DYNAMICS AND VOLATILITY AT STOCK MARKET INDEXES OF PACIFIC ALLIANCE COUNTRIES

Jaime Rojas-Mora
Julio César Chamorro-Futinico

Panorama Económico – Vol. 24. Cartagena, Octubre 2016 – Septiembre 2017

Panorama Económico, 24 (Octubre 2016 – Septiembre 2017), pp. 71-84

Jaime Rojas-Mora
Julio César Chamorro-Futinico

Dinámica y volatilidad en los índices bursátiles de los países de la Alianza Pacífico

Resumen
El Acuerdo del Mercado Integrado Latinoamericano (MILA) suscrito entre Peru, Chile, Colombia y Mexico fue suscrito en el marco de la Alianza del Pacífico, siguiendo la experiencia de la Union Europea y los procesos de integración en Asia y Medio Este. Este acuerdo busca diversificar los mercados y atraer inversionistas del resto del mundo. Mediante analisis de correlación y cointegración, ademas de fiunciones impulso-respuesta de vectores autoregresivos (VAR), idenficamos los impactos en los retornos y en la volatilidad de los principales indices para cada uno de los paises miembros del MILA.
Palabras Clave: Integración financiera, cointegración, volatilidad.
Clasificación JEL: F36, G15, G11.

Dynamics and volatility at stock market indexes of pacific alliance countries

Abstract
The Latin American Integrated Market agreement between Peru, Chile, Colombia and Mexico was signed within the framework under the Pacific Alliance, following the experiences of the European Union and integrated Asian and Middle Eastern markets. This agreement was aimed at diversifying markets and attracting global investors. Due to this, through the application of correlation and cointegration analyses, and using the impulse response function of vector autoregression (VAR), we identify the impacts on returns and volatility at the main stock indexes for each of MILA member countries.
Keywords: Financial integration, cointegration, volatility.
JEL Classification: F36, G15, G11.

Dynamique et volatilité dans les indices de bourse chez les pays de l'alliance Pacifique

Résumé
"Le Marché Intégré Latino-américain entre Pérou, Chili, Colombie et Mexique fut signé dans le cadre de l'Alliance Pacifique, suivant les expériences de l'Union Européenne et les marchés intégrés d'Asie et du Moyen Est. L'application d'analyse de corrélation et de co intégration, et de Vecteur Auto Régression servent a identifier les impacts sur le retour et sur la volatilité dans les principaux indices."
Mots-clés: Intégration Financière, co intégration, volatilité.
Nomenclature JEL: F36, G15, G11.

REVISTA PANORAMA ECONÓMICO JOURNAL

ISSN: 0122-8900 (Impreso) 2463-0470 (en línea)
Octubre 2016 – Septiembre 2017, pp. 71-84
PANORAMA ECONÓMICO 24

Editorial Universitaria Universidad de Cartagena

Artículo de Investigación

DYNAMICS AND VOLATILITY AT STOCK MARKET INDEXES OF PACIFIC ALLIANCE COUNTRIES

INFORMACIÓN DEL ARTÍCULO
Recepción de artículo: 15 de febrero de 2016
Concepto de evaluación: 3 de junio de 2016
Aceptación de artículo: 29 de junio de 2016

Jaime Rojas-Mora
Corporación Universitaria Minuto de Dios
Colombia
Julio César Chamorro-Futinico
Corporación Universitaria Minuto de Dios
Colombia

INTRODUCTION

Regional integration is a multidimensional process that includes coordination, cooperation, convergence and deep integration processes, whose reach encompasses not only economic and trade topics, but also political, social, cultural, environmental and financial ones (CEPAL, 2014). Under this frame, initiatives such as the European Union, ASEAN, UNASUR and GCC among others (Camara-Neto & Vernengo, 2010; Espinoza, Prasad, & Williams, 2011; Kim & Lee, 2012; Ocampo & Titelman, 2010; Pérez, 2010; Volz, 2013) articulated with a complex financial architecture, these enable integration and free capital mobility, thus allowing circulation of currency and convergence of interest rates.

In South America, four countries (Chile, Colombia, Mexico and Peru) led the initiative to create the Pacific Alliance, intended to: (a) build an integration area that allows free circulation of goods, services, capital and labor; (b) to boost growth and competitiveness in participating economies; and (c) become a political, economic and commercial articulation platform focused on the Asia-Pacific region. Therefore, the purpose of the current study consists of evaluating, through a VAR model (Enders, 2014; Lütkepohl & Krätzig, 2004), to what extent the stock indexes of member countries converge, and which could be the short and long term effect of financial integration originating from the Pacific Alliance (Christensen, 2014; Duwicquet & Mazier, 2011; Espinoza et al., 2011; Kim & Lee, 2012).

A brief history of financial integration throughout the world is delivered in the first section; next, the document exposes the origin of Mercado Integrado Latinoamericano (Latin

[1] Autor para correspondencia. Correo electrónico: rojasmoraster@gmail.com; jaerojasmo@unal.edu.co; chamorro.julioc@gmail.com; jcchamorrof@unal.edu.co

American Integrated Market [MILA]); the third section introduces the review of literature on financial integration studies and index convergence; the fifth section includes a detailed description of the methodology and finally the conclusions.

FINANCIAL INTEGRATION

Since 1957, with the establishment of the European Union with the treaty of Rome, the creation of a common market where goods, services, people and capital could flow freely began(Duwicquet & Mazier, 2011). The combination of trans-border integration of financial markets and liberalization of previously repressed national financial systems following the collapse of the Bretton Woods system in 1971 has been one of its fundamental transformations. Thus, after the opening of capital accounts and the introduction of single banking licences in the eighties, integration was officially finalised in late 1992. The introduction of the euro in 1999 gave a new impulse to financial integration by eliminating costs related to foreign Exchange and risk at international financial operations (Duwicquet& Mazier, 2011; Espinoza et al., 2011; Gur, 2013).

Parting from the above, the global trend on transformation and integration of stocks markets can be evidenced, in their mission to become more competitive. In this sense, the most important integration of stock markets was Euronextin 2000[1] (Schmiedel & Schönenberger, 2005.; Volz, 2013). Later, in 2004, the stock exchanges of Copenhagen, Stockholm and Helsinki merged into OMX Nordic. Later, in 2007, Euronext merged with New York Stock Exchange (NYSE), leading to the creation of NYSE-Euronext. In 2008, OMX Nordicwas bought by NASDAQand London Stock Exchange (LSE) acquired the Italian stock exchange (Borsa Italiana).

Following this trend, negotiations are being conducted in later years for additional mergers, namely those of LSE and Toronto stock Exchange, NYSE-Euronext, and Deutsche Börse, Singapore Exchange and Australian Securities Exchange(ASE), given the benefits found in economies of scale, greater reach and positive externalities created by integration, enabling cost reductions and increased efficiency on financial asset trading (Schmiedel and Schönenberger, 2005).So, in May 2011, framed under the Pacific Alliance, the initial stage of the integration between Bolsa de Comercio de Santiago (BCS), Bolsa de Valores de Colombia (BVC) and Bolsa de Valores de Lima (BVL) began, currently known as MILA.

Latin American Integrated Market (MILA)

MILA is the result of an agreement signed by BCS, BVC and BVL, in addition to central securities depositories (CSD) Deceval, DCV and Cavali, which, since 2008, began the process of creating a regional market for trading variable-income securities of these three countries, as a part of an initial stage, in which order routing between the three stock exchanges was enabled, which would motivate stock brokers to implement correspondence agreements with other brokers at the other exchanges (MILA, 2010). After this, an implementation agreement on the integration project was signed on June 2010, followed by the launch of said integration project by the three exchanges in Lima, on late

1 Euronext is an European stock market based in Amsterdam, which reunited previous stock exchanges in Paris, Amsterdam and Brussels, later joined by the stock exchanges of Lisbon and Porto (Schmiedel& Schönenberger, 2005).

2010 (MILA, 2010). So, in May 30 of 2011, MILA began its operations, aimed towards creating an integrated variable-income securities market that is attractive to local and foreign investors, by being an ample market where these could diversify their investments. On December 2014, Bolsa Mexicana de Valores (BMV) officially entered the agreement, further increasing the size of the stock Exchange available to investors through this integration project.

The second phase consists of the integration that guarantees capital mobility, needed to turn the integration into an efficient market(Fama, 1995; Hyme, 2003) through direct access to middlemen, standardised trading rules, and the definition of a transborder clearing and settlement model(MILA, 2010). With MILA, it is intended to create the largest stock Exchange markets in Latin America when measured by number of issuers, the second largest by stock capitalisation and the third largest by trading volume (CEPAL, 2014; MILA, 2010). The main goal of MILA consists of attracting investors to this new exchange by following the experiences of Europe and the United States (Schmiedel & Schönenberger, 2005).

Thus, in a combined fashion, MILA offers transaction and market capitalisation volumes that allow it to become an important alternative at international capital markets, and it will allow investors to build efficient portfolios which must be diversified and with higher liquidity, following Markowitz(1952). On the other hand, it will allow issuers to obtain financing in better conditions, while allowing stock brokers and middlemen to create new products and expand their business boundaries (Fama, 1995; Hyme, 2003; Markowitz, 1952; MILA, 2010; Schmiedel & Schönenberger, 2005).

LITERATURE REVIEW

According to Carrieri, Errunza, & Hogan (2007), integration processes at capital markets are gradual and take multiple years, with occasional delays. In general, these are part of important efforts that must include the proposition of reforms on the financial sector and the economy within a political process. Despite these changes have begun with regulation reforms at times, this does not mean the market has been integrated. In fact, it can be found during the process that legal barriers are not significantly related to a quantitative measurement based on market integration returns (Carrieri et al., 2007). The evolution of market integrations is also affected by the ability of foreign investors to enter a diversified market, as well as the ability of national investors to invest overseas through direct investments (Carrieri et al., 2007; Markowitz, 1952).

In this sense, literature on financial market integrations and convergence of stock market indexes in emerging markets has been mainly focused on Asian and Middle Eastern countries (Espinoza et al., 2011; Frey & Volz, 2013; Lee, Huh, & Park, 2013; Traczyk, 2012; You, Liu, & Du, 2014; You et al., 2014). Espinoza et al. (2011) analysed the degree of regional financial integration of the countries part of the Gulf Cooperation Council (GCC). Using data on interest rates, it was demonstrated there is a convergence, and that differences between interest rates are relatively short-lived, particularly when compared to those of the euro area after 1999. That is, data on variable-income securities using interrelated populations confirm that stock markets are highly integrated when compared to other emerging market regions (Espinoza et al., 2011).

On the other hand, You et al. (2014) explained whether economic integration could worsen financial contagion. Thus, they built a composite index on economic integration through a review of gradual reforms and aperture processes of Chinese financial markets. Parting from a dynamic conditional correlation model, they captured the correlations between Chinese stock returns and those of other important markets throughout the world, finding positive evidence for the aforementioned questions (You et al., 2014).

Frey & Volz (2013) examined the effects of political agreements on regional financial integration on the development of financial markets in sub-Saharan Africa, as well as on financing access and cost, finding that integration positively affects financial development when it is combined with a sufficient level of institutional quality. If institutional quality ranks below a threshold level, integration creates negative effects on financial development. However, there is no significant effect of integration on the ratio between private credit and GDP, nor banking sector efficiency (Frey & Volz, 2013).

When it comes to the effects of regional financial integration on access and financing costs of sub-Saharan Africa companies, Frey & Volz (2013) concluded that results were very ambiguous, as there is no significant effect of integration on financing access to all companies as a whole, but it impedes financing access to small companies. Besides, they found that credit restrictions to small companies had a significant positive influence of foreign banks' involvement, as a result of the integration.

Also, Kim & Lee (2012) examined real and financial integration of East Asia Economies, comparing real and financial integration degrees as well as regional and global ones, before and after the Asian crisis. The authors researched on price and quantities for measurements such as intraregional and interregional trade sizes, cross-border financial assets, correlations of stock returns, and differences on interest rates (Kim & Lee, 2012).

Next, Kim & Lee (2012) applied the structural panel vector autoregressive (VAR) model to analyse the macroeconomic consequences of real and financial integration on production and consumption, thus concluding that real integration degree increased significantly after the crisis, both in the region and throughout the world; measurements for quantities and prices showed greater financial integration after the crisis, unlike consumption relation; regional financial integration is lower than global financial integration, based on consumption relation; and financial integration lagged behind real integration especially on regional integration regional (Kim & Lee, 2012).

Meanwhile in Latin America, Agudelo, Barraza, Castro, & Mongrut (2012) estimated transaction costs associated to intraday liquidity of stocks belonging to the Latin American markets of Argentina, Brazil, Chile, Colombia, Mexico and Peru; during the period between July 2009 and January 2010. It was found that countries with higher market capitalisation such as Brazil, Mexico and Chile, enjoy lower transaction costs associated to liquidity, when compared to Peru, Argentina and Colombia. Besides, through a panel data model, they found there is a negative relationship between transaction costs associated to liquidity, with market

activity and volatility of stock returns. And finally, they discovered there are important differences between Chilean, Colombian and Peruvian stock markets, justifying their integration at MILA, while stating there is evidence of potential savings on associated transaction costs (Agudelo et al., 2012).

Similarly, Lizarzaburu Bolaños, Burneo, Galindo, & Berggrun (2015) determined the impact of MILA parting from the main stock Exchange indicators in Chile, Colombia and Peru, where multiple indicators were reviewed to measure its impact on returns, risk, correlations and trade volumes between markets, using indicators such as: annual returns, standard deviation, correlation coefficient and trade volumes, using a sample ranging from November 2008 to August 2013; it comprised the three stock markets associated to MILA: Bolsa de Comercio de Santiago (BCS), Bolsa de Valores de Colombia (BVC) and Bolsa de Valores de Lima (BVL). They concluded that, at the beginning of the integration process, results did not go as planned and the impacts on returns, risk and correlation were marginal, while the impact on volumes was negative (Lizarzaburu Bolaños et al., 2015).

METHODOLOGY AND RESULTS

The empirical analysis developed on the dynamics and volatility of stock indexes at the member countries of MILA considers three clearly defined stages. In the first stage, the database required for the study is consolidated, followed by 3 estimating the correlation and cointegration degree of the indexes. Finally, the impulse response technique is applied in order to learn about the reaction on the returns and volatility of the stock markets of one country, in case a shock affects any of the others.

First, data employed correspond to daily closing values in local currency and representative indexes of stock markets for each of the four countries, from January 15 of 2008 to August 6 of 2014. As the research goal consists of learning about the impact held by the creation of MILA on dynamics for return and volatility in stock indexes of participating countries, the total sample was divided into two subsamples, taking the creation date of MILA, April 28 of 2011, as the splitting point, while restricted by the fact that the COLCAP stock index began its measurements on January 15 of 2008. Therefore, the two samples were formed by a total of 825 observations each. Data on COLCAP[2], IPC[3] , IPSA[4] and PGEN[5] indexes were obtained from the websites of each stock exchange. It must be highlighted that, due to the number of holidays each country has in different calendar dates, the series was completed through missing data imputation. Daily returns were calculated as follows:

$$R_t = ln\left(\frac{P_t}{P_{t-1}}\right)$$

Table 1 introduces the correlation matrix for returns at the four stock Exchange indexes, for both subsamples, evidencing there was a decrease in the correlation on returns between the four stock exchanges

2 COLCAP corresponds to the main stock index in Colombia, reuniting the 20 companies with the highest market capitalisation in the country.

3 IPC corresponds to the main Mexican stock index, reuniting a balanced and representative sample of the stocks traded in that country.

4 IPSA corresponds to the main stock index in Chile, reuniting the 40 most representative companies at the stock market in that country.

5 PGEN corresponds to the general index of *Bolsa de Valores de Perú*, reuniting average trends for the main stocks traded in the stock markets of this country.

(Mexico, Colombia, Chile and Peru) after the creation of MILA.

Likewise, it is required to calculate volatility for each index, given by:

$$V_{it} = R_{it}^2,$$

Where V_{it} corresponds to the volatility for each of the indexes included in the study. In the particular case of volatilities, the behaviour is opposite to that of returns: while the relationship between Mexican, Colombian and Chilean markets increased 21% on average, Peru drifted away from the other members. Table 2 introduces the correlation matrix for stock index volatilities.

In a second moment, the cointegration trace test designed by Johansen was applied, in order to find out the relationship between the stock indexes of these four countries and how MILA affected said relationship. The applied Johansen test is supported on maximum likelihood estimations for an error correction model specified as follows:

$$\Delta Y_t = \mu \sum_{i=1}^{k} \Gamma_i \, \Delta Y_{t-1} \Pi Y_{t-1} + \varepsilon_t$$

Where ΔY represents the index variation vector expressed in logarithms, Γ shows short-term impact and Π is the long-term impact matrix, from which it can be deduced there is cointegration of the matrix range equals one. To determine the range of matrix Π, it is necessary to calculate its eigenvalues λ. However, the statistical significance of these eigenvalues shows matrix range and can be evaluated through the trace test, whose null hypothesis is the non-existence of cointegration (Grobys, 2010):

$$\lambda_{trace} = -T \sum_{i=q+1}^{n} \ln(1 - \tilde{\lambda}_i)$$

Likewise, the trace test was also conducted using data on index volatility. Results showed the same situation described for returns, as shown in Table 4; there is a statistically significant long-term relationship between Mexico, Colombia, Chile and Peru, which is found in both subsamples. However, unlike the results for returns, trace statistics went up after MILA.

Finally, in order to determine how a shock on returns and volatility for each country affects the dynamic adjustment of returns and volatility in other markets, the impulse response analysis technique was employed. The development of this technique was based on a basic unconstrained VAR model, following the proposal of Cheung (2000) in which all variables are included in a system on a symmetrical fashion and whose specification goes as follows:

$$V_t = c + \sum_{k=1}^{\rho} A_k V_{t-k} + \varepsilon_t$$

Where V_t corresponds to a 4x1 vector incorporating returns and later volatilities of Mexican, Colombian, Chilean and Peruvian stock market indexes; C represents the vector of constants, A_k is a 4x4 coefficients matrix and finally ε_t is a 4x1 vector of error. According to this, estimations were conducted using market returns and volatilities from the four countries, for each of the two subsamples. Figure 1 shows the results obtained using shocks on returns for the period before the creation of MILA. The results show that market responses to shocks in other markets are relatively low

Table 1. *Correlation matrix for MILA stock index returns*

		IPC	COLCAP	IPSA	PGEN
Subsample 1 (15/01/2008 - 28/04/2011)	**IPC**	1.0000	0.4958	0.6532	0.5778
	COLCAP	0.4958	1.0000	0.4881	0.5254
	IPSA	0.6532	0.4881	1.0000	0.5767
	PGEN	0.5778	0.5254	0.5767	1.0000
Subsample 2 (29/04/2011 - 06/08/2014)	**IPC**	1.0000	0.4040	0.5195	0.3923
	COLCAP	0.4040	1.0000	0.4273	0.3096
	IPSA	0.5195	0.4273	1.0000	0.4171
	PGEN	0.3923	0.3096	0.4171	1.0000

Note: calculations by the authors using stock index data.

Table 2. *Correlation matrix for MILA stock index volatilities*

		IPC	COLCAP	IPSA	PGEN
Subsample 1 (15/01/2008 - 28/04/2011)	**IPC**	1.0000	0.2942	0.6433	0.5176
	COLCAP	0.2942	1.0000	0.2957	0.5451
	IPSA	0.6433	0.2957	1.0000	0.6398
	PGEN	0.5176	0.5451	0.6398	1.0000
Subsample 2 (29/04/2011 - 06/08/2014)	**IPC**	1.0000	0.4120	0.6669	0.2759
	COLCAP	0.4120	1.0000	0.4183	0.1386
	IPSA	0.6669	0.4183	1.0000	0.2678
	PGEN	0.2759	0.1386	0.2678	1.0000

Note: calculations by the authors using stock index data.

Table 3. *Trace test matrix for MILA stock index returns*

		Eigenvalue	Trace statistic	Critical value (5%)	Critical value (1%)
Subsample 1 (15/01/2008 - 28/04/2011)	**IPC-COLCAP**	0,3513	337,7241**	3,7600	6,5100
	IPC-IPSA	0,3517	284,5910**	3,7600	6,5100
	IPC-PGEN	0,3552	340,3269**	3,7600	6,5100
	COLCAP-IPSA	0,3367	299,9154**	3,7600	6,5100
	COLCAP-PGEN	0,3487	307,4180**	3,7600	6,5100
	IPSA-PGEN	0,3417	272,4516**	3,7600	6,5100
Subsample 2 (29/04/2011 - 06/08/2014)	**IPC-COLCAP**	0,3491	287,3720**	3,7600	6,5100
	IPC-IPSA	0,3649	303,2316**	3,7600	6,5100
	IPC-PGEN	0,3255	321,0552**	3,7600	6,5100
	COLCAP-IPSA	0,3742	273,5040**	3,7600	6,5100
	COLCAP-PGEN	0,3477	283,6059**	3,7600	6,5100
	IPSA-PGEN	0,3680	306,9077**	3,7600	6,5100

Note: the trace test range was unconstrained for each of the adjusted subsamples, totalling 825 observations, with two lags using returns for the four stock indexes and measuring cointegration for each index combination, while ** denotes rejection of the null hypothesis on error values 5% and 1%, therefore proving the existence of cointegration.

Table 4. *Trace test matrix for MILA stock index volatility*

		Eigenvalue	Trace statistic	Critical value (5%)	Critical value (1%)
Subsample 1 (15/01/2008 - 28/04/2011)	**IPC-COLCAP**	0,3574	115,3263**	3,7600	6,5100
	IPC-IPSA	0,2883	199,9795**	3,7600	6,5100
	IPC-PGEN	0,3454	111,3282**	3,7600	6,5100
	COLCAP-IPSA	0,4630	111,0619**	3,7600	6,5100
	COLCAP-PGEN	0,3073	101,5579**	3,7600	6,5100
	IPSA-PGEN	0,4065	104,3655**	3,7600	6,5100
Subsample 2 (29/04/2011 - 06/08/2014)	**IPC-COLCAP**	0,2799	195,9194**	3,7600	6,5100
	IPC-IPSA	0,2885	158,4206**	3,7600	6,5100
	IPC-PGEN	0,2210	167,9137**	3,7600	6,5100
	COLCAP-IPSA	0,2738	167,6168**	3,7600	6,5100
	COLCAP-PGEN	0,2513	167,8171**	3,7600	6,5100
	IPSA-PGEN	0,1885	164, 6195**	3,7600	6,5100

Note: the trace test range was unconstrained for each of the adjusted subsamples, totalling 825 observations, with two lags using returns for the four stock indexes and measuring cointegration for each index combination, while ** denotes rejection of the null hypothesis on error values 5% and 1%, therefore proving the existence of cointegration.

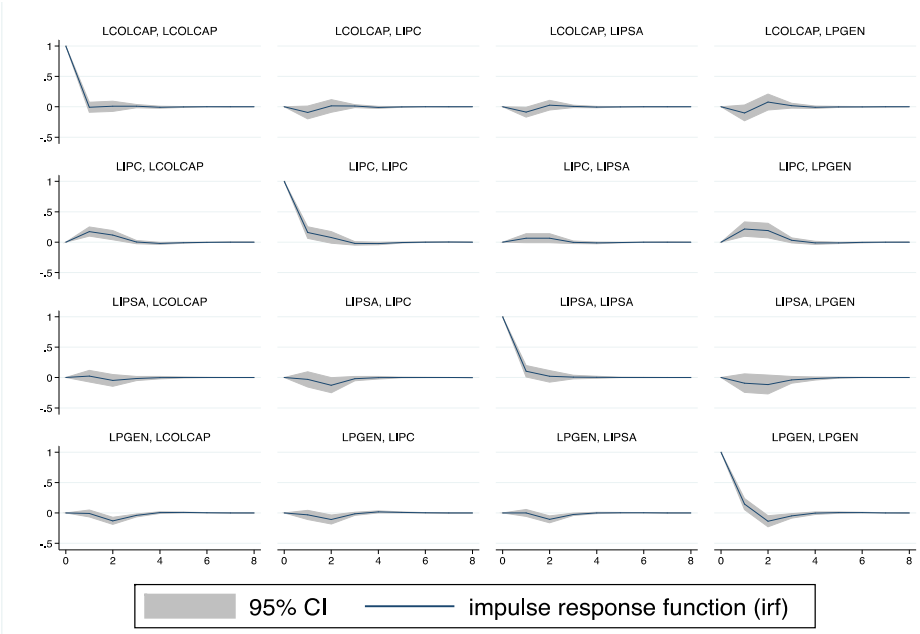

Figure 1. Impulse-response VAR model for COLCAP, IPC, IPSA and PGEN index returns, on the first subsample (15/01/2008 to 28/04/2011).

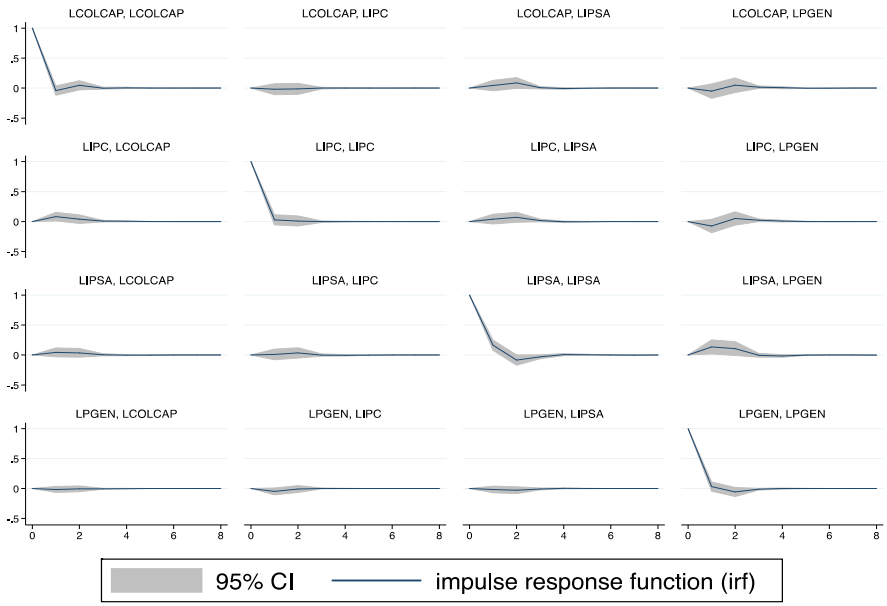

Figure 2. Impulse-response VAR model for COLCAP, IPC, IPSA and PGEN index returns, on the second subsample (29/04/2011 to 06/08/2014).

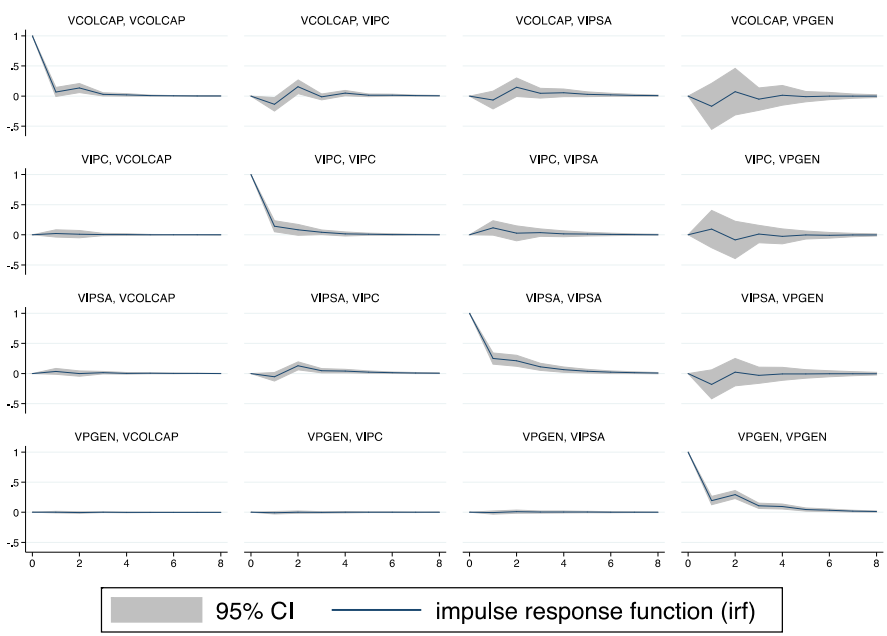

Figure 3. Impulse-response VAR model for COLCAP, IPC, IPSA and PGEN index volatilities, on the first subsample (15/01/2008 to 28/04/2011).

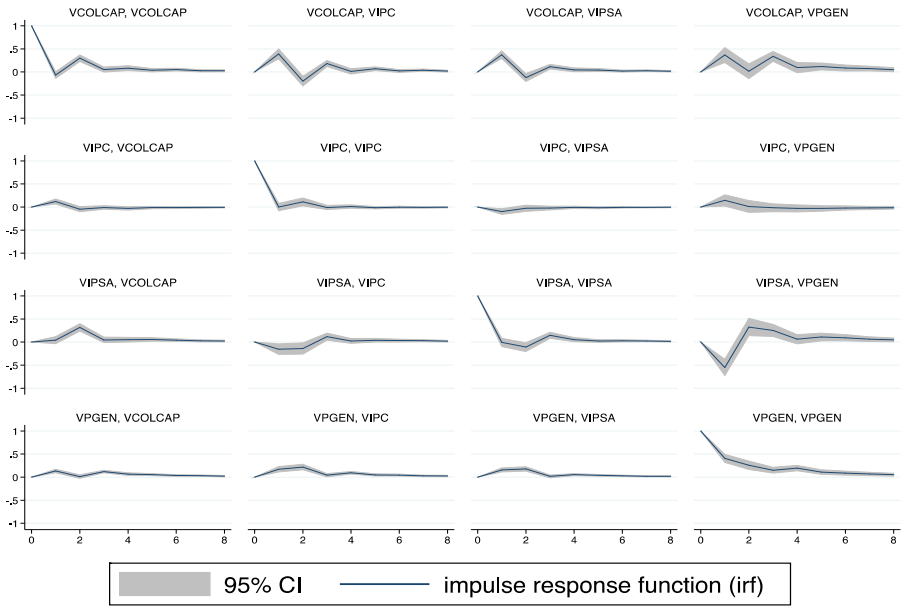

Figure 4. Impulse-response VAR model for COLCAP, IPC, IPSA and PGEN index volatilities, on the second subsample (29/04/2011 to 06/08/2014).

and did not alter stability of stock market returns, with the Peruvian stock exchange being the most vulnerable one to falls in the other exchanges. However, the effect of these shocks dissipates on an average time horizon of three days. Likewise, the figure 2 shows that after MILA started its operations, the impact found on the stock exchanges of each country due to shocks on returns in other exchanges stays low, even more so than the period before the creation of the integrated market. Even in Peru, changes on returns become more moderate when compared to the first subsample. Meanwhile, results obtained by including volatilities in the first subsample, as seen in Figure 3, show that volatility shocks at the Colombia stock exchange are the ones who create the largest response in other stock exchanges, while shocks at the Peruvian stock exchange create the smallest reaction on its trading partners. Finally, the results at the second subsample, as seen in Figure 4, show no significant change when compared to the previous period, with the Peruvian stock exchange having an increased impact against shocks in volatility coming from the other stock exchanges, showing a greater response against volatility variations at the Chilean stock exchange.

CONCLUSIONS

In conclusion, the empirical analysis developed on the dynamics and volatility of stock market indexes at MILA member countries delivered the following results: the degree of correlation between the indexes was calculated during the first stage, evidencing a reduction in the correlation between the four exchanges on returns after the creation of MILA; while the degree of cointegration was calculated during the second stage, using the Johansen test, showing there is a

long-term relationship in behaviours of index returns which tends to weaken. In contrast, when calculating cointegration using volatilities there is evidence on the existence of a long-term relationship that tended to become stronger after the establishment of MILA.

Finally, an impulse response function of VAR was applied on both returns and volatilities, delivering as a result that market responses to shocks in other markets are relatively low and do not alter stability on stock Exchange returns, with the Peruvian Exchange being the most vulnerable to shocks in other exchanges. However, the effect of these shocks disappears in an average time horizon of three days.

After MILA began its operations, the impact experienced by the stock exchanges of each country following shocks on returns in other exchanges remained low, which can be explained by the little time MILA has been operating so far, and the fact investors still mistrust stock markets after the 2007 crisis in the United States. This can be confirmed after including volatilities, as there is a greater response to shocks in volatility originating from the Colombian stock exchange on the other three countries, unlike Peru, whose shocks create the lowest reaction. This is consistent with the results obtained by Agudelo et al. (2012) and Panopoulou & Pantelidis (2009). This research is important for the stock market agents, owing to the information obtained about the integration between this four countries and the diversification advantages that this could main.

REFERENCES

Agudelo, D. A., Barraza, S. E., Castro, M. I., & Mongrut, S. (2012). Liquidez en los Mercados Accionarios Latinoamericanos: Estimando el efecto del Mercado Integrado Latinoamericano (MILA).

Camara-Neto, A. F., & Vernengo, M. (2010). Beyond the original sin: a new regional financial architecture in South America. Journal of Post Keynesian Economics, 32(2), 199–212. doi:10.2753/PKE0160-3477320205

Carrieri, F., Errunza, V., & Hogan, K. (2007). Characterizing World Market Integration through Time. Journal of Financial and Quantitative Analysis, 42(04), 915. doi:10.1017/S0022109000003446

CEPAL. (2014). Integración regional Hacia una estrategia de cadenas de valor inclusivas. Naciones Unidas.

Cheung, D. W. W. (2000). The impulse of stock market volatility and the market crash of October 1987. Journal of Business Finance & Accounting, 27(5-6), 761-776.

Christensen, B. V. (2014). Financial integration in Africa: implications for monetary policy and financial stability. BIS Paper, (76c).

Duwicquet, V., & Mazier, J. (2011). Financial integration and macroeconomic adjustments in a monetary union. Journal of Post Keynesian Economics,33(2), 333-370, doi:10.2753/PKE0160-3477330207

Enders, W. (2014). Applied Econometric Time Series (14th ed.). Wiley.

Espinoza, R., Prasad, A., & Williams, O. (2011). Regional financial integration in the GCC. Emerging Markets Review, 12(4), 354–370. doi:10.1016/j.ememar.2011.04.005

Fama, E. F. (1995). Random Walks in Stock Market Prices. Financial Analysts Journal, 51(1), 75–80. doi:10.2469/faj.v51.n1.1861

Frey, L., & Volz, U. (2013). Regional Financial Integration In Sub-Saharan Africa–An Empirical Examination Of Its Effects On Financial Market Development. South African Journal of Economics, 81(1), 79-117.

Grobys, K. (2010). Have volatility spillover effects of cointegrated European stock markets increased over time?. The review of finance and banking, 2(2), 083-94.

Gur, N. (2013). Does financial integration increase exports? Evidence from international industry-level data. Emerging Markets

Finance and Trade, 49(SUP5), 112–129. doi:10.2753/REE1540-496X4905S507

Hyme, P. (2003). La teoría de los mercados de capitales eficientes. un examen crítico. Cuadernos de Economía, 22(39), 57–83.

Kim, S., & Lee, J. W. (2012). Real and Financial Integration in East Asia. Review of International Economics, 20(2), 332–349. doi:10.1111/j.1467-9396.2012.01025.x

Lee, H.H., Huh, H.S., & Park, D. (2013). Financial Integration in East Asia: An Empirical Investigation. The World Economy, 36(4), 396–418. doi:10.1111/twec.12030

Lizarzaburu Bolaños, E. R., Burneo, K., Galindo, H., & Berggrun, L. (2015). Emerging Markets Integration in Latin America (MILA) Stock Market indicators: Chile, Colombia and Peru. Journal of Economics, Finance and Administrative Science, 20(xx), 74–83. doi:10.1016/j.anpedi.2012.06.005

Lütkepohl, H., & Krätzig, M. (2004). Applied time series econometrics. Themes in modern econometrics. doi:10.1017/CBO9780511606885

Markowitz, H. (1952). Portfolio Selection. The Journal Of Finance, 7(1), 77–91. doi:10.1111/j.1540-6261.1952.tb01525.x

MILA. Adenda al Memorando de Entendimiento de fecha 15 de enero del 2010 suscrito entre la Comisión Nacional Supervisora de Empresas y Valores del Perú , la Superintendencia Financiera de Colombia y la Superintendencia de Valores y Seguros de Chile (2010).

Ocampo, J. A., & Titelman, D. (2010). Subregional financial cooperation: the South American experience. Journal of Post Keynesian Economics, 32(2), 249–268. doi:10.2753/PKE0160-3477320208

Panopoulou, E., & Pantelidis, T. (2009). Integration at a cost: evidence from volatility impulse response functions. Applied Financial Economics, 19(11), 917–933. doi:10.1080/09603100802112300

Pérez, P. P. (2010). The Ecuadorian proposal for a new regional financial architecture. Journal of Post Keynesian Economics, 32(2), 163–172. doi:10.2753/PKE0160-3477320202

Schmiedel, H., & Schönenberger, A. (2005). Integration of securities market infrastructures in the euro area. ECB Occasional Paper, (33).

Traczyk, A. (2012). Financial integration and the term structure of interest rates. Empirical Economics, 45(3), 1267–1305. doi:10.1007/s00181-012-0652-7

Volz, U. (2013). ASEAN Financial Integration in the Light of Recent European Experiences. Asean Economic Bulletin, 30(2), 124. doi:10.1355/ae30-2b

You, J., Liu, C., & Du, G. (2014). With Economic Integration Comes Financial Contagion? Evidence from China. Emerging Markets Finance and Trade, 50(3), 62–80. doi:10.2753/REE1540-496X500305

Rojas-Mora J., & Chamorro-Futinico J. (2016). Dynamics and volatility at stock market indexes of pacific alliance countries. Panorama Económico, 24, 71-84.

AUTORES

Jaime Rojas-Mora
Magister en Economía de la Universidad Nacional (Colombia), Actualmente es Docente/Investigador de la Facultad de Ciencias Económicas y Sociales de la Universidad de La Salle (Colombia) y de la Facultad de Ciencias Empresariales de la Universidad Minuto de Dios.

Julio César Chamorro-Futinico
Economista de la Universidad de la Salle (Colombia) y Magíster en Ciencias Económicas de la Universidad Nacional de Colombia. Instructor asociado en el departamento de economía de la Universidad Central (Colombia) y profesor asistente de la Facultad de Ciencias Empresariales de la Corporación Universitaria Minuto de Dios, Uniminuto Sede Principal.