Spillovers from the US to Latin American and G7 stock markets: a VAR Quantile Analysis

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Outline

Introduction

Motivation

The analysis of spillovers between stock markets has focused on evaluating the effects of shocks on the first two conditional moments.

Bae et al., 2007; Diebold and Yilmaz, 2009; Beirne et al., 2010; Arouri et al., 2011; Rittler, 2011; Neaime, 2012; Lee, 2013.

This strategy does not appear justified empirically, because there seems to be a strong temporal dependence between the quantiles.

Engle and Manganelli, 2004; Baur et al., 2012.

Introduction

Motivation

Quantile regressions models constitute a promising tool to better understand the way in which financial spillovers occur and to quantify the sensitivity of different markets to international shocks.

Advantages

- Robustness to outliers
- Semi-parametric in nature
- Greater flexibility for analysing different market scenarios

Introduction

Motivation

Disadvantages

Quantile regressions models are susceptible to:

- Reverse causality
- Simultaneous equations
- Omitted variables
- Endogenous regressor considerations

Theoretical restrictions need to be identified before quantifying the relationship between markets in different quantiles of the returns distribution.

Introduction

Motivation

The multivariate quantile setting proposed by White et al. (2015) allows to:

- Impose theoretical restrictions very naturally
- Compute pseudo impulse-response functions (PIRFs) during different market scenarios

Introduction

Objective

The **objective** is to measure the response of the six main Latin American (LA) stock markets to a shock in the United States (US) stock index.

- LA stock markets: Brazil, Chile, Mexico, Colombia , Argentina and Peru.
- Six mature markets for comparison: UK, Germany, France, Canada, Italy and Japan.

We use **the multivariate quantile model** proposed by *White et al. (2015)*.

Introduction

Objective

The dynamics of LA markets is globally of interest for institutional investors who are constantly looking for opportunities to diversify their portfolios.

Moreover, US economy is the destination of around 40% of the region's total export and imports.

Data

- MSCI daily stock price indexes from 1995 to 2015
- Datastream International
- The period analysed was marked by several crises:

  Mexican crisis (1994-1995), Asian crisis (1997), Russian crisis (1998), Colombian crisis (1999), dotcom crisis (2000), September 11th terrorist attacks (2001), Argentine debt crisis (2002), Financial crisis (2007 to 2009), European debt crisis (2010),...

Methodology

In quantile regressions models causal relationships can only be identified after maintaining the exogeneity condition of the conditioning variables.

This condition is difficult to assume in practice. It is necessary to resort to the traditional multivariate time series tools, such as structural vector autoregressions (Sims, 1980).

Model

Multivariate quantile models (MVMQ)

Multivariate quantile models (MVMQ).

Recently proposed by White et al. (2015) as a multivariate extension of the CAViaR model developed by Engle and Maganelli (2004).

The idea behind MVMQ models is that the quantiles of the distribution of a time series r_t potentially depend on its own lags and on the lags of certain covariates of interest.

Model

Multivariate quantile models (MVMQ)

The MVMQ(1,1) model employed in this study is given by:

$$q_{1t} = c_1(\theta) + a_{11}(\theta)|r_{1t-1}| + a_{12}(\theta)|r_{2t-1}| + b_{11}(\theta)q_{1t-1} + b_{12}(\theta)q_{2t-1}$$

$$q_{2t} = c_2(\theta) + a_{21}(\theta)|r_{1t-1}| + a_{22}(\theta)|r_{2t-1}| + b_{21}(\theta)q_{1t-1} + b_{22}(\theta)q_{2t-1}$$

or more compactly by:

$$q_t = c + A|R_{t-1}| + Bq_{t-1}$$

where q_{it} is implicitly defined as $Pr[r_{it} \leq q_{it}|\mathcal{F}_{t-1}] = \theta$, $i = 1, 2$.

Model

Multivariate quantile models (MVMQ)

Assuming one suitable exogeneity restriction in the system, it is possible to recover the structural innovations, and to calculate PIRFs.

We impose the restriction that the US index is contemporaneously insensitive to external shocks and that the other markets react contemporaneously to the US index:

- The US market can be taken as the origin of recent major shocks to the global financial markets (Ehrmann et al., 2011)
- The US market mainly reacts to its own news, given its significant size and liquidity (Ehrmann et al., 2011; Brazys et al., 2015)

Model

Pseudo impulse-response functions (PIRFs)

In traditional impulse response functions a one-off intervention δ is given to the error term ε_t.

PIRFs assume that the one-off intervention δ is given to the observable return r_t only at time t.

The pseudo θth quantile impulse-response function for the *ith* return r_{it} is defined as:

$$\Delta_{i,s}(\tilde{r}_{it}) = \tilde{q}_{i,t+s} - q_{i,t+s}\,, \qquad s = 1, 2, 3, \ldots, T$$

where $\tilde{q}_{i,t+s}$ is the θth-conditional quantile of the affected series, $\tilde{r}_{it}$, and $q_{i,t+s}$ is the θth-conditional quantile of the unaffected series, r_{it}.

Results

Reduced form VAR coefficients at 50^{th} percentile.

	50%											
	c2	*a21*	*a22*	*b21*	*b22*	*js*		*c2*	*a21*	*a22*	*b21*	*b22*	*js*
Argentina	0.00	0.00	0.01	-0.08	0.08	0.54	**Canada**	0.00	0.00	0.00	0.00	0.00	0.01
	0.04	*0.02*	*0.01*	*0.70*	*0.76*			*0.00*	*0.00*	*0.00*	*0.70*	*1.20*	
Brazil	0.00	0.00	0.01	-0.03	0.00	0.33	**France**	0.09***	0.00	0.00	-0.20	-0.94***	4.62
	0.03	*0.02*	*0.02*	*0.69*	*1.84*			*0.00*	*0.00*	*0.00*	*0.10*	*0.10*	
Chile	0.00	0.00	0.01	-0.04	0.02	2.03	**Germany**	0.15***	-0.07***	0.0	-1.5	0.1	17.73***
	0.02	*0.02*	*0.02*	*0.35*	*3.80*			*0.00*	*0.00*	*0.00*	*1.00*	*0.60*	
Colombia	-0.01	0.00	0.03	0.10	0.03	0.07	**Italy**	0.00	0.00	0.00	-0.30	-0.40	1.85
	0.02	*0.01*	*0.02*	*0.40*	*0.44*			*0.00*	*0.00*	*0.00*	*0.40*	*0.60*	
Mexico	0.04	-0.01	0.02	0.07	-0.78***	1.02	**Japan**	0.00	0.00	0.00	0.00	1.00	1.50
	0.03	*0.02*	*0.01*	*0.15*	*0.24*			*0.00*	*0.00*	*0.00*	*1.00*	*1.60*	
Peru	0.03	0.00	0.03	-0.38	-0.27	0.84	**UK**	0.08***	-0.07***	0.00	-0.60	-0.50**	10.74**
	0.03	*0.02*	*0.02*	*0.51*	*0.66*			*0.00*	*0.00*	*0.00*	*0.40*	*0.30*	

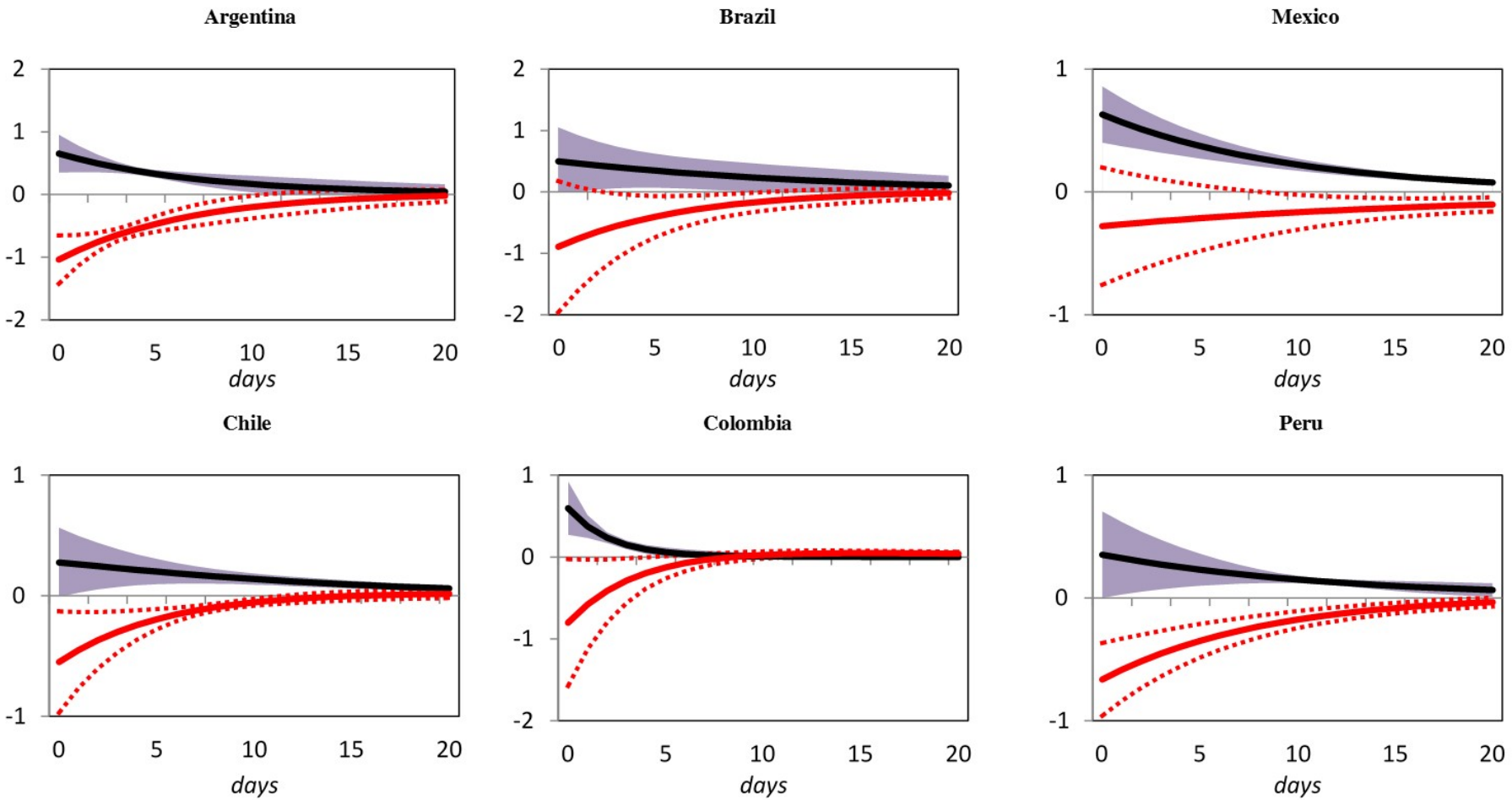
Results

Reduced form VAR coefficients at 1^{st} and 99^{th} percentile.

	1%						99%					
	c2	*a21*	*a22*	*b21*	*b22*	*js*	*c2*	*a21*	*a22*	*b21*	*b22*	*js*
Latin American Stock Markets												
Arg	-0.17**	-0.16*	-0.35	-0.05	0.88***	17.71***	0.20*	0.02	0.31**	0	0.87***	5.28
	0.1	*0.11*	*0.19*	*0.03*	*0.05*		*0.11*	*0.13*	*0.13*	*0.06*	*0.03*	
Bra	-0.18**	-0.14	-0.28**	-0.06	0.89***	6.08	0.05	0	0.24***	0.03	0.89***	0.94
	0.11	*0.2*	*0.12*	*0.05*	*0.05*		*0.06*	*0.11*	*0.05*	*0.06*	*0.02*	
Chi	-0.12**	-0.08	-0.39***	-0.04	0.86***	5.36	0.02	0	0.30***	0.03	0.87***	5.00
	0.05	*0.08*	*0.07*	*0.03*	*0.03*		*0.03*	*0.07*	*0.06*	*0.02*	*0.03*	
Col	-0.27***	-0.21	-0.58***	-0.08***	0.78***	18.52***	0.40***	0.08	0.80***	0	0.63***	4.68
	0.06	*0.15*	*0.09*	*0.03*	*0.03*		*0.1*	*0.06*	*0.14*	*0.03*	*0.08*	
Mex	-0.03	-0.05	-0.09**	-0.01	0.96***	3.56	0.01	0.10**	0.22***	-0.03	0.93***	4.57
	0.04	*0.1*	*0.04*	*0.03*	*0.02*		*0.02*	*0.05*	*0.06*	*0.02*	*0.02*	
Per	-0.08***	-0.12	-0.27***	-0.04	0.91***	15.36***	0.06***	0.06	0.15***	-0.01	0.93***	3.64
	0.02	*0.08*	*0.08*	*0.03*	*0.03*		*0.02*	*0.07*	*0.02*	*0.02*	*0.01*	
Mature G7 Stock Markets												
Can	-0.18**	-0.16	-0.34**	-0.05	0.88***	17.92***	0.21*	0	0.36**	0.01	0.86**	5.45
	0.1	*0.11*	*0.19*	*0.03*	*0.05*		*0.12*	*0.15*	*0.18*	*0.07*	*0.05*	
Fra	-0.16***	-0.13***	-0.21***	0.01	0.85***	16.58***	0.07***	0.14***	0.29***	-0.02	0.86***	27.32***
	0.04	*0.05*	*0.05*	*0.05*	*0.06*		*0.03*	*0.04*	*0.03*	*0.02*	*0.03*	
Ger	-0.15***	-0.12	-0.25***	0.03	0.83***	9.10*	0.04*	0.20*	0.14***	-0.04	0.92***	12.44**
	0.05	*0.07*	*0.05*	*0.02*	*0.04*		*0.03*	*0.11*	*0.03*	*0.03*	*0.04*	
Ita	-0.07	-0.11	-0.25	-0.04	0.92***	7.48	0.07***	0.08	0.14***	-0.02	0.94***	3.42
	0.08	*0.09*	*0.24*	*0.05*	*0.06*		*0.03*	*0.08*	*0.02*	*0.03*	*0.01*	
Jap	-0.55***	-0.39***	-0.38***	-0.03	0.65***	76.99***	0.09**	0.35***	0.19***	-0.09***	0.89***	110***
	0.13	*0.05*	*0.09*	*0.05*	*0.09*		*0.04*	*0.04*	*0.03*	*0.03*	*0.03*	
UK	-0.11**	-0.22***	-0.19***	0.05	0.78***	77.66***	0.03**	0.11***	0.11***	-0.03	0.95***	21.77***
	0.05	*0.08*	*0.04*	*0.22*	*0.27*		*0.01*	*0.04*	*0.02*	*0.02*	*0.02*	

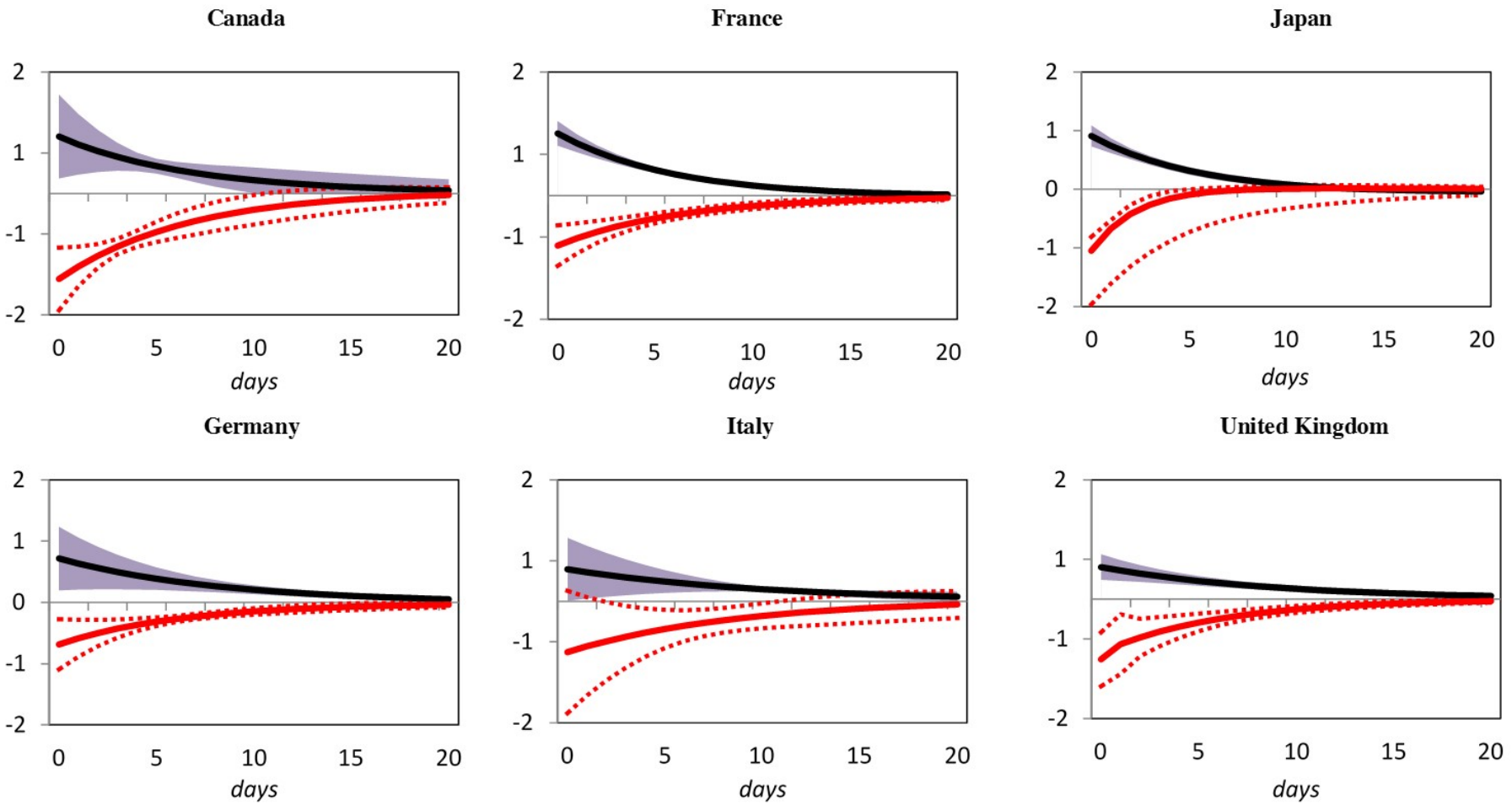
Results

Structural VAR - Pseudo impulse-response functions of the LA markets



Results

Structural VAR - Pseudo impulse-response functions of the G7 markets



Conclusions

We estimate multivariate quantile models to measure the responses of the six main LA stock markets to a shock in the US stock index.

We document common and divergent patterns in reactions in LA and mature markets to a sizeable shocks in US stock market returns:

- Both the LA and mature markets show asymmetrical responses to the US market shock, dependent on the quantile analysed.
- There is a weaker tail-codependence among the LA markets than among the mature markets with respect to the US index.

This points to possible diversification strategies that could exploit investments in the LA markets following a shock to the US market.

Conclusions

The differences within the LA sample are notorious:

- Chile, Brazil and Mexico appear to represent good diversification strategies both in times of crisis and during economic rallies.
- Colombia, Peru and Argentina present higher tail-codependeces during bearish scenarios with regard to the US market.

Thank you for your attention!