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MONETARY POLICY SIGNALING, CLARITY OF CENTRAL BANK COMMUNICATION AND SOVEREIGN RISK SPREADS: EVIDENCES FOR BRAZIL

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ABSTRACT

The literature about both sovereign risk spreads and central bank communication has evolved, but separately. The present study aims to fill this gap analyzing the relation between central bank communication and the sovereign risk spreads. We provide empirical evidence of the effects of monetary policy signaling and clarity of central bank communication over the sovereign risk spreads. The results indicate the sovereign risk spreads respond to the monetary policy signaling. Moreover, the clarity of the central bank communication can reduce the sovereign risk spreads.

Keywords: Sovereign risk, central bank communication, transparency, clarity.

SINALIZAÇÃO DA POLÍTICA MONETÁRIA, CLAREZA DA COMUNICAÇÃO DO BANCO E SPREAD DO RISCO SOBERANO: EVIDÊNCIAS PARA O BRASIL

RESUMO

A literatura sobre ambos o spread de risco soberano e a comunicação do banco central evoluíram, mas separadamente. O presente estudo busca preencher esta lacuna analisando a relação entre a comunicação do banco central e o spread do risco soberano. Fornecemos evidências empíricas sobre os efeitos da sinalização da política monetária e da clareza da comunicação do banco central sobre o spread do risco soberano. Os resultados indicam que o spread do risco soberano responde às sinalizações da política monetária. Ademais, a clareza da comunicação do banco central é capaz de reduzir o spread do risco soberano.

Palavras-chave: Risco soberano, comunicação do banco central, transparência, clareza.

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INTRODUCTION

Sovereign risk is the risk related to the government capacity to honor its debts punctually and integrally. The sovereign risk is an important information to investors and reflect the quality of the government bonds, which may reflect in the debt costs. Emerging economies face challenges related to external vulnerability and volatility. These challenges increase the sovereign risk, which implies in a higher spread of the emerging markets bonds. Sovereign risk spread is result of higher uncertainties. Furthermore, the spread in the emerging markets bonds is a good measure of sovereign risk spreads (AMADOU, 2011). Besides, sovereign risk spreads can be influenced by macroeconomic fundamentals, external factors and economic policies (MONTES; TIBERTO, 2012).

Nowadays, there is plenty of evidence that monetary policy can benefit from the central bank communication and clarity (BLINDER et al., 2008; JANSEN 2011a). To communicate clearly reduce the cost to disinflation and anchor the inflation expectations. Thus, central bank communication and clarity can influence the market's expectations. Moreover, the conduction of the monetary policy can reduce the risks associated with higher inflation and macroeconomic volatility. In this sense, central bank communication can affect the sovereign risk spreads.

Studies relating monetary policy and sovereign risk spreads are still scarce in the literature. Montes and Tiberto (2012) measures the effect of monetary policy credibility and reputation over the EMBI. The findings suggest a higher credibility and reputation of the monetary policy can reduce the sovereign risk spreads. The present work contributes to the literature since it provides evidence of the influence of central bank communication and clarity over the sovereign risk spreads.

The literature about both sovereign risks spreads and central bank communication has evolved, but evolved separately. The present study aims to fill this gap analyzing the relation between central bank communication and the sovereign risk spreads, measured through the EMBI+ [1] index calculated by the JP Morgan. In particular, this study has the following objectives: (i) to analyze whether the monetary policy signaling relates to the EMBI+; (ii) to study the relation between the clarity of the

[1] Emerging Markets Bond Index.

central bank communication and the EMBI+; and (iii) to observe whether the previous relations depends on the level of the sovereign risk spread.

Besides this introduction, section 2 presents the literature about the determinants of the sovereign risk spread. Section 3 reviews the studies about central bank communication and clarity. In section 4 we introduce the data and methodology. Section 5 explores the results and section 6 concludes.

The macroeconomic determinants of the sovereign risk spread

In this section, we discuss the literature about the determinants of the sovereign risk spreads. Several works investigated this issue, although some points are still under debate or not enough explored. The literature does not provide evidence on the effect of the central bank communication and clarity, and how it can explain the behavior of the sovereign risk spreads in emerging economies.

Kamin and Kleist (1999) studies the behavior of the emerging markets credit spreads, measured through the Brady bonds. The study aims to analyze the external factors and concludes that variation in industrialized country short-term interest rates explain little in the decline of the emerging markets credit spreads. Amadou (2001) uses a simple univariate model with panel data to analyze the sovereign risk of emerging economies. The results indicate an asymmetric adjustment of spreads and ratings and highlight the disagreement between market and rating agencies.

In contrast, Eichengreen and Mody (1998) focus on the domestic economic fundamentals. The results indicate the quality of the credit influences the spread. Moreover, the changes in the fundamentals explain only a part of the change in the spreads. In line, Arora and Cerisola (2001) analyze the impact of changes in US monetary policy on the sovereign risk spreads, measured by the EMBI+. The results suggest that the level of the US interest rates has positive effects over the sovereign bond spreads. Although countries enjoy a significant degree of freedom to influence country risk and economic growth. Strong and sustainable fiscal policy and a low level of indebtedness are extremely important in reducing country risk and country interest rates. In turn, Baek et al. (2005) analyze the determinants of the sovereign risk premium assessed by the market, as measured by the yield spread of Brady bonds. The results suggest that liquidity, solvency and economic stability variables

significantly affect the country risk premium. However, the results indicate that the market's attitude towards risk plays an important role in determining the market risk premium.

Kennedy and Palerm (2014) compare the importance of the external and domestic conditions to determine emerging market bond spreads. The results suggest that, during the subprime crisis, it was movements in the risk measure that explained much of the observed changes in EMBI spreads. Moreover, the data suggests that markets differentiated between countries and that this was in part related to domestic fundamentals. The empirical results indicate that countries with viable fiscal positions, low external debt levels, low political risk and healthy foreign exchange reserves contributed to an improvement in the EMBI.

Özmen and Yaşar (2016) analyses the impacts of sovereign credit ratings and global financial conditions on the evolution of EMBI Global (EMBIG) spreads. The work uses panel data analysis for 23 developing countries for the period between 1998 and 2012. The findings suggest that credit ratings along with global financial conditions are the main determinants of EMBIG spreads.

Considering the Brazilian economy, Andrade and Teles (2005) analyzes the relationship between macroeconomic variables and the Brazilian sovereign risk spreads using a country beta model. In this model, the Brazilian risk is a variable in time parameter that corresponds to the relation between the returns of the Brazilian stock market and the returns of the stock market of the rest of the world. The analysis is conducted using time series for the period from January 1991 to December 2002. The results show that monetary policy has a significant and stable impact on the country risk. Moreover, international reserves have a significant impact only in the period of fixed exchange rate.

Ferreira (2010) analyzes the sovereign risk determinants for the Brazilian economy. The analysis was done for the period from April 1995 to June 2008, using the general non-restricted model (GUM). The results show that macroeconomic fundamentals, such as the current account deficit to GDP ratio, public debt/GDP ratio and imports largely explain the EMBI+ spreads. Furthermore, de Mendonça and Nunes (2011) analyze the relationship between a fiscal authority committed to the stabilization of the debt/GDP ratio and the sovereign risk. The findings indicate that a proper

management of public debt and the use of primary surplus targets ensure a sound strategy to promote the fall in the risk premium.

Regarding the monetary policy effects over the EMBI, Montes and Tiberto (2012) analyzes the role of macroeconomic fundamentals, credibility of monetary policy and the reputation of the central bank in reducing the country risk. The results suggest that monetary policy and public debt management, as well as the credibility and reputation of the monetary policy, affect the country risk premium.

The literature about the determinants of sovereign risk spreads discusses the external and domestic determinants, providing evidence about the role of the macroeconomic fundamentals. Some works also study the importance of the fiscal and monetary policy. Although, to our knowledge, there is no work analyzing the effects of monetary policy signaling and clarity of central bank communication over the sovereign risk spreads.

Central bank communication and clarity

Central communication plays an important role in the task of guiding markets expectations. It can reduce the asymmetric information between the central bank and the public. Moreover, the success of the central bank communication depends on the level of clarity (JANSEN, 2011a).

Blinder et al. (2008) defines central bank communication as the provision of information by the central bank to the public regarding present and future monetary policy, the economic outlook and the goals of the central bank. Jansen (2011a) argues that is impossible to reach a high degree of transparency without central bank communication. Thus, central bank communication is important to move markets and anchor expectations.

The literature on central bank communication provided plenty of empirical evidence about its effects over financial markets, equity markets and macroeconomic performance (BLINDER et al., 2008). However, the studies paid much less attention to the overall clarity of central bank communication (BULÍŘ; ČIHÁK; JANSEN 2013). The clarity of central bank communication can be defined as the quality of the information and the capacity of comprehension the public has regarding what central bank communicates (JANSEN, 2011a). Thus, one can argue which is the importance of

clarity of central bank communication, but so far, only few studies aimed to answer this question.

Jansen (2011a, 2011b) first introduced the readability indexes (FLESCH, 1948 and KINCAID et al., 1975) as measures of the clarity of central bank communication. Both works analyzed the effects of clarity over financial markets volatility. Montes et al. (2016) verified if the clarity of central bank communication affects the disagreement of inflation expectations in Brazil. Also regarding the Brazilian economy, Montes and Nicolay (2016) analyzed the relation between monetary policy credibility and clarity. The study concludes clarity of central bank communication improves monetary policy credibility, but only if the central bank is committed to its goals.

Hence, to provide further evidence on the effect that central bank communication and clarity has on the economy, we investigate the effect of these variables over the sovereign risk spread, measured through the EMBI. To provide information to the markets' participants may reduce the degree of uncertainty, reducing the risk in the emerging markets bonds.

DATA AND METHODOLOGY

In this section, we describe the data and methodology used in the empirical analysis. The objective is to study the relation between central bank communication and clarity and sovereign risks spreads.

We analyze the Brazilian economy. Brazil is the biggest emerging economy in the Latin America and in 1999 the CBB (Central Bank of Brazil) adopted the inflation target regime. Since then, the CBB has presented a high degree of transparency and regular communication with the public. Fracasso, Genberg and Wyplosz (2003) ranked Brazil as one of the highest in terms of central bank transparency. In this sense, Brazil is a good laboratory to analyze.

The first step is to define which type of central bank communication we consider. According to Blinder et al. (2008), there are two types of central bank communication: (i) official releases and (ii) communication through the specialized media. We focus on the official releases, following the existent literature about central bank communication and clarity to the Brazilian economy. (COSTA-FILHO; ROCHA, 2009 and 2010; MONTES; SCARPARI, 2015; MONTES; NICOLAY, 2016 and 2017; TABORDA, 2015;

MONTES *et al.*, 2016). The Central Bank of Brazil (CBB) releases two official announcements related to inflation and monetary policy, the inflation report, published quarterly with focus on the economic background, and the minutes of the Brazilian Monetary Policy Committee (COPOM) meetings. We focus on the COPOM minutes, which give information about the present and future economic outlook and the path of monetary policy. Moreover, it is recommended to use the minutes in order to avoid the problem of insufficient data.

Data

The database contains 154 monthly observations from March 2003 to February 2016. We choose this period because prior to this date there was no standard for the period of time that the minutes of the COPOM meetings were published after each meeting. Moreover, after 2006, the COPOM meetings started happening every 45 days. To adequate the variables related to the central bank communication to the monthly analysis, we repeat the last value in the months there is no minutes, following Montes et al. (2016) and Montes and Nicolay (2016, 2017).

Macroeconomic Variables

To measure the sovereign risk spread we use the EMBI+, calculated by JP Morgan. We extract the monthly average from the daily data. We use this index rather than traditional spreads over U.S. Treasury because they control for floating coupons and unusual features (AMADOU, 2011). Moreover, the EMBI+ measures most traded external-currency-denominated debt instruments of the countries. The EMBI+ presents, in base points, the spread of the emerging markets bonds.

To measure the impact of the fiscal result on the sovereign risk spread, we use the Public Sector Borrowing Requirements (PSBR) in the primary concept, from the Brazilian National Treasury (series 5793 from the CBB). If the PSBR increases, we expect the sovereign risk spread to increase, because it reduces the capacity and confidence that the government is able to honor its debts. The output gap (GAP) is extracted from the IBC-BR (Central Bank Economic Index – series 24364 from the CBB) by applying the Hoddrik-Prescott filter. The output gap indicates the

macroeconomic performance. When the output is above (below) its trend, there is a high (low) economic activity, which reduces (increases) the sovereign risk spread.

The international reserves as a percentage of the GDP (RES/GDP) indicate the exposure to international issues. Following Williamson (1973) and Montes and Tiberto (2012), international reserves indicates the degree of liquidity of the country. The international liquidity measures the capacity of the country to honor the current account and to respond to external shocks. Hence, it is expected a negative relation between the international reserves and the sovereign risk spread.

In relation to monetary policy, we include two variables in the model, inflation rate (INF – series 13522 from the CBB) and the basic real interest rate (IR – calculated from the basic interest rate series, 4189 from the CBB, subtracting the inflation rate, series 13522 from the CBB). The inflation rate indicates the monetary stability and is the main goal of monetary policy. Lower inflation rates indicate more stable macroeconomic environment and a committed central bank, reducing the sovereign risk spread. In the case of the basic real interest rate, it is the main instrument of monetary policy. Moreover, both the interest rate and inflation rate are the main indexing factors of the public debt. Hence, an increase in these variables increase the risk premium of the Treasuries Bonds (DE MENDONÇA; NUNES, 2011).

Monetary Policy Signaling

One of the main objectives of this work is to find evidence on the effect of the monetary policy signaling over the EMBI. To measure the monetary policy signaling, we follow the methodology of Rosa and Verga (2007) and analyze the COPOM minutes. We construct two dummies to measure if the central bank communication signals an increase or a decrease in basic interest rate. The dummy D_UP receives value 1 if the central bank signals an increase in the interest rate and 0 otherwise. The dummy D_DOWN receive values 1 if the central bank signals and decrease in the interest rate and 0 otherwise. The glossary used to classify the minutes is presented in the table A.1 in the appendix.

Clarity of the central bank communication

The clarity of central bank communication is calculated considering readability measures. Several works consider readability indexes as a proxy for clarity of central bank communication (e.g., JANSEN, 2011a and 2011b; JANSEN; MOESSNER, 2016; MONTES et al., 2016; MONTES; NICOLAY, 2017). We consider two measures in this work: the Flesch Ease Score, (FLESCH 1948) and the Flesch-Kincaid Grade Level (KINCAID et al, 1978). Theses indexes considers only textual characteristics.

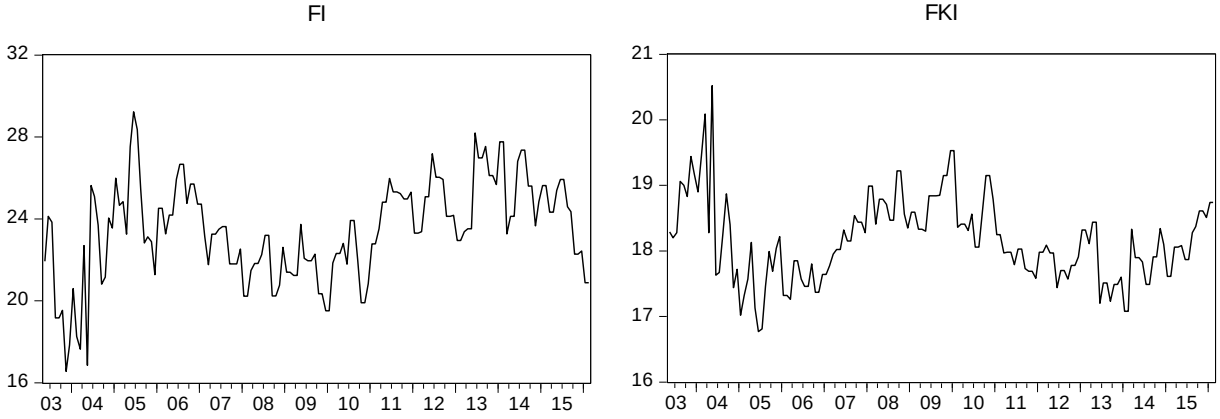
The Flesch (1948) statistic (FI) indicates the easiness to read the text. The index utilizes textual aspects as the number of words per sentences and the number of syllables per word. The formula of the index is:

FI = 206.835 − 1.015 × *(*#word/#sentences*)* − 84.6 × *(*#syllables/#words*)*

The index proposed by Kincaid et al. (1975) (FKI) represents the years of study needed to fully understand the text. This interpretation makes easier to compare different values. The formula of the index is:

FKI = 0.39 × *(*#word/#sentences*)* + 11.8 × *(*#syllables/#words*)* – 15.59

Figure 1 – Clarity indexes



Soucer: Authors' elaboration

Methodology

To measure the effects of the monetary policy signaling, clarity and transparency over the sovereign risk spread, we consider the following econometric specifications:

$$EMBI_t = \alpha_{11} + \alpha_{12}PSBR_{t-1} + \alpha_{13}GAP_{t-9} + \alpha_{14}INF_{t-3} + \alpha_{15}IR_{t-1} + \alpha_{16}RES/GDP_{t-1} + \alpha_{17}Subprime + \varepsilon_1 \quad (1)$$

$$EMBI_t = \alpha_{21} + \alpha_{22}PSBR_{t-1} + \alpha_{23}GAP_{t-9} + \alpha_{24}INF_{t-3} + \alpha_{25}IR_{t-1} + \alpha_{26}RES/GDP_{t-1} + \alpha_{17}Subprime + \alpha_{28}TFL + \varepsilon_2 \quad (2)$$

$$EMBI_t = \alpha_{31} + \alpha_{32}PSBR_{t-1} + \alpha_{33}GAP_{t-9} + \alpha_{34}INF_{t-3} + \alpha_{35}IR_{t-1} + \alpha_{36}RES/GDP_{t-1} + \alpha_{17}Subprime + \alpha_{38}D\_UP + \varepsilon_3 \quad (3)$$

$$EMBI_t = \alpha_{41} + \alpha_{42}PSBR_{t-1} + \alpha_{43}GAP_{t-9} + \alpha_{44}INF_{t-3} + \alpha_{45}IR_{t-1} + \alpha_{46}RES/GDP_{t-1} + \alpha_{17}Subprime + \alpha_{48}D\_DOWN + \varepsilon_4 \quad (4)$$

$$EMBI_t = \alpha_{51} + \alpha_{52}PSBR_{t-1} + \alpha_{53}GAP_{t-9} + \alpha_{54}INF_{t-3} + \alpha_{55}IR_{t-1} + \alpha_{56}RES/GDP_{t-1} + \alpha_{17}Subprime + \alpha_{58}FI + \varepsilon_5 \quad (5)$$

$$EMBI_t = \alpha_{61} + \alpha_{62}PSBR_{t-1} + \alpha_{63}GAP_{t-9} + \alpha_{64}INF_{t-3} + \alpha_{65}IR_{t-1} + \alpha_{66}RES/GDP_{t-1} + \alpha_{17}Subprime + \alpha_{68}FKI + \varepsilon_6 \quad (6)$$

Where ε_1 to ε_6 are the error term. The model is based on the existing literature about the macroeconomic determinants of the sovereign risk in the emerging economies. Moreover, we include a dummy for the subprime crisis, which receives value 1 to the period between September 2008 and September 2009, and 0 otherwise. The lags of the variables were determined empirically, considering the general-to-specific method. We consider the principle of parsimony and observe the statistical significance of the coefficients (HENDRY, 2001).

The first condition to validate the econometric analysis with time series data is to check if the series are stationary. This work performs the Kwaitowski-Phillips-Shin (KPSS) stationarity test. This test has the advantage over the conventional tests as they do not reject the null hypothesis too often (FRANSES; HALDRUP, 1994; CATI et al., 1999). Furthermore, Kwiatkowski et al. (1992) indicates that the test is adequate to small samples. According to this test, all series are stationary. The result is presented in the table A.2 in the appendix.

We estimate the equations by Ordinary Least Squares (OLS), Generalized Method of Moments (GMM), two-step GMM and Quantile Regression. These methods provide a straightforward interpretation of the coefficients, allowing one to observe the direction and statistical significance of the coefficients. Due to the presence of serial autocorrelation and heterokedasticity of unknown form, we estimate OLS and GMM with the Newey and West (1987) covariance matrix.

Due to the problems of endogeneity and simultaneity, common in time series analysis, we estimate all equations using the GMM, which provide robust estimates in the presence of this problem (HANSEN, 1982). In the GMM estimates, the instrumental variables play an important role. We follow the methodology of Johnston (1984) and include the same variables of the model lagged as instruments. Time series variables usually present a strong autoregressive component. Hence, this methodology provides instruments highly correlated with the variables in the model, and independent from the error term. We perform the J-statistic to check the orthogonality of the instruments.

The Durbin-Wu-Hausman[2] test indicates if the regressors are exogenous. Moreover, to avoid small sample bias problems, we estimate the two-step GMM with the Windmeijer (2005) covariance matrix.

RESULTS AND DISCUSSION

The results of the OLS and GMM estimates for the equation 1 to 6 are presented in the table 1. The Ramsey-RESET test indicates that all specifications are adequate. Moreover, in the GMM estimates, the J-statistic test shows that the instruments are orthogonal in relation to the error term. Furthermore, the Durbin-Wu-Hausman test indicates the regressor are exogenous.

All the estimated coefficients presented the expected signal. The estimates indicate the PSBR has a positive relation with the EMBI. This result shows that an increase in the PSBR also increases the sovereign risk spread. This evidence corroborates previous results founded by de Mendonça and Nunes (2011). The fiscal result is essential to indicate the capacity of the Govern to honor its debts. Hence, if the PSBR decreases, it means a higher primary surplus, increasing the resources available to reduce the public debt. This mechanism reduces the sovereign risk and reduces the bond spreads. The output gap presented a negative signal. I.e., an increase in the economic activity reduces the sovereign risk spread.

The inflation presents a positive effect over the EMBI, this result shows that higher inflation leads to higher sovereign risk, increasing the spread in the Brazilian bonds. The real interest rate has a positive relation to the EMBI. An increase in the basic real interest rate increases the spread in the Brazilian bond. Both variables are the main indexers of the Brazilian public debt. Hence, an increasing in these variables also increases the cost of the public debt, which means a higher sovereign risk spread.

The subprime crisis affected markets around the world. The emerging economies observed a negative capital flow in the period. In this sense, the dummy variables for the period of the subprime crisis presented a positive signal. Corroborating the idea of Kennedy and Palerm (2014), during the subprime crisis, the spread of the Brazilian bonds increased due to the increase of the risk perception.

[2] Based on the works of Durbin (1954), Wu (1973) and Hausman (1978).

The main analysis of this study lies in the effect of the economic transparency, monetary policy signaling and clarity of the central bank communication over the sovereign risk spread. The economic transparency presented a negative and significant signal in the OLS and GMM estimates – and a positive but not significant signal in the two-step GMM estimates. This result corroborates the idea that the economy can benefit from the reduction of asymmetric information between central bank and the markets. When the central bank is more transparent, it reduces the sovereign ris spreads.

Table 1 – OLS and GMM estimates

	OLS						GMM						TWO-STEP GMM					
	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)
C	**-47.141**	**-29.939**	**-70.221** *	**-36.694**	**-793.462** ***	**178.992** ***	**-63.479**	**-67.085** *	**-111.605** **	**-68.529**	**-133.647** ***	**164.964** **	**-26.584**	**-43.831**	**-86.830**	**-37.583**	**-928.725** **	**154.448**
	(44.330)	(45.439)	(38.263)	(43.029)	(209.988)	(62.152)	(44.151)	(34.906)	(43.540)	(37.083)	(265.811)	(67.327)	60.119	52.864	60.530	47.008	468.758	108.072
PSBR-1)	**12.234** *	**3.658**	**11.579** *	**11.364** *	**11.816** *	**13.061** **	**14.579** ***	**-4.809**	**11.123** **	**8.752** *	**11.234** **	**12.412** **	**17.015** **	**2.396**	**11.947**	**10.225**	**14.819** *	**14.509** *
	(6.797)	(7.691)	(6.264)	(6.124)	(6.250)	(6.139)	(5.409)	(6.891)	(5.376)	(5.181)	(4.961)	(5.030)	7.537	11.685	8.061	6.653	8.062	8.308
GAP(-9)	**-11.385** **	**-14.959** ***	**-12.253** **	**-10.630** **	**-8.585** **	**-8.724** **	**-13.264** ***	**-22.266** ***	**-13.016** ***	**-10.470** ***	**-12.732** ***	**-12.707** ***	**-12.769** ***	**-17.578** ***	**-11.553** ***	**-9.388** ***	**-13.120** ***	**-12.813** ***
	(4.982)	(3.681)	(4.805)	(5.102)	(3.896)	(4.192)	(2.790)	(3.678)	(2.804)	(2.711)	(2.504)	(2.304)	4.324	5.934	3.991	3.476	4.564	3.567
INF(-3)	**57.221** ***	**55.472** ***	**56.510** ***	**54.357** ***	**56.276** ***	**56.427** ***	**49.414** ***	**51.836** ***	**47.688** ***	**44.857** ***	**61.436** ***	**58.777** ***	**45.739** ***	**48.497** ***	**44.570** ***	**41.572** ***	**58.354** ***	**56.380** ***
	(5.500)	(5.042)	(5.454)	(5.394)	(4.852)	(4.766)	(4.513)	(4.625)	(3.690)	(4.494)	(4.201)	(4.020)	6.758	7.022	5.978	6.085	7.749	7.026
IR(-1)	**10.124** **	**11.987** ***	**11.706** ***	**12.893** ***	**11.349** ***	**10.137** ***	**14.474** ***	**16.000** ***	**16.754** ***	**17.993** ***	**12.846** ***	**12.001** ***	**12.906** ***	**13.855** ***	**15.721** ***	**16.154** ***	**12.789** ***	**11.364** **
	(4.170)	(3.411)	(3.662)	(3.587)	(3.569)	(3.871)	(2.758)	(2.750)	(2.087)	(2.303)	(3.009)	(3.260)	4.281	4.369	2.653	3.399	4.817	5.333
RES/GDP(-1)	**-41.780** ***	**-38.724** ***	**-40.702** ***	**-41.300** ***	**-40.573** ***	**-40.443** ***	**-18.704** *	**-15.929**	**-10.349**	**-9.742**	**-36.646** ***	**-29.342** ***	**-20.899**	**-17.731**	**-9.608**	**-10.259**	**-34.663** *	**-28.959** *
	(13.756)	(11.752)	(13.334)	(12.619)	(11.433)	(11.727)	(10.863)	(10.993)	(10.847)	(9.573)	(10.192)	(10.329)	16.280	18.070	14.382	11.737	17.836	16.160
SUBPRIME	**77.678** **	**103.714** ***	**87.672** ***	**84.872** **	**48.670**	**53.918** *	**217.361** ***	**230.562** ***	**214.776** ***	**222.076** ***	**107.749** ***	**137.305** ***	**224.261** ***	**240.724** ***	**221.033** ***	**232.265** ***	**137.380** **	**152.941** ***
	(35.056)	(25.963)	(32.939)	(36.155)	(36.141)	(32.533)	(37.852)	(31.175)	(26.450)	(28.500)	(33.948)	(34.225)	52.194	52.294	39.127	46.284	58.828	51.331
TFL		**-81.548** **						**-146.556** ***						**-86.770**				
		(33.810)						(40.074)						68.975				
D_UP			**29.727** **						**46.490** ***						**42.975** *			
			(13.306)						(12.854)						22.342			
D_DOWN				**-47.285** **						**-56.946** ***						**-51.927** **		
				(21.975)						(14.650)						20.345		
FKI					**41.052** ***						**57.259** ***						**47.215** *	
					(11.342)						(14.110)						24.909	
FI						**-9.272** ***						**-10.538** ***						**-9.172** **
						(2.350)						(2.735)						4.362
Ajusted R^2	0.636	0.648	0.646	0.659	0.672	0.660	0.489	0.531	0.522	0.531	0.614	0.584	0.466	0.489	0.506	0.503	0.590	0.567
F-statistic	42.861	38.852	38.577	40.721	43.224	40.897												
(p-value)	0.000	0.000	0.000	0.000	0.000	0.000												
Ramsey-RESET	0.287	4.539	0.724	0.124	1.015	1.008												
(p-value)	0.593	0.035	0.396	0.726	0.316	0.317												
Rank							26	29	29	29	29	29	26	29	29	29	29	29
Durbin-Wu-Hausn							0.890	1.671	4.408	2.607	2.486	3.030	0.775	1.515	5.000	2.846	2.011	2.263
(p-value)							0.989	0.976	0.732	0.919	0.928	0.882	0.993	0.959	0.660	0.899	0.959	0.944
J-statistic							14.045	13.134	12.985	13.306	18.886	17.045	13.881	14.934	13.377	13.781	18.030	16.454
(p-value)							0.781	0.904	0.909	0.898	0.592	0.708	0.791	0.826	0.895	0.879	0.647	0.744

Source: Author's estimates. *Notes:* Marginal Significance Levels: *** denotes 0.01, ** denotes 0.05 and * denotes 0.1. Coefficients in bold, standard errors in parentheses. Due to the problems of autocorrelation and heteroscedasticity, the reported t-statistics in the OLS and GMM estimates are based on the estimator of Newey and West (1987).

The monetary policy signaling follows the same direction of the basic interest rate. I.e. when the central bank indicates an increase in the interest rate, the EMBI also increases. Moreover, an indication of a reduction in the basic interest rate reduces the EMBI. This result shows the importance of the central bank communication. If the central bank has successfully moved the markets with his announcements, it reduces the need to move the basic interest rate. Furthermore, these results indicate that the international markets also consider the CBB announcements and its content.

In relation to the clarity indexes, the result indicates that an improvement in the clarity of the central bank communication reduces the EMBI. It is important to communicate, but the message should be clear enough to be fully understood by the market. The result indicates that an improvement in the clarity may reduce the sovereign risk spreads.

In general, the results indicates that a good strategy related to the central bank transparency and communication may reduce the sovereign risk spreads. If the central bank is succeeded in reducing the information asymmetry in relation to the markets, it helps to reduce the EMBI.

Interaction between the clarity and the monetary policy signaling

In this section, to provide further evidences on the effect of the clarity and the monetary policy signaling over the sovereign risk spread, we measure the effect of the interaction between clarity and monetary policy signaling over the EMBI. We consider only the FI clarity index in this section. The interaction variables are constructed multiplying the monetary policy signaling dummies for the FI index. Hence, we estimate the following equations:

$$EMBI_t = \alpha_{71} + \alpha_{72} PSBR_{t-1} + \alpha_{73} GAP_{t-9} + \alpha_{74} INF_{t-3} + \alpha_{75} IR_{t-1} + \alpha_{76} RES/GDP_{t-1} + \alpha_{77} Subprime + \alpha_{78} D\_UP * FI + \varepsilon_7 \quad (7)$$

$$EMBI_t = \alpha_{81} + \alpha_{82} PSBR_{t-1} + \alpha_{83} GAP_{t-9} + \alpha_{84} INF_{t-3} + \alpha_{85} IR_{t-1} + \alpha_{86} RES/GDP_{t-1} + \alpha_{87} Subprime + \alpha_{88} D\_DOWN * FI + \varepsilon_8 \quad (8)$$

Where ε_7 and ε_8 are the error term. The results are presented in table 2. The idea is to observe the effect of the clarity of central bank communication and monetary policy communication together.

The results of the estimates corroborate the signals founded in the Table 1. The Ramsey-RESET test indicates there is no problems of identification. Moreover, the

instrumental variables are adequate, according to the J-statistic. The Durbin-Wu-Hausman test provide evidence that the regressors are exogenous.

In relation to the variables of interaction between the monetary policy signaling and the clarity index, the results indicate that the monetary policy signaling, considering the quality of the information released, moves the sovereign risk spread in the same direction of the basic interest rate. Although all coefficients are statistically significant, the values are lesser – in an absolute perspective – than the effect of monetary policy signaling and clarity obtained at the table 1. This result may indicate a low quality of the information released, once the effect is reduced when considered the clarity of the announcement.

Table 2 – OLS and GMM estimates

	OLS		GMM		TWO- STEP GMM	
	(7)	(8)	(7)	(8)	(7)	(8)
C	**-67.441** *	**-33.131**	**-115.467** **	**-54.282**	**-70.297**	**-26.340**
	(39.215)	(42.715)	(46.407)	(35.088)	(60.185)	(41.090)
PSBR(-1)	**11.529** *	**11.242** *	**9.870** *	**10.486** **	**11.539**	**10.939**
	(6.416)	(6.161)	(5.687)	(4.924)	(8.254)	(6.615)
GAP(-9)	**-12.251** **	**-10.488** **	**-12.393** ***	**-11.302** ***	**-9.895** **	**-10.379** ***
	(4.863)	(4.979)	(3.032)	(2.787)	(4.325)	(3.654)
INF(-3)	**56.546** ***	**53.632** ***	**46.003** ***	**44.740** ***	**40.202** ***	**41.527** ***
	(5.513)	(5.036)	(4.228)	(4.428)	(6.254)	(5.813)
IR(-1)	**11.513** ***	**13.168** ***	**17.778** ***	**17.352** ***	**16.121** ***	**15.194** ***
	(3.738)	(3.650)	(2.084)	(2.374)	(2.819)	(3.306)
RES/GDP(-1)	**-40.964** ***	**-40.950** ***	**-5.957**	**-14.492**	**-5.134**	**-14.174**
	(13.543)	(12.477)	(10.530)	(9.754)	(14.282)	(12.797)
SUBPRIME	**87.458** **	**83.777** **	**244.593** ***	**220.022** ***	**255.308** ***	**227.632** ***
	(33.670)	(35.865)	(35.777)	(31.149)	(46.400)	(48.762)
*D_UP*FI*	**1.106** *		**1.715** ***		**1.554** *	
	(0.565)		(0.487)		(0.803)	
*D_DOWN*FI*		**-2.223** **		**-2.308** ***		**-1.921** ***
		(0.944)		(0.494)		(0.721)
Ajusted R^2	0.643	0.666	0.479	0.537	0.443	0.537
F-statistic	38.096	41.988				
(p-value)	0.000	0.000				
Ramsey-RESET	0.803	0.337				
(p-value)	0.372	0.562				
Rank			29	29	29	29
Durbin-Wu-Hausn			1.574	1.833	2.004	2.537
(p-value)			0.980	0.969	0.960	0.924
J-statistic			15.597	12.976	14.457	13.207
(p-value)			0.792	0.909	0.849	0.901

Source: Author's estimates. *Notes:* Marginal Significance Levels: *** denotes 0.01, ** denotes 0.05 and * denotes 0.1. Coefficients in bold, standard errors in parentheses. Due to the problems of autocorrelation and heteroscedasticity, the reported t-statistics in the OLS and GMM estimates are based on the estimator of Newey and West (1987).

Quantile Regression

In addition to the previous results, we estimate a simpler model using Quantile Regression in order to observe the effects of the monetary policy signaling, economic transparency and clarity over the sovereign risk spread, considering the level of the EMBI. Introduced by Koenker and Basset (1978), the Quantile Regression allows one to observe the differences in the estimated coefficients considering different levels of the dependent variable. In this sense, it is possible to observe if the estimated effects depends on the level of the sovereign risk spread. We estimate the Quantile Regression with moving blocks bootstrap (MBB), which provides robust standard errors to heteroskedasticity and autocorrelation of unknown form (FITZENBERGER, 1997).

The estimated model considers the central idea of the previous sections, the relation between transparency, communication and clarity and the EMBI. We include the lagged EMBI to capture the effects of all other variables. Hence, we estimate the following specifications:

$$EMBI_t = \alpha_{91} + \alpha_{92} EMBI_{t-1} + \alpha_{93} TFL + \varepsilon_9 \quad (9)$$

$$EMBI_t = \alpha_{101} + \alpha_{102} EMBI_{t-1} + \alpha_{103} D\_\text{UP} + \varepsilon_{10} \quad (10)$$

$$EMBI_t = \alpha_{111} + \alpha_{112} EMBI_{t-1} + \alpha_{113} D\_DOWN + \varepsilon_{11} \quad (11)$$

$$EMBI_t = \alpha_{121} + \alpha_{122} EMBI_{t-1} + \alpha_{123} FKI + \varepsilon_{12} \quad (12)$$

$$EMBI_t = \alpha_{131} + \alpha_{132} EMBI_{t-1} + \alpha_{133} FI + \varepsilon_{13} \quad (13)$$

$$EMBI_t = \alpha_{141} + \alpha_{142} EMBI_{t-1} + \alpha_{143} D\_UP * FI + \varepsilon_{14} \quad (14)$$

$$EMBI_t = \alpha_{151} + \alpha_{152} EMBI_{t-1} + \alpha_{153} D\_DOWN * FI + \varepsilon_{15} \quad (15)$$

Table 3 presents the results to the Quantile Regression estimates. In general, the results corroborate the previous findings. In relation to the TFL, the estimated coefficients indicate the effect over the EMBI is stronger in the central quantiles. Moreover, to very low and very high values of EMBI, the TFL presented no statistical significance.

The monetary policy signaling dummies, D_UP and D_DOWN, presents the expected signal in all quantiles. Although, they only present statistical significance between the second and eight quantile. Moreover, it is not possible to observe a strong evidence related to differences in the effect of monetary policy signaling in different parts of the EMBI distribution.

In relation to the clarity indexes, FKI and FI, it is possible to observe that the clarity of the central bank communication is able to reduce the EMBI only in the upper quantiles. This result indicates that the quality of information is important in moments of high risk. In these moments, improvements in the clarity helps to reduce the sovereign risk spreads, as the markets understand better the central bank intention and acts. On the other hand, if the central bank reduces the clarity of it statements, it may increase the risk. In the lower quantiles, the clarity indexes presents the opposite signal, indicating that in moments of very low risk, the clarity may increase the sovereign risk spread. Although, only the second quantile coefficient of the FI estimates present statistical significance.

The interaction between monetary policy signaling dummies and the clarity indexes, D_UP*FI and D_DOWN*FKI, confirms the results in the previous sections. It presents the expected signal and statistical significance in many of the estimated coefficients.

Table 3 – Quantile Regression Estimates

		Quantiles								
	OLS	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
CONSTANT	**22.851*** **	**22.222*** **	**25.275*** **	**24.515*** **	**22.044*** **	**22.851*** **	**30.743*** **	**18.388***	**24.759****	**21.542**
	(7.787)	(7.961)	(6.147)	(5.049)	(7.177)	(7.695)	(10.074)	(9.484)	(10.803)	(23.509)
EMBI (-1)	**0.935*** **	**0.849*** **	**0.865*** **	**0.898*** **	**0.935*** **	**0.935*** **	**0.947*** **	**0.997*** **	**0.993*** **	**1.021*** **
	(0.021)	(0.021)	(0.019)	(0.013)	(0.019)	(0.021)	(0.032)	(0.030)	(0.032)	(0.061)
TFL	**-22.713****	**-14.682**	**-16.337****	**-21.818*** **	**-26.165*** **	**-22.713****	**-28.046****	**-16.918****	**-13.849***	**5.625**
	(10.167)	(10.435)	(7.909)	(7.153)	(9.149)	(10.182)	(11.252)	(7.143)	(8.021)	(25.955)
CONSTANT	**9.0115**	**12.104**	**11.514****	**10.646****	**7.157**	**9.011**	**15.301**	**5.585**	**12.271**	**28.875**
	(6.608)	(9.533)	(5.768)	(4.973)	(5.052)	(6.528)	(9.906)	(9.390)	(9.647)	(23.182)
EMBI (-1)	**0.934*** **	**0.844*** **	**0.867*** **	**0.888*** **	**0.919*** **	**0.934*** **	**0.935*** **	**0.992*** **	**0.994*** **	**0.996*** **
	(0.022)	(0.031)	(0.019)	(0.018)	(0.017)	(0.022)	(0.033)	(0.031)	(0.030)	(0.075)
D_UP	**5.643**	**6.220**	**6.539****	**5.957***	**6.776***	**5.643**	**8.170**	**11.299****	**8.472**	**5.425**
	(4.623)	(6.035)	(2.990)	(3.271)	(3.913)	(4.682)	(6.258)	(5.231)	(5.811)	(14.441)
CONSTANT	**15.525****	**15.320****	**16.110*** **	**14.360*** **	**13.026****	**14.954****	**16.526***	**15.434***	**16.739***	**34.414***
	(5.963)	(6.895)	(5.332)	(4.484)	(5.612)	(5.802)	(9.837)	(8.784)	(9.994)	(18.214)
EMBI (-1)	**0.929*** **	**0.855*** **	**0.871*** **	**0.898*** **	**0.920*** **	**0.929*** **	**0.945*** **	**0.992*** **	**1.007*** **	**1.006*** **
	(0.019)	(0.023)	(0.020)	(0.016)	(0.020)	(0.018)	(0.035)	(0.029)	(0.032)	(0.064)
D_DOWN	**-10.589****	**-11.751**	**-6.363**	**-9.645*** **	**-7.819****	**-10.018****	**-9.201**	**-9.848***	**-11.548***	**-12.927**
	(4.513)	(7.905)	(4.141)	(3.370)	(3.632)	(4.563)	(6.629)	(5.233)	(5.853)	(13.113)
CONSTANT	**19.679**	**103.784**	**25.769**	**78.825**	**8.167**	**19.679**	**-112.655**	**-215.440****	**-371.787****	**-662.492*** **
	(72.893)	(80.474)	(69.909)	(54.466)	(63.392)	(73.241)	(76.199)	(91.405)	(143.0285)	(101.279)
EMBI (-1)	**0.935*** **	**0.849*** **	**0.861*** **	**0.893*** **	**0.906*** **	**0.935*** **	**0.955*** **	**0.959*** **	**0.999*** **	**1.018**
	(0.020)	(0.022)	(0.022)	(0.0159)	(0.018)	(0.020)	(0.027)	(0.029)	(0.043)	(0.028)
FKI	**-0.488**	**-4.992**	**-0.611**	**-3.657**	**0.268**	**-0.488**	**7.019***	**13.051****	**21.845*** **	**38.248*** **
	(4.036)	(4.602)	(4.021)	(3.003)	(3.460)	(4.032)	(4.182)	(5.158)	(8.066)	(5.671)
CONSTANT	**-1.76**	**-29.251**	**-40.000**	**-15.128**	**-15.091**	**-1.760**	**16.160**	**41.084**	**51.296**	**190.942*** **
	(20.379)	(34.691)	(31.592)	(19.680)	(20.537)	(20.399)	(27.816)	(35.837)	(46.899)	(43.567)
EMBI (-1)	**0.936*** **	**0.861*** **	**0.883*** **	**0.900*** **	**0.903*** **	**0.936*** **	**0.944*** **	**0.976*** **	**1.011*** **	**0.995*** **
	(0.018)	(0.031)	(0.022)	(0.015)	(0.018)	(0.018)	(0.029)	(0.033)	(0.042)	(0.031)
FI	**0.526**	**1.606**	**2.111***	**1.121**	**1.224**	**0.526**	**-0.031**	**-1.073**	**-1.572**	**-6.597*** **
	(0.833)	(1.216)	(1.172)	(0.793)	(0.868)	(0.834)	(1.110)	(1.290)	(1.734)	(1.687)
CONSTANT	**8.825**	**12.104***	**11.526****	**10.339****	**7.157**	**8.825**	**15.301**	**6.654**	**12.271**	**28.875**
	(6.604)	(6.789)	(5.724)	(4.837)	(5.151)	(6.611)	(9.867)	(8.672)	(10.191)	(21.580)
EMBI (-1)	**0.935*** **	**0.844*** **	**0.866*** **	**0.889*** **	**0.919*** **	**0.935*** **	**0.935*** **	**0.991*** **	**0.994*** **	**0.996*** **
	(0.022)	(0.020)	(0.019)	(0.018)	(0.017)	(0.022)	(0.034)	(0.029)	(0.032)	(0.072)
D_UP*FI	**0.246**	**0.268**	**0.278****	**0.244***	**0.281***	**0.246**	**0.319**	**0.450****	**0.384**	**0.233**
	(0.182)	(0.214)	(0.121)	(0.133)	(0.151)	(0.183)	(0.252)	(0.209)	(0.243)	(0.548)
CONSTANT	**16.218*** **	**16.124****	**16.110*** **	**16.321*** **	**13.326****	**16.218*** **	**16.435***	**16.473***	**20.195***	**34.382***
	(6.007)	(6.477)	(5.286)	(4.415)	(5.630)	(5.923)	(9.824)	(9.199)	(10.548)	(18.635)
EMBI (-1)	**0.925*** **	**0.852*** **	**0.871*** **	**0.890*** **	**0.918*** **	**0.925*** **	**0.946*** **	**0.988*** **	**0.996*** **	**1.006*** **
	(0.019)	(0.021)	(0.020)	(0.016)	(0.020)	(0.018)	(0.035)	(0.030)	(0.033)	(0.065)
D_DOWN*FI	**-0.416****	**-0.507***	**-0.299***	**-0.388*** **	**-0.325****	**-0.416****	**-0.390**	**-0.394***	**-0.504****	**-0.547**
	(0.181)	(0.289)	(0.164)	(0.136)	(0.141)	(0.1800)	(0.281)	(0.236)	(0.246)	(0.513)

Source: Authors' estimates. *Notes:* Marginal Significance Levels: *** denotes 0.01, ** denotes 0.05 and * denotes 0.1. Coefficients in bold and standard errors in. Regarding OLS estimates, due to the problems of autocorrelation and heteroskedasticity, the reported t-statistics in the OLS estimates are based on the estimator of Newey and West (1987). In the quantile regression, we follow Fitzenberger (1997) and we use moving blocks bootstrap (MBB) as an estimator for standard errors in quantile regression that is robust to heteroskedasticity and autocorrelation of unknown forms.

CONCLUSIONS

The present work addressed empirical evidences on the relation between economic transparency, monetary policy signaling and clarity of central bank communication and the sovereign risk spread, measured by the EMBI+. The model considers the economic fundamentals explored in the literature, and the results corroborated previous findings.

The contribution of this study is the evidence that the economic transparency, and also the clarity of the central communication, can reduce the sovereign risk spread. This result shows that the central bank can benefit of being transparent and reducing the asymmetric information with the market. When the market' participants have more information about the central bank actions, and more accessible information on the central bank announcements, it provides a better understanding of the economic outlook and reduce the sovereign risk spread.

Furthermore, the monetary policy signaling is able to move the EMBI in the same direction of the basic interest rate. This evidence suggests that international markets also consider the domestic central bank announcements.

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APPENDIX

Table A.1. Glossary of key words and expressions from minutes of COPOM meetings to build the Dummy variables of monetary policy signalling

Dummy variable	Key words
D_up	– The monetary policy should remain especially vigilant. – Maintenance of the interest rate represents a non-negligible risk for meeting the target (projected inflation above target). – Risks to achieving the goal. – Potential inflationary impacts of supply shocks yet to materialize. – Monetary policy should remain vigilant in order to avoid the propagation of shocks and exchange rate depreciation. – Monetary policy firmly committed to meeting the inflation targets. – Inflation remains high / monetary policy should be firm. – The monetary authority will be ready to adopt an active posture if projected inflation diverges from the target. – Inflation trend incompatible with the target. – Copom will need to be less tolerant if shocks threaten to raise inflation above the target. – The Central Bank will not allow supply shocks to lead to an increase in the inflation rate. – The Committee understands that it is appropriate to continue the adjustment pace of the monetary conditions underway. – The monetary authority must remain vigilant so that short-term pressures do not contaminate longer time horizont – The monetary authority should be ready to adjust the pace and magnitude of the interest rate adjustment process to the circumstances
D_down	– copom decided to continue the process of monetary easing. – Expected inflation below target/expectations consistent with the inflation risks/targets are less significant. – Consolidation of favourable perspectives for inflation in the medium term / copom considers that there is still room for further cuts in the selic rate in the future. – Benign scenario for the evolution of inflation (with reduction of uncertainties / favourable external scenario). – Economic activity consistent with supply conditions, with low probability of inflation pressures. – The gradual easing of the monetary stance will not compromise the important achievements made in lowering inflation

Source: Authors' elaboration.

Table A.2 – KPSS stationarity test

	Form	Bandwid	Teste	1%	5%	10%
EMBI	I/T	43.7	0.157	0.216	0.146	0.119
FI	I/T	12.6	0.094	0.216	0.146	0.119
FKI	I/T	11.7	0.095	0.216	0.146	0.119
GAP	I/T	30.1	0.109	0.739	0.463	0.347
INF	I	34.2	0.160	0.739	0.463	0.347
IR	I/T	58.5	0.136	0.216	0.146	0.119
PSBR	I/T	83	0.384	0.216	0.146	0.119
TFL	I/T	30.60	0.155	0.22	0.15	0.12

Source: Author's elaboration. "I" denotes intercept and "T" denotes trend. We use the Andrews Bandwidth selection.