



# Financial integration in East Asia: Evidence from panel unit root and panel cointegration tests

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## ARTICLE INFO

### JEL classification:

C33  
F32  
F36  
F41

### Keywords:

Financial integration  
Feldstein–Horioka puzzle  
Nonstationary panel data  
Panel cointegration  
East Asia

## ABSTRACT

The aim of this paper is to investigate the degree of financial integration for selected East Asian countries from 1988 to 2006 using the recently developed panel unit root and panel cointegration techniques. Investment and savings rates are found to be nonstationary and not to be cointegrated in panels. We estimate modified Feldstein–Horioka equations and our results reveal a high degree of financial integration. When we homogenize our data, results show that high-income countries have stronger financial integration than middle-income countries. Finally, we proceed to stability tests in order to test if there is a *crisis effect* and we find that financial integration is stronger in the post-crisis period.

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## 1. Introduction

In their paper, [Feldstein and Horioka \(1980\)](#) measure the degree of financial integration using the correlation of domestic saving with investment rates. Their results show a high correlation during 1960–1974. This result is contradictory with the stylized fact of this period; indeed, capital mobility appears to be increasing ever since the beginning of the 1960s ([Beitone, Gilles, & Parodi 2006](#); [Flandreau & Rivi re, 1999](#)). The Feldstein–Horioka approach is subject to two critiques that focus either on the econometric and statistical caveats – responsible for a bias towards a significant, positive and close to one coefficient – or on the economic and historical circumstances that explain the discrepancy between an expected coefficient close to zero and its effective value.

The goal of this paper is to investigate the degree of financial integration in selected East Asian countries from 1988 to 2006 using the recently developed panel unit root and panel cointegration techniques. [Ho \(2002\)](#), [Kim, Oh, and Jeong \(2005\)](#) and [B reau \(2007\)](#) have used these techniques but only [Kim et al. \(2005\)](#) focused on Asian countries. [Kim et al. \(2005\)](#) study capital mobility in 10 countries (Korea, Indonesia, Japan, Malaysia, Myanmar, Pakistan, Philippines, Singapore, Sri Lanka and Thailand) between 1960 and 1998. They find weaker financial integration during 1960–1979 than 1980–1998. The evolution of financial integration can be explained by financial liberalization of these economies in the 1980s and 1990s. But the study of [Kim et al. \(2005\)](#) does not integrate the last 10 years. Moreover, the second-generation panel unit root tests based on the hypothesis of interdependence between individuals are not used by any of the earlier studies.

We employ first-generation panel unit root tests along the lines of [Levin and Lin \(1992\)](#), [Im, Pesaran, and Shin \(2003\)](#), [Maddala and Wu \(1999\)](#) and [Hadri \(2000\)](#), and second-generation panel unit root tests along the lines of [Pesaran \(2003\)](#). We

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also test for the presence of a long term relationship between investment and saving rates using Pedroni's cointegration test (1997, 1999). We estimate three types of *modified* Feldstein–Horioka equations: *between*, *within* and *pooling*. These different estimations show a high degree of financial integration. We try to homogenize our data and estimate a new relation for high-income and middle-income countries. Our results show that high-income countries have stronger financial integration than middle-income countries. Finally, we proceed to stability tests in order to test if there is a *crisis effect*. Our results support the idea that financial integration is stronger in the post-crisis period.

The paper is structured as follows: Section 2 provides an overview of the Feldstein–Horioka puzzle. Section 3 describes the methodology. Section 4 provides a survey of the evolution of financial integration in East Asia. In Section 5 we present and discuss results. Section 6 offers concluding remarks.

## 2. Feldstein–Horioka puzzle: an econometric solution?

### 2.1. The Feldstein–Horioka paradox

In their pioneering study, Feldstein and Horioka (1980) examined the cross-sectional correlation between saving and investment by testing the following equation:

$$\left(\frac{I}{Y}\right)_{i,t} = \alpha + \beta \left(\frac{S}{Y}\right)_{i,t} + \varepsilon_{i,t} \quad (1)$$

where  $I/Y$  represents the ratio of investment over Gross Domestic Product (GDP), i.e. the investment rate.  $S/Y$  represents the ratio of saving over GDP, i.e. the saving rate. Indexes  $i$  and  $t$  respectively stand for the considered country and year.  $\varepsilon_{i,t}$  represents other factors explaining investment. This term is a random walk, with zero mean ( $E(\varepsilon) = 0$ ) and variance  $\sigma^2$ . Feldstein and Horioka work on average data in order to prevent a bias:

$$\left(\bar{\frac{I}{Y}}\right)_i = \alpha + \beta \left(\bar{\frac{S}{Y}}\right)_i + \varepsilon_i \quad \text{with} \quad \left(\bar{\frac{I}{Y}}\right)_i = \frac{1}{T} \sum_{t=1960}^{1974} \left(\frac{I}{Y}\right)_{i,t}, \quad \left(\bar{\frac{S}{Y}}\right)_i = \frac{1}{T} \sum_{t=1960}^{1974} \left(\frac{S}{Y}\right)_{i,t} \quad \text{and} \quad T = 15. \quad (1')$$

Coefficient  $\beta$  indicates the degree of financial integration: in case of weak financial integration,  $\beta$  is equal to 1 and to 0 in case of a strong financial integration.

Feldstein and Horioka (1980) test Eq. (1') for 16 OECD countries during 1960–1974. The result however pointed to a quite low degree of financial integration despite a large volume of international capital movements (Beitone et al., 2006; Flandreau & Rivi re, 1999). Since the 1970s, capital mobility has been increasing but it is hard to measure this phenomena. Still, some papers (Davanne, 1998; Obstfeld & Taylor, 2002) indicate that the daily financial transactions were equal to US\$ 1,500 billion in 1999, i.e., 50 times more than daily commercial trade. In the 1970s, this figure was in the range of US\$ 10–20 billion. One explanation, among others, is the emergence of financial markets at the end of the 1970s. World stock market capitalization was US\$ 1400 billion in 1975 and US\$ 17000 billion in 1997 (Probl mes  conomiques, 1997). Explaining the Feldstein–Horioka puzzle in the literature has been a matter of either econometrics or of economic analysis.

### 2.2. Solving the Feldstein–Horioka enigma

The economic arguments are based on historical circumstances that influence capital mobility (Flandreau & Rivi re, 1999; Obstfeld & Taylor, 2002). Therefore, financial integration can be high or low according to the precise periods and to the process of financial liberalization.

Besides, these arguments try to explain Feldstein–Horioka *enigma* by the relationship between investment and saving with variables that can influence the monetary conditions in the studied area. Economic and historical caveats have been studied by many authors: Bayoumi (1989), Frankel (1992), and Armstrong, Balasubramanyam, and Salisu (1996) are examples. None of these papers accepts perfect capital mobility. Bayoumi (1989) explains the strong relationship between investment and saving due to fiscal and monetary policy. For example, in case of a lack of saving, the government can modify its fiscal policy (decreases in taxes or increases in interest rates) and create a new link between investment and saving. In fact, *l'effet taille* can modify the relationship between investment and saving: a big country, in economic terms, can influence the world interest rate. So an increase in domestic savings will lead to a decrease in interest rates and to an increase in investment.

In addition, Bayoumi (1989), according to Summers (1989), notes that as saving and investment are procyclical variables, their correlation can result from a common response to permanent shocks. Moreover, others variables can influence financial integration, such as the interest rate or risk premium (Frankel, 1992). To correct for this bias, a *regional* approach is better than a *national* approach, proposed by Sinn (1992), Bayoumi and Rose (1993), Armstrong et al. (1996), Iwamoto and van Wincoop (2000) and van Wincoop (2001).<sup>1</sup> The goal of this approach is to study financially-integrated countries.

The econometric and statistical critiques focus on statistical properties of variables used in estimating Eq. (1). If saving and investment are not stationary and not cointegrated, Eq. (1) is a spurious regression. The interpretation of  $\beta$  is impossible.

<sup>1</sup> See, for example, H ricourt (2005) or H ricourt and Maurel (2005) for a synthesis.

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