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Consumption, Asset Returns, and Capital Mobility Tests

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Abstract

This paper proposes a new framework for investigating the degree of international capital mobility in a small open economy. The focus of the new framework is on the relationship between expected consumption growth and expected asset returns. Using data for ten OECD countries, we find that the degree of international capital mobility is low for France, Germany, the Netherlands, the United Kingdom and the United States and is far higher for Australia, Italy and Japan. However, the null hypothesis that international capital mobility is perfect cannot be rejected for Canada and Sweden.

Keywords: consumption, real interest rate, international capital mobility

1. Introduction

As international capital markets become increasingly integrated, capital controls should be relaxed in the world economy, especially in OECD countries. Therefore, by estimating the degree of international capital mobility across OECD countries, we can discuss whether restrictions on international capital mobility are indeed dismantled in these OECD countries or not. However, many empirical tests cannot sufficiently estimate the degree of international capital mobility. This paper proposes a new way to discuss it.

Feldstein and Horioka (1980) examined the cross-sectional correlation between national saving and investment across 21 OECD countries to investigate the degree of international capital mobility. They argued that national saving and investment should be independent of each other if international capital mobility is perfect. However, they found that the relationship between saving and investment was strong across these OECD countries. They therefore concluded that the degree of international capital mobility was

still low across these OECD countries. Fieleke (1982), Tobin (1983), Summers (1988) and Bayoumi (1990) showed that policy reaction might generate the positive relationship between saving and investment. Moreover Tobin (1983) and Murphy (1984) showed that there might exist a positive relationship between saving and investment for a large country in a world financial market.

MacDougall (1960) argued that, if international capital mobility is perfect, the real interest rates should be equalized across economies. Mishkin (1984), Mark (1985a, 1985b), Cumby and Mishkin (1986), however, found that real interest rates are not equalized across OECD countries. Obstfeld (1986) and Frankel (1991, 1992) argued that real interest rates are not equalized unless currency risk premia are excluded from currency exchange.

Another way is to use optimizing model to examine the degree of international capital mobility. Obstfeld (1989) used a two-country model to examine whether international capital was perfect or not. Ghosh (1995) compared the theoretical variance of the current account under perfect capital mobility to the actual value of the current account to test the degree of international capital mobility. Furthermore, based on the permanent income approach employed in the series of work by Campbell and Mankiw (1989, 1990, 1991), Shibata and Shintani (1998) used an intertemporal current account model to investigate the degree of international capital mobility across OECD countries.

Based on an asset-pricing model in a small open economy, this paper proposes a new framework to test the degree of international capital mobility. According to the optimizing model, we can obtain two polar theoretical models. If the economy is a financial autarky, expected consumption growth depends on domestic expected asset returns perfectly; if international capital mobility is perfect in the economy, expected consumption growth is random. If international capital mobility is imperfect in the economy, a change in expected returns of assets available in the economy will influence expected consumption growth to some extent. Therefore, netting the two polar theoretical models, we can estimate the degree of international capital mobility. Using data for ten OECD countries, we find that international capital mobility is low in France, Germany, the Netherlands, the United Kingdom and the United States and very high in Australia, Italy and Japan. On the other hand, the null hypothesis that international capital mobility is perfect cannot be rejected in Canada and Sweden. This means that capital controls are still not dismantled in the half of these ten OECD countries.

The Organization of this paper is as follows. Section 2 outlines the basic model. Section 3 applies the model to estimate the degree of capital mobility across ten OECD countries. Section 4 provides conclusions.

2. The model

Let us consider a small open economy that is inhabited by infinitely lived identical households. A representative household chooses consumption C_t to maximize

$$E_t \sum_{s=0}^{\infty} \frac{1}{(1+\beta)^s} U(C_{t+s}) , \tag{1}$$

$$U'(\cdot)>0, \quad U''(\cdot)<0 ,$$

where E_t is the expectation operator on all available information in period t, C_t a consumption level of the representative household and β the rate of time preference that satisfies $0<\beta<1$.

The budget constraint of the representative household is given by

$$C_t + \sum_{i=1}^{N} P_{it} A_{it+1} = \sum_{i=1}^{N} (P_{it} + d_{it}) A_{it} + W_t , \tag{2}$$

where A_{it} denotes the ith asset helt by the representative household, P_{it} is the price of asset A_{it}, d_{it} is the value of distributions of asset A_{it} during period t, W_t is the level of labor income at date t, and N denotes the numbers of assets available in the small open economy, which depend on the structure of financial market in the economy.

First, we consider a polar case where the economy is a financial autarky, in which domestic asset returns are endogenous. Since there is no international capital mobility across countries, all assets held by the representative household are only domestic assets. Assuming that the representative household has a logarithmic utility function, the following Euler equation must hold for the representative household,

$$E_t \left[\frac{R_{it}}{1+\beta} \frac{C_{t-1}}{C_t} \right] = 1 , \tag{3}$$

where R_{it} is the returns of asset A_{it} in units of the consumption good. If we assume that asset returns and consumption are jointly conditionally lognormal and homoskedastic, as

shown by Hansen and Singleton (1983), the Euler equation (3) can be simplified as

$$E_{t-1}\Delta c_t = \mu + E_{t-1} r_{it} \ , \tag{4}$$

where μ is a constant term, $r_{it} = \ln R_{it}$ and $\Delta c_t = \ln(C_t/C_{t-1})$. This equation suggests that expected consumption growth depends on domestic expected asset returns perfectly.

Next, we consider another polar case where international capital mobility is perfect. All assets held by the representative household include not only all domestic assets but also all foreign assets. Since all assets are perfectly substitution assets, expected returns of all assets are equal to the given world real interest rate. Assuming the rate of time preference, β, is equal to the world real interest rate, Eq. (4) can be modified as follows:

$$E_{t-1}\Delta c_t = \mu' \ , \tag{5}$$

where μ' is a constant term. This equation implies that a change in expected returns of any available assets will not affect expected consumption growth.

In turn, we consider a common case where international capital mobility is imperfect in the economy. Although the representative household can have access to all domestic and foreign assets, domestic and foreign assets are imperfect substitution assets. Therefore, a change in the expected returns of domestic assets will influence expected consumption growth. The greater the influence, the smaller is the degree of international capital mobility. We can therefore regard the influence as a measurement of the degree of international capital mobility. Considering the income effects and substitution effects of asset returns on intertemporal consumption, the influence may be negative or positive.[1]

From Eqs. (4) and (5), the representative household's expected consumption growth can be written as

$$E_{t-1}\Delta c_t = \mu^* + \lambda E_{t-1} r_{it} \ , \tag{6}$$

or equivalently

$$\Delta c_t = \mu^* + \lambda r_{it} + \varepsilon_t \ , \tag{7}$$

where μ^* is a constant term and λ represents the effects of asset returns on expected consumption growth. Therefore we denote λ as the measurement of the degree of international capital mobility.

From Eqs. (4) and (5), the absolute value of λ can be taken as a value between zero

and one. If $\lambda=0$, Eq. (6) indicates that international capital mobility is perfect in the economy. On the other hand, if $|\lambda|=1$, Eq. (6) or (7) indicates that the economy is a financial autarky. Hence, the smaller the absolute value of λ, the higher is the degree of international capital mobility. In the next section, based on Eq. (7), we will use data for ten OECD countries to estimate λ.

3. Estimation and results

Data

In this section, we use data for ten OECD countries to estimate λ, which indicates the degree of international capital mobility. These ten OECD countries are Australia, Canada, France, Germany, Italy, Japan, the Netherlands, the United Kingdom, the United States and Sweden. According to available data, the sample periods are different across these ten OECD countries. Australia and Sweden are from 1957 to 1994; Canada is from 1968 to 1996; France, Germany, Italy, the Netherlands and the United States are from 1957 to 1996; Japan is from 1967 to 1996; the United Kingdom is from 1957 to 1995. All available data are annual and are taken from International Financial Statistics.

We measure c_t as the log of per capita real consumption expenditure divided by population and deflated by the consumer price index (CPI) in each country. We use the short-term or medium-term government bond yields available in each country as asset returns.

Results

Since the error term, ε, may be correlated with r in Eq. (7), λ cannot be directly estimated by OLS. In an attempt to eliminate the effects of the correlation between the error terms ε and r, we use GMM to estimate λ by selecting lagged variables of Δc and r as instruments since they are orthogonal to ε. As shown by Hansen (1982), we can use overidentifying restrictions to test the plausibility of the model. The overidentifying restrictions, which are the minimized values of the GMM criterion function, are asymptotically distributed as Chi-square distribution. Another way to test the plausibility of the model is also given by Campbell and Mankiw (1990), who argued that the adjusted R^2 obtained from the regression of Δc on instruments must be smaller than that obtained from the regression of r on instruments unless ε and r are strongly negatively correlated.

Table 1 Estimation of the degree of international capital mobility

Country	GMM estimates					
	Ⅳ(1)	Ⅳ(2)	Ⅳ(3)	Ⅳ(4)	Ⅳ(5)	Ⅳ(6)
(1) Australia						
λ measure	-0.033 [-0.231]	-0.048 [-0.354]	-0.162 [-1.214]	-0.211** [-2.292]	-0.069 [-0.564]	-0.132*** [-1.686]
adjusted R^2 for Δc	0.018	-0.031	0.007	0.141	0.0005	0.153
adjusted R^2 for r	0.484	0.483	0.228	0.499	0.527	0.624
overidentifying restrictions	3.406 [0.182]	3.248 [0.517]	2.173 [0.337]	5.71 [0.222]	5.951 [0.311]	9.392 [0.402]
(2) Canada						
λ measure	-0.184 [-0.955]	-0.03 [-0.163]	-0.265 [-1.334]	0.059 [0.318]	-0.224 [-1.571]	-0.041 [-0.306]
adjusted R^2 for Δc	-0.085	-0.072	-0.059	0.054	-0.173	0.016
adjusted R^2 for r	0.436	0.446	0.353	0.464	0.585	0.691
overidentifying restrictions	1.391 [0.34]	5.771 [0.217]	1.727 [0.422]	7.619 [0.107]	2.807 [0.73]	9.182 [0.421]
(3) France						
λ measure	-0.286* [-2.956]	-0.246* [-2.655]	-0.608* [-3.273]	-0.57* [-3.35]	-0.324* [-3.411]	-0.208** [-2.374]
adjusted R^2 for Δc	0.068	0.031	0.211	0.202	0.22	0.119
adjusted R^2 for r	0.558	0.565	0.222	0.326	0.615	0.669
overidentifying restrictions	1.759 [0.415]	3.803 [0.433]	0.202 [0.904]	2.021 [0.732]	7.09 [0.214]	9.448 [0.397]
(4) Germany						
λ measure	-1.551 [-0.417]	0.658 [0.754]	1.766 [1.258]	1.165 [0.739]	1.443*** [1.874]	0.82 [0.941]
adjusted R^2 for Δc	-0.05	0.083	-0.092	-0.179	-0.156	-0.071
adjusted R^2 for r	-0.0006	0.041	0.12	0.058	0.072	0.022
overidentifying restrictions	0.917 [0.632]	3.72 [0.445]	0.658 [0.719]	2.117 [0.714]	1.821 [0.873]	5.142 [0.822]
(5) Italy						
λ measure	0.11 [0.666]	0.054 [0.364]	-0.313** [-2.084]	-0.237 [-1.558]	-0.152 [-1.289]	-0.191** [-2.012]
adjusted R^2 for Δc	-0.052	-0.098	0.013	0.117	0.196	0.27
adjusted R^2 for r	0.275	0.261	0.262	0.216	0.405	0.319
overidentifying restrictions	1.424 [0.491]	3.225 [0.521]	2.445 [0.295]	6.786 [0.148]	9.455 [0.092]	12.75 [0.174]
(6) Japan						
λ measure	-0.044 [-0.357]	0.047 [0.56]	0.164 [0.719]	0.153 [1.543]	0.057 [0.608]	0.161* [2.648]

adjusted R^2 for Δc	-0.118	0.015	-0.076	0.01	-0.145	-0.026
adjusted R^2 for r	-0.026	-0.126	0.205	0.547	0.347	0.646
overidentifying restrictions	1.279 [0.528]	2.001 [0.734]	1.882 [0.39]	2.5 [0.645]	2.879 [0.718]	5.123 [0.823]
(7) The Netherlands						
λ measure	-0.593** [-2.35]	-0.59** [-2.324]	-0.247 [-0.686]	-0.331 [-1.094]	-0.344*** [-1.646]	-0.178 [-0.979]
adjusted R^2 for Δc	0.02	-0.059	0.024	-0.065	0.091	-0.022
adjusted R^2 for r	0.191	0.137	0.117	0.062	0.169	0.041
overidentifying restrictions	0.406 [0.98]	0.127 [0.998]	5.553 [0.062]	5.348 [0.253]	6.759 [0.239]	12.131 [0.206]
(8) The United Kingdom						
λ measure	0.229 [1.187]	0.413* [2.864]	1.265 [0.967]	0.154 [0.324]	0.335* [2.777]	0.199** [2.205]
adjusted R^2 for Δc	-0.049	0.061	0.075	0.091	0.1	0.248
adjusted R^2 for r	0.154	0.172	-0.067	-0.136	0.274	0.339
overidentifying restrictions	0.567 [0.753]	4.68 [0.32]	0.202 [0.904]	10.755 [0.029]	2.643 [0.755]	16.801 [0.052]
(9) The United States						
λ measure	0.49 [1.379]	0.548** [1.962]	0.429 [1.565]	0.413*** [1.917]	0.398* [2.733]	0.397* [3.52]
adjusted R^2 for Δc	-0.021	-0.072	-0.033	-0.041	-0.072	-0.173
adjusted R^2 for r	0.159	0.108	0.125	0.12	0.499	0.455
overidentifying restrictions	0.26 [0.878]	1.117 [0.892]	1.152 [0.562]	3.916 [0.418]	1.82 [0.873]	4.255 [0.894]
(10) Sweden						
λ measure	-0.182 [-0.755]	-0.109 [-0.464]	0.032 [0.141]	0.221 [1.282]	-0.077 [-0.427]	0.08 [0.534]
adjusted R^2 for Δc	-0.085	-0.095	-0.065	-0.024	-0.164	-0.221
adjusted R^2 for r	0.236	0.182	0.145	0.216	0.462	0.451
overidentifying restrictions	0.675 [0.714]	3.456 [0.485]	1.034 [0.596]	1.746 [0.782]	1.774 [0.879]	5.08 [0.827]

Note: Estimates of λ are presented with t statistics in brackets. The instruments used in GMM estimation are a constant term and $r_{t-2}\sim r_{t-4}$ for IV(1); a constant term and $r_{t-2}\sim r_{t-6}$ for IV(2); a constant term and $\Delta c_{t-2}\sim\Delta c_{t-4}$ for IV(3); a constant term and $\Delta c_{t-2}\sim\Delta c_{t-6}$ for IV(4); a constant term, $r_{t-2}\sim r_{t-4}$ and $\Delta c_{t-2}\sim\Delta c_{t-4}$ for IV(5); a constant term, $r_{t-2}\sim r_{t-6}$ and $\Delta c_{t-2}\sim\Delta c_{t-6}$ for IV(6), respectively. The adjusted R^2 statistics for first-stage OLS of Δc and r on instruments are presented in this table, respectively. The overidentifying restrictions are presented with p values in brackets. Furthermore, *, ** and *** denote significance at the 1%, 5% and 10% levels respectively.

Sets of instruments include twice-lagged variables so as to account for excluding the effects of the measurement errors. Ⅳ(1) includes a constant term and 2-4 lags of r as instruments; Ⅳ(2) includes a constant term and 2-6 lags of r as instruments; Ⅳ(3) includes a constant term and 2-4 lags of c as instruments; Ⅳ(4) includes a constant term and 2-6 lags of c as instruments; Ⅳ(5) includes a constant term, 2-4 lags of r and 2-4 lags of c as instruments; Ⅳ(6) includes a constant term, 2-6 lags of r and 2-6 lags of c as instruments. Using Ⅳ(1)～Ⅳ(6) instrument sets, we find the absolute of λ are small for Australia, Canada, Italy, Japan and Sweden, and are large for France, the Netherlands, the United Kingdom and the United States. However, for Germany the absolute estimate of λ exceeds 1.

From Table 1, we find the null hypothesis of perfect international capital mobility ($\lambda = 0$) cannot be rejected at any conventional significance levels by using any instrument sets for Canada and Sweden, but can be rejected at one or one more conventional significance levels by using different instrument sets for the other countries.

In turn, we use overidentifying restrictions and adjusted R^2 to assess the plausibility of the model. Most results of the tests presented in table 4.1 show that the model cannot be rejected.

The results above suggest that international capital mobility is far higher for Australia, Italy and Japan, but is lower for France, Germany, the Netherlands, the United Kingdom and the United States. On the other hand, the null hypothesis of perfect international capital mobility cannot be rejected for Canada and Sweden.

4. Conclusions

This paper proposed a new framework to measure the degree of international capital mobility. The focus of the new framework is on the relationship between expected consumption growth and expected asset returns in the economy. Using available data for ten OECD countries, we found that the degree of international capital mobility is very lower in France, Germany, the Netherlands, the United Kingdom and the United States, but far higher in Australia, Italy and Japan. On the other hand, the null hypothesis of perfect international capital mobility cannot be rejected in Canada and Sweden. This means that international capital mobility is still restricted in the half of these ten OECD countries.

Based on the assumption of the small open economy model, it is convenient to measure the degree of international capital mobility. Though some OECD countries used in this paper may not satisfy the small open economy assumption, the new method to estimate the degree of international capital mobility proposed in this paper is still effective.

References

Bayoumi, M., 1990. Saving-investment correlations: immobile capital, government policy, or endogenous behavior? IMF Staff Paper 37, 360-387.

Campell, J.Y., Mankiw, N.G., 1989. Consumption, income, and interest rates: reinterpreting the time series evidence. NBER Macroeconomics Annual 1989, 185-216.

Campell, J.Y., Minkiw, N.G., 1990. Permanent income, current income, and consumption. Journal of Business Statistics 8, 265-279.

Campell, J.Y., Mankiw, N.G., 1991. The response of consumption to income: a cross-country investigation. European Economic Review 35, 723-769.

Cumby, R., Mashkin, F.S., 1986. The international linkage of real interest rates: the European-US connection. Journal of International Money and Finance 5, 5-23.

Fieleke, N., 1982. National saving and international investment, in saving and government policy. Conference Series 25, Boston: Federal Reserve Bank of Boston, pp.138-157.

Feldstein, M., Horioka, C., 1980. Domestic saving and international capital flows. Economic Journal 90, 314-329.

Frankel, J.A., 1991. Quantifying international capital mobility in the 1980s. In: Bernheim, B.D., Shoven, J.B. (Eds), National Saving and Economic Performance, University of Chicago Press, Chicago, pp.227-260.

Frankel, J.A., 1992. Measuring international capital mobility: a review. American Economic Review 82, 197-202.

Ghosh, A.R., 1995. International capital mobility amongst the major industrialized countries: too little or too much? Economic Journal 105, 107-128.

Hall, R.E., 1988. Intertemporal substitution in consumption. Journal of Political Economy 96, 339-357.

Hansen, L.P., 1982. Large sample properties of generalized method of moments estimators. Econometrica 50, 1029-1054.

Hansen L.P., Singleton, K.J., 1983. Stochastic consumption, risk aversion, and the temporal behavior of asset returns. Journal of Political Economy 91, 249-265.

MacDougall, G.D.A., 1960. The benefits and costs of private investment from abroad: a theoretical approach. Economic Record, Special Issue 26, 13-35.

Mark, N.C., 1985a. A note on international real interest rate differentials. Review of Economics and Statistics, 681-684.

Mark, N.C., 1985b. Some evidence on the international inequality of real interest rates. Journal of International Money and Finance 4, 198-208.

Mishkin, F.S., 1984. Are real interest rates equal across countries? An empirical investigation of international parity conditions. Journal of Finance 34, 1345-1357.

Murphy, R.G., 1984. Capital mobility and the relationship between saving and investment in OECD countries. Journal of International Money and Finance 3, 327-342.

Obstfeld, M., 1986. Capital mobility in the world economy: theory and management. Carnegie-Rochester Conference Series on Public Policy 24, 55-104.

Obstfeld, M., 1989. How integrated are world capital markets? Some new tests. In: Calvo, G., Findlay, R., Kouri, P., de Macedo, J.B. (Eds), Debt, Stabilization and Development. Basil Blackwell, London. pp.134-155.

Shibata, A., Shintani, M., 1998. Capital mobility in the world economy: an alternative test. Journal of International Money and Finance 17, 741-756.

Summers, L., 1988. Tax policy and international competitiveness. In: Frankel, J.A. (Ed.), International Aspects of Fiscal Policies, University of Chicago Press, Chicago, pp.349-375.

Tobin, J., 1983. Comment. European Economic Review 21, 153-156.

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1 Hall (1988) used twentieth-century United States data to discuss the elasticity of intertemporal substitution in consumption that can be measured by the response of the rate of change of consumption to changes in the expected real interest rate. He found no strong evidence for that the elasticity of intertemporal substitution is positive.