Does People's Bank of China Communication Matter? Evidence from Stock Market Reaction

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April 24, 2019

Abstract

This paper tests whether the People's Bank of China's communication affects expectations of market participants and matters as a monetary policy instrument. For that purpose, we first rely on a computational linguistic tool to measure the tone of PBC speeches and second, we use a high frequency methodology to estimate the effect of tone on stock prices. Our results show that positive changes of the tone affect positively stock prices in the Shanghai and the Shenzhen stocks markets. Additional extensions show that PBC communication does not have a persistent effect on stock prices and that the tone of PBC communication still has a positive and significant impact on stock prices even when controlling for all the monetary policy instruments implemented by the central bank. Hence, our findings show that PBC communication matters as a monetary policy instrument to shape market expectations and to move asset prices.

Keywords: Central Bank Communication; People's Bank of China Sentiment; Financial Markets

JEL classification: E52, E58

*I thank Zuzana Fungácová, Matthias Neuenkirch as well as participants at the 50th Annual Conference of the Money, Macro & Finance Research Group and the CEREC Annual Conference on the "New Challenges for Central Bank Communication" for helpful comments. I also thank seminar participants at the Bank of Finland Institute for Economies in Transition (BOFIT), the Center for Financial Development and Stability (CFDS) in Henan University, Kwansei Gakuin University and the University of Franche-Comté. I am grateful for the BOFIT and the CFDS generous hospitality. I also thank Weibo Xiong for sharing his data. Corresponding author: EconomiX-CNRS, Université Paris Nanterre, 200 avenue de la République, 92001 Nanterre (France). Contact: h.bennani@parisnanterre.fr. ORCID ID: https://orcid.org/0000-0002-0042-8897.

I Introduction

China's rising impact on global financial and economic markets has attracted a growing number of the People's Bank of China (PBC) watchers. The PBC watchers are thus increasingly paying attention to PBC communication to understand its monetary policy stance and to adjust their expectations about future monetary policy.[1] Since market expectations are important in determining asset prices, we aim to test the impact of PBC communication on stock markets to assess whether PBC communication affects expectations of market participants.

This paper fits into the literature that studies how central bank communication moves asset prices (like e.g., Bernanke and Kuttner, 2005 or Lucca and Moench, 2015). This literature suggests that central banks use verbal communication to shape market expectations and that the ability of central banks to effectively communicate can be measured by market reaction. Following this line of thought, Kohn and Sack (2004) show that the Federal Open Market Committee statements move markets, while Ehrmann and Fratzscher (2009) and Reeves and Sawicki (2009) find similar evidences for the European Central Bank and the Bank of England, respectively.

However, far nothing is known about the impact of PBC communication on asset prices even though there is an increase of PBC transparency and communication since 2001 (Garcia-Herrero and Girardin, 2013). The PBC publishes statements summarizing the meetings of its Monetary Policy Committee and its governing body delivers speeches about monetary policy and the economic outlook. Therefore, given the unobserved nature of many of the monetary policy instruments implemented by the PBC,[2] its communication provides news which are likely to raise the signal-to-noise ratio and to move asset prices. This is shown by Xiong (2012) who constructs an index of monetary policy based on central bank statements. The author codes PBC statements and uses this summary variable to estimate a monetary policy rule. He finds that his rule works better than if based on interest rates only and concludes that "words" help "deeds" in order to understand PBC monetary policy.

Furthermore, recent theoretical and empirical evidences show that sentiment determines how market participants change their expectations (Angeletos and La'O, 2013; Angeletos et al., 2014; Benhabib et al., 2015). Since sentiment may be considered as information conveyed through the tone of central bank communication beyond the traditional quantitative and qualitative information conveyed through its content (see Hubert and Labondance, 2017),[3] market participants not only pay attention to the content of central bank communication but also to the tone conveyed by central bank statements, i.e. to how the central bank expresses its policy decisions and the economic outlook.[4]. Quantifying the tone of PBC statements is thus important to assess if and how PBC communication moves asset prices and shapes market expectations.

[1] These official communications include meeting notes of the Monetary Policy Committee, the quarterly Monetary Policy Reports and speeches of the PBC senior officials.

[2] Such as reserve requirements, credit targets and window guidance.

[3] Such as the future path of policy rate or economic conditions.

[4] This is illustrated by the following quote: "As I had often remarked, monetary policy is 98 percent talk and 2 percent action." Ben Bernanke (2016, p. 498).

Against this background, we aim to fill the gap in the literature by testing the impact of the tone of PBC communication on stock prices. For that purpose, we first use PBC speeches to quantify the tone of PBC communication. Many papers use speeches to quantify the tone of central bank communication given that they provide several advantages over other communication devices (Hubert, 2016; Born et al. 2014 and Bennani and Neuenkirch, 2014): (i) speeches are scheduled in advance, (ii) are closely followed by market participants, (iii) do not concur with policy meetings and thus, allow to measure the impact of tone on asset prices without confounding effects from actual policy decisions. To measure the tone of PBC speeches, we use the financial dictionary developed by Loughran and McDonald (LM) (2011) to identify negative words in a speech. We compute the tone of the speech by assessing the prevalence of negative words in it and construct a measure showing the relative degree of negative or positive tone of the speech. Second, we use a high-frequency methodology to estimate the effect of tone on stock prices, such as in Cook and Hahn (1989), Kuttner (2001) and Cochrane and Piazzesi (2002). This procedure consists in focusing on movements in some stock prices in a narrow window around the speech.[5] The assumption underlying this procedure is that movements in stock prices during the window of a speech may only reflect the effect of this speech.

The contributions of this paper in the literature are two-fold: we first measure the tone conveyed by PBC communication using a computational linguistic approach and, second, we analyze whether communication by the PBC affects Chinese stock markets and thus, market expectations. Our results show that the tone of PBC communication has a statistically and economically significant effect on stock prices even when controlling for PBC policy action, macroeconomic fundamentals, external factors, supply shock, markets' volatility, consumer and business confidence and economic uncertainty. We provide empirical evidences showing that positive changes of the tone affect positively stock prices in the Shanghai and the Shenzhen stocks markets. Additional extensions show that PBC communication does not have a persistent effect on stock prices and that the tone of PBC communication still has a significant impact on stock prices even when controlling for all the monetary policy instruments implemented by the central bank. Overall, this paper highlights that the tone of PBC communication affects asset prices by signaling more or less negative tone. These results provide policymakers further insights on how financial markets interpret and respond to the tone conveyed by PBC communication and show that PBC tone brings additional information to market participants. The policy conclusion is that PBC communication is a monetary policy instrument that matters to move asset prices and to shape market expectations. The remainder of this paper is structured as follows. Section 2 describes the data underlying the empirical analysis. In section 3, we explain our estimation procedure. Section 4 presents the results while section 5 provides additional extensions. The last section concludes.

[5]From the day before, close of business, to the day of the speech, close of business.

II Data

II.1 Tone of PBC Communication

Since the objective is to test the impact of the tone of PBC communication on stock prices, we need to use a communication tool with a precise timing. Hence, we use PBC speeches given that they are covered live by the media and are thus immediately available to market participants. The first challenge for measuring tone is to convert PBC speeches into a quantitative measure that can be analyzed. We first collect speeches made by PBC officials and available through the Bank of International Settlements (BIS) database.[6] Speeches from the BIS are available in real time, translated in English by a dedicated team of experts and are more appropriate for textual analysis than the speeches published in the PBC website which suffer from a poor quality translation. Moreover, the financial dictionary used to compute the tone of PBC communication is in English, hence, PBC speeches need to be translated in English. We obtain in total 100 speeches delivered during the period 1996M09-2015M01. It is worth emphasizing that these speeches were made publicly (for instance, in (inter)national conferences, seminars or forums), however, they were not delivered in a regular manner as shown by figure 1 below.

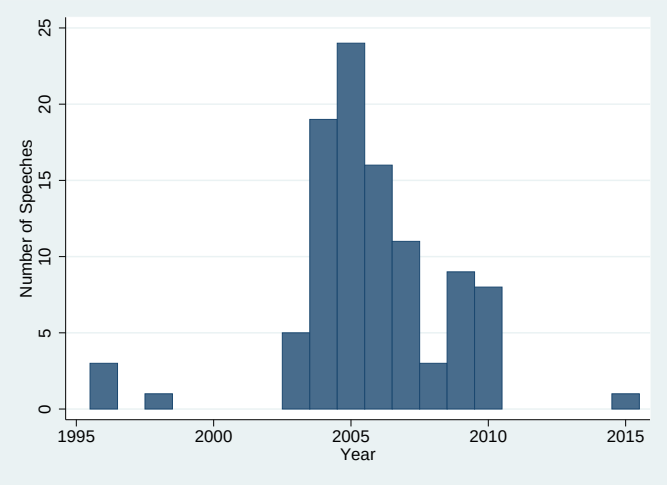

Figure 1

Number of speeches per year

Figure 1 shows that PBC speeches available through the BIS database were mainly made during the period comprised between 2003 and 2010. It is then possible that some speeches were not collected by the BIS, notably during the periods 1999-2002 and 2011-2015. Nevertheless, the PBC website displays the same number of speeches than those of the BIS although the quality of their translation is not as good.[7] For the sake of consistency, we focus on the speeches made

[6] https://www.bis.org/list/cbspeeches/index.htm.
[7] http://www.pbc.gov.cn/en/3688110/3688175/index.html.

during the period 2003-2010. Finally, a deeper analysis of the speeches shows that most of them were delivered by PBC governor Zhou Xiaochuan (2002M12 -) and in Beijing (see tables 5 and 6 in the Appendix).

As a second step, we compute the tone of PBC communication using the financial dictionary developed by Loughran and McDonald (LM) (2011). The LM dictionary is designed to fit financial and economic documents (see, e.g., Gurun and Butler, 2012 and Hillert et al., 2014) and has proven to be relevant in the context of central bank communication (Hansen and McMahon, 2016), in contrast to the widely used Harvard's Dictionary. Furthermore, the use of the LM dictionary to measure tone has many advantages. First, researcher subjectivity is avoided. Second, since we use a computer program to determine the frequency of single words, the method scales to large samples. Third, the LM list is a well established dictionary used in finance and in other contexts as well (for a survey, see Loughran and McDonald, 2016). Finally, since the LM dictionary is publicly available, it is easy to replicate this analysis. Many papers have used this approach, i.e. the use of a dictionary to count specific words, to measure the qualitative content of central bank communication (like e.g., Schmeling and Wagner, 2016 and Hubert and Labondance, 2017). Therefore, we use the LM dictionary to identify words that can be categorized as negative in economic and financial contexts.[8] We only use negative words because the usefulness of positive words to measure tone is limited since they can be negated. The paragraph below presents an excerpt of a speech made by Zhou Xiaochuan, the Governor of the PBC on December 02, 2004.[9] We highlight in bold the words that convey a negative tone according to the LM dictionary.

"*There are many underlying reasons for financial* ***risks****. First, the rapid global economic, technological and financial development has made it* ***difficult*** *to address new* ***problems*** *with existing theories and experiences. Among these are the* ***uncertainties*** *in financial stability. Second, in the transition from planned to market economy, some aspects of institution building is still in a* ***vague****, non-planned and non-market, or* ***conflicting*** *stage. Third, reality has proved that all kinds of* ***problems*** *in the economy are reflected in the workings of the financial system, which was particularly evident during the Asian financial* ***crisis****. Financial* ***risks****, if not addressed in a timely manner, could continue to grow and develop into economic and financial* ***crisis****.*"

We count the number of negative words in each speech and compute the ratio of the number of negative words, N, to the total number of words, T, N/T. On average, we find that the ratio of negative words to total words is 2.5%, while the maximum and minimum values are 7.4% and 0.84%, respectively. The tone of PBC speech delivered at time t, τ_t, is defined as:

[8] The LM dictionary lists 2335 words to describe the negative tone. Words such as *aggravate*, *anomaly*, *bankrupt*, *collapse*, *collusion* or *complaints* are used to describe negative tone in economic and financial contexts.

[9] *Improve legal system and financial ecology.* Speech by Mr Zhou Xiaochuan, Governor of the People's Bank of China, at the "Forum of 50 Chinese Economists", Beijing, 2 December 2004.

$$\tau_t = 1 - N_t/T_t \tag{1}$$

A lower value of τ_t reflects more negative PBC tone and a higher values implies more positive tone. In the empirical analysis, we use change in tone, $\delta\tau_t$, measured as the first difference in τ_t between two subsequent speeches. Hence, we interpret increase in $\delta\tau_t$ as tone becoming more positive and decrease in $\delta\tau_t$ as tone becoming more negative. We find that the tone increases in 52 speeches while it decreases in 48 speeches. Figure 2 below shows the evolution of $\delta\tau_t$ over the full sample period.

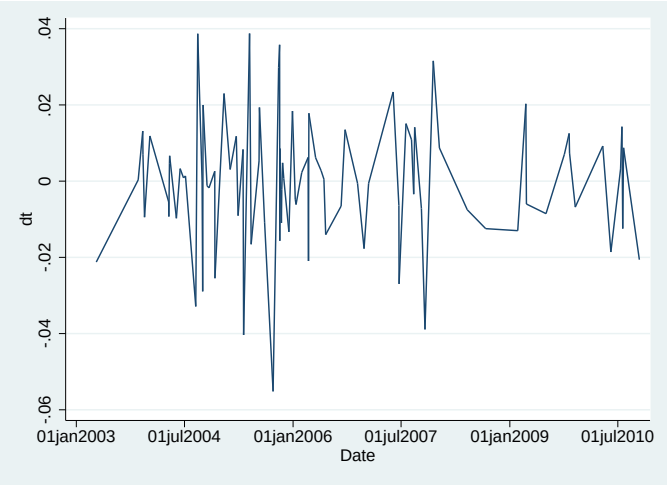

Figure 2

Changes of the tone of PBC's speeches

Figure 2 above shows that $\delta\tau_t$ does not display any apparent trend through the sample period, hence, it avoids the structural and econometric issues that arise with a trend. The figure also shows that change of the tone evolves negatively and positively through time, suggesting continuous evolution in the tone of PBC communication. Table 7 in the Appendix provides detailed statistics of $\delta\tau_t$.

II.2 Stock Market Indexes

To explore the effect of PBC communication on Chinese stock markets, we use several daily data on stock indexes. First, we use (i) an index that tracks the daily price performance of all A-shares that are restricted to local investors and qualified institutional foreign investors (SHASHR), (ii) the Shanghai Stock Exchange Composite Index (SHCOMP) which tracks the daily price performance of all A-shares and B-shares listed on the Shanghai Stock Exchange, (iii) an index consisting of the 50 most representative stocks from Shanghai security market (SSE50A) and (iv) the Shanghai Stock Exchange 180 A-Share Index which tracks the performance of the

180 most representative A-share stocks (SSE180A). Second, we use the Shenzhen Composite Index (SZCOMP) which shows the stock performance of all the A-share and B-share lists on the Shenzhen Stock Exchange.

II.3 Control variables

To test whether the tone of PBC communication has a significant impact on stock prices even when controlling for economic conditions, we use data related to PBC's policy action, macroeconomic fundamentals, external factors, supply shock, markets' volatility, consumer and business confidence and economic uncertainty as control variables.

PBC policy action. We use the one-year policy lending rate for financial institutions (Rate) as proxy for PBC policy rate decisions.
Macroeconomic fundamentals. We use the yearly change of the Gross Domestic Product (GDP), the urban registered unemployment rate (Unemp), the annual change of the Consumer Price Index (CPI) and the year-over-year change of the industrial production index (IPI) to control for macroeconomic fundamentals. Moreover, we use oil prices (Oil) to control for supply shock.
External factors. We use the US and the euro area 10-year government bond yields (US10Y and Euro1OY) as well as the World Trade Index (WTI) to control for external factors.
Markets' volatility. To control for foreign financial stress, we use the emerging markets (excluding China) volatility indexes of bond (Vol. bond) and stock markets (Vol. stock).
Confidence. We use the consumer confidence index (Cons. conf.) and the entrepreneurs' confidence index (Ent. conf.) to control for confidence.
Economic Uncertainty. We use the Economic Policy Uncertainty (EPU) index developed by Baker et al. (2016) to control for economic uncertainty in China. The EPU index is constructed based on newspaper articles regarding policy uncertainty. Baker et al. (2016) count the number of articles published in the *South China Morning Post* using the terms "uncertain" or "uncertainty", "economic" or "economy", and scale the EPU count by a measure of the number of articles in the same newspaper and month.

The sources of the data are Bloomberg, the China National Bureau of Statistics and the PBC. If data are not available at a daily frequency (such as for the GDP for instance), we use the last available data. We check the presence of unit root using the Augmented Dickey-Fuller and the Phillips-Perron tests. We find that the null hypothesis cannot be rejected for GDP, oil prices, the volatility index of bond market, the entrepreneurs' confidence index and the US and euro area 10-year government bond yields. We use the first-difference of these variables in the estimation procedure. Moreover, the inclusion of many different explanatory variables might give rise to multicollinearity problems. We calculate the variance inflation factors (VIFs) for all models. In all cases, all VIFs are well below the rule of thumb threshold of 10. Table 7 in the appendix

provides the summary statistics of the data.

III Econometric Setup

The empirical analysis follows the methodology of Schmeling and Wagner (2016). We explore how changes in the tone of PBC communication affect stock prices. For that purpose, we need to compute stock price changes around the PBC speeches. The key idea is that any price reaction in a short time window is likely to be caused by the speech.

Since the set of policy targets of the PBC not only contains the common price stability and output gap, but also contains the stability of financial market, the release of PBC speech itself may reflect the central bank intention to manage the market expectation or to guide the market reaction when it is in trouble. For instance, a positive change of tone may reflect the PBC reaction to the stock market disturbances. As a result, after a bad shock, the stock market may have positive reaction to PBC speech with the expectation of government intervention. This to some extent reflects the fact that PBC speeches act as a policy tool to guide the market reaction. So, to mitigate the endogeneity issue, we control for the aggregate factors that potentially cause the omitted variable bias.

To evaluate the immediate impact of PBC communication on stock prices at day t, we compute the one-day stock price using the closing price of the day preceding the speech and the day on which the speech takes place. We denote the speech-day return by r_t. We estimate r_t on measure of tone change, $\delta\tau_t$, as follows

$$r_t = \alpha + \beta\delta\tau_t + \gamma X_t + \epsilon_t \tag{2}$$

where r_t represents a stock price with t specifying the day of the speech. α is a constant, β captures the effect of change of the tone of PBC communication, measured by $\delta\tau_t$, and X_t is a vector of control variables. The error term, ϵ_t, represents any other pricing factors affecting the financial variable, such as revisions of the implicit short-term interest rate, term premia, risk premia and all other possible asset-specific value drivers.

IV Tone of PBC Communication and Stock Market Reaction

In this section, we highlight a significant relationship between the tone of PBC communication and stock prices in China. To provide evidence that the tone of PBC speeches contains additional information for stock prices beyond PBC monetary policy actions and the economic conditions, we estimate (2) with and without the set of control variables. Table 1 below shows the estimated results of (2) for the period 2003M01-2010M10.

Table 1: PBC Tone and Stock Prices (2003M01-2010M10)

	SHASHR		SHCOMP		SZCOMP		SSE50A		SSE180A	
α	0.11	1.005	0.11	0.99	0.08	3.26	0.005	5.17	0.06	2.7
	[0.14]	[15.7]	[0.14]	[15.6]	[0.16]	[18.27]	[0.16]	[28.6]	[0.16]	[15.2]
β	0.67**	1.01**	0.66**	1.009***	0.89**	1.14**	0.47*	0.35	0.05	-0.26
	[0.31]	[0.36]	[0.31]	[0.36]	[0.38]	[0.43]	[0.28]	[0.33]	[0.55]	[0.36]
Rate		0.82		0.82		0.51		1.26		1.54**
		[0.57]		[0.57]		[0.64]		[0.79]		[0.63]
GDP		0.008		0.006		0.07		0.10		-0.06
		[0.29]		[0.29]		[0.35]		[0.21]		[0.27]
CPI		-0.01		-0.01		0.002		0.02		0.04
		[0.05]		[0.05]		[0.06]		[0.04]		[0.05]
IPI		0.003		0.003		0.005		0.0009		-0.004
		[0.004]		[0.004]		[0.006]		[0.002]		[0.004]
Unemp		1.97		1.97		1.65		-0.23		2.69
		[3.19]		[3.19]		[3.82]		[5.26]		[2.84]
Oil		0.01		0.01		0.004		-0.03		-0.03
		[0.02]		[0.02]		[0.02]		[0.02]		[0.02]
Vol. bond		-0.11		-0.11		-0.04		-0.24		-0.17
		[0.31]		[0.31]		[0.37]		[0.27]		[0.31]
Vol. stock		0.28		0.28		0.09		0.21		-0.12
		[0.56]		[0.56]		[0.63]		[0.49]		[0.34]
Cons. conf.		-0.13		-0.13		-0.12		-0.1		-0.2**
		[0.09]		[0.09]		[0.1]		[0.08]		[0.08]
Ent. conf.		0.08		0.08		0.13*		0.01		0.03
		[0.05]		[0.05]		[0.07]		[0.04]		[0.67]
Uncertainty		-0.0007		-0.0006		0.004		-0.006		-0.001
		[0.006]		[0.006]		[0.007]		[0.006]		[0.004]
Euro10Y		-0.31		-0.31		0.31		2.83**		0.72
		[1.42]		[1.42]		[1.72]		[1.4]		[1.35]
US10Y		-1.3		-1.3		-1.43		-0.39		0.38
		[0.87]		[0.87]		[1.005]		[1.36]		[1.06]
WTI		-0.08		-0.08		-0.11		-0.02		-0.18
		[0.15]		[0.15]		[0.17]		[0.1]		[0.13]
R^2	0.03	0.22	0.03	0.22	0.05	0.25	0.01	0.27	0.002	0.31
Obs.	87	81	87	81	87	81	79	73	84	78

Estimates are obtained using Newey-West standard errors. *, **, *** denote significance at the 10%, 5% level and 1% level, respectively. Standard errors between brackets.

Table 1 shows that change of the tone of PBC speeches has a statistically significant impact on stock prices. Hence, positive (negative) change of the tone is associated with higher (lower) stock prices in the Shanghai market, the Shenzhen market and for the 50 most representative stocks from Shanghai security market, even when controlling for economic conditions. We find a significantly positive coefficient comprised between 0.7 and 1.1. In economic terms, a one standard deviation increase (decrease) in tone change, where $\sigma[\delta\tau_t]$=0.38, is associated with

higher (lower) return of 0.26% for the SHASHR and the SHCOMP, while the increase is around 0.35% for the SZCOMP. When we include the control variables, the effect of tone change on stock prices is higher, since a one standard deviation increase is positively related to the SHASHR (SHCOMP) by 0.4%, and by 0.44% for the SZCOMP. Concerning the 50 most representative stocks in the Shanghai market, a one standard deviation increase (decrease) in $\delta\tau$ increases (decreases) the index by 0.14%. Regarding the control variables, the results indicate that PBC policy action (euro area 10-year government bond yield), is positively and significantly related to the 180 (50) most representative A-share stocks in the Shanghai Stock Exchange. These results suggest that PBC tone conveys stock-relevant information beyond PBC monetary policy action and some external factors.

All in all, these findings show a significant relationship between tone changes and stock prices that is robust to controlling for monetary policy action, macroeconomic fundamentals, external factors, supply shock, markets' volatility, consumer and business confidence and economic uncertainty. This suggests that PBC tone significantly contains price-relevant information for Chinese stock markets beyond the information contained in the set of control variables.

V Extensions

In this section, we propose additional extensions. First, we test the persistence of the effect of PBC tone on equity prices, second, we differentiate the impact on stock prices of positive and negative changes of the tone and third, we use a different indicator measuring the stance of PBC monetary policy. We find that PBC communication does not have a persistent effect on stock prices and that positive changes of the tone affect significantly stock prices, while this is not the case for negative changes. Finally, the tone of PBC communication has a positive and significant impact on stock prices even when controlling for all the monetary policy instruments implemented by the PBC.

V.1 The Persistent Effect of the Tone of PBC Communication

We investigate the effect of PBC tone on stock prices beyond the speech-day. We compute cumulative stock prices over n days (starting with the speech-day) and define them as $r_{t,n}$. For $n = 1$, $r_{t,2}$ corresponds to the return one day after the speech and for $n = 5$, $r_{t,5}$ specifies cumulative stock prices from the day preceding the speech-day up to five trading days after the speech-day. The estimation procedure takes the following form.

$$r_{t,n} = \alpha + \beta_n \delta\tau_t + \gamma_n x_{t,n} + \epsilon_{t,n} \tag{3}$$

where $r_{t,n}$ is the cumulative stock price over n days (with $2 \leq n \leq 5$) after the speech made at date t. The rest of the right-hand side variables are similar to those of (2). Table 2 below presents the results of the estimation for the period 2003M01-2010M10. To save some space, we

do not show the results related to the control variables, γ_n, but only those of the persistent effect of PBC tone, β_n, with and without the control variables.

Table 2: PBC Tone and Cumulative Stock Prices (2003M01-2010M10)

		Without control variables				With control variables			
	Day	α	β_n	R^2	Obs.	α	β_n	R^2	Obs.
SHASHR	$n=2$	0.03	0.7	0.01	87	44.9**	1.06**	0.39	81
		[0.23]	[0.58]			[18.35]	[0.5]		
	$n=3$	-0.07	0.43	0.004	87	70.2***	0.67	0.33	81
		[0.27]	[0.64]			[23.8]	[58.2]		
	$n=4$	0.18	0.38	0.002	87	69.8**	1.01	0.22	81
		[0.35]	[0.79]			[31.7]	[0.64]		
	$n=5$	0.2	-0.23	0.006	87	75.02*	0.49	0.28	81
		[0.41]	[1.04]			[40.8]	[0.71]		
SHCOMP	$n=2$	0.05	0.69	0.01	87	44.78**	1.04**	0.4	81
		[0.23]	[0.57]			[18.28]	[0.5]		
	$n=3$	-0.05	0.41	0.003	87	69.1***	0.68	0.33	81
		[0.27]	[0.65]			[24.1]	[0.59]		
	$n=4$	0.2	0.4	0.002	87	70.8**	1.003	0.22	81
		[0.35]	[0.78]			[31.4]	[0.64]		
	$n=5$	0.19	-0.24	0.006	87	73.5*	0.48	0.28	81
		[0.41]	[1.04]			[40.2]	[0.71]		
SZCOMP	$n=2$	0.03	0.9	0.02	87	71.2***	1.28**	0.36	81
		[0.26]	[0.7]			[19.5]	[0.62]		
	$n=3$	-0.1	0.49	0.03	87	103.08***	0.82	0.28	81
		[0.33]	[0.76]			[26.2]	[0.65]		
	$n=4$	0.26	0.5	0.002	87	106.2***	1.12	0.21	81
		[0.4]	[0.93]			[37.03]	[0.78]		
	$n=5$	0.28	-0.22	0.006	87	93.3**	0.5	0.3	81
		[0.4]	[1.2]			[36.9]	[0.87]		
SSE50A	$n=2$	-0.05	0.14	0.0007	82	52.6***	0.5	0.42	81
		[0.23]	[0.55]			[19.1]	[0.4]		
	$n=3$	-0.21	0.38	0.003	82	66.02***	0.71*	0.42	81
		[0.28]	[0.64]			[20.7]	[0.42]		
	$n=4$	0.25	0.31	0.001	82	64.86**	0.88	0.29	81
		[0.36]	[0.77]			[27.9]	[0.56]		
	$n=5$	0.03	-0.36	0.001	82	69.004*	0.18	0.4	81
		[0.39]	[0.99]			[34.8]	[0.63]		
SSE180A	$n=2$	0.07	0.62	0.01	87	54.8***	1.02**	0.41	81
		[0.23]	[0.59]			[19.1]	[0.47]		
	$n=3$	-0.12	0.44	0.004	87	77.9***	0.76	0.38	81
		[0.28]	[0.68]			[21.9]	[0.5]		
	$n=4$	0.1	0.39	0.002	87	84.9***	0.98	0.31	81
		[0.33]	[0.78]			[30.07]	[.59]		
	$n=5$	0.23	-0.17	0.003	87	82.6**	0.52	0.32	81
		[0.41]	[1.06]			[38.4]	[0.7]		

Dependent variable: $r_{t,n}$. Estimates are obtained using Newey-West standard errors. *, **, *** denote significance at the 10%, 5% level and 1% level, respectively. Standard errors between brackets.

Table 2 shows that the slope coefficient of tone changes is significantly positive during the time window that captures PBC speech the day after, $r_{t,2}$, for all equity prices except the SSE50A, but is not significant during later time windows, i.e. when $n > 2$. Hence, these results suggest that PBC communication does not have a persistent effect on stock prices two days after the speech as shown by the non-significant value of the parameter β_n when $n > 2$.

V.2 Asymmetric Reaction to Tone Changes

To measure whether stock prices react asymmetrically to positive and negative changes of the tone of PBC communication. We estimate the following model

$$r_t = \alpha + \lambda D_t^{\delta\tau>0} + \theta D_t^{\delta\tau<0} + \gamma X_t + \epsilon_t \tag{4}$$

where $D_t^{\delta\tau>0}$ ($D_t^{\delta\tau<0}$) takes the value 1 when $\delta\tau > 0$ ($\delta\tau < 0$), and 0 otherwise. The rest of the left-hand side and right-hand side variables are similar to 2. Table 3 below shows the estimated results of 4.

Table 3: Asymmetric Tone Changes and Stock Prices (2003M01-2010M10)

	Without control variables					With control variables				
	α	λ	θ	R^2	Obs.	α	λ	θ	R^2	Obs.
SHASHR	0.1	0.75*	0.58	0.03	87	1.02	1.39**	0.66	0.23	81
	[0.16]	[0.42]	[0.53]			[16.4]	[0.52]	[0.52]		
SHCOMP	0.1	0.75*	0.58	0.03	87	1.01	1.38**	0.66	0.23	81
	[0.16]	[0.42]	[0.53]			[16.4]	[0.52]	[0.52]		
SZCOMP	0.05	1.08**	0.71	0.05	87	3.27	1.42**	0.85	0.25	81
	[0.18]	[0.48]	[0.66]			[18.9]	[0.61]	[0.66]		
SSE50A	0.002	0.49	0.46	0.01	79	13.6	1.12***	-0.38	0.29	73
	[0.18]	[0.52]	[0.35]			[27.1]	[0.4]	[0.56]		
SSE180A	0.09	-0.11	0.21	0.01	84	0.93	-0.47	-0.065	0.004	78
	[0.16]	[1.07]	[0.44]			[16.6]	[0.52]	[0.62]		

Dependent variable: r_t Estimates are obtained using Newey-West standard errors. *, **, *** denote significance at the 10%, 5% level and 1% level, respectively. Standard errors between brackets

When we considere positive and negative changes of the tone in the estimation procedure, we find that positive changes of the tone drive stock markets in Shanghai and Shenzhen upward, as shown by the significant and positive parameter λ, while negative changes of the tone do not affect stock prices. Hence, the results show that stock markets are responsive to positive changes of the tone but do not react when the tone becomes more negative. This one-side impact suggests that the PBC is able to stabilize the stock market through its communication policy. Interestingly, Frank and Sanati (2018) find similar evidences for US market responses to news stories. They interpret their results as stock market overreaction to good news and underreaction to bad news. According to Chan (2003), this might be due to the fact that investors react slowly to bad news.

V.3 An Alternative Measure of PBC Monetary Policy Stance

It is well known that the monetary policy instruments used by the PBC have varied over time. As an illustration, Xiong (2012) suggests that the credit plan was used as the main policy instrument during the 1990s but that it was abandoned in 1998 and replaced by central bank refinancing to the commercial banks. Then, from 2000s onward, open market operations began to play an important role. An additional feature of the PBC is that it uses different instruments to

achieve a similar objective. For instance, during the years 2006-2007, the reserve requirements and the open market operations were both used to absorb excessive liquidity while in 2008 and 2011, the PBC announced contractionary monetary policy and undertook a series of tightening measures to curb inflation. Consequently, the monetary policy instruments used by the PBC are different in nature and are not used in the same frequency nor magnitude. Hence, it is important to embed these different policy instruments into a single index reflecting the overall monetary policy stance of the PBC. For that purpose, we use the policy stance index constructed by Xiong (2012) between 1986Q4 and 2010Q3. The index reflects the movements of all the important monetary policy instruments used by the PBC and captures as much information on monetary policy actions as possible (see table 8 and figure 3 in the appendix).[10] We replace the control variable related to PBC policy action by the policy stance index developed by Xiong (2012) in the baseline estimation (2) and re-estimate it. Table 4 below shows the results of the estimation for the period 2003M01-2010M10. To save some space, we only show the results related to the effect of the changes of PBC tone on stock prices, the parameter β.

Table 4: PBC Tone and Stock Prices (2003M01-2010M10)

	α	β	R^2	Obs.
SHASHR	-8.72	0.86**	0.24	81
	[15.6]	[0.4]		
SHCOMP	-8.65	0.86**	0.42	81
	[15.5]	[0.4]		
SZCOMP	-10.64	0.98*	0.28	81
	[16.6]	[0.49]		
SSE50A	34.15	0.32	0.25	73
	[23.1]	[0.32]		
SSE180A	24.9	-0.24	0.23	78
	[20.7]	[0.4]		

Dependent variable: r_t. Estimates are obtained using Newey-West standard errors. *, **, *** denote significance at the 10%, 5% level and 1% level, respectively. Standard errors between brackets.

Table 4 shows that even when controlling for all the monetary policy instruments used by the PBC through the sample period, change of the tone of PBC communication still has a positive and significant impact on stock prices indexed in Shanghai and Shenzhen, although it is significant at the 10% level only for stocks in Shenzhen. Hence, these findings reveal that PBC communication conveys relevant information for stock markets beyond all the different monetary policy instruments implemented by the the central bank.

VI Conclusion

This articles aims to test the impact of PBC communication on asset prices. For that purpose, we first rely on a computational linguistic approach and the Loughran and McDonald (2011) financial dictionary to compute the tone conveyed through PBC speeches. As a second step, we

[10] For more details on the construction of the monetary policy stance index, see Xiong (p.516, 2012).

use a high frequency methodology to determine the impact of PBC tone on stock markets. The results reveal that positive changes of the tone affect positively stock prices in the Shanghai and the Shenzhen stocks markets. The significant effect of tone on stock prices is robust to a set of control variables. Furthermore, we find that PBC communication does not have a persistent effect on stock prices and that the tone of PBC communication still has a positive and significant impact on stock prices even when controlling for all the monetary policy instruments implemented by the central bank. These findings suggest that PBC communication brings additional information to market participants beyond the traditional macroeconomic and financial variables. Hence, we find that PBC communication matters as a policy instrument to shape market expectations and to move asset prices. One avenue for future research is to assess the impact on financial markets of the meeting notes of the Monetary Policy Committee, the quarterly Monetary Policy Reports and other domestic speeches and interviews.

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VII Appendix

Table 5: Number of speeches by speaker

Speaker	Number of Speeches
Zhou Xiaochuan (*gov.*)	43
Wu Xiaoling	16
Su Ning	15
Xiang Junbo	8
Hu Xiaolian	7
Dai Xianglong (*gov.*)	3
Li Ruogu	3
Chen Yuan	1
Liu Tinghuan	1
Junbo Xiang	1
Ma Delun	1
Yi Gang	1

Table 6: Number of speeches by location

Location	Number of Speeches
Beijing	54
Shanghai	14
Washington	5
Hong Kong	3
Kuala Lumpur	2
London	1
Zuhai	1
Montreal	1
Jiangxi	1
Trujillo	1
Kampala	1
Changqing	1
Guiyang	1
Gansu	1
Tianjing	1
Xiamen	1
Hefei	1
Buenos Aires	1
Istanbul	1
Shenzhen	1

Table 7: Summary Statistics

	Mean	Median	St. Dev.	Min	Max	Obs.
$\delta\tau_t$ [in %]	0.00005	0.0003	0.38	-1.03	0.98	91
SHCOMP	0.06	0.08	1.42	-3.67	4.75	92
SHASHR	0.05	0.09	1.42	-3.77	4.76	92
SSE50A	0.02	-0.03	1.39	-3.52	5.01	83
SSE180A	0.11	0.10	1.45	-3.88	5.3	88
SZCOMP	0.06	0.16	1.63	-4.22	5.06	92
HSI	0.37	0.20	1.23	-1.84	4.78	92
HSCEI	0.42	0.24	1.74	-2.77	6.93	92
Rate	5.9	5.58	1.01	5.31	10.08	92
GDP	11.29	11.6	1.95	6.4	15	92
CPI	0.26	-0.04	3.66	-9.47	5.19	92
IPI	10.7	3.72	50.05	-100	255.5	92
Unemp	4.12	4.2	0.25	3	4.3	92
Oil	58.7	60.17	19.46	15.19	127.76	92
Vol. Bond	1.53	1.14	1.10	0.68	6.49	83
Vol. Stock	1.18	1.05	0.39	0.64	2.45	83
Consumer Conf.	109.27	109.8	3.3	100.3	116.2	92
Entrepreneur Conf.	131.2	132.5	7.98	101.1	143. 1	87
Uncertainty	85.1	78.9	43.49	32.59	298.3	92

Table 8: Main monetary policy instruments used by the PBC (Xiong, 2012)

Period	Main monetary policy instruments
1986Q1-1997Q4	1. Credit plan for banks' lending; 2. Various interest rates.
1998Q1-2002Q3	1. Central bank's refinancing to banks; 2. Various interest rates; 3. Reserve requirement ratio.
2002Q4-2010Q4	1. Open market operations (central bank securities); 2. Various interest rates; 3. Reserve requirement ratio.

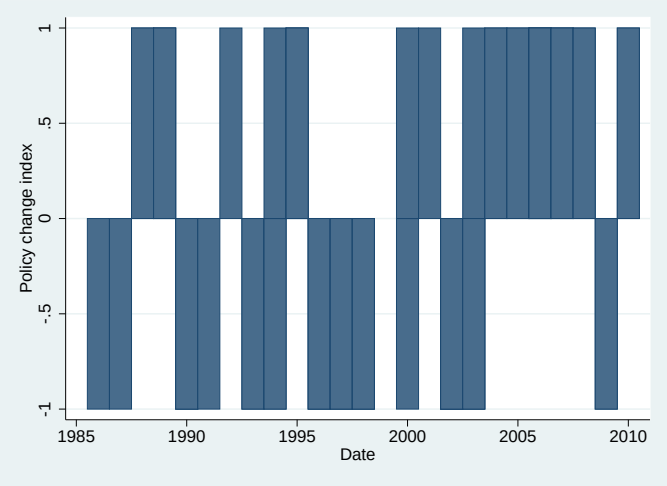

Figure 3

PBC's Monetary Policy Stance (Xiong, 2012)

The values -1, 0, and 1 indicate an expansionary change, no change, and a contractionary change in the policy stance, respectively.