 480/23.22) per ounce of fine gold—spelled the end of the reign of silver. From then to the Civil War, little silver was coined. Even subsidiary silver coins became scarce until 1853, when Congress voted to reduce the silver content of subsidiary silver coinage, so that it no longer became worthwhile to melt them down (at least until the Civil War greenback inflation). From 1834 on, gold coins circulated and gold was the effective standard. Despite the increased demand for gold for monetary use, the gold-silver price ratio fell after the Californian and Australian gold discoveries of the 1840s and 1850s so that its status as “cheap money” seemed secure.

The Civil War temporarily ended the reign of gold. The exigencies of war finance led to the introduction of paper money—greenbacks—issued without gold or silver backing and without any promise to redeem them in either metal. Paper, as it were, became the cheap money. Gold, however, continued to circulate, particularly on the West Coast, but of course not on a one-to-one ratio with greenbacks. There was a free market in which the “greenback price of gold” rose above the official legal price, indeed, at the extreme, to more than double the official price. The government required customs duties and some other obligations to be paid in gold; banks provided separate gold and greenback deposits for their clients. In short, gold and greenbacks circulated side by side at a floating exchange rate determined in the market, though greenbacks were clearly the dominant currency for most purposes and in most areas.

At long last, we return to 1873. Movement was afoot to end the greenback episode and “resume” a specie standard. It was time to start tidying up the coinage legislation. The resulting Coinage Act of 1873 listed the coins to be minted. The list included gold coins and subsidiary silver coins but omitted the historical standard silver dollar of 371.25 troy grains of pure silver. Further tidying occurred in 1874.⁶ That was followed by the Resumption Act of 1875 and successful resumption on the basis of gold on January 1, 1879.⁷

⁶ The 1873 act included provision for coining a heavier silver trade dollar to be used in trade with Mexico and the Far East, which were on the silver standard. The trade dollar had legal tender status. This was removed in June of 1874 when Congress passed the revised statutes, which provided that no silver coin was to be legal tender beyond the amount of \$5.00 and that any foreign coin was prohibited from being a tender (see Barnett 1964, p. 178). According to Nugent (1968, pp. 98, 134), the coinage legislation was first introduced by Senator John Sherman in 1868. The bill actually passed was initially drafted in 1869, though clearly there were some subsequent changes, and first introduced into the Senate in April 1870.

⁷ For a detailed discussion of the greenback period and resumption, see Friedman and Schwartz (1963, chap. 2).

The events culminating in resumption in 1879 precisely parallel a corresponding sequence in Britain six decades earlier: a bimetallic standard before 1797 followed by the adoption of an inconvertible paper standard, the demonetization of silver in 1816, and resumption in 1819 on a gold basis (without the 1816 legislation, resumption would have been on silver). The parallelism is not pure coincidence. The initial step—ending convertibility and adopting a paper standard—was a reaction in both countries to the financial pressures of war.⁸ As in the United States, Britain's decision to return to a specie standard reflected the desire to have a "sound money" and the outrage of the financial community, holders of government bonds, and some economists at the inflation produced by the departure from a specie standard. Though Britain's choice of gold instead of silver for this purpose was something of an accident, it was a major reason why the United States made the same choice roughly 60 years later.⁹

If resumption in the United States had occurred under the pre-Civil War coinage legislation, silver would have become the "cheap metal" whenever the gold-silver ratio rose appreciably above 16 to 1 (which happened by 1875), and producers of silver would have found it advantageous to bring their silver to the mint rather than to sell it on the market. Similarly, owners of gold coins would have found it advantageous to melt their coins down and sell the gold on the market rather than use them as money at their nominal face value.¹⁰

In practice, neither the conversion of specie into currency at the mint nor the melting down of gold or silver coins is costless. Commonly, a small seigniorage charge is made to cover the expenses of the mint, and melting involves similar costs. In addition, interest is

⁸ It was not the only possible reaction, despite the tendency of many historians to regard what happened as if it had to happen. France was under even greater financial pressure than Britain, yet, "through twenty years of war, at times against half Europe, [Napoleon] never once allowed a resort to . . . inconvertible paper money" (Walker 1896, p. 87).

⁹ David Ricardo, one of the most influential proponents of resumption, initially favored silver though not bimetalism ([1816] 1951, p. 63). In subsequent testimony of 1819 before a committee of Parliament, Ricardo shifted to gold because "I have understood that machinery is particularly apposite to the silver mines and may therefore very much conduce to an increased quantity of that metal and an alteration of its value, whilst the same cause is not likely to operate upon the value of gold" (1952, pp. 390–91; see also p. 427)—a judgment that like so many judgments based on the opinion of technical "experts" proved to be very wide of the mark.

¹⁰ Currently, it pays to bring neither gold nor silver to the mint because both have been replaced by a cheaper money, paper. There still are, however, official prices on the books (\$1.2929 for silver and \$42.22 for gold). The gold holdings of the U.S. government are still valued on the books at the official price. Yet no one would dream of using a silver coin stamped \$1 or a gold coin stamped \$20 as money at these nominal values. They are numismatic items valued at about \$8 and \$475, respectively. I am indebted to Conrad J. Braun for the rough estimates of the current market values of the silver and gold coins.

lost because of the delays involved in minting, and trading involves costs in selling gold or silver, and conversely. As a result, the tendency to regard the legal ratio as a precise number so that only one metal can circulate at a time is a fallacy. Just as "gold points" permit exchange rates of two gold standard currencies to fluctuate within a range without producing gold shipments, under a bimetallic standard "gold-silver price ratio points" permit the ratio to fluctuate within a range without producing either a premium on one metal or its complete replacement by the other.¹¹

The omission of any mention of the standard silver dollar in the Coinage Act of 1873 ended the legal status of bimetallism in the United States. Had that fateful line not been omitted from the act of 1873, resumption in 1879 would almost surely have been on the basis of silver, not gold. Hence, "the crime of '73" in the eyes of the proponents of silver.

Those events raise two questions: the less important but easier to answer is, Was there a "crime," in any meaningful sense? The far more important but far harder to answer is, What would have been the consequences of including the fateful line?

II. Was There a "Crime"?

In 1877, "an editorial in *The Nation* . . . read in part as follows: 'Mr. Ernest Seyd, a designing bullionist and secret agent of foreign bondholders, came to this country from London in 1873, and by corrupt bargains with leading members of Congress and officers of the Government brought about the demonetization of silver.' It was said that he brought with him \$500,000 to bribe certain members of Congress and the Comptroller of the Currency" (cited in Barnett [1964, p. 178]). If that had been true, there would indeed have been a crime in every sense of the term. But no evidence has ever been offered to indicate that it was true. Indeed, Seyd was anything but a "designing bullionist." He was a British bimetallicist who objected strongly to the demonetization of silver by the United States (Nugent 1968, pp. 153, 166). No allegation of bribery has ever been made—let alone documented—against any individual member of Congress or government official in connection with the passage of the Coinage Act of 1873. The act was discussed at great length both in committee and on the

¹¹ That was the situation in France from 1803 to 1873, during the whole of which time both gold and silver circulated despite market ratios that departed from the French legal ratio of 15.5 to 1. At times, silver was tending to displace gold; at other times, gold was tending to replace silver (Walker 1896, chaps. 4, 5, esp. p. 121). Fisher (1911, chap. 7) presents a rigorous analysis of the theory of a bimetallic standard as well as an illuminating discussion of the experience of France.

floor of Congress and openly voted for by large majorities, though later critics claim that the key provision to which they objected was barely mentioned and not further discussed on the floor.¹² In the literal dictionary sense of crime—"an act punishable by law, as being forbidden by statute or injurious to the public welfare"—there was no crime.

On the other hand, in what the Oxford English Dictionary calls a "more general" use of the term—"an evil or injurious act; an offence, a sin"—the existence of a crime is a question of opinion. What is not open to question is that the standard silver dollar was omitted from the list of coins to be minted intentionally, in full knowledge of the likely consequences, and in the belief that those consequences were desirable. That is made clear by Henry R. Linderman, the director of the mint at the time of the passage of the act, in a book published not long thereafter (1877, chap. 9). In a report to the secretary of the Treasury in November 1872, when the Coinage Act was pending in Congress, he wrote that "the fluctuations in the relative value of gold and silver during the last hundred years have not been very great, but several causes are now at work, all tending to an excess of supply over demand for silver, and its consequent depreciation" (p. 48).

On the consequences of the act, he wrote that "the declaration in the Coinage Act of 1873, that the gold dollar was to be thereafter the unit of value, and the omission of the silver dollar from the coins to be struck under the provisions of the Act, placed the United States upon the single gold standard. . . . The weight of opinion in Europe and America was against the practicability of maintaining a double standard on any basis which might be selected, and in favor of a single gold standard" (p. 44). In a later chapter, he wrote that "the advocates of the restoration of the old silver dollar . . . appear to think that an error, if not a wrong, was committed in discontinuing its coinage; and they desire to correct the same without reference to the question, whether it would be possible to maintain concurrent circulation of gold and silver coins after resumption in 1879" (pp. 100–101).

Further, as Nugent documents in great detail, Senator John Sherman, chairman of the Senate Finance Committee, had been determined to demonetize silver from at least 1867 and had arranged to have a bill to that effect drafted at the end of 1869. From then on, Sherman, Linderman, John Jay Knox (deputy comptroller of the currency and then comptroller), and Secretary of the Treasury George Boutwell cooperated to push a coinage bill that included the de-

¹² They even cite their opponent in support: "As Professor Laughlin states . . . : 'The Senate occupied its time chiefly on questions of seigniorage and abrasion and the House on a question of the salaries of the officials' " (National Executive Silver Committee 1890, p. 22).

monetization of silver (Nugent 1968, pp. 80, 88, 99, 103, 105). "Were Knox, Linderman, Boutwell, Sherman, and others aware of what they were doing when they planned to drop the silver dollar?" asks Nugent. "It is inconceivable," he goes on, "that they were not. . . . But did they urge it because they feared a drop in silver prices? No one made an explicit statement to that effect, but it was undoubtedly the case" (p. 137).

In addition, as Francis Walker (1893, pp. 170–71) wrote two decades later: "So completely without observation was this measure passed, that it was not for a year or two that the fact of demonetization was popularly known." In an attached footnote, he added that "the writer was in 1873 Professor of Political Economy at Yale, and was actually engaged in lecturing upon the topic of money. He was, also, a pretty good newspaper reader, and by the accidents of position and personal acquaintance, was fairly well in touch with the men of commerce and banking in the neighboring city of New York. Yet it was long after the passage of the act of 1873 that he first learned of the demonetization of the silver dollar" (p. 171, n. 1).

As O'Leary (1960, p. 392) summarized the evidence,

it seems only reasonable to conclude that the failure to include provision for the standard silver dollar in the Coinage Act of 1873 was based not upon recognition of the existing economic facts but rather upon calculated hostility to silver as a part of the monetary standard. The Act anticipated the future. It was purposive and deliberate in the mind of the man [according to Nugent, "men"] who largely framed the legislation and saw it through the Congress. In this sense, the silver people are correct in holding that it was the result of "malice aforethought." It was expected to accomplish and did accomplish a result going far beyond a mere "tidying-up of our coinage laws and procedures."

For the next twenty-seven years the silver question be-deviled the politics and the finances of the United States. Silver never won back the place it would have enjoyed had the Act of 1873 not failed to include provision for the coinage of the standard silver dollar. The consequences of not striking down the free and unlimited coinage of the silver dollar could have been vast for subsequent American financial, economic, and political life. That is, however, another story.¹³

To which we now turn.

¹³ In a fascinating paper, Rockoff (1990) persuasively argues that Frank Baum's *The Wonderful Wizard of Oz* "is not only a child's tale but also a sophisticated commentary on

III. The Consequences of the Coinage Act of 1873

Eliminating the free coinage of silver had major consequences because of one central fact cited by Linderman: the likely decline in the world price of silver relative to that of gold. Had there been no decline in the silver-gold price ratio—or, as it is more usually expressed, rise in the gold-silver price ratio—it would have been irrelevant whether the fateful line was included in the act of 1873 or omitted. In either event, the pre-Civil War situation of an effective gold standard would have continued when and if the United States resumed specie payments.

As it was, however, a rise in the gold-silver price ratio started well before the United States passed the act of 1873 and was in full swing when the United States resumed specie payments in 1879. Resumption by the United States on the basis of gold was the final nail in the coffin of silver. The gold-silver price ratio, plotted in figure 1, fluctuated around 15.5 (the mint ratio in France) for decades before the gold discoveries in California in 1848 and in Australia in 1851. It then fell to a low of nearly 15 by 1859, when it started an irregular but more or less steady rise.¹⁴ The rise speeded up rapidly after 1870, as one European country after another shifted from a silver or bimetallic standard to a single gold standard—a tribute to the leadership of Britain, by then the recognized dominant economic power. Germany shifted in 1871–73, after it defeated France and imposed a large war indemnity payable in funds convertible into gold. France, which had maintained a bimetallic standard since 1803, despite first major silver and then major gold discoveries, demonetized silver along with the other members of the Latin Monetary Union (Italy, Belgium, and Switzerland) in 1873–74. The Scandinavian Union (Denmark, Norway, and Sweden), the Netherlands, and Russia followed suit in 1875–76 and Austria in 1879. By the late 1870s, India and China were the only major countries on an effective silver standard. The resulting increased demand for gold and increased supply

the political and economic debates of the Populist Era" (p. 739), i.e., on the silver agitation generated by the so-called crime of '73. The land of Oz, according to Rockoff, is "the East, [in which] the gold standard reigns supreme and in which an ounce (Oz) of gold has almost mystical significance" (p. 745). He goes on to identify the Wicked Witch of the East with Grover Cleveland, the gold Democrat who, as president, "led the [successful] repeal of the Sherman Silver Purchase Act [of 1893]" (p. 746). Similarly, Rockoff is able to identify many of the other places and characters, and much of the action, with places, people, and events that played a significant role in the final years of the free-silver movement.

¹⁴ Though France doubtless adopted the ratio of 15.5 to 1 because that was roughly the market ratio in 1803, France's successful maintenance of bimetalism undoubtedly helped to stabilize the ratio (see Walker 1896, p. 87; Fisher 1911, p. 136).

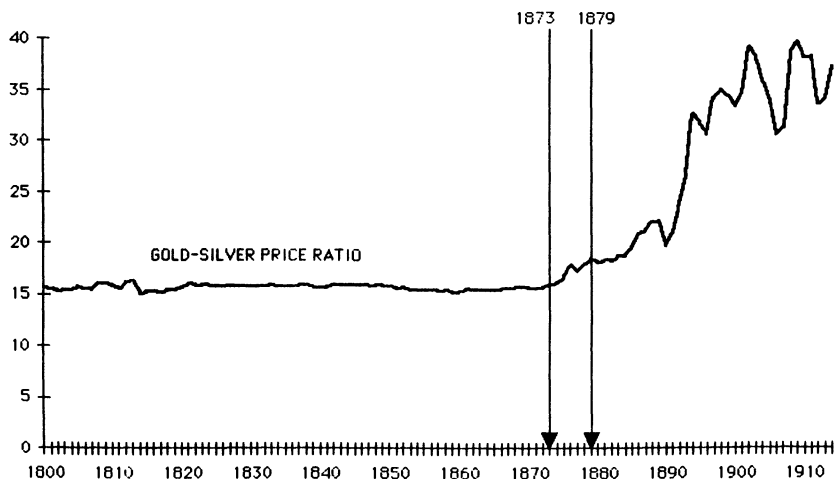


FIG. 1.—Ratio of price of gold to price of silver, annually, 1800–1914

of silver for nonmonetary purposes produced a dramatic rise in the gold-silver price ratio. From 15.4 in 1870, it jumped to 16.4 by 1873, 18.4 by 1879, and 30 by 1896, when 16 to 1 was the Bryan battle cry.

By joining the movement to gold, the United States added to the upward pressure on the gold-silver price ratio, both by absorbing gold that would otherwise have been available for monetary use by the rest of the world and by failing to absorb silver. The effects were far from trivial. In preparation for resumption, the U.S. Treasury had accumulated gold so that by 1879, the stock of monetary gold in the United States, both in the Treasury and in private hands, already amounted to nearly 7 percent of the world's stock. By 1889, the U.S. share had risen to nearly 20 percent. Even more dramatically, the increase from 1879 to 1889 in the U.S. stock of monetary gold *exceeded* that in the world's stock. The monetary gold holdings of the rest of the world declined from 1879 to 1883 and then rose but did not surpass its earlier level until 1890.

For silver, the failure to absorb silver via free coinage was offset to some extent by repeated special legislation for the benefit of silver interests requiring the federal government to buy silver at market prices. The first such measure preceded resumption, the Bland-Allison Act of 1878, which authorized the Treasury to buy between \$2 and \$4 million of silver each month at the market price and which led to continued purchases from 1878 to 1890. Then silver purchases were stepped up drastically under the Sherman Silver Purchase Act, until the silver purchase clause was repealed in 1893.

Interestingly enough, the number of ounces of silver purchased

under these acts was almost equal to 16 times the number of ounces of fine gold added to the country's monetary gold stock. On first blush, it looks as though political measures absorbed as much silver as free coinage would have. However, that is not the case. As will become apparent in what follows, had the United States been on silver, the stock of money would have risen faster than it did and hence the ounces of silver brought to the mint would have substantially exceeded 16 times the ounces of gold actually acquired.¹⁵

The most obvious, but by no means the most important, consequence of the return of the United States to gold rather than to a bimetallic standard was the sharp rise in the gold-silver price ratio. A far more important consequence was the effect on the nominal prices of goods and services in general. The increased world demand for gold for monetary purposes coincided with a slowing in the rate of increase of the world's stock of gold and a rising output of goods and services. These forces put downward pressure on the price level. Stated differently, with gold scarcer relative to output in general, the price of gold in terms of goods went up, which means that the nominal price level (under a gold standard, the price level in terms of gold) went down. The downward pressure was relieved somewhat by a rapid expansion of the banking system, which increased the amount of money that could be pyramided on each ounce of gold. On the other hand, rising real income, plus the spreading monetization of economic activities, plus the declining price level itself increased the downward pressure on prices by leading the public to hold larger cash balances relative to their income (i.e., velocity declined).

The outcome was deflation from 1875 to 1896 at a rate of roughly 1.7 percent per year in the United States and 0.8 percent per year in the United Kingdom, which means in the gold standard world. In the United States, the deflation from 1875 to 1896 followed the even sharper deflation after the Civil War. That sharper deflation was an essential requisite for successful resumption on gold at the prewar parity between the U.S. dollar and the British pound. It also produced wide unrest and dissatisfaction, particularly in rural areas. The unrest led to the formation in 1876 of the Greenback party to continue earlier agitation to issue more greenbacks to replace deflation by inflation. The political agitation ended the retirement of greenbacks, which had started after the Civil War, and led to the adoption in 1878 of the Bland-Allison bill authorizing the Treasury to purchase a limited amount of silver at market prices.

¹⁵ According to the estimates discussed in Sec. IV below, 26 times as many ounces of monetary silver would have been accumulated as the ounces of gold actually acquired.

Though the silver was purchased at market prices, it was valued for monetary purposes at the higher legal price, the difference being treated as seigniorage. The silver was mostly coined into standard silver dollars. However, most of the coins were stockpiled in the Treasury as "reserves" for pieces of paper called silver certificates or, after 1890, Treasury notes of 1890. These were nominally convertible into silver, but they were also "legal tender" effectively convertible into gold. Hence, it was cheaper to get silver by using the paper money to buy it on the market than by converting the paper money into silver at the fictional legal price. In effect, the silver certificates were fiat money differing from greenbacks only because the historic role of silver as money made it more acceptable to increase the money supply by buying silver rather than by openly issuing fiat money. It also had the political effect of harnessing silver interests to the populist cause of inflation. The stock of silver in the Treasury was the counterpart to the stock of wheat currently held by the U.S. government as a result of its attempt to prop up the price of wheat.

A 1.7 percent a year decline in prices may seem too mild to generate the kind of agitation that bedeviled the two decades from resumption to the end of the century. But several considerations argue otherwise. First, the 1.7 percent refers to a price index that covers all goods and services (the implicit price deflator). The wholesale prices of agricultural and other basic commodities doubtless fell at a greater rate (3.0 percent a year by one index). At least as important, we all want the prices of the things we sell to go up, not down, so that sellers of goods and services are almost invariably inflationists. True, we want the prices of the things we buy to go down. But as consumers, we buy many things whose prices are moving in different directions, so we are far less acutely aware of what is happening to the price level than of what is happening to the specific prices of the things we sell. And that was far truer in the nineteenth century, when data on the economy as a whole were few and far between, than it is now. Moreover, at all times, sellers tend to be relatively few in number and to be organized, so that they have more political clout than the dispersed consumers who benefit from declining prices. That was particularly true of producers of silver, who clearly had much to gain by the adoption of a silver standard. Though few, they were politically influential because the sparsely populated silver states had the same representation in the Senate as the densely populated urban states.

An additional factor was that farmers are generally net monetary debtors and, as such, are harmed by a fall in prices, which raises the real value of their debt, and benefited by a rise in prices, which reduces the real value of their debt. As debtors, they were particularly

susceptible to propaganda representing the "crime of '73" as the evil machinations of a cabal of eastern and foreign capitalists: Wall Street versus Main Street.¹⁶

One paradoxical result of the agitation for inflation via silver was that it explains why *deflation* was more severe in the United States than in the rest of the gold standard world (1.7 percent vs. 0.8 percent). As Anna Schwartz and I concluded,

This entire silver episode is a fascinating example of how important what people think about money can sometimes be. The fear that silver would produce an inflation sufficient to force the United States off the gold standard made it necessary to have a severe deflation in order to stay on the gold standard. In retrospect, it seems clear that either acceptance of a silver standard at an early stage or an early commitment to gold would have been preferable to the uneasy compromise that was maintained, with the uncertainty about the ultimate outcome and the consequent wide fluctuations to which the currency was subjected. [Friedman and Schwartz 1963, pp. 133–34]

IV. Which Would Have Been Better: Silver or Gold?

Given that either extreme would have been preferable to the uneasy compromise, which extreme would have been better: the early adoption of silver as the single standard at the monetary value of \$1.2929... an ounce or the early commitment to gold as the single standard? Or, seemingly different from either extreme, the continuation of nominal bimetallism? An answer requires a thorough examination of the quantitative consequences of the three choices.

As it happens, that examination, presented in the Appendix, makes it clear that resumption under a continuation of the bimetallic standard would have occurred to silver, not to gold, and would have occurred in 1876, a year after the passage of the Resumption Act. As a result, the gold-silver price ratio would have behaved very differently than it did.

Figure 2 plots the legal gold-silver price ratio (16 to 1), the actual market price ratio, and an estimate of the hypothetical price ratio that would have prevailed if legal bimetallism had continued. The actual ratio skyrocketed, especially after 1890, when it rose to more than 30 and stayed there. In sharp contrast, the estimated hypothetical ratio

¹⁶ I owe this comment to Hugh Rockoff.

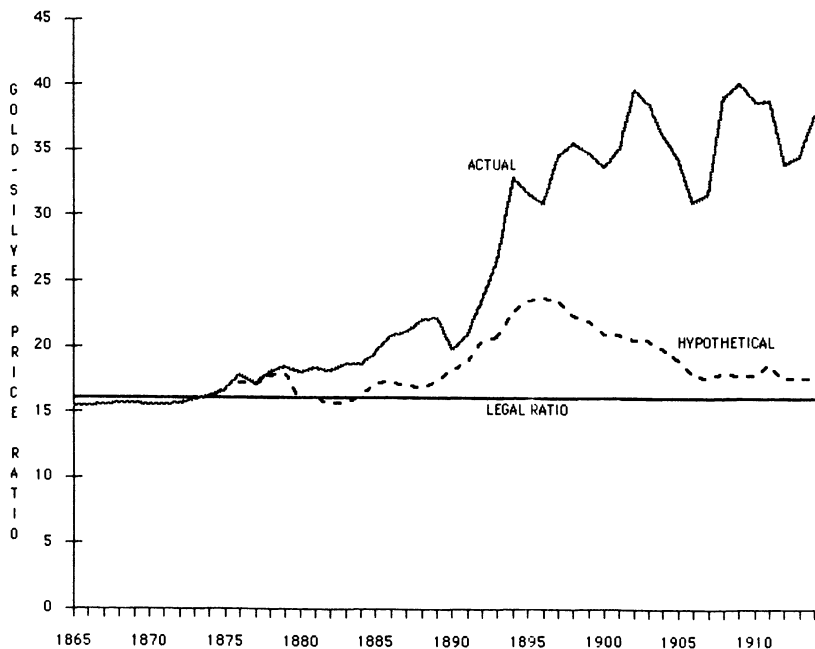


FIG. 2.—Gold-silver price ratio: legal, actual, and hypothetical, 1865–1914

departs widely from the legal ratio only from 1891 to 1904. Before 1891, it fluctuates narrowly around 16 to 1. From 1906 to 1913, it remains between 17 and 18. The years during which the ratio departs widely from 16 to 1 are no accident. The ratio rises well above 16 to 1 during the years of maximum political agitation about free silver surrounding the Bryan free-silver campaign of 1896, and the subsequent unwinding of the effects of that agitation. If the critical line had been retained in the Coinage Act of 1873, that agitation would never have occurred because the United States would have been on a silver standard. The hypothetical price ratio falls to a lower level during the period in which world gold production, which started rising rapidly in 1897, reached peak levels. This tended to depress the real price of gold.

These estimates allow as fully as I could for the alteration in economic circumstances that would have been produced by the continuation of legal bimetalism: the higher world price level and lower real price of gold, the reduction in the amount of silver available for nonmonetary use, and so on. But I have not been able to allow for some predictable effects—notably changes in real income and in the production of silver and gold—let alone for the change in the political climate. No doubt, the political vacuum created by the disappearance

of the free-silver issue would have been filled by other issues—very likely pressure for the United States to convert to a gold standard—but there is no way of conjecturing what effect they would have had on the gold-silver ratio. Any attempt to do so would carry this exercise in history as it might have been into the realm of fantasy.

I conclude that the adoption of silver would in practice have produced ratios throughout the period that would have fluctuated not far from 16 to 1 and would have varied even less than the estimates for the period before 1891 and after 1904. In short, I believe that the United States could have played the same role after 1873 in stabilizing the gold-silver price ratio that France did before 1873.¹⁷ If I am right, the fears of the opponents of bimetallism that a bimetallic standard would involve continual shifting between silver and gold would have proved false. With the United States effectively on silver and the United Kingdom and other major countries on gold, changes in the gold-silver ratio would have been directly reflected in the exchange rate between the dollar and other currencies. A rise in the ratio would have produced a dollar depreciation; a decline in the ratio, a dollar appreciation. Here again, a relatively steady gold-silver ratio would have meant relatively steady exchange rates, varying for sterling not far from the level, \$4.86, that actually prevailed.

The gold-silver price ratio is of no great importance in and of itself—silver and gold dealers excepted—but is of vital importance for the price levels that would have prevailed in silver standard countries (by assumption, including the United States) and in the gold standard countries. Figure 3 plots the actual price level and alternative hypothetical price levels corresponding to the gold-silver price ratios in figure 2. The naive estimate simply assumes that the gold-silver price ratio and the real price of silver would have been what they actually were. On that assumption the price level is readily calculated. It is necessary only to multiply the price level that actually prevailed by the ratio of the legal price of silver (1.2929) to the market price. However, this naive estimate clearly produces a great overestimate of the price rise that would have occurred. The 16 to 1 estimate goes to the other extreme: it underestimates the effect of the adoption of a silver standard on the price level by assuming that the actual ratio would have been precisely 16 to 1 throughout. The “sophisticated” estimate is in between but considerably closer to the 16 to 1 estimate than to the naive estimate for most of the period. However,

¹⁷ From 1803 to 1873, when France successfully maintained a bimetallic standard at a legal gold-silver ratio of 15.5 to 1, the lowest market ratio was 15.19 in 1859 and the highest 16.25 in 1813; most of the time the range was much narrower (Warren and Pearson 1933, p. 144, table 25).

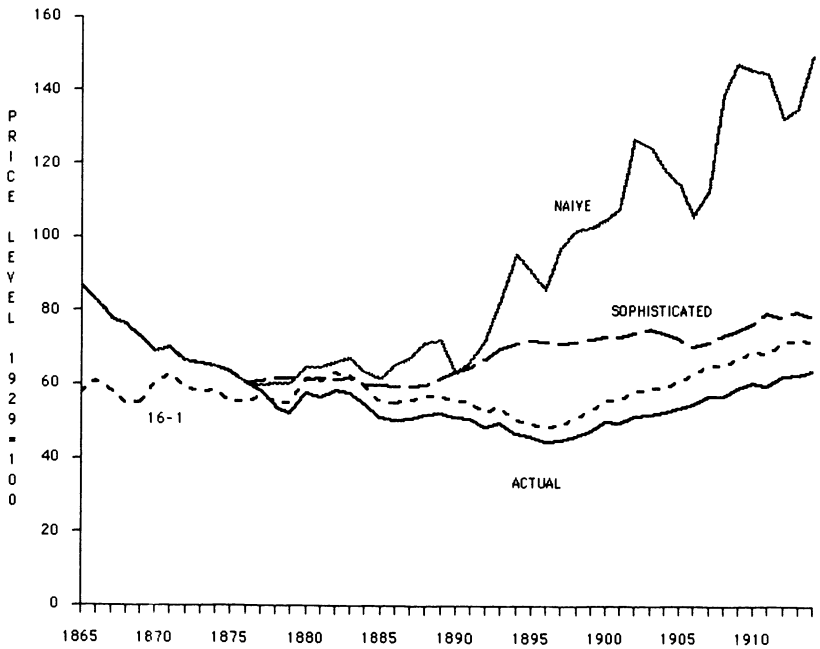


FIG. 3.—U.S. price level: actual and alternative estimates under a silver standard, 1865–1914.

the 16 to 1 estimate probably gives a more accurate picture of the likely year-to-year pattern than either of the other estimates. Both the naive and the sophisticated estimates are bedeviled by much purely statistical noise. In addition, U.S. bimetallism would have provided an incentive for worldwide stabilizing speculation in silver that would have eliminated erratic movements.

The U.S. price level fell from 1876 to 1896 at a rate of 1.5 percent a year and rose from then to 1914 at a rate of 2.0 percent a year. The 16 to 1 price level first fell at 0.7 percent to 1896 and then rose at 2.3 percent a year to 1914. The sophisticated price level declined from 1876 to 1887 at a rate of 0.2 percent a year and then rose to 1914 at the rate of 1.1 percent a year. Either alternative implies a halving or more of the initial rate of decline. The 16 to 1 alternative implies a slightly more rapid subsequent rise; the sophisticated alternative a much milder rise. If my estimates are anywhere near correct, a bimetallic—or really silver—standard would have produced a considerably steadier price level than the gold standard that was adopted.

Perhaps even more important, a silver standard almost surely would have avoided what Schwartz and I dubbed “the disturbed years from 1891 to 1897” (Friedman and Schwartz 1963, p. 104): encom-

passing the very sharp contraction of 1892–94, a brief and mild recovery from 1894 to 1895, followed by another contraction from 1895 to 1896,¹⁸ widespread bank failures plus a banking panic in 1893, and a run on U.S. gold reserves by foreigners fearful that silver agitation would force the United States off the gold standard. Confidence was restored and departure from gold prevented by a private syndicate headed by J. P. Morgan and August Belmont, under contract to the U.S. Treasury. “The allegedly onerous terms of the contract, arranged secretly through agents long identified in Populist literature as ‘the conspiracy of international bankers,’ became an issue in the campaign of 1896” (p. 112 n).

The effects would not of course have been limited to the United States. I have not been able to make as thorough an empirical study for the rest of the world as for the United States, but in the course of preparing the estimates for the United States, it was necessary to estimate the effect on the price level in the gold standard world, for which I used the United Kingdom as a proxy. Figure 4 gives the actual and hypothetical levels of prices in the United Kingdom. The estimated effect, though smaller than that in the United States, is clearly substantial. The price level would have been consistently higher for the rest of the world. The 0.8 percent a year decline in the actual price level from 1875 to 1895 would have been cut to 0.5 percent; the 0.9 percent a year subsequent rise would have been increased to 1.1 percent. Here too, however, there clearly would have been effects other than those encompassed in our simple calculation. The changes in the United States would doubtless have produced echoes elsewhere. Presumably, a healthier U.S. economy would have meant a healthier world economy. In addition, the consistently lower real price of gold would have reduced the incentive to produce gold. That might have delayed the introduction of the cyanide process for extracting low-grade ore that was responsible for the flood of gold that produced worldwide inflation after 1896. I have not allowed for any such effect.

Whether or not a verdict of “guilty” would have been appropriate in a court of law for “the crime of ’73,” it is appropriate in the court of history. The omission of the fateful line had momentous consequences for the subsequent monetary history of the United States and, indeed, to some extent, of the world. The rhetoric was overheated, but the importance of the issue was not overstated. The real issue was the monetary standard: gold and silver bimetallism, which in practice in the United States had meant alternating silver and gold standards. The act of 1873 cast the die for a gold standard, which

¹⁸ These are the annual reference dates used in Friedman and Schwartz (1982).

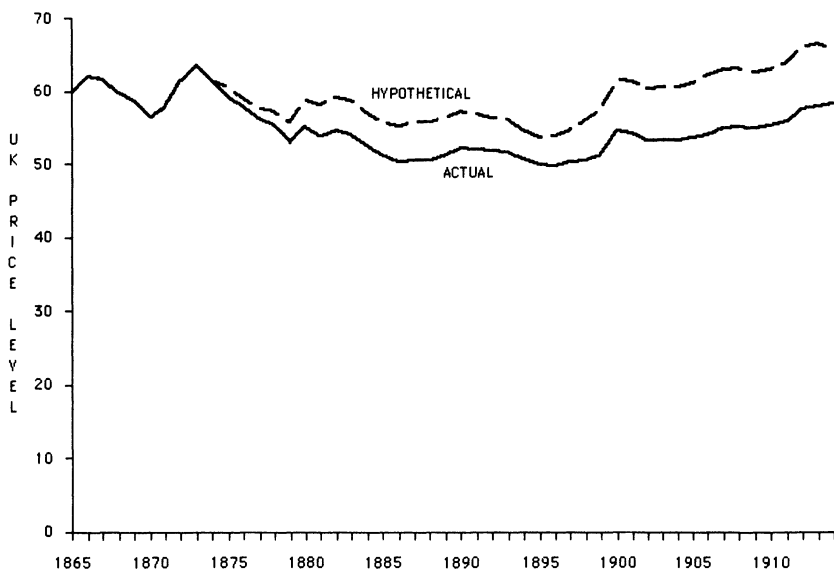


FIG. 4.—U.K. price level (1929 = 100): actual and hypothetical under a U.S. silver standard, 1865–1914.

explains its significance. Moreover, while the conventional view is Laughlin's, that "the act of 1873 was a piece of good fortune" ([1886] 1896, p. 93), my own view is that it was the opposite: a mistake that had highly adverse consequences.

I hasten to add that this is a judgment about 1873, not 1896. By 1896 it was too late to undo the damage. Bryan was trying to close the barn door after the horse had been stolen. The market gold-silver price ratio was about 30 to 1 at the time of the 1896 campaign. Adopting a legal ratio of 16 to 1 would doubtless have produced a sharp drop in the market ratio by simultaneously reducing the demand for gold and increasing the demand for silver. But however sharp the decline, it would have produced major disturbances in both price levels and international trade. The gold standard world was entering into an inflationary episode; loosening a flood of silver as money could only intensify inflation in the gold standard countries, while releasing it full force on the United States.¹⁹

¹⁹ The estimate in the Appendix is that the market ratio would have been about 24 to 1 in 1896 if the United States had remained on a bimetallic standard. However, as indicated in the text, I suspect that that is a considerable overestimate since it reflects the effect of the monetary and political controversies that would have been avoided under the hypothetical circumstances. Moreover, theoretical considerations suggest that the market ratio that would have prevailed under the hypothetical circumstances might have been either higher or lower than the market ratio that would have been

I hasten to add that this judgment is not intended either to denigrate or to praise the character or the intentions of the various parties in the long-running dispute. The prosilver group contained silver producers seeking to promote their special interests, inflationists eager to seize any vehicle for that purpose, and sincere bimetallists desiring neither inflation nor deflation who were persuaded that bimetallism was more conducive to price stability than monometallism. Similarly, the progold group contained producers of gold; deflationists, pilloried by the free-silver forces as Wall Street bankers; and sincere believers that the gold standard was the only satisfactory pillar for a financially stable society. Motives and intentions matter far less than the outcome. And, in this as in so many other cases, the outcome was very different from that intended by the well-meaning advocates of the Coinage Act of 1873.

Appendix A

Estimating the Effect of Continuing Bimetallism after 1873²⁰

The objective is to estimate the price level and gold-silver price ratio that would have prevailed if the Coinage Act of 1873 had contained provision for free coinage of the standard silver dollar of 371.25 troy grains of pure silver, so that the legal market price of silver was 1.2929....

A. Naïve Estimate

The real price of silver is simply the nominal price divided by the price level. On the naïve assumption that it remained unchanged, the real price of silver would have been 1.2929/PHN, where PHN is the naïve estimate of the hypothetical price level under a silver standard. Equating the two and solving for the naïve hypothetical price level give

$$\text{PHN} = 1.2929... \cdot \frac{P}{\text{PS}}, \quad (\text{A1})$$

produced by the election of Bryan and adoption of the free coinage of silver and gold at a 16 to 1 ratio. In another paper (Friedman 1990), I have discussed in greater detail what the effect would have been if Bryan had been elected in 1896.

²⁰ Many years ago, I suggested to Louis Drake that he estimate the effect on U.S. and world prices if the United States had remained on a bimetallic standard. He worked on the project for years and accumulated much data, but he was never sufficiently satisfied with his results to publish them. After his death in 1982, colleagues and friends edited a preliminary paper that was found in his files, retaining in full his original calculations, and published the result in *Explorations in Economic History* (Drake 1985). When I began the paper to which this memorandum is appended, I thought that I could simply use his results. But when I read his paper in detail, I appreciated the reservations about his results that presumably led him to refrain from publication. In consequence, I have produced an independent set of estimates, though benefiting from some of his data and analysis. Not surprisingly, my final results differ drastically from his.

where P is the actual price level and PS is the actual nominal price of silver.²¹ The naive estimate is less than the actual price level from 1865 to 1876. In 1876, the two are equal; hence if the fateful line had not been omitted from the Coinage Act of 1873, resumption on the basis of silver would have occurred in 1876, a year after the passage of the Resumption Act. Figure 3 of the text plots the subsequent naive estimate of the price level; table A1 gives the numerical values.

There are three defects of the naive estimate. (1) The United States would probably have added to its silver stock under a silver standard even more than it did in response to the silver interests under a gold standard. That would have tended to raise the real price of silver. (2) The United States would also have exported gold rather than accumulated gold, which would have added to the rest of the world's monetary and nonmonetary stocks of gold and raised nominal prices in the gold standard world. That would have lowered the real price of gold. (3) On both scores, the gold-silver price ratio would have been lower than it actually was.

B. 16 to 1 Estimate

Assume that the adoption of a silver standard by the United States would have been effective in establishing 16 to 1 as the actual gold-silver price ratio and that the United States stayed on a strict silver standard (i.e., the ratio was trivially above 16 to 1). As we shall see, this is not as farfetched as it seems.

To estimate the hypothetical U.S. price level under this assumption, we need an estimate of the hypothetical real price of gold. Assume that the United States disposed of the whole of its monetary gold stock when it adopted a silver standard and that the gold released was divided between nonmonetary use (by the United States plus the rest of the world) and the monetary gold stock of the rest of the world in the proportion that actually prevailed between these two components of the total gold stock.²² Assume further that the world price level rose in proportion to the increased stock of gold. We then have

$$RPGH = RPG \cdot \frac{EWMG + WNMG}{WMG + WNMG}. \quad (A2)$$

Since the real price of silver is by assumption one-sixteenth of the real price of gold and by definition equal to the nominal price (= legal price) divided by the price level, we have

$$PH16 = 1.2929... \cdot \frac{16}{RPGH}. \quad (A3)$$

The actual U.S. monetary gold stock became a steadily increasing fraction of the world's monetary gold from 1879 on, so that the hypothetical price roughly parallels the actual price, with the differential rising somewhat over the period (see fig. 3 of the text). In 1876, when resumption on silver would

²¹ For sources of data for these and succeeding variables, see App. B. The notation is also defined in App. B.

²² I owe this approach to Hugh Rockoff. It replaces a less attractive assumption I had made initially.

TABLE A1
ESTIMATED EFFECT ON U.S. AND U.K. PRICES IF THE UNITED STATES HAD BEEN ON A SILVER STANDARD, 1865-1914

YEAR	U.S. PRICE LEVEL			U.K. PRICE LEVEL (1929 = 100)		GOLD-SILVER PRICE RATIO	
	Actual	Hypothetical		Actual	Hypothetical	Actual	Hypothetical
		Naive	16 to 1				
1865	86.5		57.3	59.8		15.4	
1866	82.6		60.8	62.0		15.5	
1867	77.6		58.2	61.6		15.6	
1868	76.2		54.6	59.8		15.6	
1869	72.7		54.7	58.7		15.6	
1870	68.7		59.8	56.3		15.6	
1871	69.8		62.5	57.8		15.6	
1872	66.3		59.0	61.4		15.6	
1873	65.5		57.6	63.5		15.9	
1874	64.8		58.3	61.5		16.2	
1875	63.3		55.1	59.2		16.6	
1876	60.4	60.2	55.4	57.8	59.0	17.8	17.2
1877	58.2	59.8	56.8	56.2	57.5	17.2	17.1
1878	53.9	60.1	55.4	55.2	57.2	17.9	17.7
1879	52.0	60.0	54.7	52.8	55.6	18.4	18.0
1880	57.4	64.5	61.3	55.0	58.7	18.0	15.9
1881	56.3	64.4	60.8	53.8	58.1	18.3	16.2
1882	58.1	66.0	62.8	54.6	59.0	18.2	15.5
1883	57.4	66.8	62.3	54.0	58.6	18.7	15.7
1884	54.4	63.2	59.1	52.5	57.0	18.7	16.2
1885	50.8	61.6	55.4	51.1	55.7	19.4	17.2

1886	50.1	65.1	54.8	59.2	50.3	55.0	20.9	17.3
1887	50.6	66.8	55.8	59.2	50.5	55.7	21.1	17.0
1888	51.5	70.9	56.7	59.7	50.5	55.6	22.0	16.8
1889	51.8	71.5	56.8	61.3	51.2	56.1	22.0	17.3
1890	50.8	62.8	55.8	63.4	52.1	57.1	19.7	18.2
1891	50.3	65.8	55.0	64.4	51.9	56.7	20.9	18.7
1892	48.3	71.3	52.5	66.7	51.8	56.2	23.8	20.3
1893	49.5	81.8	53.8	69.4	51.5	55.9	26.6	20.6
1894	46.4	95.2	50.0	70.9	50.6	54.6	32.9	22.7
1895	45.7	90.5	49.0	71.9	49.9	53.5	31.9	23.4
1896	44.4	85.5	48.1	71.3	49.7	53.9	30.5	23.7
1897	44.6	96.5	48.6	71.1	50.2	54.6	34.5	23.4
1898	45.9	101.8	51.0	71.3	50.5	56.1	35.5	22.4
1899	47.1	102.3	52.6	72.0	51.2	57.1	34.8	21.9
1900	49.6	104.5	55.8	72.6	54.6	61.4	33.8	20.8
1901	49.3	108.1	55.7	72.8	54.2	61.2	35.1	20.9
1902	51.0	126.5	57.9	74.0	53.3	60.4	39.7	20.5
1903	51.5	124.4	58.6	74.9	53.2	60.4	38.6	20.5
1904	52.3	118.2	59.4	73.8	53.3	60.5	36.2	19.9
1905	53.4	114.4	60.8	72.4	53.6	61.0	34.3	19.0
1906	54.5	105.4	62.7	70.1	54.0	62.2	31.0	17.9
1907	56.8	112.4	65.2	71.3	54.9	63.0	31.8	17.5
1908	56.7	138.6	65.0	73.1	55.1	63.2	39.1	18.0
1909	58.7	147.5	67.0	74.7	54.9	62.5	40.2	17.8
1910	60.2	145.6	68.7	76.4	55.2	63.0	38.7	17.8
1911	59.7	144.9	68.3	79.6	55.9	63.9	38.9	18.6
1912	62.3	132.4	71.4	78.2	57.5	65.9	34.1	17.5
1913	62.6	135.3	71.9	79.7	57.9	66.5	34.6	17.7
1914	63.5	149.7	71.8	78.6	58.2	65.8	37.8	17.5

have taken place, the price level as estimated from equation (A3) was a trifle below the actual price level. By 1877, it was a trifle above.

The hypothetical real price of gold is also all that is needed to estimate the effect on the price level of the gold standard world if the United States were on a silver standard throughout the period. If we take the U.K. price level as representative of the price level of the gold standard world, we have

$$\text{UKPH} = \text{UKP} \cdot \frac{\text{WMG} + \text{WNMG}}{\text{EWMG} + \text{WNMG}} \quad (\text{A4})$$

(see fig. 4 of the text). The effect is clearly appreciable.²³

C. A More Sophisticated Estimate

To go beyond these simple estimates requires finding a way to estimate the real price of silver since we can use the counterpart of equation (A3) to convert such an estimate into an estimate of the hypothetical price level.

The real price of silver is determined by (a) the supply of and (b) the demand for silver for nonmonetary use in the world as a whole. The adoption of a bimetallic or silver standard by the United States would presumably not have significantly affected the world demand function for silver for nonmonetary use. To estimate that demand function (subsection 3 below) requires data on the actual nonmonetary use of silver (subsection 1). On the other hand, the adoption of a bimetallic or silver standard by the United States would clearly have altered significantly the supply of silver for nonmonetary use (subsection 2) because it would have increased the monetary demand for silver. Constructing acceptable estimates for the period in question (1875–1914) proved by far my most troublesome problem.

1. Actual Nonmonetary Use of Silver

The supply of silver for nonmonetary use is equal to (1) the production of silver minus (2) the demand for silver for monetary use by the rest of the world minus (3) the demand for silver for U.S. monetary use, or

$$\text{SNM} = \text{SPROD} - \text{EWMDS} - \text{UMDS}. \quad (\text{A5})$$

Estimates for SPROD, the annual production of silver, and EWMDS, the increment in the monetary stock of silver by other countries, are readily

²³ An interesting check on these estimates, discovered after they were completed, is provided by Irving Fisher, who, in 1911, wrote the following: "If some way had been contrived by which gold and silver could have been kept together (say by world-wide bimetallism), prices would not have fallen so much [from the average of 1873–76] in gold countries, or risen so much (if at all) in silver countries, but would probably have fallen in gold countries slightly—probably about 10 per cent up to 1890–1893 and more up to 1896" (pp. 244–45). He estimates that prices in fact fell 22 percent in gold countries between 1873–76 and 1890–93 and rose 17 percent in silver countries. According to table A1, prices in the United States, a gold country, did fall 22 percent between the indicated dates but in the United Kingdom, which I have taken as a representative gold country, by 14 percent. The estimate of the hypothetical price index for the United Kingdom falls by half as much or 7 percent and then falls further to 1896, in both respects very close to Fisher's estimates, especially with respect to the fraction of the decline that would have been avoided. As to silver countries, the estimate of the 16 to 1 U.S. price level in table A1 falls 4 percent and that of the sophisticated price level (discussed below) rises 4 percent, consistent with Fisher's "if at all."

available. I have constructed estimates for UMDS, the increment in the U.S. monetary stock of silver, for fiscal years 1873–94 from a report of the Treasury Department reporting purchases by the United States under the successive silver purchase acts, and for later years from estimates of the total dollar value of the monetary stock of silver.

2. Hypothetical Supply of Silver for Nonmonetary Use

Equation (A5) gives actual nonmonetary use. Add an H to the relevant symbols and it gives hypothetical nonmonetary use under a silver standard. Item 1, silver production, depends in principle on the real price of silver. However, during the period in question, the actual production of silver rose sharply, nearly tripling from 1880 to 1914, while at the same time the real price of silver fell to less than half its initial level. Supply was clearly being driven by exogenous discoveries and innovations. Moreover, much silver is a by-product of the mining of other metals and so is relatively inelastic in supply. Hence, I have assumed that silver production would have been what it actually was. This assumption introduces an error leading to an upward bias in the estimated real price of silver.

With regard to item 2, I have assumed that other countries would not have been affected by the U.S. adoption of a silver standard, by their either adopting silver rather than gold or changing the amount of silver added to their monetary stocks. This assumption seems eminently justified. The major move from silver to gold by Germany, France, and others came before the United States would have moved to a silver standard, and indeed was part of the reason why the United States itself moved to a gold standard. Hence, I have simply used the actual monetary demand by other countries as the hypothetical estimate.

Item 3, the hypothetical increment in the U.S. monetary stock of silver, is the most difficult. We can tautologically express the hypothetical U.S. monetary silver stock (in ounces) as the product of the ratio maintained between specie and money (SPR) times the quantity of money divided by the legal price of silver or, expressing the quantity of money by the ratio of nominal income to velocity and nominal income as the product of real income and the price level, as follows:

$$\text{UMSH} = \frac{\text{UMG\$}}{\text{UM}} \cdot \frac{y}{V} \cdot \frac{P}{\text{LP}} = \text{SPR} \cdot \frac{y}{V} \cdot \frac{1}{\text{RPSH}} = k_1 \cdot \frac{1}{\text{RPSH}}, \quad (\text{A6})$$

where y/V is the real money stock; multiplication by P converts it into nominal dollars. Only the product of SPR and y/V , which I have designated by k_1 and which equals the real value of the specie reserve, enters in the subsequent analysis. (In principle, all the symbols should be followed by an H , but since no confusion arises except for the real price of silver, I have omitted it.)

The reason for expressing the money stock as the product of the real stock and the price level is that the price level is what we are seeking to estimate. The second form of stating the right-hand side of equation (A6) introduces the hypothetical real price of silver in place of the nominal price level. From that, we can readily estimate the hypothetical nominal price level by using the counterpart of equation (A1).

In computing the actual values in equation (A5), I regarded silver in circulation or held by the Treasury as "monetary silver." However, in estimating hypothetical values of the specie reserve ratio and of specie reserves for the

gold standard period, I cannot treat monetary silver as part of specie reserves, though it would have had that status under a bimetallic or silver standard. It was simply a governmental asset accumulated as part of an attempt to prop up the price of silver (like government stocks of wheat at present).

Accordingly, I have used only monetary gold stocks for the present purpose. Figure A1 plots the gold reserve ratio (the ratio of the dollar value of monetary gold to the quantity of money), the real value of the stock of money, and the real value of gold reserves (actual gold k_1). The rapid rise in the reserve ratio during the first 5 years after the passage of the Resumption Act (1875–79) was to be expected in preparation for resumption. Presumably, a similar rise would have occurred if resumption had been on silver instead of gold, with the sole difference that silver would have been accumulated rather than gold. In either case, the accumulation of reserves required a surplus on the current account of the balance of payment or capital inflows. A sizable surplus was generated from 1876 to 1881 followed by sizable capital inflows. I see no reason to suppose that the initial buildup of reserves would have been different under silver from what it was under gold.

By 1879, the specie reserve ratio reached roughly the same level as in the early 1900s after the end of the period of uncertainty generated by the monetary disturbances of the 1880s and 1890s. The further rise after 1879 was prompted by an effort to persuade the public, not only at home but equally abroad, that the gold standard was here to stay. As agitation for a more expansive monetary policy mounted, however, that effort failed and, especially after the prosilver movement gained steam, led to continuous pressures on gold reserves, producing a sharp decline in the reserve ratio and a slightly declining level of real reserves. After the defeat of Bryan in 1896, there was a temporary spurt in the reserve ratio and an even sharper rise in real reserves as the higher reserve ratio was reinforced by a rapid increase in

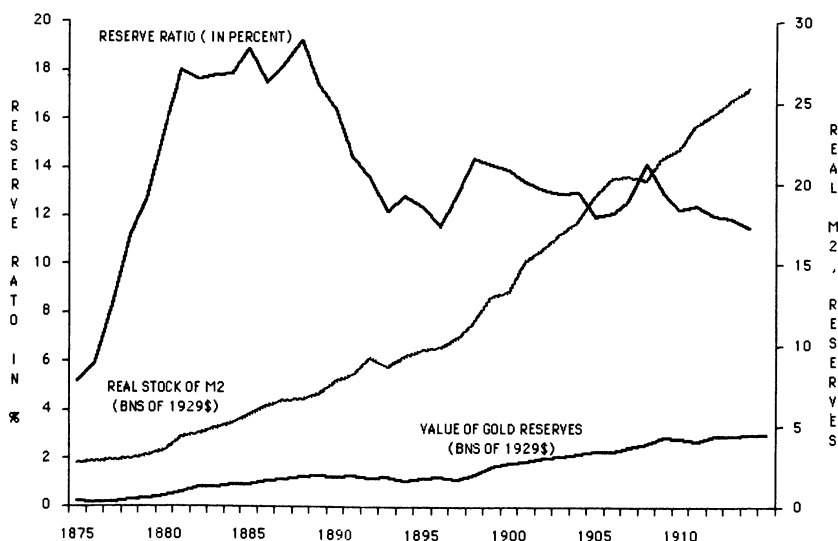


FIG. A1.—Gold reserve ratio, real money stock, and gold reserves in billions of 1929 dollars, 1875–1914.

the real money supply, itself partly a consequence of a return of confidence that both lowered velocity and fostered a higher real income. Reasonably steady conditions were not attained until the end of our period.

After trying many alternative ways of estimating what specie reserves would have been under an unchallenged and fully accepted silver standard, I finally settled on a purely empirical expedient: a straight-line trend between the average values of gold reserves during the first 5 and the last 5 years of the period from 1875 to 1914. As figure A2 shows, such a trend eliminates both the initial bulge and later decline that I attributed in the prior paragraph to the monetary disturbances and their aftermath. For 1875–79 and 1901–14, it approximates the actual pattern.

The U.S. hypothetical annual monetary demand for silver is simply the increment in the U.S. hypothetical silver stock:

$$\text{UMDSH}(t) = \Delta \text{UMSH} = \text{UMSH}(t) - \text{UMSH}(t - 1). \quad (\text{A7})$$

The possible errors in this approach are numerous. Some simply affect the year-to-year movements as a result of the use of a trend for k_1 . Any systematic bias arises primarily from the assumption that the same specie reserves would have been maintained under a silver standard in the early and late years of the period as those maintained under a gold standard. The possible sources of error are different for the specie reserve ratio and the real stock of money. The desired specie reserve ratio might have been affected by a different pattern of prices. Rising prices under a gold (silver) standard means that the real value of gold (silver) is falling, and conversely. A falling real value makes it less expensive to hold the specie reserves, and conversely. It is doubtful, however, that any such price effect has a significant influence on the decision by the monetary authority on how large a specie reserve is desirable: any

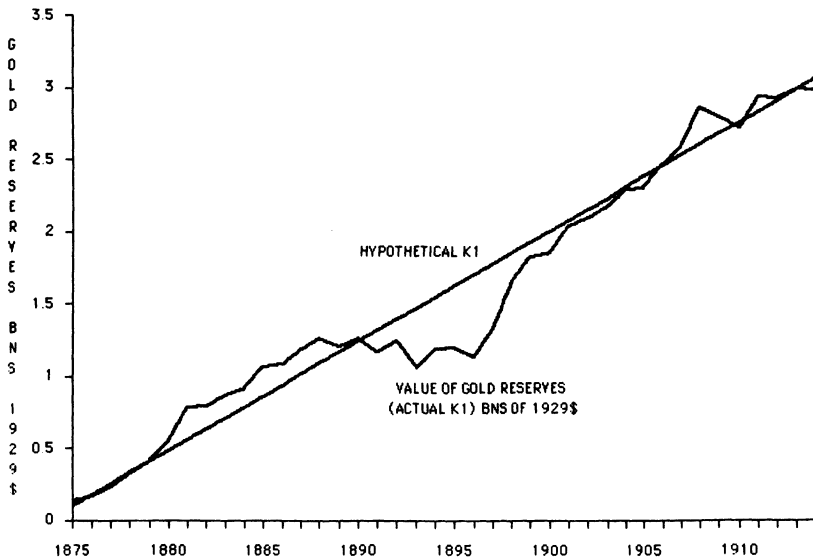


FIG. A2.—Actual and hypothetical gold reserves (k_1) in billions of 1929 dollars, 1875–1914.

financial benefit or loss is subtle and accrues to the government at large and not specifically to the monetary authority. A more important factor is surely the threat of a specie drain, which would have been largely absent under a secure silver standard.

The real stock of money would have been affected by the reduction in uncertainty as a result of settling on a definitive silver standard. The reduced uncertainty would have tended to lower velocity and raise real income, both of which would have raised the real money stock—as appears to have happened after 1896. Neglect of these effects produces an underestimate of the hypothetical silver stock. Such an underestimate introduces a downward bias in estimating the real price of silver, or a bias in the opposite direction from the possible bias introduced in estimating item 1, the production of silver.

3. Demand for Silver

The quantity of silver demanded for nonmonetary use depends primarily on world real income, the real price of silver, and the real price of gold. I have estimated a demand curve with these variables in two variants: linear and logarithmic. In general, the logarithmic form is preferable. However, in this particular case I do not believe it is. The logarithmic form forces the nonmonetary demand for silver to be positive, yet it is easily possible for additions to monetary stocks of silver to exceed the world production of silver, as happened most recently under the silver purchase program of President Roosevelt in the 1930s. In that case, the quantity of silver available for nonmonetary purposes is negative if it is estimated in accordance with equation (A5), which gives the nonmonetary supply of silver out of current production, not the nonmonetary use of silver.

As an estimate of world real income, I have used an index number of the physical volume of world production given by Warren and Pearson (1933).²⁴ For the real price of silver and the real price of gold, I simply used the actual prices divided by the U.S. deflator. This procedure assumes that the real price of silver and the real price of gold were the same throughout the world, surely a not unreasonable assumption for those two monetary metals.²⁵

The two equations are as follows for 1880–1914:

$$\log \text{SNM} = -6.96 + 1.27 \log \text{WI} - 1.28 \log \text{RPS} + 1.87 \log \text{RPG}, \quad (\text{A8})$$

(3.7) (4.0) (4.0) (5.6)

$$\text{SNM} = 58.28 + 2.13\text{WI} - 66.21\text{RPS} + .88\text{RPG}, \quad (\text{A9})$$

(.8) (4.0) (4.0) (1.1)

²⁴ A footnote to the Warren and Pearson tables says that for 1865–1932 the index was prepared by Carl Snyder of the Federal Reserve Bank of New York. Warren and Pearson report similar index numbers of U.S. physical volume of production. The trend of the index of U.S. production is steeper than the trend of U.S. real income (estimates from Friedman and Schwartz [1982]). On the other hand, the general ups and downs are very similar. Accordingly, I experimented with adjusting the Warren and Pearson index by subtracting out a trend at a rate equal to the difference between the logarithmic trends of U.S. production and U.S. real income, which was 0.4 percent a year. However, the effect on the final results was trivial and, if anything, rendered them slightly less significant statistically, so I have simply used the original index.

²⁵ However, it is not clear that it is preferable to use the U.S. rather than the U.K. deflator. I experimented with both. The difference in results was small, trivially in favor of the U.S. deflator. However, a more decisive consideration is that I want to use the equation to estimate the hypothetical U.S. price level, so it was encouraging that substituting the U.K. deflator did not produce a statistical improvement.

where WI stands for world income. As usual, the values in parentheses are the absolute t -values. In the log equation, the coefficients are all highly significant; in the linear equation, only the coefficients of world income and the real price of silver are. However, there is little to choose between the equations in terms of the goodness of fit, as can be seen graphically in figure A3 as well as from the adjusted R^2 's, which are .949 for the log equation and .950 for the linear equation. The standard error of estimate for the log equation is .180, which is comparable to an estimate of the coefficient of variation for the linear equation. That is .138 if the denominator of the coefficient of variation is the arithmetic mean of the dependent variables, and .177 if it is the geometric mean. Both estimates for the linear equation are lower than that for the log equation.

Estimating a hypothetical price level using the linear equation is mathematically far more tractable than using the log equation, which reinforces the theoretical consideration in favor of the linear equation, that is, that the silver available for nonmonetary use out of current production can be negative. Hence, from here on, I use only the linear equation.

4. Equating Supply and Demand

Equating equations (A5) and (A9) and rearranging terms yield

$$\begin{aligned} \text{UMDSH} = & \text{SPROD} - \text{EWMDS} - 58.28 - 2.13\text{WI} \\ & - .88\text{RPGH} + 66.21\text{RPSH}. \end{aligned} \quad (\text{A10})$$

To simplify, let k_2 equal all the terms on the right-hand side of (A10) except the last, and let x equal the hypothetical real price of silver that is our objective. All these are also functions of time. However, given assumptions up to this point, we have estimates of the values of k_1 and k_2 for all the years from 1874 to 1914.

In terms of these symbols, we can rewrite equation (A7), using equation (A6), as

$$\text{UMDSH}(t) = \frac{k_1(t)}{x(t)} - \frac{k_1(t-1)}{x(t-1)}. \quad (\text{A11})$$

Equating equations (A10) and (A11) and simplifying yield

$$66.21x^2(t) + \left[k_2(t) + \frac{k_1(t-1)}{x(t-1)} \right] x(t) - k_1(t) = 0. \quad (\text{A12})$$

Equation (A12) is now in the form of a straightforward quadratic equation except for the troublesome presence of the term including $x(t-1)$ in the denominator; $x(t-1)$ is one of the unknowns that we are trying to determine. As a first approximation, assume that the real price of silver does not change from year to year, that is, that $x(t)$ equals $x(t-1)$. That assumption converts equation (A12) into the simplified equation (A13), which involves only the current year's value of the unknown x , although it does involve the prior year's value of k_1 , via substituting Δk_1 for $k_1(t) - k_1(t-1)$:

$$66.21x^2 + k_2x - \Delta k_1 = 0. \quad (\text{A13})$$

The solution to this equation is a first approximation to x .

For a second, third, and so forth approximation, we can return to equation (A12) and replace $x(t-1)$ with the prior approximation estimate. The successive approximations do converge, though rather slowly. The main changes

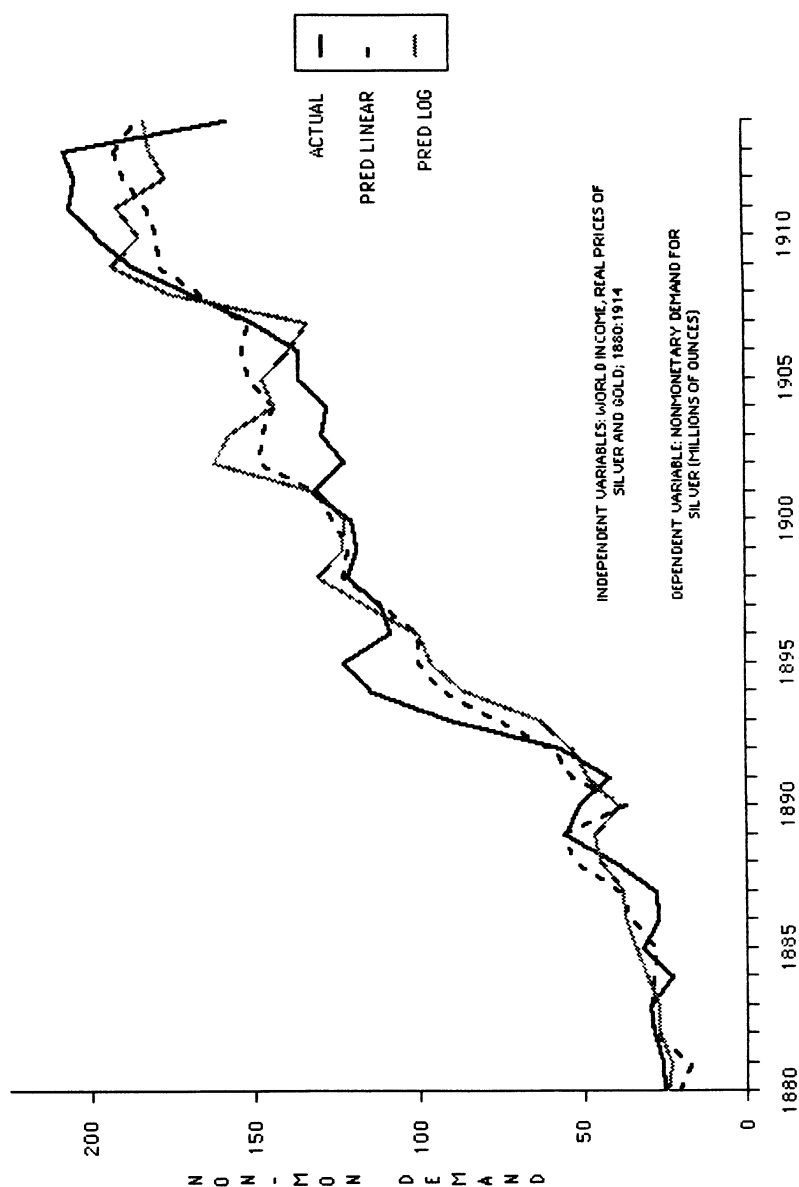


FIG. A3.—Nonmonetary demand for silver: actual vs. predicted by linear and log regressions

are not in the level or general pattern but rather in the year-to-year movements. However, each approximation involves losing one value at the beginning of the series. I stopped with the eleventh approximation, at which point 1884 is the first year for which there is an estimate. For earlier years, I used the earlier approximations, beginning with the third for 1876, the year in which the silver standard would have been adopted.²⁶ Given this estimate of the real price of silver, it is necessary only to divide the legal price by the real price to estimate the hypothetical price level under a silver standard. The resulting "sophisticated" estimate of the hypothetical price level for the United States is plotted in figure 3 of the text.

5. Gold-Silver Price Ratio

Since we have already estimated the hypothetical price of gold, it is trivial to get the hypothetical price ratio of gold to silver. The result is plotted in figure 2 of the text along with the actual and legal gold-silver price ratio. The actual gold-silver price ratio under a U.S. silver standard would almost surely have fluctuated much less than our estimates of the hypothetical gold-silver price ratio, given the arbitrary assumptions and inevitable measurement errors that affect our estimates and the extent to which they have been affected by the monetary uncertainty of the period.

These estimates suggest that, if the United States had returned to a bimetallic standard in 1879 and had stayed on it consistently throughout, the market gold-silver price ratio would have remained roughly equal to or only slightly above the U.S. legal price ratio, just as for close to a century it remained roughly equal to the legal price ratio in France. (Table A1 gives the numerical values for the curves plotted in figs. 2, 3, and 4 of the text.)

D. An Even More Sophisticated Estimate

In principle, it would be possible to get a fully simultaneous solution for both the real price of silver and the real price of gold by following the same procedure for gold as for silver, namely, estimating (a) a demand equation for the nonmonetary use of gold and (b) the hypothetical quantity of gold that would have been demanded if the United States had gone on a silver standard. However, explorations along this line proved disappointing. First, estimating the hypothetical nonmonetary demand is even more difficult for gold than for silver.²⁷ Second, estimated demand equations for gold yielded negative, though statistically not significant, coefficients for the real price of silver instead of the positive coefficient that would be expected for a substitute for gold.²⁸ That result is inconsistent with the positive coefficient for the real

²⁶ The first year for which I have an estimate for EWMDS is 1874, which explains why the first year for which I can estimate the first approximation is 1874.

²⁷ A major sticking point is specifying precisely how the U.S. gold stock would have been disposed of. My earlier rough approximation evades this question. For a full solution, however, we cannot do so. Demand functions for gold and silver refer to annual quantity demanded, and we need to equate that demand function with annual supply. This means that we would need to add to total gold production the amount of gold that the United States would have released to the rest of the world from its stock on a year-by-year basis. I see no way to estimate the annual release except by purely arbitrary assumptions.

²⁸ The calculated demand functions for nonmonetary use of gold are as satisfactory

price of gold in demand equations for silver, a violation of the Slutsky cross-equation condition. Eliminating that contradiction requires estimating the silver and gold demand equations simultaneously, imposing the appropriate cross-equation restriction. Given the drastic difference between the two separate equations, I doubt that the result would deserve much confidence. Finally, these problems resolved, the simultaneous solution requires solving a fourth-degree equation in the U.S. price level.

I am thus left in a quandary: I am unhappy with what I have done, but even more unhappy with the most obvious alternative, a simplified general equilibrium analysis. A comprehensive general equilibrium analysis would have to include not only the determinants of gold production and silver production, which I have completely neglected, but also the determinants of the fraction of gold production and silver production that go into monetary and non-monetary use. Construction of such an expanded general equilibrium model would be extremely laborious and would deserve little confidence. Under the circumstances, I am inclined to leave well enough alone, while at the same time acknowledging that the estimates are subject to a wide margin of error, particularly with respect to year-to-year movements.

Appendix B

A. *Source of Variables*²⁹

P 1869–1914: Friedman and Schwartz (1982, table 4.8); 1865–68: extrapolated backward from Hoover (1960, p. 142).

as those for silver in terms of goodness of fit, but not in terms of economic logic. The logarithmic and linear demand functions are as follows:

$$\log \text{WGNM} = \underset{(13.2)}{4.34} + \underset{(10.0)}{.555 \log \text{WI}} - \underset{(1.4)}{.077 \log \text{RPS}} - \underset{(4.5)}{.259 \log \text{RPG}}, \quad (\text{A14})$$

$$\text{WGNM} = \underset{(4.2)}{169.862} + \underset{(9.0)}{3.08 \text{WI}} - \underset{(.8)}{8.721 \text{RPS}} - \underset{(2.8)}{1.482 \text{RPG}}, \quad (\text{A15})$$

where WGNM is the world nonmonetary demand for gold. As with silver, both equations give high multiple correlations (adjusted R^2 's of .98 for the log equation and of .97 for the linear equation) and relatively small standard errors. The standard error of the log correlation is .031. The corresponding estimate for the linear equation of the coefficient of variation is .037 whether the denominator is an arithmetic mean or a geometric mean. An appendix to chap. 4 of the report of the U.S. Commission on the Role of Gold (1982, pp. 176–77) reports estimates of demand equations linear in the logarithms of the variables for the industrial demand for gold for 1950–80 and 1969–80. The independent variables are conceptually the same as those that I used: the real price of gold, the real price of silver, and real income. Both sets use two alternative deflators to estimate the real prices: the U.S. wholesale price index and the world consumer price index. The difference between the two sets of equations is that the one for the longer period uses U.S. income only, whereas that for the shorter period uses three alternative real income variables: for seven major industrial countries, for the United States, and for the world. The four equations that use U.S. income give a negative coefficient for the real price of silver, though only one out of four comes close to statistical significance. On the other hand, the four others (all for the shorter period) are all positive, in line with theoretical expectations, though none comes close to statistical significance. This evidence clearly does not contribute to resolving the puzzle.

²⁹ Sources are listed in the order in which the variables are introduced in App. A.

PS	U.S. Bureau of the Census (1975, p. 606, ser. 270). For 1865–78, original source gives price in gold dollars. Adjusted to greenback price by multiplying by reciprocal of gold value of currency, from Warren and Pearson (1933, p. 351, table 69).
WMG, WNMG	U.S. Commission on the Role of Gold (1982, p. 198, table SC 7).
UMG	U.S. Commission on the Role of Gold (1982, p. 203, table SC 9); 1865–77 shifted from June 30 to December 31 data by 2-year moving average of June 30 data for 1865–78.
EWMG	Equals WMG – UMG.
RPG	1865–78: reciprocal of gold value of currency (from Warren and Pearson [1933, p. 351, table 69]) times legal price of gold (\$20.67183) divided by P ; 1879–1914: legal price divided by P .
UKP	1868–1914: Friedman and Schwartz (1982, table 4.9); 1865–67: extrapolated back from 1868 by price index implicit in Deane (1968).
SPROD	Warren and Pearson (1933, p. 139, table 24). 1865–75: linear interpolation between centered 5-year averages in table. Thereafter, annual figures in table.
EWMDS	Drake (1985, pp. 208–9, table A) gives estimates for successive 5-year periods based on annual reports of the director of the mint. I simply assumed that the same amount was accumulated each year during the successive 5-year periods. The numbers are small and do not vary drastically from one period to the next, so not much error is introduced by this assumption. However, I suspect that the initial estimates are subject to a large margin of error.
UMDS	Purchases under the silver purchase laws of February 12, 1873; January 14, 1875; February 28, 1878; and July 14, 1890, are given in U.S. Secretary of the Treasury (1899, p. 207). For the first two purchase laws only the total is given; I have assumed that the amount purchased was the same in each month of the period for which each law was in effect. For the final two laws, figures are given for fiscal years from 1878 to 1894. For later years, I have estimated the physical stock of silver from the dollar stock of silver dollars and subsidiary silver as reported in U.S. Secretary of the Treasury (1928, pp. 552–53) by dividing by the legal price, allowing roughly for the lesser amount of silver in subsidiary silver, and differenced the series to get annual purchases. When the Treasury bought silver, it paid the market price but valued it for monetary purposes at the legal price of silver, which is why the physical stock can be estimated from the monetary stock by dividing by the legal price of silver. The allowance for the different treatment of subsidiary silver is rough, but the amounts involved are small, so no great error is introduced. The final estimates are for fiscal years ending June 30, whereas SPROD and EWMDS are for calendar years, so I have converted the fiscal year data to calendar year data by a 2-year moving average.
UMG\$	1879–1914: Friedman and Schwartz (1963, pp. 130–31, table

5); 1866–78: estimates by Anna J. Schwartz based on same sources.

UM	Friedman and Schwartz (1982, table 4.8).
y	Friedman and Schwartz (1982, table 4.8).
V	Equals nominal income from Friedman and Schwartz (1982, table 4.8) divided by UM.
WI	Equals Warren and Pearson (1933, pp. 85–86, table 12) index number of world's physical volume of production, 1880–1914 = 100, divided by two.

B. Record of Notation

EWMDS	Actual monetary demand for silver in the rest of the world (external)
EWMG	Rest-of-world actual monetary gold stock
k_1	Equals $SPR \cdot (y/V)$
k_2	Equals $SPROD - EWMDS - 58.28 - 2.13WI - .88RPGH$
LP	Legal price of silver
P	U.S. price level
PHN	Naive estimate of hypothetical price level
PH16	Hypothetical price level on assumption that the gold-silver price ratio is 16 to 1
PS	Nominal price of silver
RPG	Real price of gold
RPGH	Hypothetical real price of gold
RPS	Real price of silver in 1929 dollars
RPSH	Hypothetical real price of silver in 1929 dollars
RPSH16	Hypothetical real price of silver on 16 to 1 ratio assumption
SNM	Silver available for nonmonetary use
SPR	Specie reserve ratio
SPROD	Total silver production
UKP	British price level
UKPH	Hypothetical British price level
UMDS	Actual annual monetary demand for silver in the United States
UMDSH	Hypothetical U.S. annual monetary demand for silver
UMG	U.S. monetary gold stock in ounces
UMG\$	U.S. monetary gold stock in dollars
UMGR\$	U.S. monetary gold stock in 1929 dollars
UMS	Actual U.S. monetary stock of silver
UMSH	Hypothetical U.S. monetary stock of silver
V	U.S. velocity
WI	World real income (including the United States)
WMG	World monetary gold
WNMG	World nonmonetary demand for gold (including the United States)
x	Equals RPSH
y	U.S. real income

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