Capital Flows and Macroeconomic Performance: Lessons from the Golden Era of International Finance

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Where does international capital flow? Robert E. Lucas Jr. (1990) asked why capital did not flow from rich countries to poor, implicitly assuming that returns to capital in developing countries were higher than those in the developed world. Ohanian and Wright (2008) measured rates of return over the last 50 years to assess whether capital indeed flowed from low return countries to high return countries. We found that capital flows for much of the post-World War II period are the reverse of the flows predicted by theory. That is, capital has tended to flow to countries with relatively low returns, rather than high returns.

This paper analyzes where capital flowed during the "golden era" of international flows from 1880–1913, when capital mobility is considered to have been quite high, and during the interwar period from 1918–1938, when capital flows were increasingly restricted following the First World War and the Great Depression. Following the methodology of our earlier paper, we construct two measures of the level of returns in a country and compare these returns to observed capital flows. The first measure, based on the marginal product of capital, is constructed using a Cobb-Douglas technology and measured from the observed capital-output ratio. The second measure is based on observed consumption growth, which is the return to capital when consumers have log preferences over consumption, and which otherwise is a good proxy for the return

for the class of constant relative risk aversion utility functions.

Our main finding is that flows during the golden era are indeed consistent with standard theory, as capital flows from low to high return countries when returns are measured from consumption growth. However, this relationship breaks down during the interwar period. When returns are measured from the marginal product of capital, there is no tendency for capital to flow from low to high return countries during the golden era, a finding that is quite similar to the main findings in our analysis of the postwar period. This failure of capital flows to line up with the marginal product of capital suggests quantitatively important domestic factors that drive a sizeable wedge between net returns and the marginal product of capital.

Our paper is related to a large literature that has studied capital flows during the golden era and interwar periods. Most of these studies have built on research by Martin Feldstein and Charles Y. Horioka (1980), who found a high correlation between investment and savings across countries in postwar data. Feldstein and Horioka interpreted this high correlation as suggesting highly imperfect capital markets.

Research in this tradition for the golden era includes Tamim Bayoumi (1990), Barry Eichgengreen (1992), Alan M. Taylor (1996), and Maurice Obstfeld and Taylor (2004), all of whom examine the correlation between savings and investment during the mid-late 1800s through the early 1900s and compare those estimates to those from other time periods. A common finding in these studies is that there was a weaker correlation between savings and investment during the golden era of flows than during the interwar period and much of the postwar period. The interpretation of this finding is that there were significantly fewer impediments to capital mobility during the golden era than during other times. But even if there were fewer impediments to international capital flows

during this golden era, the literature in the style of Feldstein and Horioka is silent on whether capital flowed to those countries that *should* have been the importers of capital, as predicted by standard theory. This paper sheds new light on capital flows during this time period by directly addressing this question.

The paper is organized as follows. In Section I we present an open-economy growth model in which returns may differ across countries as the result of (possibly very small) frictions in the operations of markets and derive conditions under which capital should flow from low return to high return countries in equilibrium. Section II describes our dataset, Section III presents our results, and Section IV concludes.

I. Model

Our analysis is based on a simple open-economy version of the deterministic neoclassical growth model, in which the representative consumers in each country have identical preferences given by

$$\sum_{t=0}^{\infty} \beta^t \{\ln(c_{jt}\} + v(1 - h_{jt})\} n_{jt},$$

where c_{jt} is per capita consumption in country j at time t; v is a concave function that defines preferences over nonmarket time, which is equal to the household's time endowment normalized to one less market hours h; and n is the size of the population. The representative competitive firm in country j produces output per capita using a Cobb-Douglas technology with country specific productivity

$$y_{jt} = A_{jt} k_{jt}^{\theta} h_{jt}^{1-\theta},$$

where A is country specific productivity and k is the capital stock per capita.

Each country chooses per capita levels of consumption, leisure, and holdings of domestic capital and foreign bonds b, subject to the flow budget constraint

$$c_{jt} + \frac{n_{jt+1}}{n_{jt}}(k_{jt+1} + b_{jt+1})$$

$$\leq (1 - \tau_K)(1 + r_{Kjt} - \delta)k_{jt} + w_{jt}h_{jt}$$

$$+ (1 - \tau_{Bjt}(b_{jt+1}, b_{jt}))(1 + r_{Bt})b_{jt},$$

in which r_K is the gross return to domestic capital, w is the wage and r_B the return on foreign bonds which is common across countries. Both the return to capital and the return to foreign bonds may differ from the returns received by the consumer due to the presence of "wedges" denoted τ_K and τ_B. It is easiest to interpret these wedges as taxes on the returns to both forms of investment, although they also proxy for the presence of both technological frictions and market imperfections in domestic and international capital markets, respectively. Both wedges may vary across countries and over time, and the international wedge may also vary with the foreign investment decisions of the country. For simplicity, we restrict attention to the case of a friction (such as capital controls) that increases the cost of foreign borrowing (so that $\tau_B(b_{t+1} < b_t) = \tau_- \leq 0$) and decreases the return to foreign lending (so that $\tau_B(b_{t+1} \geq b_t) = \tau_+ \geq 0$).

We now show how the theory is used to interpret the relationship between capital flows and returns, and to assess under what conditions capital should flow to countries with either high marginal products of capital and/or high consumption growth rates. The first order conditions yield the familiar result that consumers allocate their savings until the returns from domestic capital and foreign bonds—after adjusting for the effect of the wedges—are equalized. This implies the following expression for consumption growth:

$$(1) \qquad \frac{c_{jt}}{c_{jt-1}} = \beta(1 - \tau_{Bjt})(1 + r_{Bt})$$

$$(2) \qquad = \beta(1 - \tau_{Kjt})(1 + r_{Kjt} - \delta).$$

Firm profit maximization yields $r_{Kjt} = \theta y_{jt}/k_{jt}$.

It is straightforward to see that if all wedges, both domestic and international, are zero, then returns to foreign investment and domestic capital will be equalized both within countries and across countries, implying that the marginal product of capital is also equalized across countries. In this case international capital flows are not determined without placing more structure on, amongst other things, current and future productivity levels. But as long as there is some wedge, no matter how small, between borrowing and lending rates (so that $\tau_- < \tau_+$), consumption growth rates (and hence the implied return to foreign bonds) will be higher in countries

running current account deficits $(b_{t+1} < b_t)$ than in countries running surpluses. That is, in this simple model *capital will flow from low return to high return countries.*

While the theory makes a strong prediction about capital flows to countries with high consumption growth rates, it makes no such strong prediction regarding capital flows and the marginal product of capital. That is, capital will tend to flow to countries with high marginal products only in the absence of domestic financial market distortions, or in the case where domestic distortions are largest for capital importers. This suggests that the relationship between consumption growth and flows will be much more informative than the relationship between the marginal product of capital and flows. Moreover, the relationship between capital flows and consumption growth, on the one hand, and the marginal product of capital, on the other, can shed light on the relative size of domestic versus international capital market distortions.

Given these implications of the theory, we first use data on the growth rate of per capita consumption and equation (1) to estimate the implied return on investments in foreign bonds in a country (the *bond return*). Then we use data on gross domestic product and gross capital expenditure and equation (2) to estimate the return on domestic capital (the *capital return*). We then compare our estimates to observed capital flows.

II. Data and Parameterization

We have collected data on population, the main GDP expenditure aggregates (real output, consumption, investment, government purchases, net exports), and the current account for the years prior to 1940 for 14 countries: Argentina, Australia, Canada, Denmark, Finland, France, Japan, the Netherlands, Norway, Russia, Spain, Sweden, the United Kingdom, and the United States. The data sources are typically country specific and are detailed in the data Appendix. We follow Matthew T. Jones and Obstfeld (2001) in adjusting the current account for changes in the stock of gold, although our results are robust to using unadjusted current account data. To our knowledge, this is the most comprehensive analysis of capital flows during this period, including data from more countries than most other studies, and with multiple estimates of both returns and capital flows.
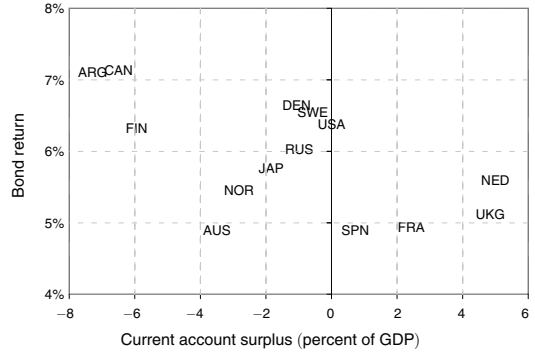

FIGURE 1. BOND RETURNS AND CAPITAL FLOWS, 1880–1913

Capital stocks are constructed as in the theory above using the perpetual inventory method with initial year capital stocks set to the steady state level implied by the first two decades of data. In many cases, we have data for several decades prior to 1880 so that the effect of the initial capital stock assumption is small. Motivated by the large share of structures in investment in the nineteenth and early twentieth centuries, we assume a depreciation rate δ of four percent. The capital share θ is set to 25 percent as a result of the substantial role played by nonreproducible capital in the larger agricultural sectors observed in this period. The discount factor β is set to 0.96. The choices of θ and β have no impact on *relative* returns displayed below.

III. Results

Figure 1 plots the relationship between the bond return (consumption growth) and capital flows (current account surplus as a percentage of GDP) for the golden era of international capital markets, 1880–1913. The result is quite striking and is consistent with the theory. All of the capital exporters are identified as having relatively low bond returns (consumption growth), while of the group of capital importers all but Australia have relatively high returns.[1] This systematic pattern between consumption growth and capital flows is consistent with the effective

[1] Australia may be the exception that proves the rule: these results were derived using data from N. G. Butlin (1964) which has been criticized for understating growth during this period (see, for example, Bryan Haig 2001).
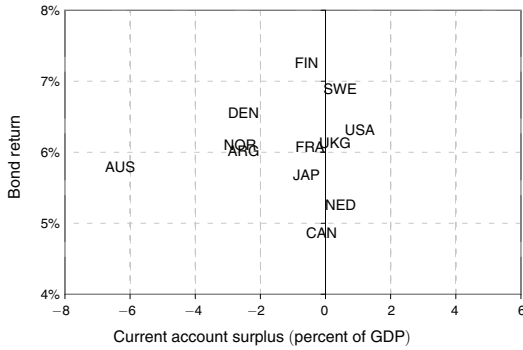
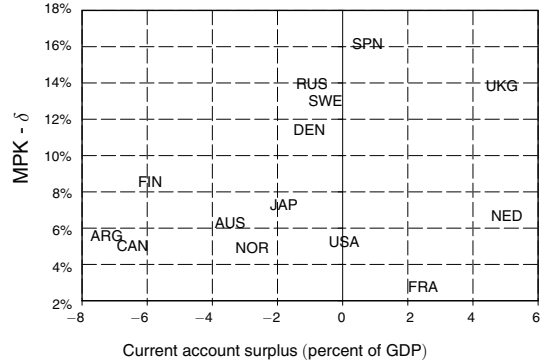FIGURE 2. BOND RETURNS AND CAPITAL FLOWS, 1918–1938

FIGURE 3. CAPITAL RETURNS AND CAPITAL FLOWS, 1880–1913

operation of international capital markets in a world economy subject only to the imperfections that allow for differences in return across countries in the first place. This pattern is also striking when compared to that in the postwar period, in which there is little tendency for capital to flow to high return countries.

Figure 2 plots the same variables for the interwar period, 1918–1938. These patterns of flows and returns contrast sharply with those during the golden era. First, capital flows are much smaller during the interwar period. This forms the basis for a substantial literature that concludes that capital mobility in the interwar period was much more limited than during the golden era. But perhaps the most striking aspect of this figure is that there is no tendency for the high return countries to be capital importers. Instead, capital tends to flow from high return to low return countries, as three of the four capital importers in the sample have relatively high consumption growth. This finding is strongly at variance with the theory and is similar to our findings for the postwar period (see Ohanian and Wright 2008). There are a number of possible interpretations of this deviation from theory, but perhaps the most plausible is a significant breakdown in the operation of international capital markets that prevents capital from flowing out of low return countries to high return countries.

Figure 3 examines the relationship between the marginal product of capital and capital flows for the golden era. The relationship between the marginal product and capital flows is strikingly at odds with that between consumption growth

and flows. The theory interprets this pattern as domestic factors that drive a wedge between the marginal product of capital and the return to capital, including capital income taxation or inefficiencies in domestic financial markets. However, this interpretation is at odds with the fact that the third highest estimated marginal product is for the United Kingdom, a capital exporter, which possessed some of the deepest and most sophisticated financial markets at the time.[2] A similar pattern is observed for the interwar period as shown in Figure 4.

IV. Conclusion

A substantial literature has asked whether or not international capital markets were more efficient during the golden era from 1880–1913 than during the interwar period, 1918–1938, or the postwar period. Many of these studies propose a test for the operation of perfect international capital markets, including analyses based on comparing savings and investment rates, and interpret the extent to which the data fail these tests as a metric for quantifying capital market imperfections. A problem with this approach is that these tests may have low power against reasonable alternatives. This is difficult to circumvent since observed

[2] Our capital expenditure data for the United Kingdom begin in 1830 so the effect of our initial capital stock assumptions on later year stocks are small. Mismeasurement of the initial capital stock could affect estimated returns in Russia (data begin in 1885), Canada and Denmark (data begin in 1870), or in Australia and Argentina (data begin in the 1860s).
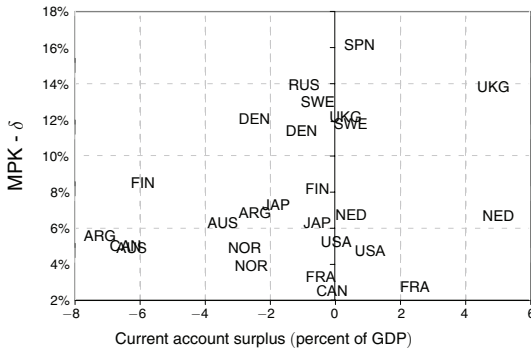
Figure 4. Capital Returns and Capital Flows, 1918–1938

capital flows are a function *both* of imperfections in international capital markets *and* of the underlying motive to engage in international borrowing and lending in the first place. As a result, it is unclear whether rejection of a test for perfect capital markets is due to capital market imperfections or to a rejection of the often very strong auxiliary assumptions made about the underlying gains from international trade in capital.

In this paper, we build on our recent work (Ohanian and Wright 2008) in assembling a series of facts regarding capital flows and rates of return that can be used to discipline alternative theories of capital market imperfections. The simple theory presented here shows that it is useful to examine the relationship between observed capital flows and observed consumption growth rates, the relationship between capital flows and estimates of the marginal product of capital. Using data on the postwar period, Ohanian and Wright (2008) found that there was a tendency for countries with low returns, measured either from consumption growth or from the marginal product of capital, to be capital importers, which is inconsistent with a number of simple theories of the operation of international capital markets.

The analysis presented here shows a very different pattern between flows and returns during the golden era of international capital flows, as capital importers during this period tended to be the highest return countries as identified by observed consumption growth rates, and capital exporters were the lowest return countries. For the interwar period, by contrast, this relationship breaks down. These findings are not inconsistent with the view that capital markets operated effectively during the classical gold standard period, and less effectively during the interwar period despite widespread adherence to the gold standard. Future research should be directed towards understanding why the effectiveness of capital markets fluctuates so much over time, and why these capital markets were apparently so effective around the turn of the twentieth century.

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