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journal homepage: [www.elsevier.com/locate/econbase](http://www.elsevier.com/locate/econbase)Economic integration and the comovement of stock returns<sup>☆</sup>José Tavares<sup>\*</sup>

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## ABSTRACT

We analyze how economic integration affects the cross-country comovements in stock returns, in developed and emerging markets. Bilateral trade intensity increases the correlation of returns, while real exchange rate volatility, the asymmetry of output growth and export dissimilarity decrease it.

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## 1. Introduction

In the past few decades there has been a marked increase in international economic integration, as measured by the increase in both trade and financial flows. The economics literature has debated quite extensively the causes and consequences of this rise in international integration.<sup>1</sup> This paper assesses the consequences of the high degree of real and monetary integration for the correlation of stock returns between countries. In light of the depth of integration under Economic and Monetary Union in Europe and other regional integration movements, it became the key to evaluate how economic integration affects – or not – the correlation of asset returns across economies.

On the one hand, economic integration may lead to lower correlation of asset returns if, for instance, it is associated with higher sectoral spe-

cialization.<sup>2</sup> On the other hand, larger flows of capital across countries, together with international arbitrage<sup>3</sup> may lead to higher correlation of stock returns across economies. Evidence on the correlation of stock returns is not conclusive. Several studies find evidence of increasing integration between stock markets.<sup>4</sup> However, Bekaert and Hodrick (2006), using a risk-based factor model, concluded that there is no evidence of an upward trend in the correlation of returns across countries, except in the case of European stock markets.<sup>5</sup> Wälti (2006)

<sup>2</sup> Roll (1992) uses a Ricardian model to relate specialization and international market correlations, but Heston and Rouwenhorst (1994) argue country effects – fiscal, monetary, legal, and cultural differences –, not differences in country specialization, explain the comovement between stock markets.

<sup>3</sup> Dumas et al. (2003) investigate the underlying determinants of cross-section stock returns correlation. The assumption of financial market integration seems to better explain observed stock market correlation.

<sup>4</sup> Lee (2005) finds that the conditional correlations between the U.S., Japan, and Hong Kong stock market returns are positive and increasing. Pascual (2002) finds evidence of increasing integration in the case of the French stock market, but not the British and German markets. Rangvid (2000) also shows that the degree of convergence among European stock markets has increased during the last two decades.

<sup>5</sup> Cross country correlations in stock returns may also change over time – as shown by Goetzmann et al. (2001) for a long time series – and are generally higher in periods of deeper integration – also Goetzmann et al. (2001) – and in periods of high variance of returns in the US market – Ramchand and Susmel (1998). The cross-market correlation of returns may change across regions, as well. There is evidence that it is higher for Europe – Books and del Negro (2002) –, increasing in East Asia – Larrain and Tavares (2003) –, and in Latin America – Heaney et al. (2002).

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<sup>1</sup> See Larrain and Tavares (2003) for indicators of regional integration since the 1970s and Kubelec and Sá (2008) for new evidence on the increase in financial flows since the 1980s.

**Table 1**  
Dependent variable: correlation of stock returns – ordinary least squares estimation.

	Benchmark Specification					Specification with additional controls				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Bilateral trade intensity	0.3762** (5.05)	–	–	–	0.0280** (3.84)	0.01276* (1.78)	–	–	–	0.01323* (1.86)
Asymmetry of output growth	–	–7.749** (–6.69)	–	–	–6.569** (–4.03)	–	–2.3874* (–1.90)	–	–	–2.7299* (–1.67)
Dissimilarity of export structure	–	–	–0.3132** (–5.48)	–	–0.194** (–3.08)	–	–	–0.014** (–2.23)	–	–0.01202* (–1.84)
Real exchange rate volatility	–	–	–	–1.042** (–3.53)	0.7634* (1.92)	–	–	–	0.06205 (0.20)	0.70997* (1.75)
Size of the economies	–	–	–	–	–	3.74e–09 (0.17)	2.05e–09 (0.09)	3.89e–09 (0.18)	2.55e–09 (0.12)	1.09e–09 (0.05)
Distance between economies	–	–	–	–	–	–1.64e–08* (–2.30)	–1.46e–08* (–2.07)	–1.37e–08** (–1.94)	–1.57e–08* (–2.23)	–1.39e–08* (–1.94)
Average per capita GDP	–	–	–	–	–	–2.90e–09 (–0.90)	–2.73e–09 (–0.86)	–3.46e–09 (–1.10)	–3.00e–09 (–0.93)	–3.53e–09 (–1.12)
Common language indicator	–	–	–	–	–	0.1302* (2.53)	0.1316* (2.55)	0.1281* (2.51)	0.10221* (1.89)	0.1073* (2.01)
Common colonizer indicator	–	–	–	–	–	0.04543 (0.32)	0.0225 (0.15)	0.0760 (0.52)	0.0225 (0.16)	0.0555 (0.38)
Island indicator	–	–	–	–	–	0.0652** (2.17)	0.0621** (2.08)	0.0629** (2.11)	0.0638** (2.14)	0.06031** (2.04)
Development of rule of law	–	–	–	–	–	0.7979** (8.88)	–0.7027** (7.46)	0.7122* (1.93)	0.7579** (8.96)	0.6460** (6.66)
Development of civil liberties	–	–	–	–	–	0.1481** (2.49)	0.1452** (2.45)	0.1279** (2.16)	0.14479** (2.45)	0.1095* (1.81)
R2	0.0413	0.0749	0.0630	0.0217	0.1146	0.1819	0.1833	0.1881	0.1786	0.1962
F stat	10.06 (3573)	18.13 (3573)	12.60 (3573)	6.95 (3573)	13.87 (6570)	13.31 (11,565)	13.61 (11,565)	13.85 (11,565)	13.29 (11,565)	11.30 (14,562)
Decision	Reject	Reject	Reject	Reject	Reject	Reject	Reject	Reject	Reject	Reject

Number of Observations: 577. Time Dummies: Yes. T-statistics in parentheses, computed using heteroskedastic-consistent standard errors. The asterisks denote that the corresponding coefficient is significant at, respectively, the 5 percent level (\*\*) and the 10 percent level (\*).

studied the impact of monetary integration on stock market synchronization and concluded that the adoption of a single currency increases correlation, the same being true for, bilateral trade flows in the latter half of the 1990s.<sup>6</sup>

This paper adds to the literature in several ways. First, it uses a new dataset on indicators of bilateral economic integration between 40 economies, large and small, developed and developing. Second, the data covers an extended period, from the 1970s to the 1990s. Finally, this paper assesses the impact of both monetary and real bilateral integration controlling for a large set of bilateral information, including, for the first time, indicators of bilateral institutional development and similarity.

## 2. Empirical results

We use a new dataset to assess the effect of economic integration on the correlation of returns. It covers 40 developed and emerging markets from the 1970s to the 1990s.<sup>7</sup> For each decade, we have computed the correlation of stock returns for all country pairs, and collected indicators of bilateral integration from Larrain and Tavares (2003). The new panel dataset we are able to use allows us to assess, quantitatively, whether and how each of the indicators of economic integration – bilateral trade intensity, dissimilarity in the structure of exports, correlation of output growth and bilateral real exchange rate variability – affects the correlation of stock returns. We also employ, for each country pair, a widely-used set of control variables related to the size of the two economies, bilateral distance, per capita GDP, population, whether the countries share a common language, a common border or a common colonizer and whether they are islands.

Finally, we introduce two new indicators of institutional development and similarity as independent control variables.<sup>8</sup> Our empirical specification is:

$$\begin{aligned} \text{Correlation of stock returns} = & \alpha + \theta_1 * \text{Bilateral Trade Intensity} \\ & + \theta_2 * \text{Asymmetry of Output Growth} \\ & + \theta_3 * \text{Dissimilarity of Export Structure} \\ & + \theta_4 * \text{Real Exchange Rate Variability} \\ & + \beta_1 * \text{Size of the Economies} + \beta_2 * \text{Distance Between Economies} \\ & + \beta_3 * \text{Average Per Capita GDP} + \beta_4 * \text{Common Language Indicator} \\ & + \beta_5 * \text{Common Colonizer Indicator} + \beta_6 * \text{Island Indicator} \\ & + \beta_7 * \text{Development of Rule of Law} \\ & + \beta_7 * \text{Development of Civil Liberties} + \varepsilon \end{aligned}$$

We test for the sign and significance of  $\theta_1, \theta_2, \theta_3$  and for  $\theta_4$  by entering the indicators of bilateral integration in sequence and then simultaneously. For each specification we obtain ordinary least square estimates, without and then with the set of controls. Table 1 presents results for the impact of the four indicators of integration on the correlation of stock returns. The first five columns show that all indicators of bilateral integration are statistically significant in explaining the correlation of stock returns. The signs of estimates are as expected: an increase in real exchange variability, a lower correlation of output shocks or a larger difference in export structure decreases the correlation of stock returns, while trade intensity increases it. When we add control variables, in columns (6) through (10), the significance levels decrease but all variables remain significant at the 10% level with the expected sign. Most of the control variables are statistically significant, the exception being the Size of the Economies, Average per capita GDP and the Common Colonizer Indicator. The indicators of institutional development are both significant throughout: a higher development of legal and political institutions in both economies increases the comovement of stock returns.

<sup>6</sup> Flows of foreign direct investment do seem to be significant.

<sup>7</sup> The use of decade averages corrects for possible bias stemming from short-term effects such as stock market crashes, which have been shown to affect the correlation of returns across countries.

<sup>8</sup> A detailed description of the data is presented in the Appendix A.

### 3. Conclusions

In this paper we provide empirical estimates of the effect of indicators of bilateral economic integration on the correlation of real stock returns between economies. We concentrate on the role of bilateral real exchange rate volatility, bilateral trade intensity, correlation of output growth and export dissimilarity and find that each indicator has the expected effect on the comovement of returns. In addition, we provide strong evidence that analogous institutional development in two given economies leads to an increase in the comovement of their stock returns.

#### Appendix A. – Data

The data-set uses information for 40 countries spanning the period 1970–1995. All variables are computed for each of three periods, 1970–79, 1980–89 and 1990–97. When a variable is not available for the whole period, it is computed where available.

*Correlation of Stock Returns* – Correlation between yearly real US Dollar returns for each country pair and each decade. Unit: Correlation. Source: Citibase dataset.

*Bilateral Trade Intensity* – Calculated as the mean, over each period of time, of the average of the two bilateral-export-to-GDP ratios for each pair of countries  $i$  and  $j$ , that is,  $\frac{X_{ij}}{GDP_i} + \frac{X_{ji}}{GDP_j}$ . Source: Larrain and Tavares (2003).

*Real Exchange Rate Volatility* – Standard deviation, over each period of time, of the change in the log of the bilateral real exchange rate for countries  $i$  and  $j$ . The real exchange rate is constructed using consumer price indices and nominal exchange rate data. Source: Larrain and Tavares (2003).

*Asymmetry of Output Growth* – Standard deviation, over each period of time, of the difference in the shocks to countries  $i$  and  $j$ . Output shocks for each country are calculated as annual change in the log of real GDP. The source for real GDP data is the IFS series of GDP. Source: Larrain and Tavares (2003).

*Dissimilarity of Export Structure* – Calculated adding, for the first eight 1-digit SITC codes, the absolute value of the difference between countries  $i$  and  $j$  of the export shares for each category. The mean is then taken over the appropriate period of time. Source: Larrain and Tavares (2003).

*Size of the Economies* – Calculated as the mean, over each period of time, of the average of countries  $i$  and  $j$ 's GDPs (logs). The GDP data are in constant dollars. Source: Larrain and Tavares (2003).

*Distance Between Economies* – Computed as the log of the Great Circle distance between the capital cities of countries  $i$  and  $j$ . Source: Rose (2000).

*Average Per Capita GDP* – log of the product of the real per capita GDPs of countries  $i$  and  $j$ . Unit: constant dollars. Source: Rose (2000).

*Common Language Indicator* – dummy variable which takes value 1 if two countries share the same official language. Source: Rose (2000).

*Common Colonizer Indicator* – dummy variable if the two countries were colonies and shared the same colonizer after 1945. Source: Rose (2000).

*Island Indicator* – takes value 1 if one of the countries  $i$  or  $j$  is an island, 2 if both of them are islands and 0 otherwise. Source: Rose (2000).

*Development of Rule of Law* – product of the indicators of development of the rule of law in each country, taking the value 1 when both countries have reached the highest level. Source: Lopes and Tavares (2009).

*Development of Civil Liberties* – product of the indicators of development of civil liberties in each country, taking the value 1 when both countries have reached the highest level. Source: Lopes and Tavares (2009).

#### References

- Bekaert, Geert, Hodrick, Robert J., 2006. International stock return comovements. CEPR Discussion Paper 5855.
- Books, Robin, del Negro, Marco, 2002. International stock returns and market integration: a regional perspective. IMF Working Paper.
- Dumas, Bernard, Harvey, Campbell J., Ruiz, Pierre, 2003. Are correlations of stock returns justified by subsequent changes in national outputs? *Journal of International Money and Banking* 22 (6), 777–811 (November).
- Goetzmann, William N., Li, Lingfeng, Rouwenhorst, K. Geert, 2001. Long-term global market correlations. NBER Working Paper 8612.
- Heaney, Richard, Hooper, Vince, Jaugietis, Martin, 2002. Regional integration of stock markets in the Latin America. *Journal of Economic Integration* 17 (4), 745–760.
- Heston, Steven L., Rouwenhorst, K. Geert, 1994. Does industrial structure explain the benefits of international diversification? *Journal of Financial Economics* 36 (1), 3–27.
- Kubelec, Chris, and Sá, Filipa 2008 “The Geographical Composition of National External Balance Sheets: 1980–2005”, Mimeo, Bank of England.
- Larrain, Felipe, Tavares, José, 2003. Regional currencies versus dollarization: options for Asia and the Americas. *Journal of Policy Reform* 6 (1), 35–49.
- Lee, Keun Yeong, 2005. The contemporaneous interactions between the U.S., Japan and Hong Kong stock markets. *Economic Letters* 90, 21–27.
- Lopes, José, and Tavares, José (2009), “Currency Volatility versus Currency Agreements: What Drives Bilateral Trade Flows?”, Mimeo, Universidade Nova de Lisboa.
- Pascual, Antonio Garcia, 2002. Assessing European stock markets (co)integration. *Economics Letters* 78 (2), 197–203.
- Ramchand, Latha, Susmel, Raul, 1998. Volatility and cross correlation across major stock markets. *Journal of Empirical Finance* 5 (4), 397–416.
- Rangvid, Jesper, 2000. Increasing convergence among European stock markets? *Economic Letters* 71 (1), 383–389.
- Roll, Richard, 1992. Industrial structure and the comparative behavior of international stock market indices. *Journal of Finance* 47 (1), 3–41.
- Rose, Andrew, 2000. One Money, one market: estimating the effect of common currencies on trade. CEPR Discussion Papers 2329.
- Wälti, Sébastien 2006, “Stock Market Synchronization and Monetary Integration”, Mimeo, Department of Economics, Trinity College Dublin.