International capital mobility: net versus gross stocks and flows

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Feldstein and Horioka (1980) observed that net capital flows have been small in relation to domestic saving and investment flows for OECD countries in the post-war period, which they interpreted as evidence of low capital mobility. This paper argues that the correlation between *gross* domestic and international financial flows can be a better indicator of capital mobility than *net* capital flows. Contrary to the conventional wisdom among international economists, gross flows have been small in relation to gross domestic asset creation for OECD countries, although by this measure the degree of capital mobility increased in the 1980s.

In an influential paper Feldstein and Horioka (1980) challenged the view that the world economy has been characterized by high and rising capital mobility in the post-war period. They found that national saving and domestic investment flows were highly correlated in a cross-section sample of 17 OECD countries. Countries with high saving rates also had high investment rates, e.g., Japan, and conversely for countries with low saving rates, e.g., the United States. Feldstein and Horioka argued that this striking empirical regularity is inconsistent with high international capital mobility. If capital were highly mobile, countries with high saving rates, ceteris paribus, would tend to invest in the international capital markets or lend directly to countries with lower saving rates, thereby tending to equalize real interest rates across the world. In the limiting case of perfect capital mobility, any increment to saving will result in an equal capital outflow, with no rise in domestic investment, unless the country is large enough to influence the world real interest rate. Other econometric studies of the link between domestic saving and the current-account balance have tended to corroborate the Feldstein and Horioka finding. The finding that domestic saving and investment are very highly correlated has elicited considerable interest and puzzlement among international economists, many of whom regard the assumption of perfect capital mobility as a reasonable first approximation to reality.

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A number of critics, however, such as Tobin (1983), Westfal (1983), Summers (1988), Murphy (1984), Frankel (1986), Obstfeld (1986), and Roubini (1989), have challenged the interpretation of this empirical regularity, pointing out that Feldstein and Horioka's findings may have little to do with the degree of capital mobility, since there are a number of other plausible macroeconomic reasons for the high observed correlation of saving and investment, such as government targeting of the current-account balance, or the influence of other variables which cause the observed co-movements in saving and investment (population growth, technology shocks, imperfect integration of goods markets). Thus, while the empirical finding of Feldstein and Horioka has been confirmed, the extent of capital mobility remains a controversial and unresolved question, calling for alternative approaches that do not rely on saving–investment correlations.

The approach of this paper is to examine *gross* international capital flows rather than net flows, as Feldstein and Horioka and subsequent authors have done. The view that gross capital flows are 'large' is one of the reasons for the surprise at the finding that net flows are small. For example, Feldstein (1983, p. 150) notes 'the puzzling fact that substantial gross capital flows produce only relatively small net capital flows.' Caprio and Howard (1984, p. 4) mention 'massive gross capital flows', Obstfeld (1986, p. 70) asserts that 'gross capital flows have been large', and Penati and Dooley's (1984, p. 7) statement about 'large two-way trade in financial assets' is quoted approvingly by Frankel (1986, p. 46). Despite the seeming unanimity of views on this matter, none of the above authors provide any evidence on the volume of two-way trade in financial assets, nor do they specify what 'large' means in this context. This paper suggests that the ratio of gross international capital flows to gross domestic financial flows is a useful measure of international capital mobility. By this criterion, capital mobility is rising but remains far less than perfect. Section I will briefly review the empirical literature on capital mobility and update the net capital flow evidence. Section II proposes an alternative approach based on gross capital flows. Section III presents the empirical evidence.

I. Tests of international capital mobility

International capital mobility can be defined broadly as the degree to which financial markets are integrated across countries. The integration of financial markets is important for a variety of reasons, including the transmission of monetary and fiscal policies between countries, the effectiveness of sterilized foreign-exchange market intervention, the efficiency of inter- and intra-temporal resource allocation, and the scope for international portfolio diversification.¹ The integration of financial markets in turn depends on two factors: (1) the extent of transactions costs and capital controls inhibiting arbitrage between foreign and domestic assets, and (2) investors' attitudes towards risk and the substitutability between foreign and domestic assets.² Assets in different countries may be imperfect substitutes for a variety of reasons such as exchange-rate risk, country risk and differential factor loadings in the case of claims to real assets (equities).³ Perfect capital mobility will be defined in this paper as the combination of zero transactions costs and the absence of a domestic bias in portfolio preferences. The textbook definition of perfect capital mobility involves perfect substitutability, i.e., an infinite cross-price elasticity of demand between domestic and foreign assets.

Perfect substitutability, together with the absence of transactions costs, implies equalization of expected yields on foreign and domestic assets. An alternative and weaker definition of perfect capital mobility does not require perfect substitutability, but merely the absence of home-asset preference, *i.e.*, investors are risk-averse but asset demand functions are not country-specific. The latter case corresponds to the pooling equilibrium of Lucas (1982).⁴

Economic theory suggests that some aspects of financial integration can be assessed by examining the extent of convergence of yields rather than the magnitude of capital flows. As Frankel (1986, 1989) notes, the effects of transactions costs and country risk can be tested by examining whether covered interest parity holds, *i.e.*, whether two otherwise identical assets located in different countries but denominated in the same currency carry the same rates of return. Such tests can be readily carried out by comparing the yields on domestic and Eurocurrency deposits. Perfect substitutability, on the other hand, requires uncovered or open interest parity, *i.e.*, whether expected yields are equalized on domestic and foreign assets without forward cover, but such tests face a fundamental obstacle. In view of the inherent difficulties of measuring exchange-rate expectations, tests of open interest parity are inevitably joint tests of some proposed measure of exchange-rate expectations and the absence of exchange risk. Conclusive evidence on open interest parity is therefore not likely to be forthcoming unless one is willing to accept specific assumptions about investor behavior, e.g., rational expectations, which is assumed in papers such as Cumby and Obstfeld (1981), Hodrick and Srivastava (1984) and many others, or mean-variance optimization (Frankel, 1986).⁵ In view of this fundamental problem of interpreting tests of open interest parity, tests focusing on the volume of international capital flows, such as that of Feldstein and Horioka (1980), can be useful additional sources of understanding of capital mobility. The remainder of this paper focuses on inferences about financial-market integration which can be drawn from the observed magnitudes of international capital flows.

Table 1 updates the data in Feldstein and Horioka, and illustrates the high positive correlation between saving and investment rates, or alternatively the low ratio of the current account to GNP. A tendency for wider current-account deficits is observable in the 1980s.⁶

Feldstein and Horioka and subsequent papers conducted regression tests which confirmed that domestic investment moves closely with domestic savings.⁷ I also updated these regression rests on the data in Table 1, obtaining the following results (standard errors in parentheses):

1970–79	I/Y = 4.54 + 0.85S/Y (2.9) (0.12)	$R^2 = 74.6$
198086	I/Y = 4.65 + 0.74S/Y (4.1) (0.18)	$R^2 = 49.2$

The regression for 1970–79 is very similar to the original results of Feldstein and Horioka, in that the coefficient on S/Y is just under 1.0, indicating that most of an increment to saving spilled over into investment. The coefficient on S/Y falls slightly in the 1980–86 regression and the R^2 is lower, which is not surprising in view of the increased current-account imbalances of a number of countries. Taken at face value, these regressions support the presumption that capital mobility

	1970–79			1980-86	
S/Y	I/Y	CA/Y	<i>S/Y</i>	I/Y	$CA_{\cdot}Y$
19.7	19.2	0.5	17.4	18.2	-0.8
35.3	34.5	0.9	31.3	29.5	1.8
24.4	23.4	0.7	21.8	20.5	0.9
24.6	24.6	-0.1	19.9	20.7	-0.8
19.4	19.8	0.3	17.2	16.5	1.1
21.4	22.2	-1.3	21.3	24.0	- 2.6
23.3	24.3	-0.8	21.3	21.5	-0.1
25.3	26.5	-1.2	20.5	25.3	-4.8
27.8	28.8	-1.0	24.2	25.0	-0.7
22.6	22.2	0.4	15.3	16.8	-1.5
21.1	23.9	-2.8	15.1	18.5	-3.4
27.0	29.3	-2.3	25.1	26.6	-1.4
25.4	27.9	-2.6	18.8	22.9	-4.0
21.8	27.0	-5.3	18.7	26.7	- 7.9
24.9	23.3	1.3	22.1	19.3	2.8
23.5	27.4	- 3.7	21.0	26.5	- 5.7
23.1	23.9	-0.8	20.4	21.0	-0.6
21.4	22.2	-0.8	20.1	18.2	-1.9
28.7	26.0	2.7	27.5	23.9	3.6
	S/Y 19.7 35.3 24.4 24.6 19.4 21.4 23.3 25.3 27.8 22.6 21.1 27.0 25.4 21.8 24.9 23.5 23.1 21.4 28.7	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$1970-79$ $1980-86^{b}$ S/Y I/Y CA/Y S/Y I/Y 19.7 19.2 0.5 17.4 18.2 35.3 34.5 0.9 31.3 29.5 24.4 23.4 0.7 21.8 20.5 24.6 24.6 -0.1 19.9 20.7 19.4 19.8 -0.3 17.2 16.5 21.4 22.2 -1.3 21.3 24.0 23.3 24.3 -0.8 21.3 21.5 25.3 26.5 -1.2 20.5 25.3 27.8 28.8 -1.0 24.2 25.0 22.6 22.2 0.4 15.3 16.8 21.1 23.9 -2.8 15.1 18.5 27.0 29.3 -2.3 25.1 26.6 25.4 27.9 -2.6 18.8 22.9 21.8 27.0 -5.3 18.7 26.7 24.9 23.3 1.3 22.1 19.3 23.5 27.4 -3.7 21.0 26.5 23.1 23.9 -0.8 20.4 21.0 21.4 22.2 -0.8 20.1 18.2 28.7 26.0 2.7 27.5 23.9

TABLE 1. Savings, investment, and the current account for OECD countries^a (annual averages, per cent of GNP).

Source: International Monetary Fund, International Financial Statistics data tape.

^a S, I, CA, and Y stand for national savings, gross domestic investment, the current account balance, and gross national product, respectively. See the Appendix for details. CA/Y may not be identical to S/Y - I/Y due to statistical discrepancies and rounding.

^b 1980-84 for Finland, and 1980-85 for Italy.

increased in the 1980s, but also suggest that capital mobility remains far from perfect.⁸

Table 2 provides an additional perspective on net international investment, in stock rather than flow form. For most countries, the ratio of the net foreign asset position to the domestic capital stock is much less than 10 per cent in absolute value, which confirms that the bulk of domestic capital formation has been financed by domestic savings, even though Table 1 indicates that there are substantial differences in savings rate across countries. As Hamada and Iwata's (1989) theoretical analysis demonstrates, even small international differences in saving rates lead to large steady-state net creditor and net debtor positions in relation to the domestic capital stocks under the assumption of perfect capital mobility. The fact that we do not observe such large net foreign asset positions in Table 2 suggests that capital mobility has been far from perfect.

While the Feldstein and Horioka approach is a useful starting point, the observation of low *ex post* net international capital flows cannot necessarily be interpreted as indicating low *ex ante* capital mobility, as noted in the introduction. Saving may not be exogenous, *e.g.*, due to government policies which adjust national saving rates in order to dampen fluctuations of the current-account balance. Another problem, discussed by Murphy (1984), is that the sample in

	1980	1985
United States	2.5	-1.7
Japan	0.6	5.2
Germany	1.3	2.8
France	7.6	1.9
United Kingdom	0.3	7.8
Italy	4.4	0.1
Canada	-11.9	-7.2
Finland	-4.6	- 5.1
Norway	-9.3	-0.9
Spain	-1.0	-0.8
Sweden	- 2.0	- 5.5

 TABLE 2. Net foreign asset position as a ratio of the capital stock (per cent).

Sources: OECD Financial Statistics, OECD National Accounts, Flows and Stocks of Fixed Capital (OECD, 1987). See Appendix for details.

Feldstein and Horioka (1980) is rather small, and results may be influenced strongly by a few outliers. Furthermore, as Frankel (1986) and Krugman (1989) point out, low net capital flows may reflect imperfect integration of goods markets rather than imperfect integration of financial markets. Frankel (1986) notes that savings and investment should be functions of the domestic real interest rate, while financial capital mobility is related to nominal yield differentials. Equalization of nominal yields across countries does not imply equalization of real interest rates unless purchasing power parity holds, which depends on the integration of goods markets. Krugman, in commenting on Hamada and Iwata (1989), points out that the extent to which differences in saving rates across countries will be manifested as current-account imbalances depends on the proportions of traded to non-traded goods. Clearly, in the extreme case where all goods are non-traded the current account will be zero. For these reasons, the extent of the integration of financial markets may not be captured by the Feldstein and Horioka approach.

II. Gross capital flows: conceptual issues

When capital is highly mobile as defined above, gross (two-way) capital flows are likely to be large even when net flows are small. There is no reason for a saver in one country to lend exclusively or even primarily to residents of that same country, in an integrated world capital market. If there are economies of scale in the establishment and operation of financial markets, one or a few major world financial centers may develop, *e.g.*, London and New York. For example, Belgians with financial surpluses might deposit their funds in London, while Belgians with deficits could borrow from London. In such an instance, Belgium could have low net capital flows, but large gross capital flows. As modelled in Grilli (1989), the extent to which financial transactions are centralized in international 'hot spots' will depend on the magnitude of external economies of scale relative to the

transactions costs of investing and borrowing abroad. A realistic implication of Grilli's analysis is that large transactions are more likely to go through international financial markets than smaller transactions. Also, in a world of differentiated financial assets, a large volume of two-way trade in financial assets will occur for the same reason that intra-industry trade in the goods market is large under conditions of low transactions costs and differentiated products, as in Krugman (1981). Investors from a small country seeking portfolio diversification (analogous to the desire for variety embodied in the utility function of Krugman's model) will therefore tend to engage in a large volume of two-way trade in financial assets. Casual observation suggests that financial assets are somewhat differentiated products: treasury securities in different countries have slightly different risk, liquidity, maturity, reversibility, etc., as do automobile company bonds and equities, and even bank liabilities.9 Another theory suggesting the coexistence of large gross capital flows with small net flows is given by the models of Eaton and Gersovitz (1980) and Dooley and Isard (1980): a country with a positive net foreign asset position is vulnerable to debt repudiation or capital controls. By contrast, a country with foreign liabilities commensurate with foreign assets is in a much better position to retaliate. Hence, international lending may flow more freely when it goes both ways. Finally, an important determinant of gross international capital flows is tax evasion and avoidance of regulations. Grilli (1989) provides some empirical evidence of the role of tax evasion and secrecy for international bank deposit flows.

For these theoretical reasons as well as the unsubstantiated presumption among international economists noted in the introduction that gross capital flows are large, a closer look at actual magnitudes seems warranted. The remainder of this section proposes a framework to do so.

Before proceeding, it should be noted that the volume of trading in the foreign exchange market is not a suitable measure of gross capital flows. As discussed above, there are two separate constraints on capital mobility: first, the degree to which financial markets are segmented by transactions costs and capital controls, and second, the degree of home-asset preference by investors. If transactions costs are low, there may be a large volume of trading in the foreign exchange market, associated with covering, arbitraging, 'churning', etc., but the willingness of investors to maintain open positions in foreign assets may be limited. The large volume of trading may simply reflect high velocity rather than a large holding of foreign assets at a point in time. Furthermore, much of the volume may consist of trades between domestic residents, and some of it is associated with trade in goods and services. A high volume of trading confirms that transactions costs in the foreign-exchange market are low, but it is not a sufficient condition for high financial integration. A better measure of capital mobility, as defined above, consists of changes in gross open positions in foreign assets over a period of, say, a year, as it will reflect both transactions costs and portfolio preferences. Indeed, foreign-exchange transactions were estimated to be of the order of \$30 trillion annually in the mid-1980s (Group of Thirty, 1985), while annual changes in the stock of gross foreign financial assets by OECD countries are of the order of \$2-3 trillion.¹⁰ The widespread view that gross international capital flows are large may stem from inappropriate use of the volume of trading in the foreign exchange market as a measure of capital mobility.

A benchmark against which to assess the volume of capital flows is required.

This paper proposes the following criterion. If capital is highly mobile in the sense of both low transactions costs and no domestic bias in asset demands, assets issued in country i will not in general be held by residents of country i, especially if the country is small. Thus the degree of capital mobility may be assessed by comparing the correlation between asset issues and asset holdings.

To clarify this idea, consider a world of two countries, each of which has agents who participate in domestic and foreign financial markets as borrowers or lenders. Let B_1 and B_2 be the value of borrowing (measured in a common currency) by residents of countries 1 and 2, and L_1 and L_2 be the total value of lending by these two countries. Lenders may lend to domestic or foreign borrowers, so let L_{ij} represent lending by country *i* residents to country *j* residents.

With this setup, the global flow of funds can be summarized by two financial-market clearing conditions, for the assets of countries 1 and 2 respectively:

$$\langle 1 \rangle \qquad \qquad B_1 = L_{11} + L_{21},$$

$$\langle 2 \rangle \qquad \qquad B_2 = L_{12} + L_{22}.$$

Let s be the share of country 1 in world lending, *i.e.*, $s = L_1/(L_1 + L_2)$. If capital mobility is perfect in the sense that there is no domestic bias towards home assets, there is in effect a single international capital market, and we will have

$$\langle 3 \rangle \qquad \qquad L_{11}/B_1 = L_{12}/B_2 = s;$$

$$\langle 3' \rangle$$
 $L_{21}/B_1 = L_{22}/B_2 = 1 - s.$

Under perfect capital mobility, the share of asset issues held by country 1 and country 2 lenders depends only on the respective sizes of the two countries. For a small country (s=0), we would expect to see lenders holding the preponderance of their wealth in foreign assets, and borrowers to obtain the bulk of their funds from foreign lenders. For larger countries, the share of domestically-issued assets in domestic lenders' portfolios would be larger, but should not significantly exceed that country's share in global lending.

Equations $\langle 3 \rangle$ and $\langle 3' \rangle$ are consistent with both definitions of perfect capital mobility proposed in Section I. Most obviously, equations $\langle 3 \rangle$ and $\langle 3' \rangle$ describe a pooling equilibrium along the lines of Lucas (1982). As noted earlier, under this interpretation of financial-market integration foreign and domestic assets may be imperfect substitutes but portfolio preferences cannot be country-specific. In this case, investors will hold the same mix of assets regardless of their nationality, and equations $\langle 3 \rangle$ and $\langle 3' \rangle$ will hold. Again, this would be analogous to Krugman's (1981) model of trade in differentiated goods in a situation where the utility functions are the same in the two countries and there are no barriers to trade. Equations $\langle 3 \rangle$ and $\langle 3' \rangle$ will not hold if investors display home-currency preference, as modelled in Beenstock (1986). In the limit, absolute home-currency preference throughout the world would imply $L_{21}/B_1 = L_{12}/B_2 = 0$.

Alternatively, under the textbook definition of perfect capital mobility which implies perfect substitutability, foreign and domestic assets are in effect identical and portfolio shares become indeterminate. However, equations $\langle 3 \rangle$ and $\langle 3' \rangle$ would still hold for the expected values of portfolio shares. Consider again an increase in the supply of Belgian assets. Under perfect substitutability and no transactions costs, these assets will be distributed randomly in the portfolios of global asset holders, with the proportions depending only on the size of each country's lending.

Note that perfect capital mobility, as defined by equations $\langle 3 \rangle$ and $\langle 3' \rangle$, is consistent with zero net foreign lending $(L_{21} = L_{12})$, which might occur if countries target their current-account balances. If we assume that there is zero net foreign lending (the current-account balance is zero), $\langle 3' \rangle$ and $L_{21} = L_{12}$ imply

$$\langle 4 \rangle$$
 $L_{21}/B_1 = 1 - s = L_{12}/B_1.$

Equation $\langle 4 \rangle$ provides a simple and intuitive measure of capital mobility: the size of inflows and outflows of capital in relation to domestic asset flows. The second equality in $\langle 4 \rangle$ is an approximation based on the assumption of zero net lending, which is made to simplify the calculations reported below. This is a reasonable approximation because current-account balances are small, as seen in Table 1, although the widening of current-account imbalances in the 1980s suggests that this approximation is less valid for the latter period.¹¹

III. Gross capital flows: empirical magnitudes

The previous discussion indicates that a useful measure of capital mobility consists of gross international assets and liabilities in relation to gross domestic asset issues. The theory can be tested in both stock and flow form. In practice much more complete data are available for flows, so most of the discussion will focus on the latter. Tables 3–5 present data on flows for a number of OECD countries, cumulated over the 1970s and 1980s, obtained from *OECD Financial Statistics*. Table 7 presents some limited evidence on outstanding stocks.¹²

Table 3 shows the cumulative flow supplies of domestic financial assets (the analogue of B_1 in the model, where 1 indexes the home country and 2 the rest of the world), private foreign holdings of domestic financial assets (L_{21}) , and private domestic holdings of foreign financial assets (L_{12}) . Table 3 compares the share of the country in OECD financial asset issues (s in the model) to L_{21}/B_1 and L_{12}/B_1 , as suggested by equation $\langle 4 \rangle$. It can be observed that the L_{21}/B_1 and L_{12}/B_1 ratios are in all cases much smaller than 1-s, clearly indicating that capital mobility is not perfect.¹³ Capital mobility does appear to be rising, however, as the sample averages of L_{21}/B_1 increase from 11.6 per cent to 14.1 per cent between the 1970s and the 1980s, while L_{12}/B_1 increases from 11.0 per cent to 13.9 per cent. For each of these two ratios, eight of the 12 OECD countries exhibit increased financial openness in the 1980s.

It may be misleading, however, to look at broad aggregates, particularly since they include banking flows, which are difficult to classify between domestic and foreign when many of the flows are between banks.¹⁴ Tables 4 and 5 report disaggregated calculations analogous to those in Table 3, for bonds and equities respectively. Table 4's message is very similar to Table 3's: capital mobility is increasing but remains limited. In all cases international bond acquisitions are much less than would be the case under the hypothesis of perfect capital mobility, but there is an increase in mobility in the 1980s, as measured by mean L_{21}/B_1 and L_{12}/B_1 ratios.

Table 5 shows that equity market flows were more internationalized than bond market flows in the 1970s and 1980s, but the extent of integration still falls well

		1970–79			1980-86	······································
	(1)	(2)	(3)	(4)	(5)	(6)
	Share of	Foreign	Foreign	Share of	Foreign	Foreign
	OECD	liability/	assets/	OECD	liability/	assets/
	financial wealth ^a	domestic assets	domestic assets	financial wealth ^a	domestic assets	domestic assets
United States	32.6	4.7	5.3	35.2	5.6	2.8
Japan	18.8	2.4	3.5	19.2	7.2	11.3
Germany	7.4	10.1	12.6	5.9	14.1	17.9
France	6.8	11.9	11.6	6.6	10.5	8.8
United Kingdom	7.5	30.6	30.3	8.1	28.3	31.9
Italy	6.9	5.1	5.7	5.8	7.2	5.7
Canada	4.2	9.8	5.1	3.6	14.2	9.8
Netherlands	2.4	15.3	18.6	1.6	11.8	21.9
Belgium	1.8	20.2	20.3	2.4	39.9	34.9
Sweden	1.7	8.6	5.3	1.6	9.7	5.9
Spain	2.4	8.9	6.5	2.2	6.0	4.5
Finland	0.5	11.8	6.7	0.7	14.5	11.1
Average (unweighted)	—	11.6	11.0		14.1	13.9

 TABLE 3. All assets: foreign assets and liabilities as a ratio of domestic asset supplies (cumulative flows, per cent).

Source: OECD Financial Statistics (see Appendix for details).

^a Does not sum to 100 per cent because of missing data for some small OECD countries. The latter's share of asset issues was assumed to be proportional to their share of 1980 OECD GNP, which was 7 per cent.

short of the criterion of perfection used here, with the exception of the Netherlands, the United Kingdom, and Germany. The Netherlands' equity market appears to be perfectly integrated with the world equities market for both inflows and outflows of capital, while Germany and the United Kingdom exhibit near-perfect mobility for outflows but not inflows. Again, mobility appears to have increased in the 1980s relative to the 1970s for most countries.

To formalize and summarize the findings, equation $\langle 4 \rangle$ was tested with the regressions reported in Table 6. The variable 1-s was regressed on L_{21}/B_1 and L_{12}/B_1 respectively, for each subperiod and for each category of assets reported in Tables 3–5. The constant term was suppressed as much better fits were obtained in all cases than with a constant term. In addition, the theory does not suggest that there should be a constant term. The following regressions were run:

$$\langle 5 \rangle$$
 $L_{21}/B_1 = b1.(1-s),$

$$\langle 5' \rangle \qquad \qquad L_{12}/B_1 = b2.(1-s).$$

Under the hypothesis of perfect capital mobility we would obtain b1 = b2 = 1. With zero capital mobility we would obtain b1 = b2 = 0. Thus, this test on gross flows is analogous to the regression tests on net flows performed by Feldstein and Horioka and others (and updated earlier in this paper). The regression tests on gross flows lead to the same conclusion as the net flow tests: capital mobility is

		1970–79			1980–86	
	(1)	(2)	(3)	(4)	(5)	(6)
	Share of	Foreign	Foreign	Share of	Foreign	Foreign
	OECD	liability/	assets/	OECD	liability/	assets/
	bond	domestic	domestic	bond	domestic	domestic
	issues ^a	assets	assets	issues ^a	assets	assets
United States	43.5	1.3	4.0	46.4	5.7	1.2
Japan	18.5	4.2	N.A.	18.3	9.0	N.A.
Germany	6.5	5.5	2.9	5.9	23.0	17.8
France	3.4	13.0	6.4	4.6	26.5	0.2
United Kingdom	3.8	9.3	1.8	4.3	19.2	67.2
Italy	7.5	0.5	1.2	4.9	1.7	0.5
Canada	5.0	28.7	-0.1 ^b	3.7	36.9	7.0 ^b
Netherlands	0.7	34.7	6.7	1.2	21.3	24.3
Belgium	0.5	1.5	11.5	0.5	16.3	18.5
Sweden	2.4	12.2	0.0	2.1	18.1	1.2
Spain	0.8	0.2	0.0	0.7	0.1	5.5
Finland	0.2	50.2	12.7	0.3	37.4	3.7
Average (unweighted)		13.4	4.3	—	17.1	13.4

TABLE 4. Bonds: foreign assets and liabilities as a ratio of domestic assets supplies (cumulative flows, per cent).

Source: OECD Financial Statistics (see Appendix for details).

^a See note a to Table 3.

^b All securities.

limited but rising. The coefficients b1 and b2 are always considerably below 1, but in all cases increase in the 1980s relative to the 1970s.

As stressed earlier, integration of financial markets depends on both transactions costs and attitudes of investors. Of the two, the more important barrier in the 1980s, at least as far as developed countries are concerned, is probably home-currency preference. With the growth of international financial innovation and communications and the liberalization of capital controls, barriers to international investment have dropped sharply. Several OECD countries (notably Italy and France) maintained controls on capital movements as of the mid-1980s, but many others, including Japan, the United Kingdom, and Germany have eliminated or significantly relaxed capital controls. This is evidenced by recent studies of international interest-rate differences (Frankel and MacArthur, 1988; Frankel, 1989), which show that political risk and transactions costs as measured by covered interest differentials are very low in the 1980s for most OECD countries. Frankel and MacArthur also suggest that exchange-risk premia may be substantial, although the latter are difficult to measure for reasons noted earlier. Therefore, attitudes of investors towards foreign-exchange risk rather than physical impediments to international investment are probably the explanation for the limited integration of financial markets, but this factor may be diminishing too.

The fact that gross flows in equities are larger than for bonds and bank assets and liabilities appears somewhat puzzling. It is generally assumed, as in Zeira (1987)

		1970-79			1980–86	
	(1) Share of OECD equity issues ^a	(2) Foreign liability/ domestic assets	(3) Foreign assets/ domestic assets	(4) Share of OECD equity issues ^a	(5) Foreign liability/ domestic assets	(6) Foreign assets/ domestic assets
United States	22.2	24.3	2.8	18.8	24.0	7.8
Japan	10.4	-2.2	N.A.	5.9	11.5	N.A.
Germany	6.7	40.3	60.4	4.8	63.7	79.6
France	15.1	25.5	25.5	22.0	12.3	10.7
United Kingdom	6.7	36.8	70.8	12.1	31.3	105.8
Italy	10.1	9.6	8.0	10.1	3.3	18.6
Canada	5.2	0.0	N.A.	8.3	4.9	N.A.
Netherlands	3.5	72.3	163.9	2.0	92.8	156.4
Belgium	2.1	1.6	12.3	1.8	14.4	17.0
Sweden	2.1	0.8	21.3	2.4	6.5	19.1
Spain	6.3	17.6	6.6	3.1	40,4	10.4
Finland	2.4	2.7	5.5	1.7	2.9	12.3
Average (unweighted)		19.1	37.7	—	25.7	43.8

 TABLE 5. Equities: foreign assets and liabilities as a ratio of domestic assets supplies (cumulative flows, per cent).

Source: OECD Financial Statistics (see Appendix for details).

^a See note a to Table 3.

and Dooley et al. (1987) that bonds are close substitutes across countries, but equities are not. Indeed, these authors suggest that the Feldstein and Horioka result can be explained by the lack of linkage between equity markets. An explanation for the finding here that equity markets are characterized by relatively greater two-way trade than bonds and other financial assets may be that equities are more differentiated in terms of their risk and other characteristics. There may therefore be a greater incentive for international portfolio diversification, which more than compensates for greater differential transactions costs, for equities compared to other assets. This finding is in accordance with Svensson's (1988) theory of international asset exchange which suggests two-way trade in equities, but not bonds. Another possibility is that the relatively large equity flows represent a stock adjustment from low levels prior to the 1970s. Support for the stock-adjustment hypothesis is provided by Table 7 which reports data on outstanding stocks for the few countries for which consistent data could be obtained. For all four of the countries in Table 7, it can be observed that the equity portfolios remain less internationalized than bonds portfolios in 1987, despite very large increases for some of them. Table 7 again reveals the general trend towards internationalization for both types of assets. Furthermore, the presumption that foreign investment in equities is riskier than in bonds may be false in some cases: the political risk on government bonds may be greater than that of equity claims on multinational corporations. The marked increase in international equity flows in the 1980s may also be partially attributable to the global boom in stock prices.

		Total assets	3	
	197079		1980-86	
Dependent variable	Coefficient on $1-s$	<i>R</i> ²	Coefficient on $1-s$	R^2
L_{21}/B_{1}	0.13	74.3	0.15	69.9
L_{12}/B_{1}	0.12 (0.03)	67.7	0.15 (0.03)	67.1
		Bonds	·····	
	1970-79		1980-86	
Dependent variable	Coefficient on $1-s$	R ²	Coefficient on $1-s$	R^2
L_{21}/B_{1}	0.15 (0.05)	47.2	0.20 (0.04)	73.3
L_{12}/B_{1}	0.05 (0.015)	55.6	0.15 (0.07)	35.7
· · · · · · · · · · · · · · · · · · ·		Equities		
	1970-79	-	1980-86	
Dependent variable	Coefficient on $1-s$	<i>R</i> ²	Coefficient on $1-s$	R^2
L_{21}/B_{1}	0.21 (0.07)	43.8	0.28 (0.09)	49.5
L_{12}/B_{1}	0.42 (0.17)	40.1	0.48 (0.18)	45.6

TABLE 6. Regression tests on gross flows (standard errors in parentheses).

Source: Text Tables 3, 4, 5. See text for explanations of the symbols.

	Boi	nds	Equities		
	1964ª	1987	1964 ^a	1987	
United States	5.3	8.1	2.1	6.1	
Germany	3.1	15.6	4.3	9.0	
United Kingdom	14.6	13.3	4.6	6.3	
Canada	17.7	30.1	6.3	4.5	
Average (unweighted)	10.2	16.8	4.3	6.5	

 TABLE 7. Foreign liabilities as a ratio of domestic asset supplies (outstanding stocks, per cent).

Source: OECD Financial Statistics (see Appendix for details). * 1971 for Germany, 1973 for Canada.

The results reported here also give pause to the presumption that short-term financial markets are more integrated internationally than long-term financial markets. Both bonds and equity markets are characterized by greater two-way trade in financial assets than the average financial market, in that the L_{21}/B_1 and

 L_{12}/B_1 ratios are generally higher for both bonds and equities than those for all assets combined. However, as noted earlier, this may in part reflect problems of measuring banking flows in the Eurocurrency market.

IV. Conclusion

Feldstein and Horioka (1980) made the simple but striking observation that net capital flows have been small in relation to domestic saving and investment flows for OECD countries in the post-war period. While Feldstein and Horioka's finding has been corroborated by subsequent empirical work, the inference they drew that capital mobility is very low has been criticized. A number of authors have pointed out that the high observed correlation between saving and investment rates could arise for reasons having nothing to do with low capital mobility, such as the effects of government policy which targets the current account balance.

This paper has argued that under some conditions the correlation between *gross* domestic and international financial flows may be a better indicator of capital mobility than *net* capital flows. At least, it provides additional information on the international capital market. Contrary to the conventional wisdom among international economists, who frequently assert that gross flows are very large, this paper has shown that they are small in relation to gross domestic asset creation for OECD countries, although by this measure the degree of capital mobility has been increasing in the 1970–86 period. In this regard, the updated net flow evidence and the new gross flow evidence reported here are remarkably congruent.

The remaining constraint on capital mobility for most OECD countries is probably investor preferences rather than transactions costs, since the physical barriers to international asset trade have been dramatically brought down by technological change and liberalization. The widespread view that capital mobility is nearly perfect may arise in part from confusion between the volume of transactions in the foreign exchange market, which is indeed enormous, and the willingness of domestic residents to invest in foreign-currency-denominated assets, which remains limited.

Statistical appendix

Table 1. All figures in this table are derived from the International Monetary Fund International Financial Statistics data tape. Savings are defined as Gross National Product (line 99ac) plus net unilateral transfers (77afd plus 77agd) minus government and private consumption (91fc plus 96fc). Investment is gross fixed capital formation (93ec) plus change in stocks (93ic). The current account is exports (90c) minus imports (98c) plus net factor income from abroad (90e). In a few cases (Greece, Australia) substantial statistical discrepancies appeared in the national accounts, and these were dealt with by defining GNP endogenously as C + I + G + CA.

Table 2. The net foreign asset position is from OECD Financial Statistics, Table 34B. The capital stock data are mostly from Flows and Stocks of Fixed Capital (OECD, 1987), except for Italy, Finland, and Spain. For the latter three countries, data were provided by the Division of Economics and Statistics at the OECD for the period up to 1983, and were updated to 1985 by revaluing at current prices and adding net investment (gross investment minus capital consumption) from OECD National Accounts.

Tables 3-5 are derived from OECD Financial Statistics. Unless noted otherwise all the data are from Table 21F 'Summary Table of Flows.'

Table 3. It will be useful to use the following definitions. Total domestic assets (TDA) is line II.7 'Total Financial Assets' minus line II.7.b 'Domestic Claims on the Rest of the World' (DCF). Line II.7.a 'Foreign Claims on Domestic Sector' will be denoted FCD.

Column 1 of Table 3, the share of country *i* in total OECD financial assets, is cumulative country *i* TDA divided by cumulative OECD TDA, over the respective periods shown in Table 3. The OECD TDA is adjusted for the fact that OECD *Financial Statistics* do not contain data for several of the smaller OECD countries. It was assumed that the missing countries' TDA are proportional to their share of OECD GNP in 1980, which was 7 per cent.

Column 2 is FCD/TDA, where FCD and TDA are again cumulative annual flows. Column 3 is DCF/TDA, calculated as in column 2.

Tables 4 and 5. The method used is identical to Table 3. The TDA figures are obtained as line 1.7 minus 1.5 (subcategory c. for bonds and d. for equities). The FC and DC series are obtained from Table 34F 'Capital Operations and Financial Transactions with the Rest of the World.'

Table 7 is based on Table 22B, line 4 divided by total, for domestic issuers.

Notes

- 1. Cole and Obstfeld (1989) argue that international portfolio diversification may not be important for welfare, because terms of trade variations can provide a viable form of international risk spreading. They acknowledge, however, that the models upon which this conclusion is based are not completely general.
- 2. Some authors, e.g., Frankel (1983), define capital mobility in terms of transactions costs and distinguish it from substitutability. This is largely a semantic matter, although for most important economic questions, such as the transmission of disturbances between countries, it is the joint influence of transactions costs and investor behavior towards risk which matters. For example, even if there are no transactions costs of operating in foreign assets, the cross-price elasticity of demand for foreign assets can still be low if domestic agents have a high degree of preference for domestic assets. Therefore, it seems most useful for the purposes of this paper to depart from Frankel's terminology and to define capital mobility as the extent of integration of financial markets, which is jointly determined by transactions costs and investor preferences.
- 3. Imperfect substitutability of assets may reflect lack or integration of goods markets, so that optimal portfolios diverge by nationality, as emphasized by Adler and Dumas (1983).
- 4. Lucas acknowledges that the pooling assumption that all agents hold the world market portfolio is unrealistic although it is crucial for his model.
- 5. Survey data on exchange-rate expectations as discussed in Frankel and Froot (1986b) may be of some help in this regard, but there are a number of difficulties with these data, including the relatively short time period they cover, and the possibility that the respondents answers may not correspond closely with actual traders' views. In particular, as Frankel and Froot (1986a) themselves point out, the survey data indicated persistent expectations of US dollar depreciation during the 1981–85 period of dollar appreciation, suggesting either market inefficiency or very large risk discounts on dollar-denominated assets at a time of surging US current-account deficits.
- 6. Feldstein (1983) updated the calculations of the original Feldstein and Horioka paper, and confirmed its results using alternative sample periods and estimation techniques. Harberger (1980) and Sachs (1981) reached conflicting conclusions, however, with Sachs finding that current account balances and investment rates are strongly negatively correlated. Penati and Dooley (1984) carefully evaluated the conflicting evidence in the above-mentioned papers and concluded that the evidence broadly corroborated the finding of low international capital mobility. Caprio and Howard (1984), Murphy (1984), Obstfeld (1986), and Frankel (1986) criticized some aspects of Feldstein and Horioka's approach and found somewhat lower capital mobility, but their estimates of the correlation of savings and investment were still indicative of limited capital mobility and hence broadly supportive of the original Feldstein and Horioka result. For more detailed surveys of the literature on net

capital flows, domestic investment, and domestic saving, see Penati and Dooley (1984), Obstfeld (1986), and Frankel (1986, 1989).

- 7. By using mean values of saving and investment over a number of years, Feldstein and Horioka hoped to avoid cyclical correlations between saving and investment, which could arise when changes in investment entail changes in national income and saving.
- 8. Since the sample consists only of OECD countries, it is not an adequate test of world capital mobility. However, Dooley et al. (1987) found that the inclusion of developing countries did not alter the finding of low capital mobility.
- 9. See Tobin, Chapter 2, 'The Properties of Assets,' for a comprehensive description of the characteristics of financial assets.
- 10. OECD Financial Statistics, Part II, 1987. This is a rough estimate of the sum of gross acquisitions of financial assets by all the major OECD countries.
- 11. For countries with current-account deficits, comparing L_{12}/B_1 to 1-s will understate capital mobility, while the reverse is true for countries with current-account surpluses. This follows from the identity $L_{12} - L_{21} = CA$, where CA is the current-account balance. However, there should be no overall bias to the extent that the OECD sample as a whole has a balanced current account with the rest of the world. Furthermore, the comparison of L_{21}/B_1 to 1-s is appropriate irrespective of the magnitude of current account imbalances, *i.e.*, the first equality of $\langle 4 \rangle$ is not dependent on the simplifying assumption of zero net flows. In other words, the assumption of zero net flows does not matter much for the findings reported below, although the foreign asset ratio may be an inappropriate measure of capital mobility for individual countries if this assumption is violated.
- 12. Much of the outstanding stock information is unavailable or difficult to assess because the revaluation methods used in computing stocks of assets are not consistent between countries (some use book values, others market values, and still others face values).
- 13. s is overstated in Tables 3-5, because the non-OECD countries' asset creation is not included in OECD Financial Statistics. This reinforces the point that 1 - s is smaller than the L_{21}/B_1 and L_{12}/B_1 ratios.
- 14. For example, Van der Ven and Wilson (1987) note that the Federal Reserve Board's Flow of Funds definition of gross international bank claims and liabilities differs from the US Department of Commerce's International Investment Position definition. The Federal Reserve treats International Banking Facilities located in the United States as foreign, whereas the Commerce Department treats the IBFs as domestic. The OECD uses the Federal Reserve's data set.

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