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Are European Stock Markets Influencing Latin American Stock Markets?

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Abstract

In this study, we examine the response of Latin American stock markets to movements in European stock markets. Our results vary depending on the openness of the country in terms of international trade. We find evidence that Latin American stock markets are affected by Spanish stock market. Additionally, during the second and third-periods (1995 to 1998 and 1999 to 2004) Spain appears to have much stronger ties (such as more trade) with Brazil and Chile, and this might explain why Brazil and Chile are affected from Spain and not from the other European markets. This study uncovers two important findings. First, Spain has an effect on Latin American markets but these responses are not homogeneous across markets. Second, the magnitude of Spain's influence is different in each of the three sub-periods under study.

Keywords: Emerging Markets, Latin America, Stock Markets Interdependence.
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Introduction

Previous studies on Latin American stock markets have examined the following issues: (1) effect of the US market (Soydemir, 2000; Meric *et al*., 2001a,b; Ratanapakorn and Sharma, 2002); (2) interdependence (Ratner and Leal, 1996; Choudhry, 1997; Meric *et al*., 1998; Christofi and Pericli, 1999; Pagan and Soydemir, 2000; Chen *et al.*, 2000; Pretorius, 2002; Johnson and Soenen, 2003); (3) effect of macroeconomic variables (Bailey and Chung, 1995; Bilson *et al*., 2001; Adrangi *et al*., 2001; Verma and Ozuna, 2003); (4) asymmetric responses (Pagan and Soydemir, 2001); (5) effect of the US Treasury Bill Market (Soydemir, 2002); (6) volatility (Ortiz and Arjona, 2001); (7) contagion (Calvo and Reinhart, 1996; Bazdresch and Werner, 2000); (8) interrelationships among regional stock indexes (Ratanapakorn and Sharma, 2002) and (9) global and regional integration indexes (Barari 2004).

These studies have consistently supported the argument that Latin American equity markets are driven by both global and local risk factors. Specifically, the US market and the local macroeconomic variables are the most significant global and local factors respectively. However, an area of research that has drawn little attention is whether Latin American markets have any significant relationship with the European markets. One can expect such relationship due to the developments in some of the following areas: first, there has been significant growth in the bilateral trade between Europe and Latin America in the past few years (Yeyati and Sturzenegger, 2000; Europa, 2005); second, following the privatization policies pursued by Latin America, there has been a significant increase in the foreign direct investments in the region by European countries (Hawkins and Mihaljek, 2000; Bubel and Skelton, 2002); third, during the recent years, the capital flows into Latin America from Europe have been steadily increasing due to low European interest rates (Verner, 1999; Yeyati and Sturzenegger, 2000). Since trade links, foreign direct investments and international capital flows are important determinants of the international stock market linkages, one can expect significant co-movements between Latin American and European stock prices.

Our study contributes the literature as follows. First, unlike previous studies that have examined the role of the US market, we investigate the impact of the European stock markets; second, we examine how this relationship (if any) changes during the three periods of the study; and third, we analyze whether Latin America markets respond homogeneously to European markets.

The results generated from the Ordinary Least Squares (OLS) model suggest that Latin American stock markets are affected with varying degrees of magnitude, to movements in the stock market of Spain. In addition, there are significant differences in the response of these markets during different sub-sample periods.

The balance of the paper is organized as follows: section 1 provides a description of the linkages between Latin America and Europe. Section 2 describes the theories of stock market interdependence. Section 3 presents the empirical results of the estimated model and a discussion of these results. Lastly, section 4 concludes the study and draws implications.

1. Linkages between Latin America and Europe

Economic fundamentals might play an important role regarding the degre of stock market interconnectedness. Dornbusch *et al*. (2000) argue that trade links have been identified as one of the major channels through which a crisis in one economy can affect the economic fundamentals of other countries. A frequent measure of market interconnectedness includes the contemporaneous movement of output growth between countries, which is based on the theory that substantial trade transmits economic activity from one country to another. If two countries experience co-movements in their output, then their cash flows will move together and so will their stock markets (Phylaktis and Ravazzolo, 2002). Empirical studies have confirmed the long-run positive relationship between economic activity and stock prices (Schwert, 1990, and Roll, 1992, for the US, and Canova and DeNicolo, 1995, for European countries). The importance of Europe and, in particular, of some European Union (EU) members as a source of capital inflows to Latin America has been steadily increasing during recent years (Yeyati and Sturzenegger 2000). According to the European Commission-External Relations (Europa, 2005), trade between the European Union and Latin American countries is becoming increasingly important.

Table 1 shows the direction of trade flows between Brazil, Chile, and Mexico and European countries (UK, Spain, France, Italy, and Germany) and the US. Mexico has the highest trade links with the US among the Latin American countries. Overall, the volume of exports and imports of Brazil, Chile, and Mexico to European countries increased from 1990 to 1998, suffered a small decline in 1998 and increased again from 1999 to today. During the period of 1990 to 2003 imports from Spain by Mexico, Brazil, and Chile increased 170%, 325%, and 183% respectively, whereas exports from these countries to Spain increased by 2%, 120%, and 76% respectively. Although European countries have now much stronger trade links with Mexico, these represent only about one tenth of the Mexico-US trade. In addition, the volume of exports and imports of Brazil and Chile with respect to the US is much smaller than that of Mexico. Overall, in the year 2002, EU imports from Latin America and the Caribbean accounted for ε$53.7 billion, and exports to the region amounted to 57.5 billion (Europa, 2005).

Table 1
Directions of trade flows

Panel a: Mexico

	US		UK		Spain		France		Italy		Germany	
Year	*Export*	*Import*	*Export*	*Import*	*Export*	*Import*	*Export*	*Import*	*Export*	*Import*	*Export*	*Import*
1990	18,494	19,848	182	590	1,440	504	546	716	208	447		
1991	18,738	24,652	225	496	1,184	572	607	980	170	621	558	2,328
1992	37,284	45,721	242	590	1,234	822	594	1,260	146	955	489	2,318
1993	42,935	48,321	220	544	876	1,172	444	1,012	76	735	426	2,652
1994	51,198	54,813	276	706	870	1,338	426	1,527	99	1,021	401	3,100
1995	66,339	53,973	488	531	789	694	484	980	197	771	515	2,686
1996	79,771	67,615	434	679	953	629	375	1,020	183	999	596	3,174
1997	93,019	83,214	556	943	947	1,056	367	1,230	344	1,531	624	3,997
1998	101,927	93,307	621	1,055	719	1,256	379	1,430	195	1,580	1,112	4,542
1999	120,455	105,376	746	1,135	822	1,321	294	1,394	170	1,649	2,088	5,031
2000	147,186	127,789	859	1,091	1,527	1,430	376	1,469	224	1,850	1,459	5,728
2001	140,465	114,060	673	1,325	1,254	1,827	376	1,578	239	2,100	1,504	6,079
2002	143,151	106,901	625	1,350	1,433	2,224	351	1,808	174	2,171	1,237	6,066
2003	147,027	106,082	561	1,242	1,465	2,288	324	2,019	267	2,475	1,753	6,275

Panel b: Brazil

	US		UK		Spain		France		Germany		Italy	
Year	*Export*	*Import*	*Export*	*Import*	*Export*	*Import*	*Export*	*Import*	*Export*	*Import*	*Export*	*Import*
1990	7,733	4,505	945	460	705	240	902	635	0	0	1,615	732
1991	6,387	5,395	1,057	489	706	243	864	652	2,158	2,030	1,353	845
1992	7,081	5,379	1,287	435	739	171	844	631	2,074	2,018	1,597	876
1993	8,030	6,270	1,140	565	676	258	791	736	1,824	2,422	1,312	1,005
1994	8,969	8,203	1,229	781	709	326	901	933	2,049	3,614	1,647	2,066
1995	8,799	12,752	1,326	988	877	818	1,038	1,412	2,158	5,423	1,713	3,159
1996	9,312	12,632	1,324	1,328	937	968	959	1,421	2,083	5,031	1,531	3,071
1997	9,408	15,244	1,259	1,560	1,057	1,199	1,151	1,732	2,608	5,349	1,709	3,626
1998	9,889	14,319	1,339	1,561	1,055	1,251	1,256	2,068	3,006	5,463	1,931	3,324
1999	10,868	12,414	1,437	1,273	1,171	1,224	1,227	2,070	2,544	4,901	1,845	2,704
2000	13,549	13,647	1,498	1,297	1,010	1,179	1,791	1,977	2,526	4,591	2,146	2,274
2001	14,379	13,596	1,705	1,287	1,030	1,286	1,675	2,184	2,502	4,950	1,809	2,279
2002	15,535	10,881	1,769	1,397	1,105	1,029	1,554	1,832	2,537	4,594	1,817	1,840
2003	16,901	10,166	1,899	1,251	1,552	1,019	1,752	1,844	3,136	4,375	2,208	1,828

Panel c: Chile

	US		UK		Spain		France		Italy		Germany	
Year	*Export*	*Import*	*Export*	*Import*	*Export*	*Import*	*Export*	*Import*	*Export*	*Import*	*Export*	*Import*
1990	1,428	1,372	557	180	272	159			407	193	398	297
1991	1,388	1,582	559	163	348	148	716	499	339	177	388	241
1992	1,582	1,984	619	188	361	223	609	631	377	273	381	282
1993	1,526	2,477	552	215	243	278	493	620	331	335	376	346
1994	1,861	2,638	505	243	221	341	548	507	352	350	394	362
1995	2,138	3,793	1,044	247	304	445	808	790	596	509	501	446
1996	2,373	4,109	917	282	275	530	758	730	490	551	404	582
1997	2,439	4,332	1,040	320	334	621	750	844	498	700	450	502
1998	2,360	4,025	1,157	256	280	656	570	812	675	680	450	680
1999	2,811	2,986	1,063	181	313	409	563	615	639	513	492	411
2000	3,008	3,273	1,065	176	377	426	459	600	823	418	632	442
2001	3,484	2,976	1,243	193	354	464	547	684	830	435	621	573
2002	3,483	2,549	797	183	389	416	426	718	856	352	631	619
2003	3,570	2,531	694	180	480	451	578	696	924	386	743	593

There seems to be agreement in the literature about the argument that the recent increase in the supply of foreign direct investment and capital has been driven by the success of some Western Hemispheric countries in implementing sound macroeconomic policies and structural reforms. European foreign direct investment in Latin America, for instance, rose from US$31,179 million to US$73,915 million between 1996 and 1999. This was largely the result of privatization programs undertaken by most countries in the Latin American region, focusing initially on industrial sectors and subsequently on service sectors (Europa, 2005). International companies have invested a total of US$136.9 billion in Latin America since 1995, with 45% of this coming from Spanish companies, followed by US (32%), French, Portuguese, UK, Canadian and Italian firms (Thomson Financial Services). The banking industry, for example, represents the most impacted industry due to liberalization. The market share of foreign banks in the region rose from 7% in 1990 to 40% in 2000 (Hawkins and Mihaljek, 2000). Foreign banks accounted for 78.8% of the Mexican banking market while they controlled 24.4% of the market in Brazil and 47% of the market in Chile (Bubel and Skelton, 2002).

Table 2 reports the European and US foreign direct investment from 1990 to 2002 in Brazil, Chile and Mexico. From 1990 to 1997, the US had the highest FDI in Brazil. By contrast, after 1998, Spain had the highest Forergn Direct Investiment (FDI) in Brazil. The UK and France also had a very significant share of FDI in Brazil. A very similar pattern took place in Chile during the same period. In the case of Mexico, the US remained the highest Foreign Direct Investment (FDI) contributor. From 1990 to 1998, the EU became the main recipient of investment from Latin America while the EU's principal destination of FDI was Latin America. European FDI inflows peaked in 2000 (Europa, 2005).

Table 2
Foreign direct investment
(in millions of US dollars)

Region/ economy	*1990*	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*
Brazil													
France	77.6	87.1	44.7	37.4	104.3	na	969.9	1235.3	1805.4	1982.1	1909.7	1912.8	1815
Germany	103.4	35.2	53.1	16.2	130.1	na	212	195.9	412.8	480.8	374.6	1047.5	628.3
Italy	3.3	10.1	-93.5	81.6	30.1	na	12.3	57.4	646.6	408.5	488	281.3	472.5
Spain	12.9	8.3	20.7	16.8	-3.4	na	586.6	545.8	5120.2	5702.2	9592.9	2766.6	586.9
United Kingdom	90.2	-14.8	214.4	153.2	384.2	na	91.5	182.5	127.9	1268.8	393.7	416.2	474.4
United States	144.5	461.5	1008.8	472.5	1476.7	na	1975.4	4382.3	4692.5	8087.6	5398.7	4464.9	2614.6
Chile													
France	na	na	40.2	12.3	27.2	26.6	65.8	62.6	150.2	608	43	57.5	20.2
Germany	na	na	16.1	10	8.7	56.3	-6.6	25.8	146.9	69.1	10.6	30.9	7.9
Italy	na	na	3.3	2.5	7.9	5.2	324.9	18.5	5.6	51.2	96.1	920	29.7

continue...

Region/ economy	*1990*	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*
Spain	na	na	7.1	103.4	17.6	55.4	487.8	1497.7	896.1	4582.8	723.4	388.5	241.6
United Kingdom	na	na	17	17.8	36	90.3	231.7	200.6	411.6	310.9	180.3	423.6	1499.2
United States	na	na	300.1	624	1001.2	1550.4	2263.8	934.6	1358.1	1909.1	750.9	1759.8	529.9
Mexico													
France	na	na	na	na	90.5	125.9	124	59.8	127.8	167	-2565.9	354.8	150
Germany	na	na	na	na	307.5	548.6	201.4	481.1	136.9	742.6	342.8	-195.5	476
Italy	na	na	na	na	2.7	10.5	18.3	29.1	17.2	35.8	31.6	15.2	9.5
Spain	na	na	na	na	144.3	49.6	73.5	326.9	307.8	995.4	1890.3	585.3	239.8
United Kingdom	na	na	na	na	593.4	218.7	82.7	1829.8	182.9	-193.5	237.3	91.1	69.3
United States	na	na	na	na	4961.5	5480.7	5180.6	7432	5288.6	6904.6	11363.9	19812.1	7071.4

Source: UNCTAD.

The capital flows to Latin America from Europe have been increasing during the last few years (Yeyati and Sturzenegger, 2000; Europa, 2005). The growing significance of Europe as a source of foreign funds in Latin America is the result of a general trend towards international portfolio diversification common to most European banks. European investors see Latin American markets as another potentially profitable choice for their investments. The managers of the growing pools of savings in European countries with aging populations seek higher returns by increasing their investments in fast-growing developing countries. Private institutions such as pension funds and insurance companies have shifted a large share of their portfolios into Latin American countries in order to diversify their portfolios (Verner, 1999). The stock of European investment in Latin America and the Caribbean continues to increase and in 2002 it accounted for more than ε$200 billion (Europa, 2005).

In addition to the success of some Latin American countries in implementing sound economic policies, studies have found that the increase in the supply of capital to Latin American economies emerges from the relatively low interest rates that followed the recent recessionary period in Europe, and from the decrease of attractive opportunities for investors to diversify their portfolios within European markets as a consequence of the common interest rates and high correlation among European MonetaryUnion (EMU) members (Soydemir, 2000; Yeyati and Sturzenegger 2000).

European countries have become important suppliers of foreign investment in Latin America, perhaps competing with the US as the main source of international capital (Verner, 1999; Yeyati and Sturzenegger, 2000). Furthermore, capital flows to emerging markets such as those in Latin America have predominantly been driven

by liquidity and performance considerations in contrast to the developed long-term banking relationships (Soydemir, 2000). Therefore, one could expect to see changes in the relationships between Latin American and European stock markets during the last 15 years.

This study attempts to contribute to the existing literature by examining whether European stock markets have an impact on Latin American stock markets.

2. Data and econometric methodology

In order to measure the effect of the European stock markets on Latin American stock markets, we use weekly closing equity price indexes from Spain, Italy, Germany, France, and UK and from Brazil, Chile, and Mexico. We also included US stock market data to test for response heterogeneity across Latin American markets to shocks originating in the world's largest equity market.

The stock market indices represented in our study are the Bovespa price index for Brazil, the General Price Index (IGPA) for Chile, the IPC price index (BOLSA) for Mexico, Madrid SE price index for Spain, the Milan MIB Storico price index for Italy, the DAX Industrial price index for Germany, the CAC 40 price index for France, the FTSE100 for UK, and the S&P500 composite price index for the US.

The Latin American stock markets included in our study have exhibited phenomenal growth in the past two decades. Brazil, Mexico, and Chile are placed among the top 30 developed and emerging markets in the world and are ranked 18th, 25th, and 30th respectively (IFC, 1999). The European countries included in this paper were among the first to form the EMU, and have shown stronger economic ties with the selected Latin American countries (IMF, 1999).

The data set spans from January 4th, 1988, to December 8th, 2004, and contains 778 observations. We transform our data into weekly percentage returns as $(\log P_t - \log P_{t-1})$, where P_t is the value of the index at time *t* in terms of the local currency, in this way we are able to obtain continuously compounded returns (Tsay, 2002). This transformation facilitates our econometric estimation. To examine the stability of the results we run a VAR model for the whole sample period (January 4th, 1988, to December 8th, 2004) and for three sub-sample periods based on the dates of major events in the period. The sub-sample periods are January 1988 to December 1994, January 1995 to December 1999, and January 2000 to December 2004.

There are two major reasons for dividing the data in three sub-samples. First, because of the changes in the levels of trade, FDI, and capital flows among the

countries during the whole sample period. For instance, the volume of exports and imports of Brazil, Chile, and Mexico to European countries increased from 1990 to 1994, however, they suffered a small decline in 1998 and increased again from 1999 to date.

Second, during the last 20 years these markets have faced financial crises and contagion. Kaminsky and Reinhart (1998), Edwards (2000), and UN (1998) have documented spillover effects from Asian financial crises to financial markets in Latin America. Similarly, Edwards (2000) and Gelos and Sahay (2000), report that Russian financial crises have had significant effects on Latin America financial markets. These studies found that these financial crises weakened domestic economies, affecting other countries with which they had trade links, propagating the shocks. Therefore, it is important to consider in our study these major events, to evaluate whether external financial crises had an influence on the linkages among European and Latin American stock markets.

During the sub-sample period of January 1988 to December 1994, currency and banking crises unfolded in Mexico and were followed by the so called "tequila effect." This was also a period of hyperinflation in Brazil. Then, during the sub-sample period of January 1995 to December 1999, a financial crisis started in Thailand (1997) and spread across Malaysia, Indonesia, Korea and other Asian countries. During the same period, the Russian crisis (1998) took place, which impacted Latin American countries. During the sub-sample period of January 2000 to December 2004, the EMU members switched to the euro currency.

Table 3 reports the descriptive statistics of the continuously compounded returns for the data used in this study. Latin American markets, in general, experienced higher risk (as measured by standard deviation) compared to those markets in Europe and in the US. The stock markets of Brazil and Mexico exhibited highly volatile returns as measured by their respective standard deviations while the Chilean stock market displayed low volatility of returns. When comparing the standard deviation and the mean, higher average return for most countries are associated with higher levels of volatility.

The skewness statistics suggest lack of normality in the distributions of returns. The US and all the European markets had distributions of returns that were negatively skewed. Latin American countries such as Brazil and Chile, however, had positively skewed distributions whereas Mexico exhibited a negative skewed distribution of returns. The values of kurtosis indicate that the returns of all countries are leptokurtic compared to the normal distribution (i.e., they are more peaked than normal distribution).

Table 3
Descriptive Statistics of Returns (in local currency)

Local Currency	*Mean*	*Median*	*Maximum*	*Minimum*	*Std. Dev.*	*Skewness*	*Kurtosis*
R_BR	0.0189	0.0101	0.6931	-0.6931	0.1118	0.1179	19.9254
R_CH	0.0031	0.0024	0.1325	-0.1218	0.0234	0.1195	7.0056
R_MX	0.0043	0.0058	0.1730	-0.1676	0.0385	-0.1793	4.2786
R_SPA	0.0014	0.0036	0.0960	-0.1414	0.0271	-0.4277	5.0613
R_ITL	0.0009	0.0031	0.1058	-0.1153	0.0298	-0.1669	3.8493
R_GER	0.0011	0.0023	0.1490	-0.1526	0.0311	-0.4847	5.8852
R_FR	0.0008	0.0009	0.1432	-0.1094	0.0287	-0.1066	5.0601
R_UK	0.0009	0.0010	0.0991	-0.0815	0.0216	-0.1294	4.7257
R_US	0.0016	0.0023	0.0895	-0.1041	0.0213	-0.3559	4.7441

Note: (R_BR) Brazilian stock market return; (R_CH) Chilean stock market return; (R_MX) Mexican stock market return; (R_SPA) Spain market return; (R_ITL) Italian market return; (R_GER) German stock market return; (R_FR) French stock market return; (R_UK) UK stock market return; and (R_US) US stock market return. All the variables are in the form of continuously compounded rate of change.

Table 4 provides the correlation matrix of stock market returns for all countries in both local currency (panel a) and US dollars (panel b). The pair-wise correlations amongst the Latin American countries were low when compared to those amongst the European and US market returns. For example, Chile/Mexico exhibited the highest correlation for Latin America countries at 0.295 while the correlation for the Germany/France pair was the highest at 0.805 for the European countries. However, when comparing Latin American stock market returns with those of the US market, the highest correlation turned out to be the one between the US and Mexico at 0.513 in local currency and at 0.416 in US dollars. Latin American markets do not seem to exhibit much correlation with any European country. Mexico showed a correlation above 0.400 with the European countries, except Italy, where the correlation was 0.376. However, on average, the correlation of Brazil with European markets was about 0.16 while the correlation of Chile with European markets was approximately 0.22.

Table 4

Panel a
Correlation Coefficients (in local currency)

	R_BR	*R_CH*	*R_MX*	*R_SPA*	*R_ITL*	*R_GER*	*R_FR*	*R_UK*	*R_US*
R_BR	1								
R_CH	0.261	1							
R_MX	0.262	0.295	1						
R_SPA	0.174	0.262	0.483	1					
R_ITL	0.113	0.161	0.376	0.629	1				
R_GER	0.186	0.206	0.464	0.708	0.673	1			
R_FR	0.176	0.231	0.465	0.732	0.647	0.805	1		
R_UK	0.147	0.252	0.438	0.649	0.562	0.717	0.744	1	
R_US	0.196	0.274	0.513	0.548	0.468	0.655	0.652	0.654	1

Panel b
Correlation Coefficients (in USD$)

	R_BR	*R_CH*	*R_MX*	*R_SPA*	*R_ITL*	*R_GER*	*R_FR*	*R_UK*	*R_US*
R_BR	1								
R_CH	0.261	1							
R_MX	0.337	0.337	1						
R_SPA	0.256	0.227	0.396	1					
R_ITL	0.150	0.139	0.260	0.610	1				
R_GER	0.231	0.202	0.340	0.665	0.604	1			
R_FR	0.235	0.212	0.331	0.685	0.587	0.785	1		
R_UK	0.171	0.217	0.293	0.593	0.497	0.653	0.659	1	
R_US	0.246	0.260	0.416	0.455	0.397	0.580	0.574	0.566	1

Note: All the variables are in the form of continuously compounded rate of change.

Standard correlation measures can offer misleading results when they fail to take into account relations that take place over longer time horizons. A long-run correlation estimator, such as the block estimator presented in Bartlett (1946), can be used to calculate the relationship between permanent stock market innovations, thus, eliminating this problem. The use of a block estimator involves the choice of interval and alignment parameters, which can be done optimally following the approach presented in Albuquerque (2001). The results are presented in Table 5.

Table 5

Panel a
Long-Run Correlation Coefficients (in local currency)

	R_BR	*R_CH*	*R_MX*	*R_SPA*	*R_ITL*	*R_GER*	*R_FR*	*R_UK*	*R_US*
R_BR	1								
R_CH	0.461	1							
R_MX	0.363	0.472	1						
R_SPA	0.311	0.313	0.498	1					
R_ITL	0.207	0.185	0.378	0.793	1				
R_GER	0.281	0.263	0.455	0.761	0.730	1			
R_FR	0.221	0.297	0.470	0.818	0.751	0.850	1		
R_UK	0.293	0.350	0.508	0.768	0.611	0.714	0.763	1	
R_US	0.212	0.307	0.506	0.740	0.593	0.696	0.745	0.799	1

Panel b
Long-Run Correlation Coefficients (in US$)

	R_BR	*R_CH*	*R_MX*	*R_SPA*	*R_ITL*	*R_GER*	*R_FR*	*R_UK*	*R_US*
R_BR	1								
R_CH	0.430	1							
R_MX	0.368	0.416	1						
R_SPA	0.438	0.260	0.386	1					
R_ITL	0.262	0.146	0.260	0.689	1				
R_GER	0.331	0.264	0.340	0.662	0.640	1			
R_FR	0.295	0.268	0.331	0.737	0.614	0.806	1		
R_UK	0.379	0.266	0.288	0.713	0.518	0.648	0.680	1	
R_US	0.366	0.329	0.416	0.642	0.492	0.629	0.658	0.682	1

Note: All the variables are in the form of continuously compounded rate of change.

As expected, long-run correlation estimates are typically greater than standard correlation estimates. The overall conclusions, however, did not change. Latin American long-run correlations were typically lower than those of European countries. Mexico had the highest long-run correlation levels with the US. Chile had the lowest long-run correlation levels when measured in foreign currency while Brazil had the lowest long-run correlation levels when measured in local currency.

Darrat and Zhong (2002) argue that the relative low correlations of emerging markets with more mature markets appear to be consistent with

international diversification. However, the study of Cooper and Kaplanis (1994) showed that US investors held nearly all (more than 95%) of their portfolios in domestic assets. This means that portfolios held by investors are typically different from the optimal ones, given the estimated weak correlations. Additionally, Kasa (1992) argued that correlations do not convey real information about relationships across national markets. Thus, these portfolio patterns beg the question about whether simple correlations provide sufficient information to reveal the linkages between Latin American markets and the more mature markets of Europe.

3. Estimation results

In order to capture if there is any effect of European stock markets on Latin American stock markets, we run the following OLS model.

$$R_{i,t} = \sum_{j=1}^{5} \beta_{i,j} EC_{j,t} + C_{i,t} + \varepsilon_{i,t};\ i = 1, 2, 3;\ j = 1 \text{ through } 5,$$

$$\text{and } \varepsilon_{i,t} \sim N(0, \sigma^2_{i,t}) \qquad (1)$$

Where:

$R_{i,t}$ is the return on the market index (i = 1,…,3; where 1 = Chile, 2 = Brazil, 3 = Mexico);

EC_i represents each European stock market (j=1,…,5; where 1=Spain, 2=UK, 3=Germany, 4=Italy, 5=France);

α_i, and β_i are the parameters to be estimated; and

ε_{it} is the random error term.

Table 6 presents the estimates of the OLS results for Brazil. The results show that for the sub-sample period of January 1988 to December 1994 none of the countries in the study has a statistically effect on the Brazilian returns. However for the subsequent sub-sample periods, we can see that both the US and Spain stock markets have positive effects on the Brazilian stock market. The US-Brazil and Spain-Brazil trade links and the FDI links increased importantly during the second and third period, which may partially explain the difference in response patterns between these sub-periods for these countries.

Table 6
OLS results for brazil

Variable	*1988-1994 coefficient*	*Prob.*	*1995-1998 coefficient*	*Prob.*	*1999-2000 coefficient*	*Prob.*
R_US	0.478	0.244	1.322	0.000	0.498	0.007
R_SPA	0.296	0.329	1.062	0.000	1.089	0.000
R_UK	-0.530	0.127	0.004	0.990	-0.074	0.748
R_GER	0.161	0.638	-0.233	0.390	0.261	0.206
R_ITL	-0.183	0.426	0.067	0.674	-0.181	0.385
R_FR	0.420	0.223	-0.306	0.261	-0.277	0.330
C	0.005	0.450	-0.006	0.176	0.001	0.704
R-squared	0.026		0.231		0.309	
Durbin-Watson	2.008		2.371		2.294	

Table 7 presents the result of the OLS for Mexico. The finding shows that, for the three sub-sample periods, the coefficients for US and Spain are positive and statistically significant. Consistent with the finding of Soydemir (2000), we find that there is a positive and significant effect of the US on the Mexican stock market. Unlike Soydemir (2000), we also considered the effects of European Markets on Latin America. Lastly, we do not find evidence that the stock markets of the UK, Germany, Italy, and France had an effect on the stock market of Mexico. These findings are consistent with the trade links observed between these economies. The US-Mexico trade links are stronger than those between Spain and Mexico.

Table 7
OLS results for Mexico

Variable	*1988-1994 coefficient*	*Prob.*	*1995-1998 coefficient*	*Prob.*	*1999-2000 coefficient*	*Prob.*
R_US	0.448	0.008	1.122	0.000	0.73	0.000
R_SPA	0.572	0.000	0.778	0.000	0.326	0.006
R_UK	-0.156	0.277	-0.218	0.372	0.046	0.735
R_GER	0.079	0.576	-0.069	0.734	0.076	0.529
R_ITL	-0.175	0.064	0.209	0.119	0.031	0.797
R_FR	-0.037	0.794	-0.153	0.436	-0.098	0.557
C	0.006	0.021	-0.009	0.010	0.003	0.074
R-squared	0.111		0.352		0.418	
Durbin-Watson	1.773		1.626		1.791	

Table 8 presents the result of the OLS for Chile. Like the results for Brazil, the findings show that neither the European nor the US stock markets have an effect on Chile's stock market during the first sub-sample period. However for the subsequent sub-samples periods, we find that Chilean stock market is affected by the US and Spain stock markets. The coefficient estimates for US and Spain are positive and statistically significant. The Chile-Spain trade and foreign direct investment links are greater than those for Chile and the US during the second sub-period, which may partially explain the importance of Spain in the Chilean stock market.

Table 8
OLS results for Chile

Variable	*1988-1994 coefficient*	*Prob.*	*1995-1998 coefficient*	*Prob.*	*1999-2000 coefficient*	*Prob.*
R_US	0.136	0.213	0.427	0.000	0.275	0.000
R_SPA	0.037	0.645	0.344	0.001	0.225	0.004
R_UK	0.112	0.226	-0.022	0.863	0.021	0.819
R_GER	-0.041	0.649	-0.053	0.623	-0.030	0.713
R_ITL	-0.026	0.665	-0.091	0.202	0.013	0.876
R_FR	0.004	0.966	-0.024	0.817	-0.016	0.886
C	0.006	0.001	-0.006	0.002	0.002	0.062
R-squared	0.016	0.006	0.198	-0.003	0.225	0.002
Durbin-Watson	1.741	0.461	1.664	0.000	1.618	0.000

Conclusion

In this study an OLS model is estimated to examine whether the stock markets of Latin American countries (Brazil, Chile, and Mexico) are affected by the US and the European stock markets from January 1988 to December 2004. The estimation and analysis was conducted for three sub-periods.

During the first period of the study (January 1988 to December 1994), neither the US nor the European stock markets have an effect on the returns of Brazil and Chile. Of all the European countries in the study, Spain is the only stock market that has a significant impact on the three Latin American stock markets during the second and third sub-sample periods. Consistent with previous studies, we found that the US stock market had a strong influence on the Latin American stock markets during the three sub-periods under study for Mexico and during the second sub-period for Brazil and Chile.

Our findings are consistent with the view that trade links and differences in institutional structures caused emerging markets to respond differently to shocks originating from Europe and the US For example, Mexico is more responsive to US stock market movements than to European shocks, which can be attributed to the fact that the Latin American economies, and especially Mexico, are more geared towards the US economy.

In sum, this study uncovers two important findings. First, Spain, seem to have influenced Latin American markets. Second, the effects of European markets are not homogeneous across Latin American markets or through time. These results are particularly important for investors and policy makers, especially in those Latin American markets with increasingly stronger ties to some European markets.

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