Investment and Savings Cycles and Tests for Capital Market Integration

Cooray, Arusha and Felmingham, Bruce

University of Tasmania

2005

SCHOOL OF ECONOMICS

Discussion Paper 2005-01

Investment and Savings Cycles and Tests for Capital Market Integration

Arusha Cooray and **Bruce Felmingham**
(University of Tasmania)

ISSN 1443-8593
ISBN 1 86295 241 8

Investment and Savings Cycles and Tests for Capital Market Integration

Arusha Cooray*

School of Economics
Private Bag 85
University of Tasmania
Hobart Tasmania 7001
Australia

Phone: 61-3-6226-2820
Fax: 61-3- 6226-7587

Email: arusha.cooray@utas.edu.au

Bruce Felmingham

School of Economics
Private Bag 85
University of Tasmania
Hobart Tasmania 7001
Australia

Phone: 61-3-6226-2312
Fax: 61-3-6226-7587

Email: bruce.felmingham@utas.edu.au

Abstract:

A spectral analysis of the Australian time series for the investment and savings ratio on monthly data over the period finds that the investment ratio is subject to a cycle of 6 months duration while the savings ratio series is concentrated on a longer swing of 4 to 6 years. The implications for the Feldstein-Horioka test of capital mobility are explained.

* Corresponding author
† This research is funded by a University of Tasmania Institutional Research Grant (IRG)

1 Introduction

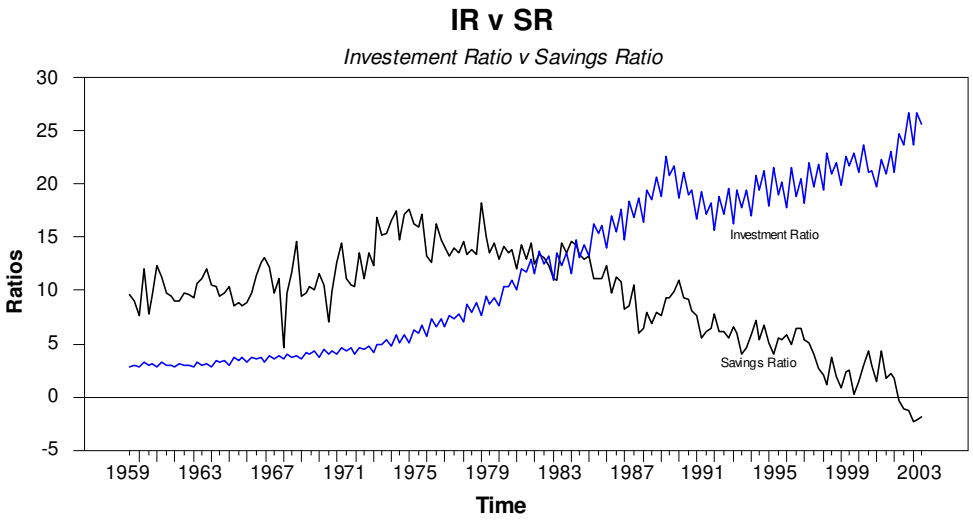
The original Felstein-Horioka (1980) condition was based on a linear relationship between the investment (I/Y) and saving ratios (S/Y). If there is no evidence of any relationship between these then it is argued that capital is perfectly mobile because all domestic investment can be financed through foreign borrowing. Alternatively, the equality of the investment and savings ratios suggests complete immobility because all domestic investment is financed from domestic savings and foreign capital is not required.

The objective here is to examine the consequences of the cyclic behaviour of the investment and savings ratios for the Feldstein-Horioka (FH) condition. These two ratios may follow cyclical episodes of quite different periodicity. In fact our prior expectation is that investment is subject to short cyclic components while saving is subject to a swing of longer duration. This matters for all macro phenomena dependent upon some relationship between saving and investment. The difference between saving and investment at a point in time may by distorted by contrary cyclic behaviour, for example, if investment is in an upswing phase while saving is on the downswing, the difference between investment and saving will be exaggerated by the contrary cyclic pattern. This paper examines the periodicity of swings in savings and investment ratios for Australian data.

2 The Stylised Facts about Investment and Savings Relations in a Small Open Economy

The stylised facts about the behaviour of the investment and savings ratios for one small open economy, Australia, are displayed on Figure 1.

Figure 1



This shows that the domestic savings ratio exceeded the domestic investment ratio for the entire period from 1959:3 to 1983:4, a period in which Australia had made various adjustments of its exchange rate regime designed to liberalise its foreign exchange markets while still preserving some central bank control over the foreign exchange market. From 1959 to 1967, the Australian currency was pegged to the Pound Sterling although the strength of the US dollar as the world base currency led to a switch in the basis of fixing the currency from the British pound to the US dollar. The peg was shifted to a trade weighted exchange rate index in September 1974, the number of currencies comprising the trade weighted index was enlarged in 1976 and ultimately the most flexible of fixed systems, the crawling peg mechanism was implemented. The peg was adjusted by a troika of public officials twice daily.[1] Ultimately, attempts to administer large variations in capital flows were abandoned in favour of deregulation and currency floating. The behaviour of the Australian investment and savings ratios over this period of exchange rate rigidity can be described as an era of over-saving relative to investment: from Figure 1 the savings ratio exceeds the investment ratio from the late 1950s to the early 1980s in this period of Australia's financial history. The

[1] The Governor of the Reserve Bank of Australia, the secretary of the Prime Minister and Cabinet office and the secretary of the Treasury.

Feldstein-Horioka condition therefore suggests that capital is imperfectly mobile because Australia's domestic savings were more than adequate to meet its investment requirements. The graph does reveal however, that the margin between the savings and investment ratios is closing over this thirty year period to 1983.

The Australian foreign exchange market was deregulated in December 1983 and was followed by a period of increased volatility of the US$/A$ exchange rate. During this adjustment period the savings and investment ratios are approximately equal, which according to the Feldstein-Horioka condition implies the complete absence of capital mobility. In the years following this era, 1984 to the present time the investment ratio continues its upward trend while the Australian savings ratio falls. Domestic savings are no longer adequate relative to domestic investment and it is in this modern era from 1985 to the present date that the Feldstein-Horioka condition suggests increasing capital mobility between Australia and the rest of the world. From the pattern evident on Figure 1 it is clear that the savings of Australian households are declining while investment demand was rising in parallel with Australia's comparatively high rate of economic development.

A further interesting characteristic of these investment and savings ratio data is their cyclical behaviour. From Figure 1, the amplitude and periodicity of the savings ratio appears to remain relatively constant while the amplitude of the investment ratio has increased post-deregulation. Casual observation of Figure 1 also suggests that the cycle in the savings ratio is of a longer duration than the cycle of the investment ratio. What happens to the Felstein-Horioka argument if it is the case that the savings ratio follows a longer swing than the investment ratio? This is the question that we set out to answer in the following paragraphs.

3 Methodology

The aim here is to identify the main cycles in the behaviour of both I/Y and S/Y variables given the mixed support for the Feldstein-Horioka condition in earlier studies acknowledging the potential distortion associated with the condition when cyclic behaviour is taken into account. The most appropriate method for studying the cyclic behaviour of individual time series is spectral analysis.

Spectral Analysis

Spectral analysis is the study of time series in the frequency domain. The purpose of this analysis is to determine if the savings and investment ratios exhibit any cyclical variation. The spectral densities of the logarithms of the prices and their first differences are estimated for 150 lags. The spectral densities are estimated as follows:

$$F\left(\varpi_j\right) = 1/2\pi\left[\lambda_0 C_0 + 2\sum_{K=0}^{\infty}\lambda_k C_k \cos \varpi_j k\right]$$

$\varpi_j = \pi j/m = j = 0, 1, 2, \ldots m$, where $m = 150$ lags.

The estimated autocovariance is given by,

$$C_k = 1\Big/ n-k\left[\sum_{t=1}^{n-k} x_t x_{t+k} - 1/n-k \sum_{t=1+k}^{n} x_t \sum_{t=1}^{n-k} x_t\right]$$

If x_t, the savings/investment ratio series, contains a periodic element of period k and therefore the frequency, $2\pi/k$, the spectral densities will have a sharp spike at $\alpha = \alpha_k$., where α = amplitude of changes in savings/investment ratios. If the filtered x_t does not contain any periodicities, the spectral densities will be smooth. With data, x_t, t = 1, …n and the weights, λ_k are dependent upon m.

4 Empirical Results

The major cyclical components in the behaviour of the Australian savings and investment ratios are shown in Table 1.

Table 1: Major Cyclic Components[(1)] the Time Series for the Australian I/Y and S/Y Ratios 1959-2003

Series	Frequency (Radians)	Periodicity (Quarters)	Spectral Density [(2)] *Bartlett Window	% Explained
I/Y -	3.1416	2	13.7476	41.6
S/Y -	0.3625	17.33	2.4877	9.3
-	0.24166	26.00	2.597	9.7

(1) The Hodrick-Prescott filter is used to detrend the series.
(2) Tukey and Parzen windows provide similar results – see Figures 2-3.

The power in the I/Y series is concentrated at a short frequency (3.1416) a cyclic component of only six months. Forty two percent of the variation of the I/Y series is explained by this component. The swing in the savings ratio (S/Y) is smoother and dispersed, although the key component in this series occurs at 17.33 or 26.00 quarters. These two components of the S/Y series explain 20 percent of its variation and are by far the major important cycles in the S/Y series. The remaining components of each series are shown on Figures 2 and 3.

Figure 2

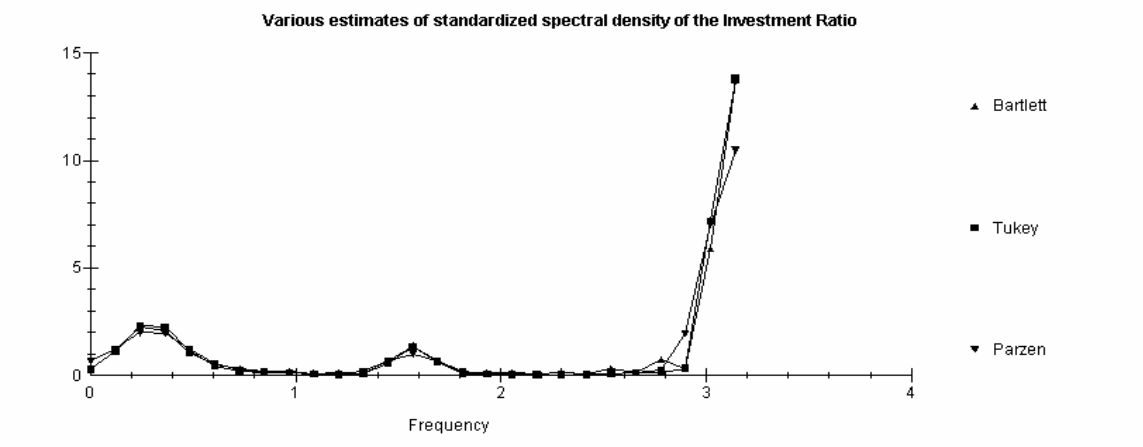
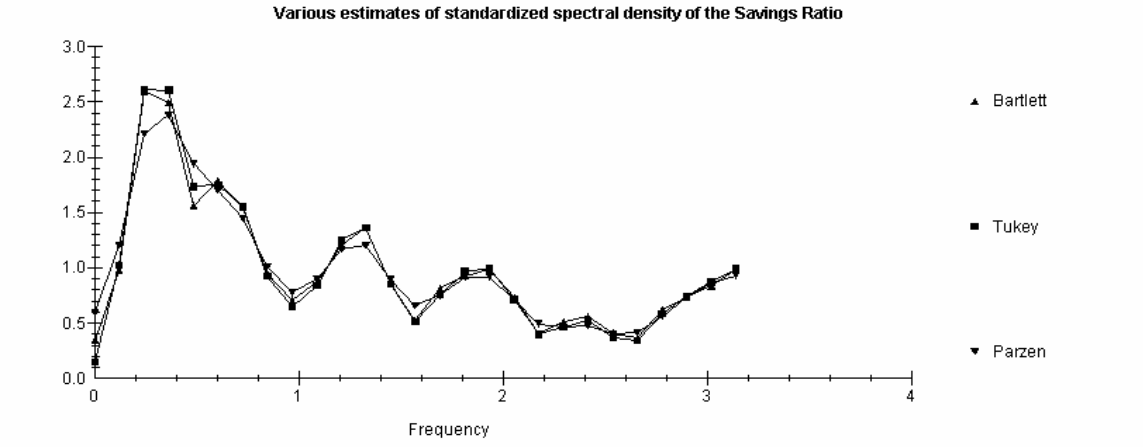


Figure 3



In Figures 2 and 3; the spectral density estimated is shown on the vertical axis while the frequency components are shown on the horizontal axis. Almost forty two percent of the variance of the investment ratio (I/Y) is explained at a low frequency of just six months duration suggesting that investment in Australia is volatile passing one peak level to another in only six months. This is in direct contrast to the behaviour of the savings ratio (S/Y) of Figure 3 where approximately 20 per cent of the variation of S/Y is explained by a longer swing of four to six years. The intriguing aspect of these results is that investment cycles are short and sharp while savings behaviour is much smoother passing from peak to peak over the long term. The conundrum which is to be resolved in this proposed research is to

determine what the short/long swing behaviour of Australian investment and savings rates means for the current Feldstein-Horioka theory about capital mobility.

5 Conclusion

The reliability of the Feldstein-Horioka condition as a test for capital mobility on Australian data is diminished by the disparate cyclical pattern of the investment and savings ratios. It is conceivable that I/Y is on an upswing phase of its cycle while S/Y is on a downswing. The difference between these two ratios maybe exaggerated by these contra cyclical positions. If the Feldstein-Horioka condition is to provide a reliable guide then trends in the two series should form the basis of comparison, alternatively, the Feldstein-Horioka condition should be redesigned to accommodate the differing cyclic behaviour of the two ratios. This issue constitutes a further research agenda.

References

Feldstein M. and Horioka C. (1980), 'Domestic Saving and International Capital Flows,' *Economic Journal*, 90, 314-329.

Economics Discussion Papers

2005-01 Investment and Savings Cycles and Tests for Capital Market Integration, **Arusha Cooray** and **Bruce Felmingham**

2005-02 The Efficiency of Emerging Stock Markets: Empirical Evidence from the South Asian Region, **Arusha Cooray** and **Guneratne Wickremasinghe**

2005-03 Error-Correction Relationships Between High, Low and Consensus Prices, **Nagaratnam Jeyasreedharan**

2005-04 Tests for RIP Among the G7 When Structural Breaks are Accommodated, **Bruce Felmingham** and **Arusha Cooray**

2005-05 Alternative Approaches to Measuring Temporal Changes in Poverty with Application to India, **Dipankor Coondoo, Amita Majumder, Geoffrey Lancaster** and **Ranjan Ray**

2005-06 Intertemporal Household Demographic Models for Cross Sectional Data, **Paul Blacklow**

2004-01 Parametric and Non Parametric Tests for RIP Among the G7 Nations, **Bruce Felmingham** and **Arusha Cooray**

2004-02 Population Neutralism: A Test for Australia and its Regions, **Bruce Felmingham, Natalie Jackson** and **Kate Weidmann.**

2004-03 Child Labour in Asia: A Survey of the Principal Empirical Evidence in Selected Asian Countries with a Focus on Policy, **Ranjan Ray –** published in *Asian-Pacific Economic Literature*, 18(2), 1018, November 2004.

2004-04 Endogenous Intra Household Balance of Power and its Impact on Expenditure Patterns: Evidence from India, **Geoffrey Lancaster, Pushkar Maitra** and **Ranjan Ray**

2004-05 Gender Bias in Nutrient Intake: Evidence From Selected Indian States, **Geoffrey Lancaster, Pushkar Maitra** and **Ranjan Ray**

2004-06 A Vector Error Correction Model (VECM) of Stockmarket Returns, **Nagaratnam J Sreedharan**

2004-07 Ramsey Prices and Qualities, **Hugh Sibly**

2004-08 First and Second Order Instability of the Shanghai and Shenzhen Share Price Indices**, Yan, Yong Hong**

2004-09 On Setting the Poverty Line Based on Estimated Nutrient Prices With Application to the Socially Disadvantaged Groups in India During the Reforms Period, **Ranjan Ray** and **Geoffrey Lancaster –** published in *Economic and Political Weekly, XL(1), 46-56, January 2005.*

2004-10 Derivation of Nutrient Prices from Household level Food Expenditure Data: Methodology and Applications, **Dipankor Coondoo**, **Amita Majumder**, **Geoffrey Lancaster** and **Ranjan Ray**

2003-01 On a New Test of the Collective Household Model: Evidence from Australia, **Pushkar Maitra** and **Ranjan Ray –** published in *Australian Economic Papers,* 15-29, March 2005.

2003-02 Parity Conditions and the Efficiency of the Australian 90 and 180 Day Forward Markets, **Bruce Felmingham** and **SuSan Leong**

2003-03 The Demographic Gift in Australia, **Natalie Jackson** and **Bruce Felmingham**

2003-04 Does Child Labour Affect School Attendance and School Performance? Multi Country Evidence on SIMPOC Data, **Ranjan Ray** and **Geoffrey Lancaster –** forthcoming in *International Labour Review.*

2003-05 The Random Walk Behaviour of Stock Prices: A Comparative Study, **Arusha Cooray**

2003-06 Population Change and Australian Living Standards, **Bruce Felmingham** and **Natalie Jackson**

2003-07 Quality, Market Structure and Externalities, **Hugh Sibly**

2003-08 Quality, Monopoly and Efficiency: Some Refinements, **Hugh Sibly**

Copies of the above mentioned papers and a list of previous years' papers are available on request from the Discussion Paper Coordinator, School of Economics, University of Tasmania, Private Bag 85, Hobart, Tasmania 7001, Australia. Alternatively they can be downloaded from our home site at http://www.utas.edu.au/economics