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SAVING, INVESTMENT, AND GOLD: A REASSESSMENT OF HISTORICAL CURRENT ACCOUNT DATA

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ABSTRACT

This paper revises pre-World War II current account data for thirteen countries by treating gold flows on a consistent basis. The standard historical data sources often fail to distinguish between monetary gold exports, which are capital-account credits, and nonmonetary gold exports, which are current-account credits. The paper also adjusts historical investment data to account for changes in inventories. The revised data are used to construct estimates of saving and investment over the period from 1850 to 1945.

Our methodology for removing monetary gold flows from the current account leads naturally to a gold-standard version of the Feldstein-Horioka hypothesis on capital mobility. The regression results are in broad agreement with those of Eichengreen, who found a significantly positive cross-sectional correlation between saving and investment even during some periods when the gold standard prevailed. Despite reaching broadly similar conclusions, we estimate correlations between saving and investment that are somewhat lower and less significant than those Eichengreen found. In particular, we find that in comparison to other interwar subsamples, the saving-investment correlation is markedly low during the fleeting years of a revived world gold standard, 1925-1930.

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1. Introduction

This paper revises pre-World War II current account data for thirteen countries by taking explicit account of the distinction between monetary and nonmonetary international flows of gold. The new data are used to examine the historical cross-sectional correlation between national saving and domestic investment rates. Our statistical analysis is based on an econometric specification that is appropriate for a world in which gold serves as both domestic and international money.

In a seminal paper, Feldstein and Horioka (1980) demonstrated that industrial countries with high saving rates also tend to have high investment rates in post-1960 data. The interpretation of this finding has proven controversial, and has spawned a vast literature. Feldstein and Horioka interpreted their result as indicating a long-term international immobility of capital: national savings, rather than seeking out the most productive uses anywhere in the world, remain in their country of origin. Current account imbalances thus do not allow countries to finance long-run capital needs with foreign savings. Many subsequent authors have been reluctant to embrace this vision, because it contradicts other evidence pointing to a high degree of capital mobility within the modern industrial world.[1]

A natural question to consider, therefore, is whether the Feldstein-Horioka regularity persists in data from the classical gold standard, a period of presumed high capital mobility. An affirmative answer would tend to support the critics of Feldstein and Horioka who have argued that common determinants of saving and investment rates, not capital immobility per se, generate the high post-war saving-investment correlations. Bayoumi (1990) and Eichengreen (1992a) both examined gold standard data, but reached different conclusions. Bayoumi, who worked with data from 1880-1913 for eight countries, found no significant cross-sectional correlation for any sub-period of the gold

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[1] See Obstfeld (1995) for a survey.

standard. In contrast, using different data for a sample of nine countries (the additional country being the United States), Eichengreen found much higher and marginally significant coefficients in cross-sectional regressions of investment on saving.

Both Bayoumi and Eichengreen relied heavily on standard data sources such as Mitchell (1981, 1983, 1988, 1992). While these data are often useful for the purposes of historical comparison, they have at least two shortcomings. One shortcoming that is particularly worrisome for an analysis of current accounts during the gold standard era is the treatment of gold in trade statistics. For many countries in the available sample, official balance of payments statistics confound net exports of commodity gold with monetary gold flows. Some countries exclude all gold flows, while others attempt to make a distinction between nonmonetary and monetary gold trade. Nonmonetary gold exports are a valid current account credit, while exports of monetary bullion and coin should be treated as a capital account credit, and not a current account credit. This misclassification can introduce substantial errors into saving rates, which in the absence of direct observations must be estimated residually as the sum of investment and the current account. As we shall see, however, it is often impossible to classify particular gold transactions as either monetary or nonmonetary.

A further shortcoming of Mitchell's data are their omission of inventory changes from many countries' investment data. When data are available, estimates of gross capital formation should include changes in stocks or inventories as well as gross fixed capital formation. Overlooking inventory accumulation may give an upward bias to estimates of the correlation between saving and investment.[2]

Our yearly data on saving and investment rates from the late nineteenth century through

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[2] See Appendix A for a discussion of this point.

World War II expands the sample of countries examined in previous work.[3] The data we report include inventories for a larger number of countries, and treat international flows of gold on a more consistent basis. Our basic finding is that the cross-sectional correlation between gold-standard-era saving and investment rates is somewhat lower, and less significant, than Eichengreen's (1992a) estimates suggest, but is still greater than the correlation Bayoumi (1990) reports. The explanatory power of these regressions is uniformly much lower under the gold standard than in post-World War II data.

Although we present a specific application of these data, they obviously have many other uses. Researchers interested in studying long-run saving behavior or economic growth, for example, should find the data we present useful.

2. The Treatment of Gold Flows in Current Account Data

Under the classical gold standard (ca. 1870-1914), gold was the predominant means of official international settlement, as well as being the lodestar of monetary policy in most market economies.

> Prior to 1914 the major nations had alternated between gold and silver and bimetallic standards, but by 1870 gold ruled the roost. Gold was the anonymous monarch in a world of creative nationalism, and it counted for more than a mere medium of exchange and contract; it symbolized internationalism and the rule of international law.[4]

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[3] The thirteen countries in our sample are Australia, Canada, Denmark, Finland, France, Germany, Italy, Japan, Norway, Russia, Sweden, the United Kingdom, and the United States. Finland was a province of Russia until 1917, when it declared independence. Even before independence, however, Finland had a high degree of economic autonomy, having its own currency and central bank. For further details on sources and methods, see Appendix B. Our study is very much in the spirit of Bloomfield (1968), who assembled the available data on net capital movements for a sample of countries that partially overlaps our sample.

[4] Mundell (1968, p. 288).

In addition to its monetary role, however, gold was also a traded commodity, the product of mineral exploitation. Indeed, the growth of world monetary gold reserves depended on new production and discovery. For gold producing countries, official statistics on gold exports and imports usually did not attempt to distinguish between newly produced gold and shipments of preexisting monetary stocks. Exports of newly produced gold represent a current account credit, just like any other merchandise or service export; *ceteris paribus* they add to national saving. Net shipments to foreigners of monetary gold, however, are a capital account credit; *ceteris paribus* they reduce national saving by reducing net foreign assets.

Historians have dealt with the problem of classifying gold flows by using three different methodologies. One practice (e.g., Feinstein 1972, p. 115, fn. 1) has been to classify all gold movements as monetary in nature, and to subtract them from measured export balances in calculating the current account. A second procedure is to leave all gold shipments in the current account (e.g., Viner 1924). A third approach, theoretically preferable to the first two, is to attempt to distinguish monetary from nonmonetary gold movements. The next section describes the assumptions that underlie proper application of this third approach.

A. Gold Flows in the Balance of Payments

It might appear feasible to adjust official current account data simply by subtracting some measure of the net shipments of monetary gold. Typically, countries classified gold flows into three different categories: specie (coin), bullion, and unrefined gold. Unfortunately, these three categories do not correspond directly to monetary and nonmonetary flows of gold. For example, circulating coins may be melted down to bullion and exported to finance the balance of payments. This would imply that

monetary gold flows were not fully captured by the data on specie exports. As Morgenstern (1955, p. 5) observes:

> The separation of monetary and non-monetary gold is neither simple nor conclusive. Gold can move from one category into the other within one country and domestic gold production can affect the stocks of both. During the classical gold standard period it was impossible to know, in the vast majority of cases, whether gold leaving and arriving came from one or the other of these sources and whether it was going - or in which proportions - to industrial or monetary use.

Figure 1 illustrates the problem by showing two equivalent international transactions.[5] In the first, indicated in the upper half, an ounce of newly-mined gold ore is shipped directly from an Australian mine to an industrial user in the United Kingdom. This transaction raises Australia's official current account surplus (in terms of gold) by one ounce. Since the transaction clearly is not a monetary gold shipment, any reasonable measure of the current account surplus would rise by one ounce.

The lower half of Figure 1 shows what happens when the U.K. industrial user satisfies his or her demand by purchasing an ounce of monetary bullion in Australia, instead of relying on a direct shipment of ore. In this transaction the gold ore enters the Australian monetary gold stock in the form of bullion, and then is shipped abroad.[6] If this gold shipment were labeled as "monetary" and subtracted from Australia's exports to the U.K., Australia's current account deficit would be overstated and Britain's surplus overstated.

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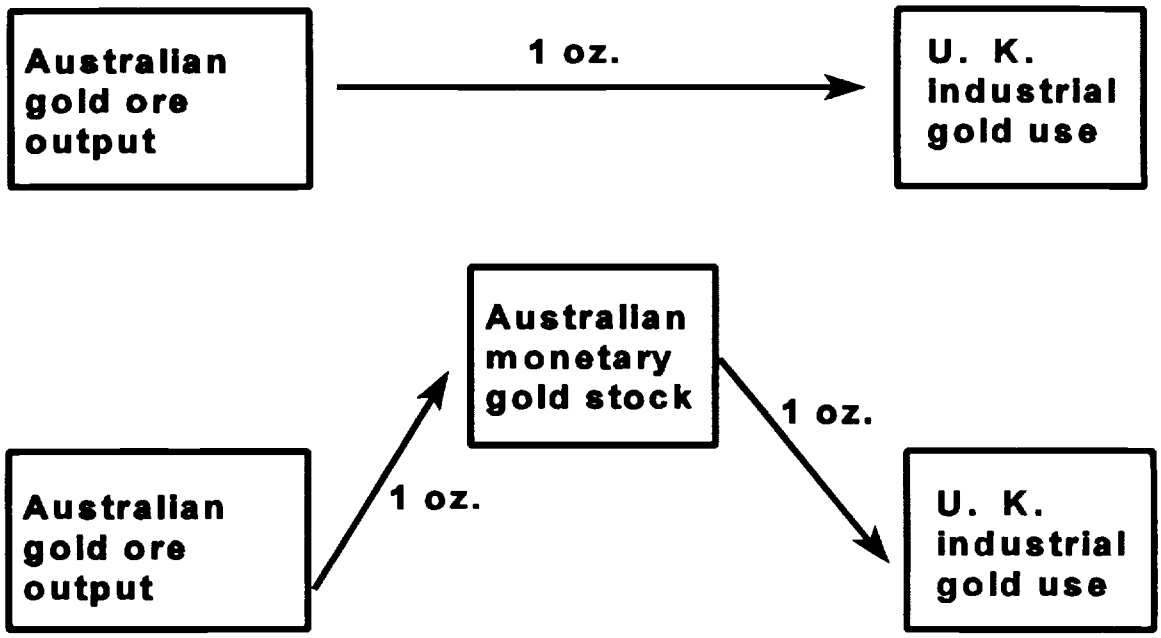
[5] This example draws on Gardner (1953).

[6] Clearly, we are abstracting from costs of turning an ounce of gold ore into an ounce of bullion.

Figure 1: Equivalence of different gold transactions



To avoid such problems, it is standard practice in balance of payments accounting to classify all movements of gold from domestic nonmonetary sources into the domestic money supply as nonmonetary gold exports. To offset this current account credit in the balance of payments, an equal capital account debit is added. The debit reflects the acquisition of foreign assets, and is a monetary gold import.[7] The rationale for this practice is that any increase in the monetary gold stock is an increase in national foreign exchange reserves. As Gardner (1953, p. 159) writes:

> Gold is peculiar ... in the way it affects international monetary reserves. Sales of ordinary merchandise increase those reserves only if the sale is to foreigners. Domestic sales of newly mined gold ... to the Central Bank or Treasury of the producing country effect the same additions to the country's international reserves as if the gold has been exported and sold abroad. Foreign exchange or its equivalent is created in the hands of the monetary authorities by either process. Hence newly mined gold is regarded as an export of the country whether sold abroad or directly to the local monetary authorities.

[7] This accounting convention is the one recommended by the International Monetary Fund. For further details, see the Inter-Secretariat Working Group on National Accounts (1993).

Similarly, domestic consumption out of the monetary gold stock is regarded as a simultaneous import of nonmonetary gold and export of monetary gold. A key implication is that any increase in the domestic monetary gold stock is deemed to be a monetary gold import.

Under this convention, it is straightforward to separate monetary from nonmonetary gold flows. Let ΔMG be the change in the monetary gold stock. Since ΔMG also equals net monetary gold imports, net nonmonetary gold exports can be calculated as total net gold shipments, SG, less net monetary gold exports, $-\Delta MG$:

$$\textit{Net nonmonetary gold exports} = SG - (-\Delta MG) = SG + \Delta MG \ . \qquad (1)$$

On this definition, the true current account, CA, is the sum of the current account excluding all gold flows, CA^{NG}, and net nonmonetary gold exports from equation (1):

$$CA = CA^{NG} + SG + \Delta MG \ . \qquad (2)$$

Notice that any monetary gold shipments in SG are canceled by the corresponding decrease in the monetary gold stock MG, and thus do not affect the true current account. Equation (2) also has the following interpretation: under a gold standard, the current account equals total net foreign asset accumulation including all net accumulation of monetary gold.

Returning to the examples in Figure 1, neither transaction sequence changes Australia's monetary gold stock, so both of the gold shipments shown raise Australia's current account balance as measured in equation (2) by one ounce of gold.

B. Application

We now describe the standard historical data and the adjustments that we have made to them. Our adjustments amount to adding the change in the domestic monetary gold stock to the current account inclusive of all international gold shipments.[8] Given the predominance of gold as an international reserve asset in our sample period, this adjustment is appropriate even when a country is not formally on the gold standard; we therefore apply it in every year for which we have data. We treat Australia and Canada individually and then discuss more briefly the treatment of other countries.[9]

Australia

The standard historical data on the Australian current account are those compiled by N. Butlin (1962). He adjusts the Australian current account figures by using data on gold production instead of net exports

$$CA^{BUTLIN} = CA^{O} - SG + YU, \qquad (3)$$

where CA^{O} is the current account inclusive of all gold shipments SG and YU is Australia's total output of unrefined gold. Butlin argued that gold production was the appropriate current account credit for a gold producing country. Boehm (1965) criticized N. Butlin's treatment of gold, and argued that this procedure overstates the extent of gold exports, and consequently understates the

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[8] Morgenstern (1955) argued forcefully that monthly and quarterly historical data on bilateral gold flows are too inaccurate to be useful. Thus it might seem pointless (and at worst harmful) to adjust the standard series using data on international gold flows. Goodhart (1969), after examining 1900-1912 data on bilateral flows between the US and UK, concludes that Morgenstern overstated the case. We use annual data on each country's total gold flows, which presumably are less subject to error than bilateral monthly data.

[9] For a detailed description of the data sources and methods used in this paper, see Appendix B.

current account deficit. We can see that the approach adopted by Butlin omits some of the terms that appear in equation (2), and is, therefore, a less accurate correction of official statistics. No doubt Butlin proposed this approximation because the problem of identifying monetary gold flows is particularly acute for Australia. For instance, one might hope to identify monetary gold movements with gold shipped by banks, and then adjust the trade figures accordingly. Unfortunately, it is not clear from the data whether banks were shipping gold for eventual industrial use or to finance capital inflows. To get the appropriate current account figure for Australia, we can modify equation (3) to get:

$$CA = CA^{BUTLIN} + SG - YU + \Delta MG . \qquad (4)$$

This procedure was applied to Australia, and a new current account series was produced. Estimates of the change in the monetary gold stock were derived as follows. Specie flows into and out of New South Wales, Victoria, and Western Australia (as reported in Annual Report of United Kingdom, Deputy Master of the Mint) were added to the change in the total bullion holdings of Australian trading banks. The Mint reports document the flow of gold specie into and out of the three colonies only. However, this measure of the change in Australia's monetary gold stock appears to be the best available. For data after 1900, we use the estimates of the gold coin and bullion stock compiled by S. J. Butlin et al. (1971).

Canada

Viner's (1924) classic study assembled balance of payments data for Canada between 1900 and 1913. Viner's current account estimates, however, included all international gold shipments (monetary as

well as nonmonetary). Hartland (1954) extended Viner's methodology to cover the years 1868-1899.

In a meticulous analysis, Rich (1988) adjusted the Canadian data to account properly for monetary gold flows. Rich's current account estimates for Canada, however, omit net interest and dividend flows, despite his recognition that they constituted "a sizeable item in the Canadian balance of payments" (Rich 1988, p. 248). His motive in this omission was the unreliability of available estimates of net foreign asset income.

We calculate Canada's current account for the years 1870-1926 as follows. We take the current account including all gold shipments from Urquhart (1986). As in equation (2), we add the change in the total domestic monetary gold stock, as calculated by Rich (1988) for 1872 through 1913, supplemented by our own estimates for 1869-1871 and 1914-1926. Thus our approach corresponds to Rich's, except that Urquhart's data include superior estimates of net dividend and interest payments.[10] For 1927 onwards, we use the Dominion Bureau of Statistics estimates presented in Urquhart and Buckley (1965), which appropriately separate monetary from nonmonetary gold flows.

Other Countries

Given the importance of gold as an international reserve asset for the entire period, we perform the gold adjustment for all countries in every year of our sample. For countries that were on a bimetallic standard (France 1850-1870, Italy 1862-1866, Japan 1878-1896, and Russia 1886-1897), we combine silver and gold data to obtain estimates of net exports and the monetary stock of the two

[10] See Sinclair (1993) for details. Urquhart's estimates of net dividends and interest payments are based on direct estimates of asset and liability stocks. In contrast, Viner and Hartland used cumulated current account balances to estimate net foreign asset income.

precious metals.[11]

For Denmark, France, Germany, Italy, Japan, Norway, Russia, Sweden, and the United Kingdom, the standard current account data exclude all gold flows. The Finnish data on the current account include all gold shipments. The United States current account data includes all gold shipments prior to 1874, and then includes nonmonetary gold exports (calculated as the sum of net gold shipments and the change in the monetary gold stock).

For Denmark, Finland, and Norway we estimate the monetary gold stock as the stock of gold at the central bank. Data on net shipments of gold for these countries are derived by taking the change in the monetary gold stock, supplemented with League of Nations data and trade statistics. For Sweden the gold holdings of the central bank were used to calculate changes in the monetary gold stock for several periods, supplemented by data on gold in banks. Data on net gold shipments and the monetary gold stock for Germany are reported by the Bundesbank.

France was on a bimetallic standard from 1850 until 1870 (Bordo and Kydland 1995). Thus for France the monetary stock is set equal to the gold and silver holdings of the Bank of France until 1870. From 1871 to 1914 we use direct estimates of the monetary gold in circulation plus holdings by the central bank. Data on net shipments include silver until 1870, then subsequently include gold only. For Italy and Japan the specie component of the monetary gold stock is estimated in a manner similar to the Australian calculations: taking the sum of inflows and outflows of coin from the mints and trade returns. For Italian data from 1862 to 1866, silver is included in the estimates of net gold

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[11] For the United States, we do not consider the period from 1873 to 1878 when the Coinage Act of 1873 was in force to be a true bimetallic standard. According to Friedman (1990, p. 1165) "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."

shipments and the monetary stock. The Italian data relating to monetary bullion are fragmentary and difficult to interpret, so we make no use of them. For Japan, the change in the monetary gold stock is calculated as the change in the estimated stock of specie in the country, less net exports of bullion. Use of bullion exports is problematic, as we have discussed, but should induce less serious errors than in the case of a gold producer like Australia. Data on the Japanese monetary stock for 1878 to 1896 include silver and gold; data after 1897 include gold only. For Russia, the monetary gold stock is estimated as the sum of gold holdings in the Treasury and State Bank until 1891, and then gold in circulation is included. For the period from 1886 to 1896 when Russia was on a bimetallic standard, the monetary stock and net shipments data include silver.

For the United Kingdom, estimates of the monetary gold stock are provided by Capie and Weber (1985) up to 1921. We extend their data past 1921 with estimates of changes in the gold holdings of the Bank of England. Trade returns provide the estimates of net gold flows into the United Kingdom. For the United States prior to 1874, the Treasury figures on the monetary gold stock are used throughout: we add changes in the monetary gold stock to the official current account. The trade returns provide the data on net gold shipments.

From the preceding discussion it is obvious that the data on monetary gold flows and net shipments of gold are far from perfect. Our reliance on central bank gold stocks for estimates of changes in the monetary gold stock overlooks the important role played by changes in private hoards. The gaps in the trade data for many countries also force us to rely on central bank gold stocks for some trade figures, effectively ignoring industrial consumption of gold. Thus we are often left with an imprecise measure of gold flows.

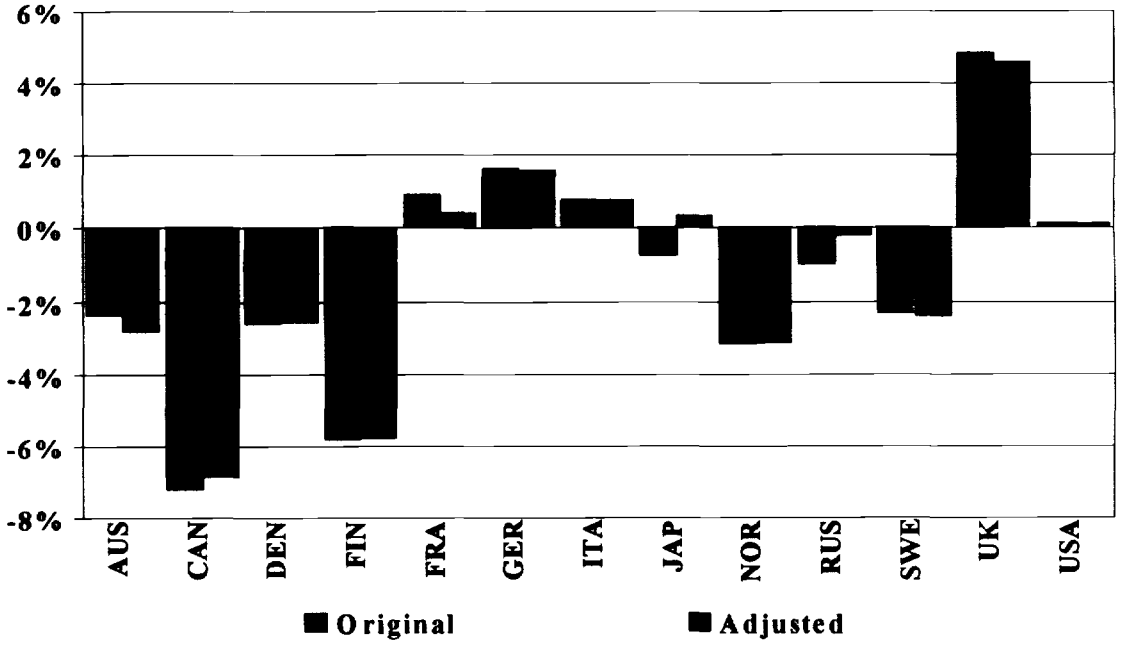
However, it is difficult even today to obtain precise estimates of currency in the hands of the

public, because of unrecorded flows into and out of a country. The object of this paper is to obtain estimates of gold flows for a wide group of countries and then ensure the consistent treatment of gold in the current account statistics. The inaccuracies of the data must be considered in light of this objective. Bearing in mind these caveats, the data we have compiled should provide a superior estimate of the current account and savings flows; one that is less distorted by the conflicting national treatments of gold in the balance of payments.

The end result of the estimation of gold flows is presented in Figure 2, which shows average current account to GDP ratios over 1885-1913 for the countries in our sample.[12] The figure presents the original current account figures given in the standard historical sources, along with the gold-adjusted figure, as per equation (2). We can see from this figure that correcting for gold flows can make a substantial difference to the measured current account, even when averaged over relatively long periods of time.

[12] Net national product is used in place of GDP for Germany and Russia.

Figure 2: Current account with original and gold-adjusted data 1885-1913 (expressed as a percentage of GDP), period averages



Adjusting for gold flows has the biggest impact on the averaged original data for Australia, Canada, France, Japan, Russia, and the United Kingdom. As major gold producers, we would expect Australia, Canada, and Russia to be likely candidates for current account mismeasurement. In the presence of large gold flows in and out of a country, it becomes extremely difficult to measure the monetary and nonmonetary components of gold exports with any accuracy. The standard current account figures for both France and Japan exclude all gold flows. Therefore, the difference between the original current account and the gold-adjusted figure represents nonmonetary gold exports, which must have been substantial for these two countries.[13] Both of these instances should be treated with

[13] Nonmonetary gold exports can be calculated as the sum of net gold shipments, SG, plus the change in the monetary gold stock, ΔMG. The ratio of nonmonetary gold exports to GDP for 1885-1913 is Australia: 4.2%, Canada: 0.7%, Denmark: 0.0%, Finland: -0.0%, France: -0.5%, Germany: -0.0% (of NNP), Italy: 0.0%, Japan: 1.1%, Norway: 0.0%, Russia: 0.7% (of NNP), Sweden: -0.1%, the U.K.: -0.2%, the U.S.: 0.2%.

caution, since they may reflect mismeasurement of the change in the monetary gold stock. For example, French gold imports that did not find their way into the measured stock of monetary gold may well have entered private hoards rather than industrial use, and in that form could have been highly substitutable for monetary gold.

Table 1 shows the effect of adjusting the current account statistics for gold flows for each country. We can see from this table that our treatment of gold provides current account estimates that diverge from the standard historical measures. The mean absolute deviation (MAD) measure presented in the table suggests that for some countries the absolute divergence is frequently large, especially for Denmark, France, Japan, and Russia.

Table 1: Effect of gold adjustment on current accounts: Means and standard deviations of original data, gold adjusted data, and mean absolute difference (expressed as a percentage of GDP)

Country	*Full Sample Period*					*1885 to 1913*				
	Original CA		*Adjusted CA*		*MAD*	*Original CA*		*Adjusted CA*		*MAD*
	Mean	*Std. Dev*	*Mean*	*Std. Dev*		*Mean*	*Std. Dev*	*Mean*	*Std. Dev*	
Australia	-3.9	6.2	-4.2	6.1	0.5	-2.4	6.0	-2.8	6.0	0.5
Canada	-3.5	5.7	-3.4	5.7	0.3	-7.2	3.7	-6.9	3.6	0.4
Denmark	-0.2	4.6	-1.2	2.1	1.2	-2.6	1.5	-2.6	1.4	0.2
Finland	-5.2	5.5	-5.1	5.6	0.2	-5.8	2.5	-5.8	2.5	0.1
France	1.6	3.8	1.2	4.1	1.0	0.9	2.7	0.4	2.7	0.8
Germany	1.2	1.3	1.2	1.3	0.1	1.6	0.7	1.6	0.7	0.1
Italy	-1.3	4.5	-1.3	4.5	0.1	0.8	2.3	0.8	2.3	0.0
Japan	-0.1	3.3	0.5	3.4	0.6	-0.7	2.9	0.3	3.1	1.1
Norway	-1.7	4.0	-1.7	4.0	0.2	-3.2	2.8	-3.1	2.9	0.2
Russia	-1.0	1.5	-0.2	2.7	1.5	-1.0	1.5	-0.2	2.7	1.5
Sweden	-0.8	3.3	-0.8	3.5	0.3	-2.3	2.1	-2.4	2.1	0.1
U K	2.3	4.3	2.3	4.0	0.5	4.8	2.5	4.6	2.6	0.3
USA	0.5	1.6	0.5	1.7	0.0	0.1	1.2	0.1	1.2	0.0

The full sample period consists of Australia: 1861-1945; Canada: 1870-1945; Denmark: 1874-1914, 1921-1945; Finland: 1872-1945; France: 1851-1918, 1924-1944; Germany: 1877-1913, 1925-1938; Italy: 1861-1936; Japan: 1885-1944; Norway: 1865-1939; Russia: 1885-1913; Sweden: 1875-1945; U. K.: 1869-1945; U.S.: 1870-1945.

3. Inventories Data

An analysis of saving and investment flows requires a measure of total gross investment. Gross investment consists of the sum of fixed investment plus changes in stocks or inventories. As Eichengreen (1992a) points out, previous compilations of historical statistics have often ignored the role of inventories in gross investment. We have gathered additional data on inventories, so that the

investment numbers for Australia, Canada, Finland, France, Germany, Italy, Japan, Norway, Russia, Sweden, the United Kingdom, and the United States now include estimates of changes in stocks or inventories. The details are discussed in Appendix B.[14]

The omission of inventories introduces a source of bias into regression estimates of saving-investment correlations. Table 2 shows the magnitude of changes in stocks and inventories for countries with available data. It is evident from the magnitude of the numbers in this table that adjusting for inventory changes may have potentially large effects.[15]

Table 2: Estimates of changes in stocks / inventories (as a percentage of GDP), period averages

Country	*Sample Period*	*Stocks Ratio*	*Country*	*Sample Period*	*Stocks Ratio*
Australia	1861-1945	1.00	Japan	1885-1944	2.81
Canada	1926-1945	0.57	Norway	1900-1939	-0.04
Denmark	-	-	Russia	1885-1913	1.69
Finland	1860-1945	3.74	Sweden	1861-1945	0.03
France [1]	1850-1944	1.97	UK	1850-1945	0.48
Germany [2]	1872-1938	0.97	USA	1869-1945	2.05
Italy	1861-1945	0.12			

[1] No data for 1919 to 1923

[2] No data for 1914 to 1924

[14] Eichengreen (1992a) added inventory data for Canada and the UK to the countries for which Mitchell (1983) reports inventory changes. Our coverage expands Eichengreen's by adding inventory data for Australia, Finland, France, Japan, Russia, and Sweden.

[15] In our 1885 to 1913 sample, omitting data on inventories raises the estimated slope coefficient in the Feldstein-Horioka regression by over six percent, and raises the standard deviation by almost seventeen percent. Thus it appears that including estimates of changes in stocks or inventories is an important consideration in any analysis of saving-investment correlations. See Appendix A for a full discussion of the effect of removing stocks/inventories data. The stocks ratio for Finland includes the statistical discrepancy.

4. Empirical Analysis

In a world on the gold standard, the two principal outside financial assets are capital and monetary gold. In a closed economy, all saving must flow into one of these two assets. Thus,

$$I = S - \Delta MG . \tag{6}$$

Under a gold standard, the Feldstein-Horioka capital immobility hypothesis (in its most extreme form) is that all trade imbalances are financed by international gold flows, rather than by private capital flows (which could involve repayment or political risk). This implies that equation (6), which was derived as a closed-economy identity, also applies to open economies when international borrowing and lending are impossible. For example, a country's investment can increase above its saving only if it exports monetary gold abroad or transforms some of its monetary gold into plant and equipment.

Because of the imprecise or inadequate nature of historical national accounts data, historical estimates of saving must be calculated residually as the sum of investment and the current account:

$$S = I + CA . \tag{7}$$

Under a gold standard, the appropriate definition of saving recognizes that the current account is equal to net foreign asset accumulation, including monetary gold acquisitions. The typical (post-gold standard) implementation of the Feldstein-Horioka test is a cross-sectional regression of I on S (both variables defined as ratios to GDP or NNP). The more appropriate test under the gold standard is a regression of I on $S - \Delta MG$, according to equation (6).

There are thus two ways to implement the Feldstein-Horioka test in a world where gold plays an important monetary role. The first is to run the cross-section regression

$$\frac{I}{Y} = \alpha + \beta \frac{S}{Y} + \gamma \frac{\Delta MG}{Y} + u \quad . \tag{8}$$

The Feldstein-Horioka hypothesis is that $\beta = 1$ and $\gamma = -1$. Alternatively, one could impose the constraint that saving and the change in the monetary gold stock have coefficients equal in absolute magnitude but of opposite sign. This procedure leads to the specification

$$\frac{I}{Y} = \alpha + \beta \frac{(S - \Delta MG)}{Y} + u \quad . \tag{9}$$

The Feldstein-Horioka hypothesis implies that $\beta = 1$.

Notice that $S - \Delta MG$ is the saving measure one derives by adding to investment the current account inclusive of all gold shipments, as per Viner's (1924) current account estimates for Canada, described above. Why is Viner's measure, rather than true saving, S, the appropriate one to use on the right hand side of equation (9)? Suppose a country imports gold coin ($\Delta MG > 0$), with true saving, S, unchanged. If investment does not fall by an equal amount, then the country would necessarily be borrowing abroad to maintain an unchanged path of national wealth. If international borrowing and lending are ruled out (as implied by the Feldstein-Horioka hypothesis), it follows that increases in national saving and decreases in monetary gold holdings both feed through fully to investment.[16]

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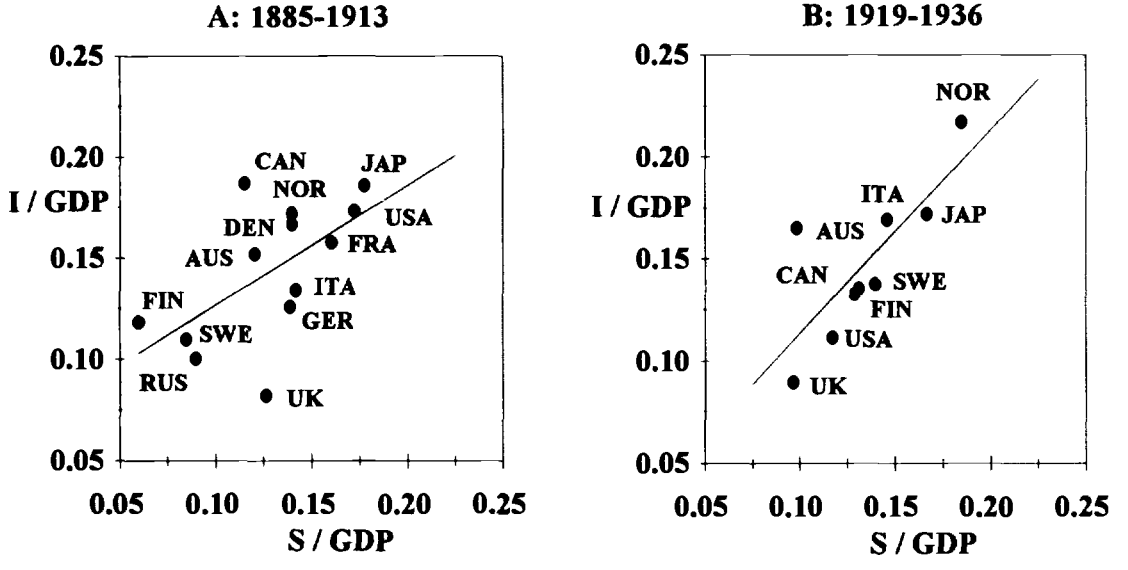
[16] The regression thus tests the hypothesis that an increase in national saving, net of the increase in monetary gold holdings, flows completely into domestic investment. To see this another way, observe from equations (2) and (3) that $CA^O = CA^{MG} + SG = CA - \Delta MG$. Thus CA^O equals the difference between an economy's total outward shipments of goods, services, and gold and its total inward shipments, which must equal its net accumulation of

(continued...)

Our empirical analysis is based on data from thirteen countries: Australia (1861-1945), Canada (1870-1945), Denmark (1874-1914, 1921-1945), Finland (1872-1945), France (1851-1918, 1924-1944), Germany (1877-1913,1925-1938), Italy (1861-1936), Japan (1885-1944), Norway (1865-1939), Russia (1885-1913), Sweden (1875-1945), the United Kingdom (1869-1945), and the United States (1870-1945). The data sources are described in Appendix B. Figure 3 presents scatter plots of the saving and investment data for two sub-periods. (Rather than plotting true saving, the horizontal axis plots the independent variable in equation (9).)

Figure 3: Saving and investment rates (expressed as ratios of GDP)



[16] (...continued)
nongold foreign claims. This follows from the balance of payments identity that the true current account surplus plus the nongold capital account surplus equals monetary gold acquisitions. Therefore, the Feldstein-Horioka hypothesis implies that $CA^{O} = S - \Delta MG - I = 0$.

Table 3 presents the basic Feldstein-Horioka (1980) cross-sectional regression of average investment rates on average saving rates, using the specification of equation (9).[17] The estimates of the slope parameter range from just under one half to close to one. The later samples (after World War I) tend to have stronger correlations and after 1931 much more explanatory power. (After 1931, the R^2 statistics are above 0.90.) Prior to 1914 the R^2 statistics are much lower than those found for industrial countries in the 1960s (usually around 0.90), and even lower than those found for the 1980s (usually around 0.5 to 0.7, depending on the period of estimation).[18]

The results presented in the table suggest that the saving-investment correlation has been lower in periods when the gold standard prevailed. The immediate post-World War I period (1919-1924) and later samples (1931-1936, 1937-1939), periods when many countries were not on strict gold standards, both have higher correlations. These periods also saw rather widespread use of capital controls. Because these controls became much more stringent in the 1930s, they probably are the major explanation for the very high R^2 statistics reported in Table 3 post 1931.[19]

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[17] Regression estimates of the specification in equation (8) are presented in Appendix A, section 3.

[18] See Obstfeld (1995) for a discussion of recent data. Taylor (1996) reviews the behavior of the saving-investment correlation over time since the nineteenth century.

[19] On interwar period capital controls, see Obstfeld and Taylor (1997).

Table 3: Parameter estimates from regression of investment on savings ($S \equiv I + CA^{NG} + SG - \Delta MG$)

Sample Period	*Number of Countries*	*Coefficient on S*	*Standard Error*	*Adj. R^2*
1880-1913	11	0.463	0.288	0.137
1885-1913	13	0.594 **	0.240	0.299
1880-1890	11	0.471	0.296	0.133
1891-1901	13	0.661 ***	0.168	0.546
1902-1913	13	0.600 *	0.282	0.227
1919-1924	9	0.969 *	0.476	0.283
1925-1930	12	0.653 **	0.215	0.427
1931-1936	12	0.866 ***	0.064	0.943
1937-1939	9	0.921 ***	0.093	0.924

*, **, *** indicate significance at the 10%, 5%, and 1% level respectively. The estimates for 1880-1913 and 1880-1890 exclude Japan and Russia; for 1919-1924 they exclude Denmark, France, Germany and Russia; for 1925-1930 and 1931-1936 they exclude Russia; and for 1937-1939 they exclude France, Germany, Italy, and Russia.

Even though the R^2 statistics tend to be low before the 1930s, and especially before World War I, the 1891-1901 decade is an exception, with an R^2 not far from those one finds in OECD data from the 1980s and 1990s. In addition, the slope coefficient is sometimes significant under the classical gold standard, notably after 1891, when its magnitude is comparable to the estimates from recent OECD data.The results for the late nineteenth century seem even more comparable with those in recent data when one observes that several of the countries in the gold-standard sample could be classified as developing then. Even in post-World War II samples that include the developing countries, the empirical saving-investment link is much weaker prior to the 1982 debt crisis; see Dooley, Frankel, and Mathieson (1987) and Summers (1988).

Having estimated the regression equation, it is now useful to consider testing some hypotheses. The first question to consider is whether there is sufficient evidence to believe that the coefficient on saving is equal to one, i.e. investment and saving are perfectly correlated in cross-section. We see from Figure 4 that the ninety-five percent confidence intervals for most of the slope estimates are quite wide. Since most of the point estimates are clustered around 0.5, we perform a one-tailed *t* test of the hypothesis $\beta = 0.5$ against the alternative $\beta > 0.5$. We can also perform the one-tailed test of the restriction that $\beta = 1$, against the alternative hypothesis that $\beta < 1$. We present the results of these hypothesis tests in Table 4.

Figure 4: Slope estimates (β)and 95 percent confidence intervals

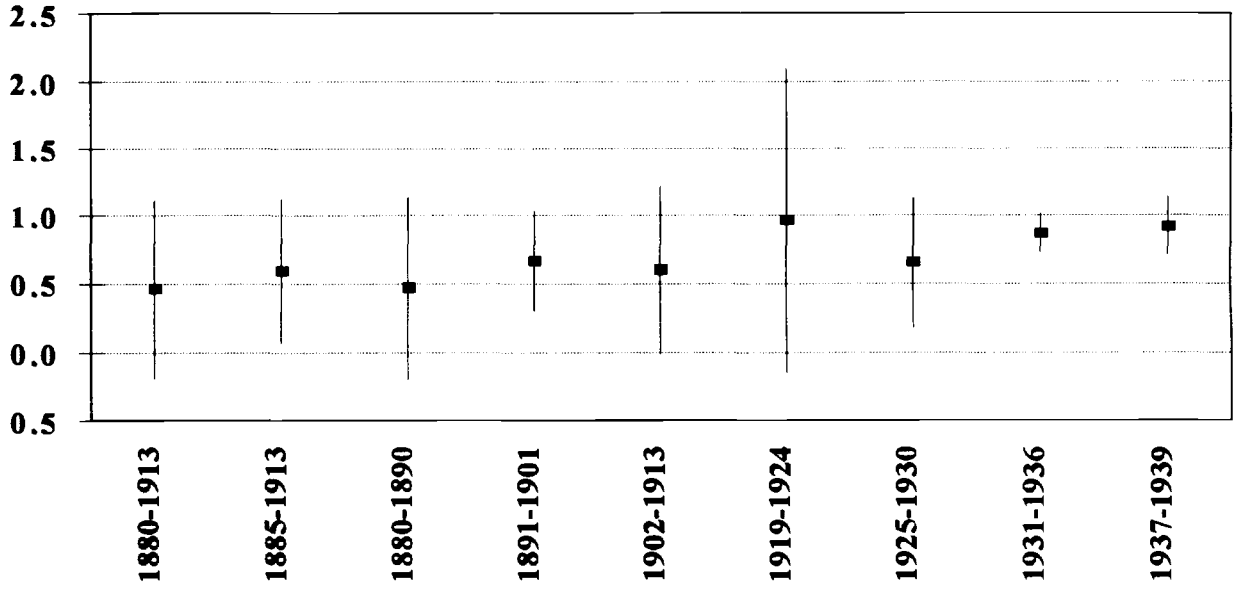

Table 4: Hypothesis tests from regression of investment on savings ($S \equiv I + CA^{NG} + SG - \Delta MG$)

Sample Period	*Coefficient on S*	*p Value of Test* β=0.5	*p Value of Test* β=1
1880-1913	0.463	0.550	0.048 **
1885-1913	0.594 **	0.352	0.059 *
1880-1890	0.471	0.538	0.054 *
1891-1901	0.661 ***	0.179	0.035 **
1902-1913	0.600 *	0.365	0.092 *
1919-1924	0.969 *	0.178	0.475
1925-1930	0.653 **	0.247	0.069 *
1931-1936	0.866 ***	0.000 ***	0.031 **
1937-1939	0.921 ***	0.001 ***	0.211

*, **, *** indicate significance at the 10%, 5%, and 1% level respectively. The estimates for 1880-1913 and 1880-1890 exclude Japan and Russia; for 1919-1924 they exclude Denmark, France, Germany and Russia; for 1925-1930 and 1931-1936 they exclude Russia; and for 1937-1939 they exclude France, Germany, Italy, and Russia.

The column labeled *p Value of Test* $\beta = 0.5$ gives the result of the hypothesis test that the coefficient on savings, β, is equal to one half, against the alternative that β is greater than one half. The p value is the probability of incorrectly rejecting the null hypothesis when it is true, so a low p value implies strong evidence against the null hypothesis that β equals one half. We can see from this column that we can reject the hypothesis $\beta = 0.5$ only for the last two sub-samples in our data set: 1931-1936 and 1937-1939. The column labeled *p Value of Test* $\beta = 1$ show we can reject that hypothesis for all sample periods except for 1919-1924 and 1937-1939.

To summarize the results of the previous two tables, we can say that we do not have strong evidence against the coefficient on saving being equal to one half. We have evidence that the

coefficient is less than one for most periods examined. There is some evidence of a positive relationship between saving and investment rates even under the classical gold standard. This last result stands in contrast to Bayoumi (1990), who found no significant cross-sectional relationship between saving and investment for any period from 1880-1913. However, Eichengreen (1992a) reported relatively high estimates of the β coefficient over some sub-samples.[20] The results in Tables 3 and 4 indicate slope coefficients generally lower than those found by Eichengreen but higher and more significant than Bayoumi found.

Table 5 presents the parameter estimates of Bayoumi (1990) and Eichengreen (1992a) for comparison. Using the same countries and time periods, we estimated the correlations using our gold-adjusted data. For instance, the third column labeled *Adjusted Bayoumi* shows the results of the regression using our gold-adjusted data, but with the eight countries in Bayoumi's sample. Similarly, the column labeled *Adjusted Eichengreen* shows the results of the regression using our gold-adjusted data with the nine countries in Eichengreen's sample. The column labeled *Full-Sample Estimates* shows the results from Table 3, i.e. the coefficient estimate using the gold adjusted data for all available countries. Bayoumi's results appear to stem mainly from the use of a small country sample. Eichengreen's addition of the United States raises the slope coefficients and increases the statistical power available. But our addition of more countries to Eichengreen's sample moderates his findings somewhat.

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[20] Bayoumi's sample of countries consisted of Australia, Canada, Denmark, Germany, Italy, Norway, Sweden, and the United Kingdom. Eichengreen added the United States. Our data set adds Finland, France, Japan, and Russia.

Table 5: Comparison of parameter estimates from Bayoumi, Eichengreen and gold-adjusted data

Sample Period	*Bayoumi Estimates*	*Adjusted Bayoumi*	*Eichengreen Estimates*	*Adjusted Eichengreen*	*Full-Sample Estimates*
1880-1913	0.290	0.430	0.630 *	0.573	0.463
1880-1890	0.480	0.144	0.590 *	0.498	0.594 **
1891-1901	0.690	0.622	0.710 ***	0.671 *	0.661 ***
1902-1913	-0.100	0.889	0.720	0.857	0.600 *
1924-1936	-	0.703 **	1.060 ***	0.758 **	0.870 ***
1925-1930	-	0.565	1.220 ***	0.549	0.653 **

*, **, *** indicate significance at the 10%, 5%, and 1% level respectively.
Bayoumi's sample of countries consisted of Australia, Canada, Denmark, Germany, Italy, Norway, Sweden, and the United Kingdom. Eichengreen added the United States. Our data set adds Finland, France, Japan, and Russia and adjusts for gold flows. The full sample estimates for 1880-1913 and 1880-1890 exclude Japan and Russia; for 1924-1936 they exclude Germany and Russia; for 1925-1930 they exclude Russia.

We can see from the results presented in Table 5 that the selection of countries in the cross-sectional average is of key importance. Indeed, this appears to matter as much as the gold adjustment we perform. As we show in Appendix A, the parameter estimates are sensitive to the choice of countries in the cross-sectional average. Changing the countries in the sample can alter the estimated slopes by as much as 0.3, and the explanatory power can vary by as much as forty percent. Despite these caveats, the significance of parameter estimates seems fairly robust to single deletions from the sample of countries. Thus, despite the sensitivity of the estimates to outliers, the broad thrust of the results suggested in the preceding two tables remains valid.

A sample period of particular interest is 1925-1930, during which Britain adhered to the interwar gold standard and most market economies in the world likewise rejoined the gold standard. Eichengreen (1992a) estimates a highly significant slope coefficient of 1.220 under the reconstituted

gold standard of 1925-1930 (see Table 5), much higher than those found for the classical, pre-1914 gold standard. On that basis he disputes the theory, advanced by the *Economist* magazine among others (*Economist* 1989), that the nominal exchange-rate certainty prevailing under gold-standard regimes necessarily leads to greater international capital mobility and thereby to lower saving-investment coefficients. Table 5 shows, however, that for Eichengreen's original sample of nine countries, our adjusted data lead to a statistically insignificant slope coefficient of only 0.549, which is quite comparable to those one finds for pre-1914 data.[21] In our fully-sized sample the estimated slope is somewhat higher, at 0.653, and is significantly different from zero at the 5 percent level. Furthermore, our estimated slope for 1925-1930 seems markedly lower than those we estimate for any other subperiod of the interwar years.

Thus, there is indeed some evidence that the interwar gold standard made a difference for the cross-country saving-investment relationship. Exchange-rate volatility could be only a minimal part of the reason, however. The restored interwar gold standard was accompanied by a general relaxation of capital controls, which may well have had a much greater impact on capital mobility than the nominal exchange-rate regime.

If the cross-sectional averages used in the saving-investment regression correspond to the years when each country was on the gold standard, then the estimated correlations actually are higher.[22] However one cannot conclude from this result that gold-standard adherence resulted in a

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[21] In recomputing Eichengreens's (1992a) estimates using the Mitchell (1992) data (with our Australian, Canadian, and US data, without gold adjustments) and Eichengreen's specification, we found a slope coefficient of 0.656 for 1880-1913, 0.529 for 1880-1890, 0.778** for 1891-1901, 0.749 for 1902-1913, 0.873*** for 1924-1936, and 0.853*** for 1925-1930. When Eichengreen uses alternative data for the US compiled by Roger Ransom and Richard Sutch, he finds a slope coefficient of 0.58* for 1925-1930.

[22] See Appendix A, section 5, for more details.

tighter saving-investment link. Countries may have been more likely to be on gold in periods when their current accounts were near balance.

5. Conclusions

In this paper we have presented revised estimates of saving and investment for thirteen countries over the period from 1850 to 1945. We have constructed a measure of the current account that treats gold flows on a consistent basis across countries, and also adjusted investment data to account for changes in inventories.

Our methodology for removing monetary gold flows from current account data led naturally to a gold-standard version of the Feldstein-Horioka (1980) hypothesis on capital mobility. Our regression results are in broad agreement with Eichengreen (1992a), who found a significantly positive cross-sectional correlation between saving and investment even during some periods when the gold standard prevailed. Despite the high level of capital mobility that prevailed under the gold standard, it seems that average national saving and domestic investment rates were cross-sectionally correlated, contrary to the Feldstein-Horioka hypothesis. Nonetheless, the explanatory power of the pre-1914 regressions is usually much lower than in the corresponding post-1960 regressions.

Despite reaching broadly similar conclusions, we estimate correlations between saving and investment that are somewhat lower than those Eichengreen (1992a) found. In particular, we find that in comparison to other interwar subsamples, the saving-investment correlation is markedly low during the fleeting years of a revived world gold standard, 1925-1930. The proportions in which this phenomenon should be ascribed to greater exchange-rate predictability as opposed to relaxed capital controls is a topic for future research.

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Appendix A: Omitted Variables Bias, Alternative Specification, and Parameter Sensitivity

This appendix deals with the sensitivity of the parameter estimates in the paper to the inclusion of gold flows, stocks data, and the selection of countries in the cross-sectional average.

1. Gold Flows

We have argued in the paper that figures for the current account should include all data on gold flows. Omitting data on net gold shipments or changes in the monetary gold stock will introduce an omitted variables bias into the estimates.

Suppose that the true variable of interest is the current account including all gold, CA^O, expressed as a proportion of GDP or NNP, which is defined as the sum of the nongold current account, CA^{NG}, plus net shipments of gold, SG:

$$CA^O = CA^{NG} + SG . \qquad \text{(A1)}$$

Now suppose that the true relation we are interested in estimating is given by the expression

$$I = \alpha + \beta(I + CA^O) + u . \qquad \text{(A2)}$$

This expression can be rewritten by using equations (A1) and (A2):

$$\begin{aligned} I &= \alpha + \beta(I + CA^{NG} + SG) + u \\ &= \alpha + \beta(I + CA^{NG}) + \beta SG + u . \end{aligned} \qquad \text{(A3)}$$

Excluding gold flows from the measured value of the current account introduces a source of bias into the estimation procedure, as regressing savings on investment omits the third term on the right hand side of equation (A3). The extent of the omitted variables bias is illustrated in the following table.

Table A1: Comparison of parameter estimates from regression of I on $(I + CA^{NG} + SG)$ with regression of I on $(I + CA^{NG})$

Sample Period	*Estimated Parameter*	*With SG*	*Without SG*	*Percent Bias* †
1885 to 1913	Slope: β	0.594 **	0.467 *	-21.27
All countries	Adj. R^2	0.299	0.191	-36.00
1919 to 1936	Slope: β	0.999 **	0.876 **	-12.29
Excl. Den Fra, Ger, Rus	Adj. R^2	0.541	0.409	-24.28

† Percent bias is calculated by taking the difference in parameter estimates as a proportion of the correctly specified parameter

*, **, *** indicate significance at the 10%, 5%, and 1% level respectively.

This table illustrates that the slope coefficient is underestimated by almost twenty-five percent when the 1885 to 1913 data are used. When data from the interwar period are used, the extent of the

understatement of the slope coefficient is reduced, but it still remains important. In both cases the explanatory power of the regression is reduced by almost a third. These results are in accord with our intuition of the likely impact of including gold flows, as current account balances tend to be negatively correlated in cross-section with the net shipments of gold.[1] Adding gold flows to the estimated equation will have the effect of raising the measured correlation between saving and investment, as the table demonstrates.

2. Stocks

We have argued briefly in the paper that figures for gross investment should include the value of changes in inventories or stocks. Omitting data on stocks will introduce another source of bias into the estimates.

Suppose that the true variable of interest is total gross investment, I, which is defined as the sum of gross fixed investment, I^F, and changes in inventories or stocks [2]:

$$I = I^F + \Delta Stocks \ . \qquad \text{(A4)}$$

Saving is defined residually, as the sum of the current account and gross investment

$$S = CA + I \ . \qquad \text{(A5)}$$

Let the level of *fixed* saving, S^F, equal the current account plus gross *fixed* investment:

$$S^F = CA + I^F \qquad \text{(A6)}$$

such that $S = S^F + \Delta Stocks$. Now suppose that the true relation we are interested in estimating is given by the expression

$$I = \alpha + \beta S + u \ . \qquad \text{(A7)}$$

This expression can be rewritten by using equations (A5) through (A7):

$$\begin{aligned} I^F + Stocks &= \alpha + \beta (S^F + \Delta Stocks) + u \\ so \qquad I^F &= \alpha + \beta S^F + (\beta - 1)\Delta Stocks + u \ . \end{aligned} \qquad \text{(A8)}$$

Excluding changes in stocks data from the measured value of investment introduces a potential source of bias into the estimation procedure, as regressing savings on investment omits the third term on the right hand side of equation (A8). The extent of this omitted variables bias is illustrated in the following table.

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[1] The time-series correlation between net gold shipments and the current account excluding all gold flows was negative for Australia, Finland, France, Italy, Japan, Norway, the United Kingdom, and the United States for the full sample period; eight out of thirteen countries. For the 1885-1913 period, the correlation was negative for Denmark, France, Germany, Italy, Japan, Norway, Sweden, the United Kingdom, and the United States; nine out of the thirteen countries.

[2] Expressed as a percentage of Gross Domestic or Net National Product.

Table A2: Comparison of parameter estimates from regression of I on (S^F + and Δ *Stocks*) with regression of I^F on S^F

Sample Period	*Estimated Parameter*	*With Δ stocks*	*Without Δ stocks*	*Percent Bias †*
1885 to 1913	Slope: β	0.594 **	0.699 ***	17.75
All countries	Adj. R^2	0.299	0.602	101.76
1919 to 1936	Slope: β	0.999 **	0.958 **	-4.10
Excl. Den Fra, Ger, Rus	Adj. R^2	0.541	0.504	-6.80

† Percent bias is calculated by taking the difference in parameter estimates as a proportion of the correctly specified parameter

*, **, *** indicate significance at the 10%, 5%, and 1% level respectively.

This table illustrates the effect of omitted variable bias on the estimated coefficients. When inventories data are excluded, the slope coefficient is mildly overstated and the explanatory power of the regression is affected by fifteen percent or more.

3. Alternative Regression Specification

An alternative specification, given in equation (8), allows for possibly different coefficients on saving and the change in the monetary gold stock. Results from this specification are presented in Table A3.

Table A3: Parameter estimates from regression of I on S and ΔMG ($S \equiv I + CA^{NG} + SG + \Delta MG$)

Sample Period	*Sample Size*	*Coefficient on S: β*	*Stand Error*	*Coefficient on ΔMG: γ*	*Stand Error*	*Wald Test β=1, γ=-1*	*Adj. R^2*
1880-1913	11	0.40	0.28	8.85	7.60	2.588	0.18
1885-1913	13	0.58 **	0.26	0.30	2.66	1.373	0.24
1880-1890	11	0.34	0.25	10.76 *	4.97	4.893 **	0.41
1891-1901	13	0.65 ***	0.18	-0.37	1.34	1.871	0.50
1902-1913	13	0.53 *	0.29	4.97	5.79	1.464	0.22
1919-1924	9	1.09	0.66	-3.10	7.18	0.046	0.18
1925-1930	12	0.61 **	0.26	-0.26	1.29	1.229	0.37
1931-1936	12	0.87 ***	0.06	0.13	0.71	3.394 *	0.95
1937-1939	9	0.93 ***	0.10	-0.67	0.70	0.383	0.91

*, **, *** indicate significance at the 10%, 5%, and 1% level respectively.
The estimates for 1880-1913 and 1880-1890 exclude Japan and Russia; for 1919-1924 they exclude Denmark, France, Germany and Russia; for 1925-1930 and 1931-1936 they exclude Russia; for 1937-1939 they exclude France, Germany, Italy, and Russia.

We can see from the results in this table that including the monetary gold stock adds little to the previous results. The explanatory power does not change by much, because the coefficient estimates on the change in the monetary gold stock are mostly insignificant, even at the ten percent level. We can reject the hypothesis that the coefficient on savings equals one and the coefficient on changes in the monetary gold stock equals negative one for two periods only; for one period this rejection is only at the ten percent level.

4. Outlier Sensitivity

This section deals with the question of how sensitive the parameter estimates are to outliers. Table A4 presents the results of the regressions for different time periods when one country is dropped from the sample at a time. Using this procedure, the highest and lowest parameter estimates were obtained. For comparison, the full sample estimates of the slope are presented in the final column.

Table A4: Maximum and minimum slope estimates from regression of investment on savings

Sample Period	*Min β Parameter*	*Adj. R^2*	*Missing Country*	*Max β Parameter*	*Adj. R^2*	*Missing Country*	*Full Sample β*
1880-1913	0.38	0.02	USA	0.55	0.07	FIN	0.463
1885-1913	0.53 *	0.22	SWE	0.71 **	0.29	FIN	0.594 **
1880-1890	0.22	-0.08	USA	0.54 *	0.28	UK	0.471
1891-1901	0.57 **	0.33	JAP	0.74 ***	0.58	FIN	0.661 ***
1902-1913	0.53	0.15	RUS	0.76 *	0.20	FIN	0.600 *
1919-1924	0.53	0.05	NOR	1.12 *	0.40	AUS	0.969 *
1925-1930	0.52 *	0.25	GER	1.06 ***	0.92	AUS	0.653 **
1931-1936	0.83 ***	0.94	GER	0.90 ***	0.96	UK	0.866 ***
1937-1939	0.87 ***	0.92	JAP	0.95 ***	0.95	AUS	0.92 ***

*, **, *** indicate significance at the 10%, 5%, and 1% level respectively.
The full sample estimate for 1880-1913 and 1880-1890 excludes Japan and Russia; for 1919-1924 it excludes Denmark, France, Germany and Russia; for 1925-1930 it excludes Russia; for 1931-1936 it excludes Russia; for 1937-1939 it excludes France, Germany, Italy, and Russia.

We can see from this table that the parameter estimates are quite sensitive to the sample of countries in the cross-sectional average. The estimated slope coefficient can change by as much as 0.3, and the explanatory power can change by as much as forty percent. For the pre-World War I period, the inclusion of the U.S. tends to raise the parameter estimates, while Finland tends to lower the estimates. For the post-World War I period, the inclusion of Germany tends to raise the saving-investment correlations, while Australia tends to lower them.[3]

5. Parameter Estimates: On or Off Gold Standard

Another interesting question to consider is whether being on the gold standard makes a difference to the estimated saving-investment correlation. This question can be addressed by estimating the parameters only for countries that were on the gold standard for the entire sample period, or by using

[3] An alternative method to test the sensitivity of the parameter estimates to the sample of countries is to perform bootstrap regressions. Bayoumi (1990) calculates bootstrap estimates for his sample of eight countries and finds parameter estimates quite similar to his least squares calculations.

data for the years that a country was on the gold standard.[4] We adopt both approaches here. Table A5 shows the results of estimating the parameters for countries that were on the gold standard, as well as country averages based on the period for which the country was on the gold standard. For comparison, we include in the final two columns the parameter estimates based on all available data.

Table A5: Slope estimates from regression of investment on savings for countries on the gold standard and for years on the gold standard

Sample Period	*Including countries on gold standard*		*Including years on gold standard*		*All available data*	
	β	R^2	β	R^2	β	R^2
1880-1913	0.415	0.025	0.583 **	0.273	0.463	0.137
1885-1913	0.438	0.035	0.599 **	0.276	0.594 **	0.191
1880-1890	0.228	-0.093	0.228	-0.076	0.471	0.133
1891-1901	0.528	0.156	0.705 ***	0.533	0.661 ***	0.546
1902-1913	0.625 *	0.222	0.625 *	0.222	0.600 *	0.227
1919-1924	-	-	-	-	0.969 *	0.283
1925-1930	0.780 **	0.872	0.796 ***	0.673	0.653 **	0.427

*, **, *** indicate significance at the 10%, 5%, and 1% level respectively.
The estimate for countries on the gold standard for 1880-1913, 1885-1913, 1880-1890, and 1891-1901 excludes Italy, Japan, Russia, and the United States; the estimate for 1902-1913 excludes Italy, the estimate for 1925-1930 includes only Germany, Sweden, the United Kingdom, and the United States. The full sample estimate for 1880-1913 and 1880-1890 excludes Japan and Russia; for 1919-1924 it excludes Denmark, France, Germany and Russia; for 1925-1930 it excludes Russia.

We can see from the results presented in this table that including only countries on the gold standard for the entire sample period tends to lower the estimated saving-investment correlation. However, taking the country average for years that a country was on the gold standard tends to raise the estimated correlation dramatically, as well as the explanatory power of the regression. As noted in the text, this result is difficult to interpret because the timing of gold standard adherence was endogenous for many countries.

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[4] We use the following dates for when countries were on the gold standard - Australia: 1852-1915, 1925-1929; Canada: 1853-1914, 1926-1931; Denmark 1872-1914, 1927-1931; Finland 1877-1914, 1926-1931; France: 1878-1914, 1928-1936; Germany: 1871-1914, 1924-1931; Italy 1884-1894, 1927-1936; Japan 1897-1917, 1930- 1931; Norway: 1875-1914, 1928-1931; Russia: 1897-1914; Sweden: 1873-1914, 1924-1931; the United Kingdom: 1821-1914, 1925-1931; the United States: 1893-1907, 1908-1933. See Bordo and Kydland (1995) or Eichengreen (1992b) for surveys of gold standard participation.

Appendix B: Data Sources and Methods

The investment ratios estimated in the paper were calculated by taking current price estimates of gross domestic capital formation (gross fixed investment plus changes in stocks/inventories) as a percentage of gross domestic product[5] at market prices. The estimates of stocks may include changes in the value of livestock.[6] The saving ratio was estimated by adding the investment ratio to the current account to GDP or NNP ratio, measured in current prices. The saving ratio is thus defined residually, and hence incorporates all measurement error from both investment and the current account.

Australia

GDP:

GDP data from 1861-1900 are from N. G. Butlin (1962, T. 1, col. 2, p. 6), market prices, calendar years, millions of pounds. GDP data from 1900 to 1944 are from M. W. Butlin (1977, T. IV.1, col. 11, pp. 78-79), current prices, millions of dollars, converted to pounds by dividing by two. Data are for financial years (July 01 to June 30) 1900/01 to 1944/45.

Capital Formation:

Capital formation data for 1861-1900 are from N. G. Butlin (1962, T. 4, p. 16), total public and private gross domestic capital formation, market prices, calendar years, thousands of pounds. Capital formation data include changes in stocks. Changes in stocks data for 1861-1900 are from N. G. Butlin (1962, T. 7, p. 22), livestock accumulation, market prices, calendar years, thousands of pounds. Butlin (1962, p. 21) argues that "Livestock assets form a large part of the total private Australian assets, and changes in livestock assets are very large in relation to total private gross capital formation." Butlin proposed a measure of domestic capital accumulation equal to capital formation plus changes in livestock. This procedure is used for Australian data prior to 1901.

This inclusion of livestock accumulation estimates in capital formation data is often controversial, however. As Boehm (1965, p.211) argues "The alternative sequence warrants close attention in income and growth analyses because the general effects on output and expenditure of changes in livestock are not necessarily comparable with the effects of changes in fixed assets." For Australia, increases in livestock average around 1.07 percent of GDP from 1861 to 1900, and then 0.94 percent from 1900/01 to 1944/45.

From the perspective of national accounts classification, the System of National Accounts advocates the classification of livestock accumulation into estimates of changes in stocks. According to the UN Statistical Office (1952, p. 80), the value of the increase in stocks should be classified in the same way as fixed capital formation in the national accounts. The System of National Accounts was adopted by many countries in our dataset and applied retrospectively to historical data. Thus, for the purposes of this thesis, we will follow this procedure and include livestock accumulation in estimates of changes in stocks.

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[5] Net national product if GDP is unavailable.

[6] See the notes on capital formation in Australia for a discussion of this point.

Capital formation data from 1900 to 1944 are from M. W. Butlin (1977, T. IV.1, pp. 78-79), private plus public fixed capital formation, current prices, millions of dollars, converted to pounds by dividing by two. Data are for financial years (July 1 to June 30) 1900/01 to 1944/45. Capital formation data include changes in stocks. Data for changes in stocks from 1900 to 1944 are from M. W. Butlin (1977, T. IV.1, pp. 78-79), current prices, millions of dollars, converted to pounds by dividing by two. Data are for financial years (July 1 to June 30) 1900/01 to 1944/45.

Current account:
Current account data for 1861-1900 are from N. G. Butlin (1962, T. 265, p. 444) for current account balance, in millions of pounds. (Number in table is defined as excess of debits, so negative of this number is used for current account balance - i.e. positive number implies surplus). Current account data for 1900-1944 are from M. W. Butlin (1977, T. IV.17, pp. 108-109) for data on exports, imports, and net property income paid overseas (cols. 1, 2, and 4 respectively). Data are in current prices, millions of dollars, converted to pounds by dividing by two. Data are for financial years (July 01 to June 30) 1900/01 to 1944/45. The value of exports less imports less net property income gives the current account balance. For the current account data prior to 1901, N. G. Butlin excluded net exports of gold and included gold production, "treating gold production as the proper current account credit of a gold producing country" Butlin (1962, p. 435). M Butlin also followed this procedure for data from 1900/01 to 1944/45. To arrive at a figure for the current account excluding all gold flows, gold production numbers are subtracted from the current account figures.

Gold:
Data on the gross value of gold production from 1861 to 1900 are from N. G. Butlin (1962, T. 55, p. 115). Data on gold production from 1900 to 1945 are from McLean (1968), pp. 83-86, row 2, gold production, millions of pounds. Data from 1901 to 1913 are for calendar years, data from 1914 are for financial years (July to June). Data on net exports of gold coin and bullion from 1861 to 1900 are from N. G. Butlin (1962), data on current account credits for gold and specie exports from T. 247, pp. 410-411, line 12, and gold and specie imports are from T. 248, pp. 413-414, line 11. Data on net exports of gold coin and bullion from 1901 to 1945 are from the Commonwealth Yearbook (various years), exports of gold bullion and specie less imports of gold bullion and specie. The Yearbook data from 1901 to 1913 are for calendar years, data from 1914 are for financial years. Data from 1901 to 1914 are converted to financial years by averaging with the data from the previous year.

The monetary gold stock includes coin and bullion held by the Treasury, mints, banks, and the public. According the the Statistical Register of New South Wales, 1876, p. 255 and 1890, p. 255, data on gold coin and bullion held by the NSW Treasury and mint for 1867-1876 and 1881-1890 suggest that mint holdings of coin are negligible (maximum value of £ 804). Bullion held at the mint reaches a maximum of £ 136, 904 in 1874. Treasury holdings of bullion and coin are listed as being negligible. Data on bullion in the hands of the public or banks are not available. The bullion component of the monetary gold stock held by the public and official agencies is therefore ignored in these calculations.

For data on the monetary gold stock of Australia, the flows of gold reported by the three mints (Sydney, Melbourne, and Perth) can be added to provide an estimate of changes in the total coin stock of the country. For New South Wales, data on gold coin in banks of issue and private

hands from 1855 to 1890 are taken from the Colony of New South Wales, Statistical Register (1890, p. 234). Data for 1891 to 1899 are taken from United Kingdom, Annual Report of the Deputy Master of the Mint, various issues. Data for 1900 and 1901 are estimated by adding gold coin issued by the mint less gold coin withdrawn, plus coin imported less coin exported by the colony of New South Wales, using data from the Annual Report of the Deputy Master of the Mint (1901, p. 138).

For Victoria, there is little data available on the stock of gold coin in banks and private hands. However, the Annual Report of the Deputy Master of the Mint (1893, p. 123; 1899, p. 123; 1901, p. 138) gives data on gold coin flows for the colony of Victoria from the opening of the Melbourne mint in 1872. The sum of the data on gold coin issued less coin withdrawn, plus gold coin imported less coin exported from the colony of Victoria gives the change in gold coin in the colony.

For Western Australia, the Annual Report of the Deputy Master of the Mint (1901, p. 138) gives data on gold coin flows for the colony of Western Australia from the opening of the Perth mint in 1899. The sum of the data on gold coin issued less coin withdrawn, plus gold coin imported less coin exported from the colony gives the change in gold coin in Western Australia.

Data on the stock of gold bullion held by the banks is taken from S. J. Butlin et al. (1971), Australian Banking and Monetary Statistics 1817-1945, T. 1, p. 113, average of weekly figures for December quarter until 1900, then average of weekly figures for June quarter. The data are for total bullion, but according to the notes on p. 77, bank bullion holdings are mainly gold bullion.

Changes in the monetary gold stock for Australia are then estimated as the sum of changes in the stock of gold coin in banks of issue and private hands in New South Wales, plus the sum of changes in the gold coin stock in the colonies of Victoria and Western Australia, plus the change in bullion held by Australian Trading Banks. Data from 1861 to 1900 are for calendar years. Data on the monetary gold stock for 1901 to 1944 are taken from Australian Banking and Monetary Statistics 1817-1945, T. 42, pp. 453-457, total gold coin held by banks and the public, and bullion held by Australian Trading banks, T. 1, pp.115, end of financial year (June quarter averages). An estimate of the gold stock for the financial year 1899 was calculated as the average of the gold stock in 1899 and 1900. The estimated gold stock at the end of 1899 and 1900 was calculated by taking the cumulative sum of net additions to coin in the colonies of Victoria and Western Australia from 1872 to 1899 and 1900 (ie the sum of gold coin issued less coin withdrawn, plus gold coin imported less coin exported), plus the stock of gold coin in banks of issue and private hands in New South Wales in 1899 and 1900, plus the gold bullion holdings of Australian Trading Banks. Data on changes in the monetary gold stock from 1900/1901 onwards are calculated as the first difference of the sum of coin stock held by banks and the public plus bullion held by trading banks, listed in Australian Banking and Monetary Statistics 1817-1945.

The main drawback with estimating the monetary gold stock using this method is that it tends to overstate the actual gold stock. As S. J. Butlin et al. (1971, p.92) caution: "Because of inadequacies in the gold production figures and the freedom until 1914 with which coins in circulation in Australia were imported and exported and the probable statistical significance thereafter of unrecorded imports and exports of coins, it is not possible to produce satisfactory estimates of coinage in use in the nineteenth century, or to be more exact, it would not be possible to do so without conducting much more detailed research." Another relevant comment on the accuracy of the statistics is made in the Annual Report of the Deputy Master of the Mint, 1902, p. 138: The above return shows that only 13.73 percent of the gold coined at the Melbourne, Sydney, and Perth Mints during the last 29 years has been retained in the States coining it. The amount actually retained

is probably much less than this, for considerable quantities are taken away by passengers for Europe which do not appear in the Customs House Returns, and which probably are not counterbalanced by sums brought in by incoming passengers... Thus in Victoria, the amount of all coined metals held by Banks on the 31st December 1901 was only £3 928 107 more than they held on the 31st December 1872, or only 26.84 percent of the amount apparently retained in the State since that date, and in a State where the practice of keeping Bank accounts is almost universal, and the circulation of L1 Bank Notes very large ... it is not probable that the amount of gold coin in private hands is very large." On a compounded basis, this is equivalent to overstating outflows by 4.43% per year i.e. $(1-0.0443)^{29} = 0.2684$. Some of the gold may have also made its way into banks in other states instead of being unrecorded flows. This is equivalent to overstating the change in the monetary gold stock by less than 5% per year. Since reliable data are not available on funds taken overseas and inbound by passengers, there is little that can be done to the estimated figures for the monetary gold stock to adjust for this source of error.

Canada

GDP:

GDP data from 1870 to 1926 are calculated by subtracting net interest and dividend payments from abroad from the figures for GNP. Data for GNP are from from Urquhart (1986, T. 2.1, pp. 11-15, row 25), market prices, thousands of dollars. GNP data from 1927 to 1944 are from Urquhart and Buckley (1965, series E 27, p. 131), gross national expenditure at market prices, millions of dollars. Data for net interest and dividend payments from 1870 to 1926 are from Urquhart (1986, T. 2.1, pp. 11-15, row 8 less row 21), interest and dividends credits less interest and dividends debits, market prices, thousands of dollars. Data from 1927 to 1944 are from Urquhart and Buckley (1965, series F 60 less F66, p. 160), current receipts of interest and dividends less current payments of interest and dividends, millions of dollars.

Capital Formation:

Capital formation data for 1870 to 1926 are from Urquhart (1986, T. 2.2, pp. 16-17, col. 8), grand total, gross fixed capital formation, current dollars, millions. Data from 1927 to 1944 are from Urquhart and Buckley (1965, series E 17, p. 131), total business gross fixed capital formation, millions of dollars. Capital formation data include changes in stocks. Changes in stocks data available only from 1927 to 1944, from Urquhart and Buckley (1965, series E 21, p. 131), total value of the physical change in inventories, millions of dollars.

Current account:

Current account data from 1870 to 1926 are from Urquhart (1986, T. 2.4, pp. 20-25, rows 9 and 22), total current credits and total current debits, thousands of dollars. Data include net exports of gold coin and bullion. Data from 1927 to 1944 are from Urquhart and Buckley (1965, series F 71, p. 160), net balance, all countries, millions of dollars. Data include net exports of non-monetary gold. Data for the current account excluding all gold flows from 1870 to 1926 are calculated by subtracting net exports of gold coin and bullion from the current account. Data on the current account excluding gold from 1927 to 1944 are calculated by subtracting net exports of non-monetary gold from the current account.

Gold:

Data on net exports of gold coin and bullion for 1870 to 1926 are from Urquhart (1986, T. 2.4, pp. 20-25, rows 2 and 16), exports of gold coin and bullion, less imports of gold coin and bullion, thousands of dollars. Data on net exports of non-monetary gold for 1868 to 1899 are from Rich (1988, T. A-3, pp. 245-246, col. 3), millions of dollars. Data on net exports of non-monetary gold for 1900 to 1913 are calculated by taking the sum of net gold exports and the change in the monetary gold stock. Data on net gold exports are from Urquhart (1986) as listed above. Data on the change in the monetary gold stock are from Rich (1988) as listed below. Data on net exports of non-monetary gold from 1927 to 1944 are from Urquhart and Buckley (1965, series F 58, p. 160), current receipts, net exports of non-monetary gold, millions of dollars, all countries. Data on net exports of monetary gold from 1927 to 1937 are from Urquhart and Buckley (1965, series F99, p. 164), monetary gold movement (net). Data for 1938-1939 are from calculated by using the change in the gold holdings of the Bank of Canada, from Canada Yearbook (1939, p. 934) and (1941, p. 805). Data for 1940-1945 are from Dominion Bureau of Statistics (1949), Statement 8 - Canada's holdings of gold and US dollars, p. 57, converted to Canadian dollars at the official exchange rate of US$ 0.909090 = C$ 1. Monetary gold movements are taken as the negative of the change in the Canadian gold stock. Data on net exports of gold from 1927 to 1944 are calculated as the sum of net exports of non-monetary gold minus the change in the monetary gold stock.

Data on the monetary gold stock from 1869 to 1871 are calculated as the sum of bank gold and subsidiary coin plus the stock of gold held against Dominion notes. Data on bank gold and subsidiary coin are from Curtis (1931, p.36) current gold and subsidiary coin, thousands of dollars, December figures. Data on gold held against Dominion notes are from Curtis (1931, p. 92), thousands of dollars, December figures. Data on the monetary gold stock from 1872 to 1913 from Rich (1988, T. A1, pp. 239-242), Dominion government gold holdings plus the gold holdings of chartered banks, end of year. Data on the monetary gold stock from 1914 to 1926 are calculated as the sum of official Canadian gold reserves, plus bank gold and subsidiary coin holdings, plus bank gold held in the central reserves of the banking system (a private gold reserve managed by trustees from the Ministry of Finance and the Canadian Bankers Association). Data on the offical gold reserves are from the Canada Yearbook 1927-28, p. 857, T. 3, total Canadian gold reserves, end of year figure. Data on bank gold and subsidiary coin are from Curtis (1931, p.36) current gold and subsidiary coin, thousands of dollars, December figures. Data on bank gold held in the central gold reserves are from Curtis (1931, p. 35), gold coin, thousands of dollars, December figures.

Denmark

GDP:

GDP data from 1850 to 1944 are from Hansen (1977, T. 5, pp. 261-263), gross factor incomes (bruttofaktorindkomst) plus net import of goods and services (netto import af varer og tjenester) plus indirect taxes less subsidies (indirekte afgifter - pristilskud), equalling disposal of merchandise and services (varer og tjenester til radighed), current market prices (lobende markedspriser), millions of kroner.

Capital Formation:
Capital formation data from 1850 to 1944 are from Hansen (1977, T. 6, pp. 264-266, col. 2), gross investment (brutto-investering), current prices, millions of kronor. Data do not include stocks.

Current Account:
Current account data from 1874 to 1944 are from Bjerke and Ussing (1958, T. VI, pp. 152-153, col. 4), net imports of goods and services, millions of kroner.

Gold:
Data on the monetary gold stock from 1874 to 1906 are from the U.S. Annual Report of the Director of the Mint (various years). Data on the gold stock for 1875 and 1894 are calculated by adding net exports data for the following year to gold stock figures for the following year. Data on the gold stock for 1877, 1886-1888 are calculated by subtracting net exports data for the year from the gold stock figures for the previous year. Data on the gold stock for 1874 and 1878 are calculated as the average of the preceding and following years. US dollar values are converted to crowns at the exchange rate of 0.268 US dollars per crown. Data on the gold holdings of the central bank (Danmarks Nationalbank) from 1907 to 1944 are from Statistisk Arbog Danmark (Statistical Yearbook) (various years). The change in the monetary gold stock is assumed to equal the change in the gold holdings of the central bank.

Data on gold exports and imports for 1874 to 1906 are from the U.S. Annual Report of the Director of the Mint (various years). Data on gold imports and exports from 1910 to 1930 are from the League of Nations Memorandum on the Balance of Payments (1924, 1927, 1931, 1932), bullion and specie import, bullion and specie export, then gold import and export. The figures for bullion and specie import include some non-gold coin. However, there is a close correspondence between gold bullion and specie trade and total bullion and specie trade from the League of Nations figures for the years with overlapping data (1922-1930), suggesting that the non-gold element of bullion and specie trade was small. On this basis, the figures for total bullion and specie trade were used from 1910 to 1921, then gold bullion and gold specie trade figures were used from 1922 to 1930. Data on the net export of gold from 1907 to 1909 and from 1931 to 1934 and are assumed to be equal to the negative of the change in the monetary gold stock (ie an increase in the monetary gold stock implies and equal amount of gold imports). According to the League of Nations Memorandum on Balance of Payments and Foreign Trade Balances 1911-1925, vol. II, p. 85, Danish trade statistics exclude gold bullion and all specie. Silver bullion is included in merchandise trade. Thus the current account data should not include gold trade. Data on monetary gold exports for 1935 to 1944 are from Statistisk Arbog Danmark (Statistical Yearbook) (various years). Data on net exports of gold for 1935 to 1944 are assumed to equal the monetary gold exports.

Finland
Finland became an autonomous Grand Duchy connected with Russia in 1809, and declared independence from Russia on December 6, 1917. Finland had its own monetary system from 1860, and was on the gold standard from 1877 to 1914. The unit of currency was the Finnmark (Finnish markka), equivalent to one French gold franc. Finland returned to the gold standard on January 1, 1926, and remained on the gold standard until October 1931.

GDP:
GDP data from 1860 to 1944 from from Hjerppe (1989, T. 3A1, col. 1, pp. 201-203), market prices, thousands of FIM.

Capital Formation:
Capital formation data from 1860 to 1938 from from Hjerppe (1989, T. 3A1, col. 5, pp. 201-203), gross fixed capital expenditure, market prices, thousands of FIM. Changes in stocks data from 1860 to 1938 from from Hjerppe (1989, T. 3A1, col. 7, pp. 201-203), increase in stocks + statistical discrepancy, market prices, thousands of FIM.

Current Account:
Current account data from 1860 to 1938 from from Hjerppe (1989, T. 3A1, cols. 2 and 6, pp. 201-203), imports of goods and exports of goods, market prices, thousands of FIM. The statistical discrepancy includes data on net exports of services.

Gold:
Net Exports of gold from 1860 to 1909 from Pihkala (1970, T. 2, pp. 80-91), value of exports, 43: Raha (coinage), 1000 mk, less Pihkala (1970, T. 7, pp. 112-123), value of imports, 1252: Hopea, kulta, platina (silver, gold, platinum), 1000 mk. This data includes some silver and platinum imports and exports. Net exports of gold from 1910 to 1930 are from the League of Nations Memorandum on the Balance of Payments (1924, 1927, 1931, 1932), gold bullion and specie import, less gold bullion and specie export. According to the League of Nations (1927, p. 104), Finnish merchandise trade statistics include gold specie and bullion movements in the data for manufactured gold and unwrought gold, respectively. Net exports of gold from 1931 to 1944 are from Ulkomaankauppa Vuosijulkaisu (various years), item numbers 951-953, precious metal imports: Kultaa: valmistamatonta ja jatteita, lankaa ja levya, teoksia muunlaisia, rahaa, muita (gold, manufactured and unmanufactured, coin), then from 1939 items 61-005, 61-102 to 61-014, and 62-001. Exports data are given in series 61-002 Kultaa: valmistamaton seka jatteet ja romu and 62-001 Kutaraha (gold coin).

Data on the monetary gold stock from 1871 to 1944 are taken from Suomen tilastollinen vuosikirja (Statistical yearbook of Finland), various years, gold assets of the Bank of Finland. The change in the monetary gold stock is calculated as the first difference of the gold assets of the Bank of Finland. Data on the current account excluding gold are calculated by subtracting net gold exports (which include some silver and platinum) from the current account data.

France
GDP:
GDP data from 1850 to 1900 are from Levy-Leboyer and Bourguignon (1985, T. A-III, series 1, pp. 329-332), produit interieur brut, millions de francs courants. Data from 1901 to 1944 are from Villa (1983, p. 459, series PIBQ), Production Interieure Brute en valuer - en gros franc courants.

Capital Formation:
Capital formation data from 1850 to 1900 are equal to gross fixed capital formation plus changes in stocks. Capital formation data are from Levy-Leboyer and Bourguignon (1985, T. A-III, series 4, pp.

329-332), investissements, bruts, (gross fixed capital formation), millions de francs courants. Changes in stocks data from 1850 to 1900 are from Levy-Leboyer and Bourguignon (1985, T. A-III, series 8, pp. 329-332), variations des stocks (change in stocks), millions de francs courants. Capital formation data from 1901 to 1944 are are equal to gross fixed capital formation plus changes in stocks. Capital formation data are from Villa (1983, p. 439, series IE, IG, IM), Investissement des Entreprises, Investissement des Administrations, Investissement des Menages, en valeur, en Gros franc courants, (sum of investment by businesses, government, households). Changes in stocks data are from Villa (1983, p. 457, series DS), variations de stocks en valeur - en Gros franc courants (changes in stocks).

Current Account:
Current account data from 1850 to 1900 are from Levy-Leboyer and Bourguignon (1985, T. A-III, series 5, 6, and 7, pp. 329-332), exportations (exports) plus gains invisibles (invisible earnings) minus importations (imports), millions de francs courants. Current account data from 1901 to 1923 are from Villa (1983, p. 437: series EXPORT, plus p. 448: series SUS, plus p. 438: series IDVX, plus p. 435: series DREX, plus p. 435: series DOMX, minus p. 439: series IMPORT minus p. 444: series ODRX), exportations en valeur (exports), plus solde des utilisations de services (balance of services), plus interets et dividendes verses par l'exterieur (interest and dividends), plus depenses et recettes exterieurs (external revenue and expenditure), plus dommages de guerre verses par l'exterieur (war reparations), minus importations en valeur (imports), minus operations diverses de rapartitions exterieur (sundry external transactions), all en Gros franc courants. Current account data from 1924 to 1944 are from Villa (1983, p. 436, series EBX), epargne brute de l'exterieur - en gros franc courants.

Gold:
Data on net exports of gold and silver for 1850 to 1875 are from the US Annual Report of the Mint (1900, pp. 424-425). US dollar values are converted to French Francs at the exchange rate of 0.193 US dollars per Franc.
Data on net exports of gold from 1876 to 1914 from NBER Macrohistory database (series 14114), excess of gold exports over imports, sum of 12 months data. Data for 1915 to 1930 are from the League of Nations (1924, 1927, 1931, 1932), gold bullion and specie exports less gold bullion and specie imports. Data from 1931 to 1944 are from Annuaire Statistique (1966, Ch. 40, T. I, p. 365), mouvements d'or, million de francs 1928. The figures for net exports of gold include gold and silver from 1850 to 1870.

Data on changes in the monetary gold stock for 1851 to 1865 are calculated from Annuaire Statistique (1966, T. III, p. 516), Banque de France encaisse d'or et d'argent (Bank of France holdings of gold and silver, average for year). Changes in the monetary gold stock are set equal to the change in gold and silver holdings of the Bank of France. Data from 1866 to 1870 are from NBER Macrohistory database (series 14100), Bank of France metallic reserve (gold and silver), December figures. Data from 1871 to 1913 are from Saint Marc (1983, pp. 24, 25, col. E), Monnaies d'or, total existant evalue (total gold existing in country). Data from 1913 to 1927 are from Annuaire Statistique (1966, T. III, p. 517), Banque de France encaisse d'or (Bank of France gold holdings, annual average). Data from 1928 to 1945 are from Annuaire Statistique (1966, T. II, p. 562), Banque de France encaisse d'or (Bank of France gold holdings, year end), multiplied by the price of gold

from Annuaire Statistique (1966, T. II, p. 562), cours de l'or a Paris, cours d'achat par la Banque de France. Price data from 1938 to 1945 are from Annuaire Statistique (1952, p. 503), cours de l'or a Paris et a Londres depuis 1938, end of December figures.

According to Annuaire Statistique (1952, p. 195), external trade data excludes gold, silver, and copper coin, raw gold and silver, gold and silver in bars, ingots, and powder. On this basis, the current account data excluding gold were assumed to equal the original current account data.

Germany

GDP:

GDP data from 1850 to 1939 are from Hoffman (1965, T. 248, col. 5, pp. 825-826), Nettosozialprodukt zu Markt-preisen, (NNP at market prices), mill mark, raised 8.4% to approximate GDP following procedure in Maddison (1991).

Capital Formation:

Capital formation data from 1850 to 1939 from Hoffman (1965, T. 248, col. 2, pp. 825-826), Nettoinvestitionen (net investment), mill mark. Data includes stocks. Stocks data from 1851 to 1939 are from Hoffman (1965, T. 32, col. 4, p. 237), Investitionen der Landwirtschaft, Vorrate (investment in agriculture, stocks), plus T. 36, col. 3, p. 247, Investitionen im Gewerbe, Vorrate, (investment in trade/industry, stocks). Data from 1851 to 1913 are for the sum of Anlagen and Vorrate (fixed assets and stocks). Data for 1851 to 1913 estimated by using the average of Vorrate (stocks) to the sum of Anlagen and Vorrate for the years 1924-1959, and multiplying by the annual sum data.

Current Account:

Current account data from 1860 to 1938 are from Hoffman (1965, pp. 825-826, col. 4), Saldo der Leistungsbilanz. The current account data exclude net exports of precious metals. The current account excluding gold is calculated by adding net exports of precious metal to the current account and subtracting net exports of gold.

Gold:

Exports data from 1872 to 1942 from Germany, Deutsche Bundesbank (1976), T. J 1.03, p. 324, col. 11, Ausfuhr, darunter gold (exports of gold) and col. 13, Einfuhr, darunter gold (imports of gold). Exports data for 1872 to 1879 are estimated by taking the average of gold exports to total exports of precious metal for the period 1880 to 1913 and multiplying by the figure for corresponding figure for total precious metal exports. Imports data for 1872 to 1875 are estimated by taking the average of gold imports to total imports of precious metal for the period 1876 to 1913 and multiplying by the figure for corresponding figure for total precious metal imports.

Gold holdings of the Reichsbank for 1876-1945 from Germany, Deutsche Bundesbank (1976), T. C 1.01, p. 36, col. 2, Aktiva: Gold in Barren and Munzen (gold in bars and coin). Data for 1878, 1879, 1883, 1887, 1888, 1890 are not shown separately, but data are given for sum of Gold in Barren und Munzen and Deutsche Scheidemunzen (total gold in bars and coin and German subsidiary coin), Data for 1878, 1879, 1883, 1887, 1888, 1890 are estimated by taking the ratio for the previous year of gold in bars and coin to the sum of gold in bars and coin plus subsidiary coin, and multiplying by the corresponding sum for the missing year. Gold coin in circulation from 1876 to 1913 from Deutsche Bundesbank (1976), T. B 1.01, p. 14, Munzen, Goldmunzen (coin, gold

coin), col. 7. The monetary gold stock is calculated as the sum of gold coin in circulation plust the gold holdings of the Reichsbank.

Italy

GDP:

GDP data are calculated by taking the figures for GNP and subtracting net factor incomes and current transfers received from the rest of the world. GNP data from 1861 to 1925 are from Italy, ISTAT (1957, T. 36, col. 6, p. 249-250), reddito nazionale lordo ai prezzi di mercato (gross national product at market prices), milioni di lire. Net factor incomes from abroad are from ISTAT (1957, T. 36, col. 3, p. 249-250), Esterno redditi netti dall'estero, milioni di lire. Current transfers are from ISTAT (1957, T. 39, col. 4, p. 255), trasferimenti correnti, saldo, milioni di lire. GNP data for 1926 to 1945 are from ISTAT (1986), T. 8.1, p. 143, col. 1, reddito nazionale netto (net national income), plus col. 2, ammortamenti (depreciation). Net factor incomes from abroad are from ISTAT (1986, T. 8.11, p. 151, cols. 2, 7), exportazione redditi dei fattori less importazione redditi dei fattori (exports of factor income less imports of factor income).

Capital Formation:

Data from 1861 to 1925 are from ISTAT (1957, T. 44, col. 6, pp. 264-265), investimenti lordi (gross investment), current prices. Data includes stocks. Data for 1926 to 1945 are from ISTAT (1986), T. 8.1, p. 143, col. 6, investimenti lordi (gross investment). Data on changes in stocks from 1861 to 1925 are from ISTAT (1957, T. 44, pp. 264-265, col. 5), Variazioni scorte (change in stocks). Data on changes in stocks for 1926 to 1945 are from ISTAT (1986, T. 8.28, p. 166, col. 5), variazione delle scorte (change in stocks).

Current Account:

Data from 1861 to 1925 are from ISTAT (1957, T. 39, col. 5, p. 255), Bilancia dei pagamenti correnti, conto transazioni e trasferimenti correnti (balance of current payments, including current transfers) Data for 1926 to 1945 are from ISTAT (1986, T. 8.11, p. 151, col. 11), Saldi, transazioni correnti (settlement of current transactions), equal to the sum of net exports of goods, services, factor income, and transfers. Merchandise trade figures include silver bullion, but exclude gold bullion and silver coin of the Latin Union. The current account excluding gold is therefore the same as the original current account figure.

Gold:

Data for 1861 to 1936 are from Di Mattia (1967). Data for gold and silver coin withdrawn from T. 8, pp. 473-474, cols. 1 and 2, Retiri di monete, oro and argento ed eroso misto (withdrawn coins, gold and silver). Data for gold and silver coined and recoined from T. 9, pp. 477-478, col. 1, Coniazioni e Reconiazioni di Monete, Oro and Argento (coinage and recoinage, gold and silver). Imports and exports data from T. 10, pp. 481-482, cols. 1, 2, 5, 6, Esportazioni oro grezzo (exports unrefined gold), Esportazioni oro monetato (exports gold coin), Importazioni oro grezzo (imports unrefined gold), Importazioni oro monetato (imports gold coin). Data for 1861 to 1877 for gold imports and exports include silver coin & unrefined silver.

Data for 1861 to 1877 for gold specie exports are calculated by taking the average of gold specie to total specie exports for the years 1878-1936, and multiplying by the annual figure for total

specie exports. Data for unrefined gold exports are calculated by taking the average of gold specie to total specie exports for the years 1878-1936, and multiplying by the annual figure for total unrefined gold and silver exports. The data for gold imports are calculated similarly.

The change in the monetary gold stock is calculated as the sum of specie imports less specie exports plus coinage and recoinage less withdrawn coin. Data on official reserves of gold from ISTAT (1968, T. 83, p. 105, col. 11), Riserve Ufficiali, Di Cui Oro, lire milioni (official reserves of gold coin, millions lire).

For the period from 1862 to 1866 when Italy was on a bimetallic standard, the change in the monetary stock includes coinage and recoinage and net specie imports of silver as well as gold. The data on net exports also include net exports of silver bullion and specie for this period.

Japan

The New Coinage Act of 1871 declared the gold yen as the standard unit of value and legal tender for transactions of any value. Silver coins were relegated to subsidiary money, legal tender up to 10 yen. However, the Act also declared the silver Yen Trade Dollar as legal tender within the confines of treaty ports. An amendment in May 1878 made the silver Trade Dollar legal tender throughout the Empire of Japan. Thus both gold and silver were legal tender within Japan and for all foreign transactions from 1878 to 1897. It wasn't until the Coinage Act of 1897 declared the gold yen as the standard unit of value and legal tender that Japan officially adopted the gold standard. The coinage of the Yen Trade Dollar ceased, and they were gradually withdrawn from circulation.

GDP:

GDP data are calculated by taking the figures for GNP and subtracting net factor incomes and transfers received from the rest of the world. GNP data from 1885 to 1929 are from Ohkawa et al (1979, T. A1, pp. 251-253, col. 7), gross national expenditure at market prices, millions of yen, current prices. GNP data from 1930 to 1944 are from Ohkawa et al (1979, T. A2, p. 254, col. 7), gross national expenditure at market prices, millions of yen, current prices. Data on net factor incomes received from the rest of the world are from Ohkawa et al (1979, T. A31, pp. 332-335, cols. 3, 6), exports: income from abroad less imports: income from abroad. Data on net transfers from abroad are from Ohkawa et al (1979, T. A31, pp. 332-335, col. 8), net transfers from abroad.

Capital Formation:

Capital formation data equal gross domestic fixed capital formation plus changes in stocks. Data from 1885 to 1929 from Ohkawa et al (1979, T. A1, pp. 251-253, col. 3), gross domestic fixed capital formation. Data from 1930 to 1944 from Ohkawa et al (1979), T. A2, p. 254, col. 3, gross domestic fixed capital formation. Change in stocks data from 1885 to 1929 are calculated by taking Inventory Data as % GNE taken from p. 63 of Ohkawa et al (1979) quoting from Fujino, Shozaburo and Akiyama, Ryoko (1973), Zaiko to Zaiko Toshi, 1880-1940, Hitotsubashi Daigaku, Keizai Kenkyujo, and multiplying by the figure for GNE. Inventories data from 1930 to 1944 are from Ohkawa et al (1979, T. A2, p. 254, col. 4), increase in stocks.

Current Account:

Data for 1868 to 1940 from Ohkawa et al (1979, T. A31, pp. 332-335, col. 9), surplus on current account (excluding reparations). Data does not include nonmonetary gold or monetary gold

shipments. Data from 1940 to 1944 from Ohkawa et al (1979, T. A32, p. 336, col. 9) surplus on current account (excluding reparations).

Gold:

Gold coinage data for 1871 to 1897 are from Matsukata (1899), T. II, p. 13, Amount of gold coins issued, and T. III, p. 14, Amount of silver coins issued. Data for 1900 to 1939 are from Japan, Ministry of Finance, Financial Annual of Japan, nos. 1, 10,16, 26, 36, 40, coins turned out by the mint. Data for 1913 to 1936 on coinage withdrawn are from Japan, Bank of Japan (1932, 1937), Economic Statistics of Japan, p. 2, amount of coin melted by the mint.

Data on gold exports and imports for 1872-1933 on exports and imports of gold from Ishibashi (1935), details of coin and bullion exported, pp. 431-433, details of coin and bullion imported, pp. 436-437, gold bullion and total of gold coin and bullion. Data are for Japan Proper (ie excludes Korea and Taiwan after annexation). Data for 1934-1936 on net exports of gold coin and bullion from Japan, Japan Statistical Yearbook (1949, T. 280, pp. 520-521, col. 7-8), domestic (Japan Proper) exports and imports of gold coin and bullion. Silver exports and imports data for 1872-1933 are from Ishibashi (1935), details of coin and bullion exported, pp. 433-435, details of coin and bullion imported, pp. 437-439, silver bullion and total of silver coin and bullion. Data are for Japan proper (ie excludes Korea and Taiwan). Data for 1934-1936 on net exports of silver coin and bullion from Japan Statistical Yearbook (1949), T. 280, pp. 520-521, col. 7-8, domestic (Japan Proper) exports and imports of silver coin and bullion. Data on gold coin and bullion imports and exports and silver coin and bullion imports and exports for 1937 to 1945 are from Japan, Hundred Year Statistics of the Japanese Economy (p. 561, and Supplement, p. 157)

Data on coins existing in the country from 1868 to 1900 from Japan, Financial Annual of Japan (1901). Data on coins existing in the country from 1901 to 1914 from Shinjo (1962), T. XXB, p. 101. Data on the estimated stock of specie in the country from 1872 to 1914 is derived from the data on coins existing in the country. Data after 1914 take the previous years estimate of specie existing in the country, plus coins turned out by the mint, less coin melted by the mint, less net exports of specie. Changes in the monetary stock take the change in estimated stock of specie, less net exports of bullion. Data on the monetary stock for 1878 to 1896 include silver and gold. Data after 1897 include gold only. Data after 1934 are based on coinage less recoinage less net exports of gold coin and bullion.

Norway

GDP:

GDP data from 1865 to 1938 are from Norway, Statistisk Sentralbyra (1965, T. 49, r. 11, pp. 340-343), current prices, millions of kroner.

Capital formation:

Capital formation data from 1865 to 1938 are from Norway, Statistisk Sentralbyra (1965, T. 49, r. 5, pp. 340-343), current prices, millions of kroner. Data include increase in stocks from 1909. Data on increase in stocks for 1900-1908 are from Statistisk Sentralbyra (1953, T. 2, p. 107, col. 9), Lagerendring (change in stocks). Data for 1909-1939 are from Statistisk Sentralbyra (1965, T. 49, pp. 340-343, r. 7). Increase in stocks not estimated for the years 1865-1899. For 1900-1913 and 1921-1929 only net increase in standing forests and in livestock are included. From 1930 increase in

standing forestsis regarded as fixed capital investment.

Current Account:
Current account data from 1865 to 1899 are from Mitchell (1993, T. J3, pp. 922, 927), current prices, millions of kroner. Current account data for 1900-1929 are from Statistisk Sentralbyra (1953, T. 12, p. 126, col. 5), Netto oking eller nedgang i Norges netto fordringer pa utlandet (Net increase or decrease in Norway's foreign assets). Data for 1930-1939 from Statistisk Sentralbyra (1965, T. 25, pp. 184-185, r. 16). The current account data exclude crude gold and silver and coins.

Gold:
Data on gold and silver holdings from 1865-1913 are from Norway, Statistisk Sentralbyra (1978, T. 257, col. 1&6, p. 484), Metallfondene (gold and silver) at bank of Norway. Data from 1914-1939 from Statistiske Oversikter (1948, T. 159, rows. 1 & 4, pp. 300-303), Gullbeholdning (gold stock), and Midlertidig anbrakt i gull (temporarily invested in gold). The change in the monetary gold stock is calculated as the first difference of the gold stock at the Bank of Norway (gold and silver stock until 1914). According to United States, Report of the Director of the Mint (1886, p. 222), "the amount of gold in banks, other than the Bank of Norway, or in circulation, has probably not been considerable."

Data on gold exports and imports for 1865 to 1896 are calculated as the first difference of the gold and silver holdings of the Bank of Norway (the negative of the change in the monetary stock equals the net exports - i.e. an increase in the monetary stock corresponds to an import). Data on gold exports and imports from 1895 to 1909 and for 1931 to 1944 are from Norway, Norges Handel (annual issues), unwrought platinum, gold and silver and coins and medals. Missing trade returns data for 1897 and 1899 are interpolated linearly from the previous and subsequent years. Data on net exports of gold from 1910 to 1930 are from the League of Nations (1927, 1931, 1932), exports of bullion and specie less imports of bullion and specie (including silver and platinum, as per the trade returns).

Russia
GDP:
Data on net national product are from Gregory (1982, T. 3.2), net national product, Russian Empire, millions of credit roubles.

Capital Formation:
Data on capital formation are from Gregory (1982, T. 3.2), net investment, Russian Empire, millions of credit roubles. Data include inventories. Data on inventories are from Gregory (1982, T. 3.2), inventories, total, Russian Empire, millions of credit roubles.

Current Account:
Data on the current account are from Gregory (1982, T. 3.2), net foreign investment, Russian Empire, millions of credit roubles. The current account data include net exports of silver. Data on the current account excluding gold and silver are calculated by subtracting the figures for net silver exports from the figures for net foreign investment for the years 1886 to 1896. Net silver exports data are from Gregory (1982, T. M1, p. 314, col. 2 less col. 5), silver exports less silver imports,

millions of credit roubles.

Data on the monetary gold stock are from United States, Annual Report of the Director of the Mint (various years). Data for 1880-1891 are calculated as the sum of bullion and gold coin of the Treasury at the Bank of Russia plus gold specie on hand at the Bank of Russia (belonging especially to the Bank of Russia). Data on the monetary gold stock from 1891 to 1914 are the sum of gold coin in circulation plus gold coin and bullion in the treasuries and the State Bank. Data on the silver stock for 1885 to 1897 are from United States, Annual Report of the Director of the Mint (various years). Data on the silver stock for 1886-1891 are calculated by adding coingage less recoinage less net exports of silver to the stock of silver from the previous year. Data on the change in the monetary gold stock include changes in the silver stock for the years 1886 to 1896.

Data on net exports of gold from 1885 to 1913 are from United States, Annual Report of the Director of the Mint (various years). Data for 1900, 1901, 1912 are calculated as the negative of the change in the monetary gold stock. Data on net exports of silver from 1885 to 1899 are from United States, Annual Report of the Director of the Mint (various years). Data on net exports of gold include net exports of silver from 1886 to 1896.

US dollar values are converted to roubles at the exchange rate of 0.7718 roubles per US dollar until the end of 1897, then 0.514556. Data on monetary gold and silver, net exports of gold and silver are converted from roubles to credit roubles by multiplying by a factor of 1.5.

Sweden

GDP:

Data on gross domestic product at factor cost data for 1861 to 1945 are from Krantz and Nilsson (1975, T. 1:2, pp. 154-155, col. 4). Indirect taxes and customs duties from Krantz and Nilsson (1975, T. 1:2, pp. 154-155, col. 3). GDP at market prices calculated as sum of GDP at factor cost plus indirect taxes and customs duties.

Capital Formation:

Data on capital formation for 1861 to 1945 are from Krantz and Nilsson (1975, T. 1.1, col. 6, pp. 150-152), domestic investment. Data does not include stocks. Data on stocks for 1861 to 1945 are from Johansson (1967, T. 1, col. 3, pp. 38-39), changes in livestock. Data on capital formation include domestic investment plus changes in livestock.

Current Account:

Data on the current account from 1861 to 1930 from Lindahl et al (1937), T. 174, col. 8, pp. 598-599. Net balance on goods and services. Data do not include shipments of gold and silver. Data for 1931 to 1935 from Ohlsson (1969), T. B:1., p. 123, col. 6, bytesbalansens saldo. Data does not include net exports of gold and silver. Data for 1936 to 1945 from Sweden, Historisk Statistik for Sverige (1960), T. 33, p. 64, r. 6. Data does not include net exports of gold and silver. Net exports of silver are added to the current account balance.

Gold:

Data on net exports of gold from 1861 to 1874 from Lindahl et al (1937, T. 175, pp. 604-605, col. 1), net imports of gold according to trade statistics. Data on gold and specie flows from 1861 to 1871 included both gold and silver. According to Lindahl et al (1937, p. 610), the figures included

only insignificant quantities of gold, so the net export of gold is assumed to be zero from 1861-1871. Data from 1875 to 1913 from Lindahl et al (1937, T. 175, pp. 604-605, col. 4), change in bank holdings plus gold absorbed by industry. Lindahl et al argue that the trade statistics data suffer from several shortcomings with regards to the net exports of gold, and use the estimated change in the stock of gold held by banks and the value of gold absorbed by industry as the measure of net gold exports. Data from 1914 to 1945 are from Sweden, Historisk Statistisk for Sverige (1960, T. 30, p. 62, cols. 2, 5, 9, 12), imports of unmanufactured gold and gold coins and exports of unmanufactured gold and gold coins. Data on changes in the monetary gold stock for 1875 from Lindahl et al (1937, T. 175, col. 2, p. 604), increase in bank holdings of gold. Data on the monetary gold stock from 1876 to 1945 from Historisk Statistik for Sverige (1960, T. 76, pp. 97 and T. 77, p. 98), gold holdings of banks (including Riksbank). Change in the monetary gold stock is calcuated as the change in the gold holdings of banks.

United Kingdom

GDP:

From 1850 to 1969 from Mitchell (1988), Ch. 16, T. 5, pp. 831-832, Gross domestic product at market prices. Data from 1870 to 1944 from Feinstein (1972), T. 3, pp. T10-T11, gross domestic product at market prices.

Capital Formation:

Data from 1850 to 1869 from Mitchell (1988), ch 16, T. 5, pp. 831-832, gross domestic fixed capital formation plus value of physical increase in stocks. Data from 1870 to 1920 from Feinstein (1988), T. 17, pp. 462-463, gross domestic fixed capital formation plus value of physical increase in stocks and works in progress. Data from 1921 to 1944 from Feinstein (1972), t. 2, pp. T8-T9, gross domestic fixed capital formation plus value of physical increase in stocks and works in progress.

Current Account:

Data from 1850 to 1869 from Imlah (1958), T. 4, pp. 70-72, balance on current account. Data includes net export of gold and silver bullion and specie. Data from 1870 to 1920 from Feinstein (1988), T. 17, pp. 462-463, net investment abroad. Data includes balance of payments surplus on current account, less net imports of all gold and silver, plus net increase in holdings of monetary gold and silver. Data from 1921 to 1944 are from Feinstein (1972), T. 15, pp. T38-T39, Net investment abroad. Data includes silver trade after 1913, and excludes gold trade. Data for the current account excluding all gold flows for 1850 to 1869 are calculated by taking the current account data from Imlah (1958), less net exports of gold and silver, plus net exports of silver. Data for 1870 to 1920 are calculated by taking the net investment abroad data from Feinstein (1988), less the change in total gold and silver coin stock (as calculated below using data from Capie and Weber (1985)), plus net exports of silver. Data for 1921 to 1944 are taken from Feinstein (1972), net investment abroad, which includes silver trade and excludes gold trade.

Gold:

Gold and silver bullion and specie trade data from 1850 to 1870 are from Imlah (1958), T. 4, pp. 70-72. Gold exports data are from United Kingdom, Board of Trade (various years), exports of gold bullion and specie less imports of gold bullion and specie. Gold exports data for 1917 to 1919 are

from Morgan (1952), T. 52, p. 335, net exports of gold coin and bullion. Data on gold in the Bank of England is taken from United Kingdom, Board of Trade (various years), gold in the Bank of England Issue Department, December quarter. Silver and gold imports data were not collected prior to 1858. Data for silver imports from 1850 to 1858 are derived by taking the average ratio of silver imports to total silver trade (export+imports) for the period 1858 to 1945. Data for gold imports from 1850 to 1858 are derived by taking sum of gold and silver exports less estimated silver imports less the data for total gold and silver trade in Imlah (1958), T. 4, pp. 70-72. Silver exports data from Board of Trade (various years), exports of silver bullion and specie less imports of silver bullion and specie. Silver exports data for 1917 to 1919 from Morgan (1952), T. 53, p. 341, net exports of gold and silver, less net exports of gold from T. 52, p. 335.

Data on the change in the monetary stock of gold and silver are from Capie and Weber (1985, T. 7.3, pp. 198-200). Mid year data from 1868 to 1904 were converted to year end data by adding data from following year and dividing by two (this procedure assumes an even distribution across year). Data on the gold coin stock from 1915 to 1920 are calculated by taking the average of the gold coin stock to the total coin stock for the years 1868 to 1914 and multiplying by the figure for the total coin stock. The silver coin stock from 1905 to 1920 is calculated by taking the average of the silver coin stock to the total coin stock for the years 1868 to 1905 and multiplying by the figure for the total coin stock. Data on the change in the monetary gold stock from 1921 to 1931 are taken from the Statistical Abstract (1939), December quarter averages of changes in the gold coin and bullion in the Issue Department of the Bank of England. Data from 1932 to 1945 are from United Kingdom, Financial Secretary of the Treasury (1951), gold reserves in the Bank of England Issue Department and the Exchange Equalisation Account until 1939, then gold and dollar reserves from 1940 to 1945. assumes that the only source of changes in the monetary gold stock arise from changes in the gold holdings of the central bank. This procedure was adopted because of the lack of available data on holdings of gold coin outside the Bank of England.

United States

GDP:

Data for 1869 to 1888 from Kuznets (1961), T. R-25, pp. 561-562, col. 3, GNP, Variant III, 5 year centred moving average and T. R-23, pp. 557-558, col. 1, B. Variant III, billions of dollars. Using annual data from 1889-1892, the 5 year moving average number for 1890 is used to deduce the level of GNP in 1888 as five times the 5 year centred moving average for 1890 less the actual levels for 1889-1892. Using a similar procedure, the annual data for 1869-1888 are derived by disaggregating the 5 year moving averages. Data for 1889 to 1928 are from Kendrick (1961), T. A-IIb, col. 11, pp. 296-297, Gross National Product, Commerce concept, millions of dollars. Data from 1929 to 1945 are from United States, Bureau of the Census (1975), Series F47, Gross National Product, current prices, p. 229. GDP data are calculated by subtracting net income from investments abroad and, net unilateral transfers from abroad from the figures for GNP. The data on income on investments abroad are from United States, Bureau of the Census (1975, series U13, p. 865 then series U5, U6, and U13, p. 864), income on investments abroad, private and public (U5 + U6) less income on foreign investments in US (U13). The data on unilateral transfers are from United States, Bureau of the Census (1975, series U16 and U17, pp. 866-867), unilateral transfers, net private (U16) plus unilateral transfers, net public (U17).

Capital Formation:
Data for 1869 to 1888 from Kuznets (1961, T. R-29, pp. 572-574, col. 1), gross capital formation, five year centred moving average, less col. 3 from T. R-34, pp. 599-600, net changes in claims against foreign countries, five year centred moving average, and T. R-23, pp. 558, col. 4, gross capital formation, B. Variant III, five year centred moving average, less T. R-4, col. 4, net changes in claims against foreign countries. Annual data are derived from the 5 year centred moving average using the same procedure that was applied to the GNP series. Data from 1889 to 1928 are from Kendrick (1961, T. AIIb, col. 7, pp. 296-297), gross private domestic investment, Commerce basis, millions of dollars. Data from 1929 to 1945 are from United States, Bureau of the Census (1975, Series F52, p. 229), gross private domestic investment, current prices. Data on stocks for 1869 to 1888 from Kuznets (1961, T. R-34, pp. 599-600, col. 1), net changes in inventories, current prices, five year centred moving average, and T. R-4, p. 490, col. 3, net changes in inventories, billions of dollars. Annual data are derived from the 5 year centred moving average using the same procedure that was applied to the GNP series, except the data are unscrambled from 1920 backwards. Data from 1889 to 1928 are from Kendrick (1961, T. AIIb, col. 8, pp. 296-297), change in business inventories, millions of dollars. Data from 1929 to 1945 are from United States, Bureau of the Census (1975, Series F60, p. 230), total net change in business inventories, current prices.

Current Account:
Data for 1869 to 1945 from United States, Bureau of the Census (1975), balance on goods and services, series U15, pp. 866-868, plus series U16 and U17, net private and government unilateral transfers. Data from 1869 to 1899 are for fiscal year ended June. Data are converted to calendar year basis by adding each year to subsequent year and dividing by two. For instance, fiscal year data for 1869 are added to fiscal year 1870 and divided by two, yielding calendar year 1869. Data from 1900 are for calendar year. Data to 1873 include exports and imports of gold. Data from 1874-1945 include nonmonetary gold exports. Data for current account less gold for 1869 to 1973 are calculated by taking the current account balance less net exports of gold. Data for current account less gold for 1874 to 1945 are calculated by taking the current account balance less net exports of gold less change in the monetary gold stock (equivalent to subtracting nonmonetary gold exports).

Gold:
Exports: Data for 1869 to 1914 are from NBER Macrohistory Database, series 14112 net gold exports, thousands of dollars, monthly data. Annual data are derived by adding the sum of monthly net exports for each year (fiscal or calendar). Data from 1915 to 1945 from United States, Bureau of the Census(1975), series U197 less U198, gold exports less imports, pp. 884-885, calendar year, millions of dollars.

Monetary gold stock data for 1869 to 1878 are from United States, Bureau of the Census (1975, series X417, p. 993), billions of dollars, annual average. Data from 1879 to 1945 from NBER Macrohistory Database, series 14076, billions of dollars. Data for 1879 to July 1917 are end of month data, then monthly averages of daily figures. Data for fiscal years are end of June data. Data for calendar years are end of December data. Data excludes $287 million in gold coin outside Treasury and Federal Reserve Banks. Increase in value of gold stock from January 1934 to February 1934 of $2.81 billion due to gold revaluation is excluded from figures for changes in monetary gold stock.