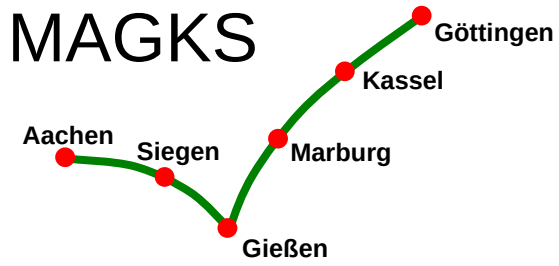

Joint Discussion Paper Series in Economics

by the Universities of

Aachen · Gießen · Göttingen
Kassel · Marburg · Siegen

ISSN 1867-3678

No. 23-2008

Bernd Hayo and Matthias Neuenkirch

Does the Currency Board Matter? U.S. News and Argentine Financial Market Reaction

This paper can be downloaded from
http://www.uni-marburg.de/fb02/makro/forschung/magkspapers/index_html%28magks%29

Coordination: Bernd Hayo • Philipps-University Marburg
Faculty of Business Administration and Economics • Universitätsstraße 24, D-35032 Marburg
Tel: +49-6421-2823091, Fax: +49-6421-2823088, e-mail: hayo@wiwi.uni-marburg.de

Does the Currency Board Matter?

U.S. News and Argentine Financial Market Reaction

Bernd Hayo and Matthias Neuenkirch

Philipps University Marburg

This version: 29 March 2010

Corresponding author:

Bernd Hayo
Faculty of Business Administration and Economics (FB 02)
Philipps University Marburg
D-35032 Marburg
Germany
Tel.: ++49(0)6421-2823091
Fax: ++49(0)6421-2823088
Email: hayo@wiwi.uni-marburg.de

---

* Thanks to participants of the MAGKS research seminar in Rauischholzhausen for their helpful comments on earlier versions of the paper. The usual disclaimer applies.

Does the Currency Board Matter?
U.S. News and Argentine Financial Market Reaction

Abstract

Using a GARCH model, we study the effects of U.S. monetary policy and U.S. macroeconomic announcements on Argentine money, stock, and foreign exchange market returns and volatility over the period 1998 to 2006. We show, first, that both types of news have a significant impact on all markets. Second, we conclude that Argentine markets have become less dependent on U.S. news after abandonment of the currency board. Third, we find that U.S.-dollar-denominated assets react less to news, which suggests that the currency board was not completely credible. Fourth, we discover that financial markets react more strongly during the financial crisis. Fifth, in the case of peso-denominated assets, U.S. central bank communication helps reduce money market volatility during the financial crisis in Argentina.

JEL: E52, F33, G14, G15

Keywords: Argentina, Financial Markets, Monetary Policy, Federal Reserve Bank, Central Bank Communication, Macroeconomic Announcements

1. Introduction

The impact of central bank communication and macroeconomic announcements on financial markets in the United States has been studied extensively. Concentrating on the formal and informal channels of central bank communication, many papers find that U.S. financial markets react to this news. However, given that the United States is the world's largest economy, it is likely that its economic news matters for other countries, too. To our knowledge, there are only a few studies addressing this issue and these papers assess either the reaction to changes in monetary policy instruments or the impact of macroeconomic announcements. This paper considers both types of influences simultaneously and also employs a newly constructed data set of speeches by FOMC members on the topics of monetary policy inclination and economic outlook.

As a case study of an emerging financial market, Argentina during 1998–2006 is of particular interest. Until February 2002, the Argentine central bank had no national monetary policy discretion due to the existence of a currency board system with the U.S. dollar. Given this fixed exchange rate regime, we expect U.S. developments to have a substantial impact on the Argentine economy. For instance, in the context of the Hong Kong currency board, Lo (2005) reports that in response to a U.S. contractionary monetary shock, domestic output falls dramatically. Studying this period of recent Argentine economic history also allows an analysis of how news from the anchor country affects financial markets during the currency board breakdown and abandonment of the exchange rate peg.[1] Finally, it is also possible to study how financial markets in Argentina react to U.S. news after entering the new regime of flexible exchange rates with the U.S. dollar.

Within the context of these three phases of the Argentine economy, we address five specific research questions:

1. Do U.S. central bank communication and U.S. macroeconomic announcements exert any influence on Argentine financial market returns?
2. Does the creation of the currency board affect the strength of this effect?
3. Was the currency board credible?
4. Was the reaction of financial markets to news stronger during the financial crisis?
5. Does U.S. news have an impact on Argentine financial market volatility?

The remainder of the paper is organized as follows. In the next section, we summarize the previous work in this area and outline the contributions of this paper. Section 3 describes the construction of the news dummies and explains our data set as well as the econometric

[1] Over the course of the crisis in 2001–2002, money market rates reached 127 percentage points amid extremely high volatility.

methodology. Section 4 reports our empirical results for the money, stock, and foreign exchange markets. Some robustness checks and alternative specifications are shown in Section 5. Section 6 concludes.

2. Related literature and our contribution

There are a few papers that study spillover effects of *U.S. monetary policy* and *U.S. macroeconomic announcements* on emerging markets. Wongswan (2005) analyzes the response of global equity indices to *U.S. monetary policy announcements*.[2] Using intraday data, he finds that the *Argentine Merval Index* falls significantly, by 6 percentage points, after a surprise hike of 100 bps. However, when excluding intermeeting target rate moves, the coefficient becomes insignificant. He also concludes that the transmission of news across these countries is due to financial integration rather than to trade linkages or flexible exchange rates. Also employing intraday data, Robitaille and Roush (2006) examine the reaction of *Brazilian sovereign yield spreads* and *stock prices* to *FOMC announcements* and *U.S. macroeconomic surprises*.[3] They find that announcements of a U.S. interest rate hike lead to an increase in bond spreads and a decline in the Bovespa index. Nonfarm payroll news as well as CPI surprises tend to raise spreads and cause a fall in share prices. Wongswan (2006) analyzes the transmission of *U.S. macroeconomic announcements* and *interest rate decisions* on financial markets in developing countries. Using high-frequency data, he concludes that a large and significant association exists between news originating in the United States and volatility, as well as trading volumes, in the Korean and Thai equity indices.

Andritzky et al. (2007) investigate the reaction of *emerging market bonds* to *U.S. macroeconomic announcements* and *target rate changes*. Global bond spreads tend to respond more to rating actions and changes in U.S. rates than to the respective domestic news. U.S. macroeconomic data and policy announcements reduce uncertainty and stabilize spreads. U.S. announcements matter less for countries with more transparent policies and higher credit ratings. Arora and Cerisola (2001) explore how *sovereign bond spreads* are influenced by *U.S. monetary policy*. They conclude that the stance and predictability of U.S. monetary policy are important for stabilizing capital flows and capital market conditions in emerging markets. Alper (2006) concludes that the *unanticipated component of U.S. monetary policy* is significant in explaining movements in *emerging market sovereign bond spreads*.

In this paper, we study the effects of all types of FOMC communication (including target rate movements) and U.S. macroeconomic announcements on money, stock, and

[2] Sample length: September 1998–November 2004.
[3] Sample length: February 1999–April 2005.

foreign exchange market returns and volatility in Argentina. Our sample time period (1998–2006) is particularly useful in this regard as it includes the switch in the Argentine exchange rate regime and the financial crisis. Econometrically, we employ a rich GARCH specification of daily financial returns to capture the autoregressive conditional heteroscedasticity that characterizes many financial series. Our approach extends the existing literature in several ways. First, ours is a pioneering study of the effects of formal and informal communication by the U.S. Federal Reserve Bank (the Fed) on Argentine financial markets. Previously, only actual target rate changes by the Fed have been studied. Second, this is the first paper to examine the different Argentine exchange rate regimes as well as the financial crisis in 2001–2002 in this context. Third, this is the first application of a GARCH approach to Argentine financial market returns and volatility in the context of U.S. macroeconomic and monetary policy news. Finally, our inferences are derived within the context of a rigorous and consistent general-to-specific model-reduction process.

3. Data and econometric methodology

In our analysis, we use the data set introduced and extensively described in Hayo et al. (2008). It includes summaries of 1,439 speeches and 151 congressional hearings, covering all FOMC members, as well as 68 post-meeting statements and 20 monetary policy reports (MPR). The communication events are coded into dummy variables on the basis of their content. Following the literature (see, e.g., Ehrmann and Fratzscher, 2007), we categorize the communication content into a monetary policy and an economic outlook component. The coding for the U.S. economic outlook news is either "positive" (EO+) or "negative" (EO–), while "tightening" (MP+) or "easing" (MP–) are the categories for the Fed's monetary policy stance. In the analysis, we employ dummy variables that are split into positive and negative news to take into account possible asymmetric reactions of financial markets.[4] In total, there are 16 communication dummies as all four types (statements, MPR, testimony, speeches) can be coded into the four different categories EO+, EO–, MP+, and MP–.

The surprise components of several macroeconomic indicators typically watched by financial market participants are also subject to examination. We choose 11 important news items from the list by Ielpo and Guégan (2009): advance GDP, industrial production, and trade balance to capture the growth expectations; the ISM index and the Conference Board consumer confidence for producer and consumer confidence; housing starts for real estate

[4] Evidence of this type of asymmetries can, for instance, be found in the impact of IMF statements on financial returns in emerging markets (Hayo and Kutan, 2005) or in the effects of FOMC communication on U.S. financial market returns (Hayo et al., 2008).

effects, nonfarm payroll, and the unemployment rate to proxy labor market conditions; retail sales for actual consumption; and the consumer price index and producer price index for inflation. These variables enter the equations separated into positive and negative impulse dummies on the day of their announcement.

Our Argentine financial market indicators are comprised of daily closing interbank lending rates and daily returns on stock and foreign exchange markets over the period from January 2, 1998 to December 28, 2006.[5] As dependent variables, we employ daily changes of the three-month, six-month, and one-year Buenos Aires Interbank Offered Rate. Until the abandonment of the currency board in February 2002, we examine both peso- and dollar-denominated interbank rates. We also assess the daily growth rates of the Merval Stock Index and the dollar/peso spot rate.

In a first step, we split the sample into the periods during and after the currency board regime. However, it turns out that some of the regressions do not achieve convergence and others reveal no economically interesting results. A more detailed analysis of the sample indicates that this outcome is probably driven by the extraordinarily high volatility in the months before and after the currency board was abandoned.[6] Therefore, after an extensive grid-based search, we split the sample into three subsamples, yielding stable estimates: the first ends on March 16, 2001 and is called the "pre-crisis" subsample or "currency board" period. The second subsample closes on November 20, 2002 and is termed the "crisis" period. The "post-crisis" or "floating exchange rate" period follows the crises period and continues until the end of our sample window.[7]

Descriptive statistics show that all financial market series exhibit excess kurtosis (see Table A1 in the Appendix).[8] ARCH models increase estimation efficiency in time series characterized by volatility clustering (Engle, 1982). We start with a generalized version of the GARCH specification proposed by Bollerslev (1986) and apply a testing-down process to further increase estimation efficiency.

[5] Data sources: U.S. bond market and foreign exchange market series—Federal Reserve's statistical releases H10 and H15; stock market series—Yahoo! Finance database; Argentine interbank lending rates—Central Bank of Argentina statistical database; Surveys of macroeconomic announcements—Bloomberg newswire.

[6] Table A2 in the Appendix shows that the means and variances of the estimated conditional historic variances are quite small in the first and third subsample, whereas the ones in the crisis subsample are exceptionally high.

[7] The dollar-denominated interest rate series are discontinued on February 1, 2002, so the "dollar crisis" subsample ends on this day. The dollar/peso spot rate is used as an endogenous variable only in the third subsample, as it was pegged until February 2002 and was still heavily influenced by monetary policy actions in the first months after the breakdown of the currency board.

[8] In the case of the three stock market series, there is only mild evidence of excess kurtosis.

$$(1)\ returns_t = \gamma + \sum_{r=1}^{5} \delta_r\ returns_{t-r} + \sum_{r=1}^{5} \zeta_r\ other\ markets' and\ U.S. returns_{t-r}$$
$$+ \eta\ ID + \theta\ U.S. Macroeconomic\ Announcements + \iota\ FFTR\ movements$$
$$+\lambda\ U.S. Communication\ Dummies + \upsilon h_t + \mu_t,$$
$$\mu_t = \epsilon_t h_t^{1/2},$$
$$h_t = \alpha_0 + \alpha_1(u_{t-1} - \kappa_1)^2 + \kappa_2 \tau(\mu_{t-1} - \kappa_1)^2 + \beta_1 h_{t-1},$$
$$\tau = 1\ if\ u_{t-1} < \kappa_1\ and\ zero\ otherwise,$$

where α_0, α_1, β_1, μ, κ_1, κ_2, γ, δ, ζ, η, θ, ι, λ, and ν are parameters or vectors of parameters, h is the conditional variance, τ is an indicator function as defined in the last line above, and $\varepsilon_t|\Gamma_{t-1} = t(v)$; with Γ_{t-1} capturing all information up to t–1, and t(v) a t-distribution with v degrees of freedom. The general specification (1) is an autoregressive-distributed lag model with five lags.[9] Contemporaneous other markets' and U.S. returns are excluded to avoid potential simultaneity problems. We also control for movements in the Federal Funds Target Rate by including separate dummies for rate hikes and cuts. Rate movements after unscheduled FOMC meetings are captured by an additional dummy. To avoid spurious correlations, we include a number of impulse dummies (ID) in the crisis sample to take into account exceptional events not captured by our types of news dummies.[10]

Model (1) has several special features. First, student-t distributed errors (Bollerslev, 1987) are assumed; these provide a better approximation to residuals that are not normally distributed. Second, the variance enters the main equation (Engle et al., 1987) to test whether volatility as a measure of risk is priced in the markets. Asymmetric effects of shocks (Engle and Ng, 1993), defined as last period forecast errors, are included in the model if κ_1 is significantly different from zero. In addition, asymmetry thresholds (Glosten et al., 1993) are captured when κ_2 is not equal to zero. After estimating these rich GARCH(1,1) models, we exclude all insignificant variables in a general-to-specific approach. Serial correlation is left in two of the regressions (pre-crisis six-month dollar, crisis one-year dollar) as the Portmanteau statistics are significant at the 5% level. Diagnostic testing shows that nonnormality appears

[9] The lag structure is shortened to three in the regressions for dollar-denominated interest rates in the crisis subsample.

[10] These impulse dummy variables correspond to the first trading day in our sample after the respective event: July 12, 2001: worse credit rating; September 17, 2001: 9/11; November 1, 2001: public debt swap; November 30, 2001: bank run; December 4, 2001 (dollar series only): capital restrictions to contain bank run; December 5, 2001 (dollar series only): International Monetary Fund denies release of financial aid; January 22, 2002 (dollar series only): first exchange rate devaluation; January 25, 2002 (peso series only): sample break; February 15, 2002 (peso series only): abandonment of currency board.

to be present in all but two series (crisis three- and six-month dollar) and we consequently use robust standard errors as suggested by Bollerslev and Wooldridge (1992).

4. Analyzing the effects of Fed communication on returns and volatility

We first discuss the effects of news on financial market returns (Equation (1)) in each of our three sample periods.[11]

Pre-crisis subsample: Effects on returns

Table 1a shows the impact of news on peso-denominated money market returns (Buenos Aires Interbank Offered Rate, Baibor) at different maturities and on the main equity market index (Merval) before the financial crisis.

Weak market efficiency is violated on all money markets, as past interest rates help predict those of today. Note the different result for the stock market, which appears to be efficient. There are portfolio diversification effects in the case of interest rates, as a bullish stock market will depress money market rates. The negative sign of the conditional variance suggests that volatility is particularly high during phases of falling interest rates. U.S. stocks and interest rates have no influence on Argentine yields (i.e., they did not survive the testing-down process).

We find mixed signs across the maturity spectrum as a sound (poor) economic outlook can cause some rates to rise and others to decline. For instance, look at the impact of negative post-meeting statements: the three- and twelve-month rates fall, while the six-month rate rises, on the days this type of communication is made. Because of these mixed signs in the pre-crisis period, we cannot decisively conclude whether Argentinean financial markets mirror U.S. reactions to central bank communication or whether diversification effects across the two countries dominate. Economic outlook news generally has more significant effects than does monetary policy news. This suggests that the forward-looking character of monetary policy seems better captured by the economic outlook variables than by the monetary policy announcements. Finally, as in Hayo et al. (2008), the impact of central bank communication is ascending with the asset's maturity.

A higher than expected CPI announcement significantly moves the three-month rate up, an indication of the Fisher relationship, and the stock market down. We also observe falling money market rates after negative GDP (positive trade balance) shocks and rising rates in the case of positive retail sales (negative housing) news. On the equity market, we find

[11] The comparisons of coefficients within or across models are generally based on point estimates and the statistical significance of these effects is noted separately.

unambiguous evidence for diversification effects as negative GDP and employment news generate higher daily returns, and better than expected industrial production news depresses the Argentinean stock market.

Table 1a: Results for the pre-crisis subsample (peso-denominated Baibor and Merval index)

	3-M Peso	**6-M Peso**	**1-Y Peso**	**Merval**
Conditional Variance in Mean	–0.09 *	–0.11 **	–0.09 **	
$Baibor_{t-1}$	0.32 **	0.3 **	0.13 **	
$Baibor_{t-2}$	0.12 **	0.22 **		
$Baibor_{t-3}$	0.09 *			
$Baibor_{t-4}$			0.08 **	
$Baibor_{t-5}$			0.05 *	
$Merval_{t-1}$	–0.40 **			
$Merval_{t-2}$			–0.45 *	
FFTR Cut			0.16 **	
FFTR Intermeeting Cut				0.04 **
Statements EO–	–0.07 **	0.07 *	–0.31 **	
MPR EO–	0.03 **			–0.02 **
Testimony EO+	0.02 **	–0.05 **		–0.06 **
Speeches MP+	–0.02 *			–0.01 *
GDP–	–0.09 **			0.02 **
Industrial Production+				–0.01 *
Trade Balance+		–0.04 *		
Retail Sales+		0.05 **		
Housing Starts–	0.03 *	0.03 *		
Nonfarm Payroll–				0.01 *
CPI+	0.05 *			–0.03 **
CPI–	–0.04 **			

Notes: * (**) indicates significance at a 5% (1%) level. Standard errors are heteroscedasticity-consistent. Only the variables of interest of the reduced model resulting from the testing-down process ($Chi^2(48) = 63.5$; $Chi^2(51) = 61.9$; $Chi^2(51) = 58.6$; $Chi^2(49) = 59.9$) are listed. Full tables are available upon request.

In Table 1b the results of the dollar-denominated counterparts are listed. Again, (weak) efficiency is violated in all markets, as lagged values are significantly different from zero. U.S. markets have no impact on Argentine returns. Reflecting the role of the U.S. dollar as a safe haven, we do not find risk, proxied by the conditional variance, affecting financial market returns, which is in contrast to the findings for peso-denominated securities.

Neither communication about the future course of U.S. monetary policy nor any macroeconomic news category triggers a significant reaction on Argentine markets. Negative

post-meeting economic outlook statements bring down all rates, with a maximum at a one-year maturity. The three-month interest rate falls after a Fed intermeeting rate cut, too. In the case of the six-month rate, changes occur after a negative economic outlook in the monetary policy reports and after a positive economic outlook discussed in testimony. Once again, the economic outlook leads to more significant coefficients than the monetary policy inclination.

Table 1b: Results in the pre-crisis subsample (dollar-denominated Baibor)

	3-M Dollar	**6-M Dollar**	**1-Y Dollar**
$Baibor_{t-1}$	0.23 **	0.2 **	0.08 **
$Baibor_{t-2}$	0.14 **	0.1 **	
$Baibor_{t-3}$		0.07 **	
$Baibor_{t-4}$		0.06 *	
FFTR Intermeeting Cut	–0.09 **		
Statements EO–	–0.14 **	–0.07 **	–0.24 **
MPR EO–		0.03 **	
Testimony EO+		–0.08 **	

Notes: * (**) indicates significance at a 5% (1%) level. Standard errors are heteroscedasticity-consistent. Only the variables of interest of the reduced model resulting from the testing-down process ($Chi^2(56) = 62.8$; $Chi^2(52) = 57.9$; $Chi^2(58) = 46.2$) are listed. Full tables are available upon request.

On the one hand, dollar-denominated assets are expected to react more strongly to U.S. news than are peso-denominated assets because of movements in the external value of the U.S. dollar. On the other hand, dollar assets are considered to be much safer investments than are peso-denominated assets and thus markets react less nervously to any U.S. news. The latter interpretation receives indirect support by the sharp increase in the spread between peso and dollar assets at the beginning of the crisis. In addition, our finding of fewer significant coefficients can be interpreted as evidence that even during its heyday, the currency board was not completely credible. Finally, the "safe harbor" interpretation is, at least indirectly, supported by two tests: Compared to their respective dollar-denominated counterparts, negative post-meeting statements exert a significantly larger influence on three-month peso rates as do positive testimony by BOG members on six-month peso rates.[12]

Crisis subsample: Effects on returns

The results of peso-denominated assets and the Merval equity index are set out in Table 2a. The sample period includes also the months after the abandonment of the currency board that

[12] The outcome of these tests of differences in means under the assumption of independent samples is z = –3.1** and –6.3**, respectively.

can still be described under the heading of "crisis." (Weak) efficiency is violated in the equity market, as past U.S. money and stock market figures help predict the daily returns of the Merval. Equity indices move in different directions, which suggests that investors diversify between U.S. and Argentine markets. We find no significant pricing of risk. Leaving aside the violation of market efficiency, the Merval index shows no signs of an extraordinarily high volatility during the crisis (see Tables A1 and A2).

Table 2a: Results in the crisis subsample (peso-denominated Baibor and Merval index)

	3-M Peso	**6-M Peso**	**1-Y Peso**	**Merval**
ARG Bond Return$_{t-1}$	0.38 **	0.41 **	0.14 **	
U.S. Bond Return$_{t-1}$			1.3 *	
U.S. Bond Return$_{t-5}$			1.89 *	–0.09 **
S&P 500$_{t-4}$				–0.15 *
FFTR Intermeeting Cut	–1.33 **		–0.74 **	0.02 **
MPR EO+	0.97 **	1.45 **		
Testimony EO–	–1.48 **		–1.80 **	
Speeches MP–				–0.04 **
GDP+			1.6 **	
GDP–			1.04 *	–0.02 **
Industrial Production+			–1.01 *	
Trade Balance+		–0.71 **		
Retail Sales+			0.83 *	–0.02 **
Nonfarm Payroll+			–6.19 **	0.03 **
Nonfarm Payroll–		–1.26 *		
Unemployment Rate+		1.99 *		
Unemployment Rate–		1.32 *	1.16 **	
CPI+				–0.02 **
CPI–				0.03 **

Notes: * (**) indicates significance at a 5% (1%) level. Standard errors are heteroscedasticity-consistent. Only the variables of interest of the reduced model resulting from the testing-down process ($Chi^2(46) = 62.1$; $Chi^2(41) = 56.6$; $Chi^2(37) = 47.7$; $Chi^2(42) = 57.1$) are listed. Full tables are available upon request.

We find that a negative (lower than expected) CPI affects the Argentina stock market index more than a positive shock. An intermeeting cut raises the Merval, whereas Fed speeches indicating looser U.S. monetary policy lower the index. Negative GDP news and positive employment news matter significantly. While we find both spillover and diversification effects in our analysis of the earlier subsample, during the crisis the former are dominant. The

impact of intermeeting cuts before the financial crisis is statistically larger.[13] Given that the Merval performed quite normally during the crisis, the noticeable impact before the crisis could be driven by the workings of the currency board.

Turning to the money market, a Fed 25 bps intermeeting rate cut decreases both three-month and one-year interest rates in Argentina. Both positive economic news communicated in monetary policy reports and negative news originating from congressional hearings raise (lower) three-month rates, with negative news having a statistically larger economic impact.[14] Price indicator shocks have no significant impact on Argentina's money markets. GDP and unemployment shocks always push up interest rates, whereas rates fall after nonfarm payroll news. Positive industrial production, trade balance, and retails sales news also induce significant reactions. Testing the size of the effects across the subsamples, we find that positive trade balance shocks exert a significantly larger influence during the crisis.[15] Finally, we also find many more significant coefficients of U.S. news variables during the crisis period compared to the pre-crisis subsample.

Table 2b summarizes the reaction of dollar-denominated rates during the financial crisis. These series were discontinued in February 2002 and, therefore, our estimates are based on only 186 observations. A major difference here from the results obtained for the earlier period is that now the U.S. money market matters. If U.S. interest rates go down, Argentinean rates move up sharply, which implies that U.S. assets perform the role of a safe harbor. For the six-month series, we find signs of capital market interdependencies, with stock market hikes pushing up interest rates.[16]

Despite the general upward trend in interest rates during the crisis period, intermeeting rate cuts have a negative effect on three- and six-month rates. Testimony and speeches with a positive (negative) economic outlook bring rates up (down), with positive speeches having the larger economic impact. To compare these results with those from the pre-crises subsample, a substantial increase in the standard deviation has to be taken into account. For instance, a 25 bps intermeeting cut brings down three-month rates by 86 bps compared to 8.9 bps in the pre-crisis period, which is both a statistically and economically significant difference.[17]

We find for all maturities that U.S. price indicators do not matter. Housing and unemployment news bring up interest rates, with negative news having relatively larger

[13] $z = 4.5$**.
[14] $Chi^2(1) = 4.3$*.
[15] $z = 2.6$**.
[16] As the optimization algorithm does not achieve convergence with the conditional variance term added to the mean equation, we are not able to test whether risk is priced in the markets.
[17] $z = 2.26$*.

absolute effects.[18] A positive nonfarm payroll shock has the largest economic impact on Argentina's financial markets out of all macroeconomic surprises, driving up interest rates by 2 to 3 percentage points. Examining business-cycle indicators, we find significant coefficients for positive GDP news, negative trade balance news, and for positive industrial production shocks. Finally, a better than expected consumer confidence index and sound retail sales affect interest rates positively. With few exceptions, we find spillover effects for both U.S. central bank communication and macroeconomic announcements. Finally, we discover more statistically significant influences of U.S. variables on Argentinean financial markets in this subsample period than in the currency board era.

Table 2b: Results in the crisis subsample (dollar-denominated Baibor)

	3-M Dollar	**6-M Dollar**	**1-Y Dollar**
$Baibor_{t-1}$	0.55 **	0.42 **	
$Baibor_{t-2}$	–0.19 *		
$Baibor_{t-3}$			–0.14 *
$Merval_{t-1}$		2.54 **	
U.S. Bond $Return_{t-1}$	–6.25 **	–5.67 **	–6.04 **
U.S. Bond $Return_{t-2}$		–4.93**	–3.95*
FFTR Intermeeting Cut	–0.86 *	–0.47 **	
Testimony EO+	3.2 **	2.24 **	
Testimony EO–			–1.05**
Speeches EO–	–0.41 *	–0.25 *	
Speeches MP–	0.54 *		
GDP+			0.54 *
Industrial Production+		–0.91*	
Trade Balance–		–0.35*	
Consumer Confidence+	0.25 *		
Retail Sales+	0.81 *	0.59 *	
Housing Starts+		0.79*	0.45*
Housing Starts–			0.57*
Nonfarm Payroll+	1.97 *	2.2 *	3.17 **
Unemployment Rate+		1.04**	
Unemployment Rate–		0.52*	

Notes: * (**) indicates significance at a 5% (1%) level. Standard errors are heteroscedasticity-consistent. Only the variables of interest of the reduced model resulting from the testing-down process ($Chi^2(13) = 21.7$; $Chi^2(13) = 17.7$; $Chi^2(30) = 42.1$) are listed. Full tables are available upon request.

[18] There is a significantly stronger reaction to bad news in the case of the unemployment rate: $Chi^2(1) = 4.58$*.

Post-crisis subsample: Effects on returns

The results for the post-crisis subsample, characterized by a floating exchange rate and less volatility, are given in Table 3. Results for the one-year interest rates are not reported because we found no significant financial control or U.S. news variables for these rates. In general, we find that there are fewer significant variables in the money market equations after the crisis than during the other sample periods. We interpret this as evidence that the Argentine economy has become less dependent on events in the United States due to the abandonment of the currency board. In addition, the share of foreign trade with the United States is declining during this period.

Table 3: Results in the post-crisis subsample

	3-M Peso	**6-M Peso**	**Merval**	**USD/ARS**
$Baibor_{t-1}$	0.19 **	0.13 *		
$Merval_{t-3}$			0.08 *	
USD/ARS Spot $Rate_{t-2}$				–0.14 **
FFTR Cut				0.006 **
Testimony MP+			–0.03 **	
Speeches MP–				0.006 **
Trade Balance+	0.05 *			
Consumer Confidence+		0.06 **		
ISM+			0.01 **	0.002 *
ISM–				0.001 *
Retail Sales+				
Retail Sales–			0.005 *	
Housing Starts–		0.04 *		–0.002 **

Notes: * (**) indicates significance at a 5% (1%) level. Standard errors are heteroscedasticity-consistent. Only the variables of interest of the reduced model resulting from the testing-down process ($Chi^2(48) = 60.3$; $Chi^2(61) = 79$; $Chi^2(53) = 70.2$; $Chi^2(56) = 74$) are listed. Full tables are available upon request.

Neither U.S. central bank communication nor rate movements have any significant impact on money market rates. The Merval index goes down if the possibility of a Federal Funds rate hike is mentioned in Fed testimony. The exchange rate increases after an actual rate cut or when a cut is considered in a speech. A relatively higher Argentine rate then triggers additional capital imports, which lead to an appreciation of the exchange rate.

The only relevant macroeconomic shocks for the money markets are positive trade balance and consumer confidence news as well as negative housing news. Positive ISM news drives equity returns up, whereas any announcement about the index causes an appreciation of

the spot rate, with positive news having a larger absolute impact. Finally, negative housing news, perhaps reflecting expectations of higher interest rates, depreciates the exchange rate.

Again, we mainly obtain spillover effects on money and equity markets. In the case of the exchange rate, there are some diversification effects, which is not surprising as good (bad) news for the U.S. dollar is bad (good) news for the dollar/peso exchange rate. Finally, very few of the variables are significant both before and after the crisis, but if they are, statistical testing indicates similar economic effects in both periods.[19]

Effects on volatility

The specification of Equation (1) is too demanding for the analysis of an impact of news variables on the *conditional variance*. The large number of dummy variables in the model prevents convergence in the estimation procedures (see Doornik and Ooms, 2008). Therefore, we simplify the specifications as follows:

$$(2)\ returns_t = \delta_r\, returns_{t-1} + \eta\, ID + \theta\, U.S.\, Macro\ Announcements$$
$$+ \iota\, FFTR\ movements + \lambda\, U.S.\, Communication\ Dummies + \upsilon h_t + \mu_t,$$
$$\mu_t = \epsilon_t h_t^{1/2},$$
$$h_t = \alpha_0 + \alpha_1(u_{t-1} - \kappa_1)^2 + \kappa_2\tau(\mu_{t-1} - \kappa_1)^2 + \beta_1 h_{t-1} + \lambda\, Event\ Dummies,$$
$$\tau = 1\ if\ u_{t-1} < \kappa_1\ \ and\ zero\ otherwise,$$

where the parameters are defined as above. Some of the control variables used in Equation (1) are omitted and the macroeconomic announcements are aggregated into real and price indicator announcements with codings +1, 0, and –1. All communication dummies are aggregated into economic outlook and monetary policy dummy variables with +1, 0, and –1 codings and the target rate movements are merged in the same way.

We run three sets of regressions for all series. First, we test whether a dummy variable capturing all events (central bank communication and macroeconomic shocks) affects the conditional volatility of financial market returns. Second, we distinguish between the occurrence of communication and macroeconomic news by creating two separate variables. Third, we differentiate between good and bad news independent of the type of announcement or shock. After estimating these models, we exclude all insignificant variables using a general-to-specific approach. Table 4 sets forth the only two models characterized by robust

[19] For instance, one cannot reject the null hypothesis that negative housing news has the same impact before and after the financial crisis (z = 0.32).

convergence and that contain significant explanatory dummy variables in the volatility equation.

Table 4: Volatility results in the crisis subsample (peso-denominated Baibor)

	3-M Peso	**1-Y Peso**
Communication Event (Volatility)	–1.24 *	–1.36 **

Notes: * (**) indicates significance at a 5% (1%) level. Standard errors are heteroscedasticity-consistent. Only the variables of interest of the reduced model resulting from the testing-down process $Chi^2(6) = 5.7$; $Chi^2(7) = 8.5$) are listed. Full tables are available upon request.

Neither in the first nor the last sample period do we achieve convergence or obtain significant coefficients, implying that none of the events has a significant impact on the conditional volatility of returns, nor does the differentiation in good and bad news reveal significant coefficients. Only for peso-denominated money market rates during the crisis period do we find that U.S. communication events reduce volatility.

The largest and most significant effect is on one-year interest rates, although the average size of the conditional variance for this market is the smallest among both maturities listed in Table 4. At least during the severe crisis associated with the breakdown of the currency board system, Fed central bankers appear able to calm financial market participants in Argentina, too. Hayo et al. (2008) show a similar impact of FOMC communications on U.S. markets.

5. Further specifications and robustness checks

We now test the robustness of our findings. First, we systematically split the sample at different dates. However, only the three periods previously employed achieve convergence of the estimators. Instead of splitting the data set into three subsamples, we also apply impulse and step dummies to a pooled set of data to capture the periods of different market activities; however, it is not possible to robustly estimate Equations (1) and (2) within such an encompassing framework.

Second, we control for regional effects and contagion in South America by including the corresponding Brazilian assets and the real/peso spot rate in the equation. Only a few securities from Brazil are significant and, moreover, they do not significantly affect our main variables of interest. To avoid losing observations and problems related to the timing of news, as well as to facilitate a smooth convergence of the estimators, we keep the simpler specifications.

Third, we use several specifications for U.S. macroeconomic news dummies. In a first step, we test whether the actual values, the standardized shocks, or both have an impact on our financial market indicators. The shocks are significant, whereas the actual values remain insignificant. The same outcome occurs when including actual values and news dummies instead of shocks. In a second step, we discover that the results using news dummies weakly dominate the ones using standardized shocks and, therefore, we employ news dummies in the analysis presented above.

Fourth, we try different types of aggregation for central bank communication. We split the speeches into those given by Board of Governors' members and those by regional presidents. This richer specification, as well as a further disaggregation according to formal importance, is dominated by our more parsimonious approach as we have to include many more dummy variables, causing instability of the GARCH models without discovering additional significant coefficients.

Finally, we explore anticipation and persistence or reversion effects by also including one-period lead and lagged U.S. central bank variables and macroeconomic announcements. This overburdens the models and rarely achieves convergence and, if it does, the results are not particularly noteworthy.

6. Conclusions

We study the effects of many types of FOMC communication and U.S. macroeconomic shocks on Argentina's financial market returns and volatility. Using a GARCH model, we explore the impact on money, stock, and foreign exchange markets over the period 1998 to 2006 after splitting the sample into three subsamples (pre-crisis/currency board; financial crisis; post-crisis/floating exchange rate). We concentrate our analysis on five research questions.

First, do U.S. central bank communication and U.S. macroeconomic announcements exert any influence on Argentine financial market returns? We show that both types of news have a significant impact on money, equity, and foreign exchange markets. The impact is statistically significant and economically relevant. Clear diversification effects can be found only in the reaction of the equity market to real macroeconomic announcements prior to the financial crisis as bad (good) U.S. news brings higher (lower) Argentine returns. In all other markets and subsamples we find a dominating role for spillover effects, i.e., Argentine and U.S. markets react symmetrically.

Second, does the creation of the currency board affect the strength of this effect? Yes, as we conclude that Argentina's financial markets have become less dependent on U.S. events after the breakdown of the currency board. There are fewer significant central bank and macroeconomic news variables (in particular, no price indicators) in the post-crisis subsample compared with the currency board subsample. In addition, we discover no influence of the corresponding U.S. assets on money or stock markets after abandoning the currency board.

Third, was the currency board credible? We find that our pre-crisis equations for assets denominated in dollars reveal less significant and smaller coefficients than the corresponding equations for peso-denominated assets. Intuitively, one would expect dollar-denominated assets to react more sensitively to U.S. news because this news should affect the dollar exchange rate and via this channel the dollar-denominated assets, too. However, our results suggest that dollar-denominated assets are seen as safer than peso-denominated assets, which implies that the currency board was not regarded as completely credible by market participants.

Fourth, was the reaction of financial markets to news stronger during the financial crisis? We obtain a significantly larger economic reaction to U.S. news during Argentina's financial crisis on both dollar- and peso-denominated assets. Moreover, additional types of U.S. news have a significant impact on Argentine financial markets compared to those found in the pre- and post-crisis subsamples. Thus, we have evidence for an increased sensitivity of Argentine financial markets to U.S. news during the crisis.

Fifth, does U.S. news have an impact on Argentine financial market volatility? Monetary policy news by the U.S. Federal Reserve Bank affects the financial market volatility of peso-denominated assets during the financial crisis. During these turbulent times, U.S. central bankers seem able to calm Argentine markets, as on days of Fed communications there is less conditional volatility in the peso-denominated money market.

References

Alper, C. E. (2006), U.S. Monetary Policy Surprises and Emerging Markets Sovereign Spreads, *2007 AEA Conference Papers*.

Andritzky, J. R., Bannister, G. J., and Tamirisa, N. T. (2007), The Impact of Macroeconomic Announcements on Emerging Market Bonds, *Emerging Markets Review* 8 (1), 20–37.

Arora, V. and Cerisola, M. (2001), How Does U.S. Monetary Policy Influence Sovereign Spreads in Emerging Markets? *IMF Staff Papers* 48 (3).

Bollerslev, T. (1986), Generalized Autoregressive Conditional Heteroscedasticity, *Journal of Econometrics* 31 (3), 307–327.

Bollerslev, T. (1987), A Conditional Heteroscedastic Model for Speculative Prices and Rates of Return, *Review of Economics and Statistics* 69 (3), 542–547.

Bollerslev, T. and Wooldridge, J. M. (1992), Quasi-Maximum Likelihood Estimation and Inference in Dynamic Models with Time Varying Covariances, *Econometric Reviews* 11 (2), 143–172.

Doornik, J. A. and Ooms, M. (2008), Multimodality in the GARCH Regression Model, *International Journal of Forecasting* 24 (3), 432–448.

Ehrmann, M. and Fratzscher, M. (2007), Communication by Central Bank Committee Members: Different Strategies, Same Effectiveness? *Journal of Money, Credit and Banking* 39 (2–3), 509–541.

Engle, R. F. (1982), Autoregressive Conditional Heteroscedasticity with Estimates of the Variance of United Kingdom Inflation, *Econometrica* 50 (4), 987–1008.

Engle, R. F., Lilien, D. M., and Robbins, R. P. (1987), Estimating Time-Varying Risk Premia in the Term Structure: The ARCH-M Model, *Econometrica* 55 (2), 391–407.

Engle, R. F. and Ng, V. K. (1993), Measuring and Testing the Impact of News on Volatility, *Journal of Finance* 48 (5), 1749–1778.

Glosten, L. R., Jagannathan, R., and Runkle, D. E. (1993), On the Relation Between the Expected Value and the Volatility of the Nominal Excess Return on Stocks, *Journal of Finance* 48 (5), 1779–1801.

Hayo, B. and Kutan, A. M. (2005), IMF-Related News and Emerging Financial Markets, *Journal of International Money and Finance* 24 (7), 1126–1142.

Hayo, B., Kutan, A. M., and Neuenkirch, M. (2008), Communicating with Many Tongues: FOMC Speeches and U.S. Financial Market Reaction, *MAGKS Joint Discussion Paper Series in Economics* No. 8-2008.

Ielpo, F. and Guégan, D. (2009), Further Evidence on the Impact of Economic News on Interest Rates, *Frontiers in Finance and Economics* 6 (2), 1–45.

Lo, M. C. (2005), International Monetary Policy Transmission Under a Currency Board: An Empirical Investigation, *St. Cloud State University Working Paper* 2005-01.

Robitaille, P. and Roush, J. (2006), How Do FOMC Actions and U.S. Macroeconomic Data Announcements Move Brazilian Sovereign Yield Spreads and Stock Prices? *Board of Governors of the Federal Reserve System, International Finance Discussion Papers* No. 868.

Wongswan, J. (2005), The Response of Global Equity Indexes to U.S. Monetary Policy Announcements, *Board of Governors of the Federal Reserve System, International Finance Discussion Papers* No. 844.

Wongswan, J. (2006), Transmission of Information Across International Equity Markets, *Review of Financial Studies* 19 (4), 1157–1189.

Appendix

Table A1: Descriptive statistics of Argentine financial market returns

Currency Board (Pre-Crisis): January 1, 1998–March 16, 2001							
	3-M Peso	**6-M Peso**	**1-Y Peso**	**3-M Dollar**	**6-M Dollar**	**1-Y Dollar**	**Merval**
Mean	–0.0027	–0.0015	0.0010	–0.0007	–0.0004	0.0002	–0.0006
Minimum	–3.0	–2.5	–2.3	–1.4	–1.3	–1.5	–0.1
Maximum	4.4	4.7	6.6	2.3	2.6	4.9	0.1
Standard Deviation	0.32	0.31	0.40	0.18	0.18	0.26	0.02
Skewness	3.8	5.2	7.1	3.0	4.8	8.7	–0.2
Excess Kurtosis	67.5	83.3	106.6	45.2	69.9	161.0	4.7

	Crisis: March 19, 2001–November 20, 2002				Crisis: March 19, 2001–February 1, 2002		
	3-M Peso	**6-M Peso**	**1-Y Peso**	**Merval**	**3-M Dollar**	**6-M Dollar**	**1-Y Dollar**
Mean	0.19	0.16	–0.006	–0.002	0.12	0.11	0.12
Minimum	–40.4	–27.0	–14.9	–0.2	–24.1	–20.8	–9.8
Maximum	39.5	30.3	29.1	0.1	9.2	7.6	20.8
Standard Deviation	5.7	4.6	3.6	0.03	2.6	2.3	2.3
Skewness	1.4	1.5	1.8	–0.5	–3.5	–3.3	3.5
Excess Kurtosis	24.6	19.5	16.9	2.6	39.4	35.3	39.9

Floating Exchange Rate (Post-Crisis): November 21, 2002–2006					
	3-M Peso	**6-M Peso**	**1-Y Peso**	**Merval**	**USD/ARS**
Mean	–0.01	–0.01	–0.03	0.002	0.0001
Minimum	–1.19	–1.88	–6.25	–0.09	–0.04
Maximum	2.25	2.38	3.19	0.07	0.04
Standard Deviation	0.19	0.2	0.43	0.02	0.01
Skewness	0.7	–0.4	–5.5	–0.4	–0.5
Excess Kurtosis	32.4	38.4	89.2	2.1	10.2

Table A2: Means and variances of the estimated conditional variances

Currency Board (Pre-Crisis)							
	3-M Peso	**6-M Peso**	**1-Y Peso**	**3-M Dollar**	**6-M Dollar**	**1-Y Dollar**	**Merval**
Mean (h_t)	0.08	0.08	0.16	0.03	0.03	0.07	0.0006
Variance (h_t)	0.23	0.19	0.52	0.01	0.02	0.12	0.0000002

Crisis							
	3-M Dollar	**6-M Dollar**	**1-Y Dollar**	**3-M Peso**	**6-M Peso**	**1-Y Peso**	**Merval**
Mean (h_t)	1.8	2.7	2.3	16.3	11.3	15.2	0.0008
Variance (h_t)	10.2	66.6	30.4	1048	398	305	0.0000002

Floating Exchange Rate (Post-Crisis)					
	3-M Peso	**6-M Peso**	**1-Y Peso**	**Merval**	**USD/ARS**
Mean (h_t)	0.04	0.04	0.25	0.0003	0.00004
Variance (h_t)	0.004	0.007	0.49	0.00000003	0.000000005