

Bank Al-Maghrib communication: A new evaluation of the power of monetary and economic transparency

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ABSTRACT

Theoretical arguments indicate that transparency could increase the credibility of low-inflation monetary policy, ameliorate the performance of decision-making and enhance the efficiency of interest rate setting. However, the qualitative nature of the communication makes its assessment difficult. The purpose of this article is to propose a new method of quantifying the information contained in central bank press releases and to examine whether the words spoken by policymakers can influence future monetary policy decisions in addition to macroeconomic variables. Through discourse analysis, we compared the importance attached to price stability and production. Then we developed a specific dictionary to measure Bank Al-Maghrib's communication and finally, we examined the utility of transparency in predicting monetary decisions by exploiting the prospective Taylor rule. By creating two indicators of transparency (monetary and economic), we find that central bank governor statements are significantly related to future interest rate decisions. This approach should improve the ability of market participants to predict interest rate decisions and reinforce the emphasis placed on the information in the Taylor rule in addition to anticipating inflation and production, especially that Morocco is considering the transition to an inflation-targeting regime.

Keywords: Transparency, flexible inflation targeting, press releases, textual analysis, prospective Taylor rule, Ordered Probit.

The particular charm of watercolor, with which any oil painting always looks red and pissing, is the continual transparency of the paper.
Eugène Delacroix (1847).

INTRODUCTION

Communication has become a very effective monetary policy instrument that can lead to greater predictability of central bank actions, which in turn reduces uncertainty in the financial markets. Indeed, by divulging information on future economic or political developments, the central bank could influence economic agents' expectations for interest rates.

In the literature, there are two ambiguities about the communication strategy: criticism of the central bank for its power to move financial markets in the desired direction; and a disagreement [1] about the extent to which communication variables add information to that contained in the macroeconomic variables that are included in the Taylor rule.

The degree of success of the communication is thus an empirical question. The purpose of this article is to find out if Bank Al-Maghrib's communication was informative, how to measure it and whether it can predict monetary policy decisions.

After a literature review on transparency, we will deal with some of the textual analysis of speech analysis with Tropes and Sphinx Quali software. This will allow us to have a global idea about a Bank Al-Maghrib communication tool, namely the Wali press releases, as well as the preference given to the inflation and growth objective. Then we will propose a method of quantifying the monetary and economic transparency specific to these releases. These communication variables will be integrated into the Taylor rule and tested by an ordered Probit model.

THE RELATIONSHIP BETWEEN TRANSPARENCY, INFLATION AND ECONOMIC GROWTH: LITERATURE REVIEW

Transparency is the fact that the central bank discloses to the public, in real time, a set of strategic and operational information. In other words, a transparent monetary policy means that changes in short-term interest rates should not surprise the market.

The aim of transparency is to enable economic agents to verify that the central bank is correctly pursuing the objectives assigned to it, which leads to a stabilization of inflation expectations (future interest rates) and thus the improvement of the effectiveness of monetary policy. [2].

There are different mechanisms that have been put in place to ensure greater transparency of the inflation targeting policy, namely:

- Regular consultations between the Governor and the Minister of Finance;
- Publication of regular reports (active communication) on the future orientations of monetary policy, forecasting models used, inflation, changes in interest rates and results of Executive Board votes;
- Justification in front of the government, parliament, and public opinion (through communiqués and conferences) of the monetary policy gap: explain a general price level above the inflation target and announce a timetable for back to normal. Indeed, central banks are considered responsible for the results obtained and must be submitted to evaluation procedures, followed sometimes by serious consequences in case of non-compliance with the stated objective.

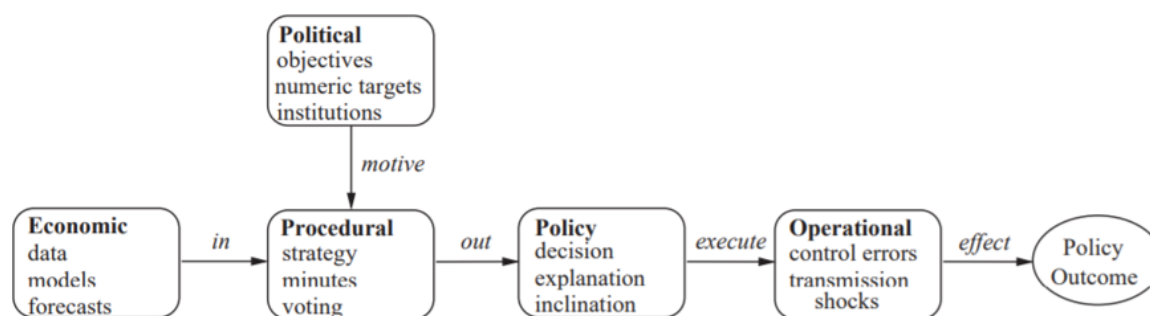
Kenneth and Kuttner bring together the commonalities of different countries' experiences in targeting inflation. Central bank transparency and accountability are included. [3].

In Appendix 1, we presented a non-exhaustive list of emerging market countries that opted for the inflation-targeting regime, which details how they meet the transparency criterion.

For inflation targeting countries, the main vehicle of communication is the minutes of the policy-making meeting and the inflation report published in the vast majority of cases on a quarterly basis. This report usually presents the central bank's assessment of economic conditions and its perspective on the outlook for inflation and growth. The main risks for projections and alternative scenarios are often included. The other main purpose of the Inflation report is to explain the rationale behind recent monetary policy decisions.

Transparency is a multifaceted concept associated with the different stages of the decision-making process of monetary policy. According to Geraats and Eijffinger, transparency can be classified into five categories: [4].

Figure 1: Conceptual Framework for the Monetary Policy Process.



Source: Eijffinger, S. C., & Geraats, P. M. (2006).

Political, economic and operational transparency could increase the credibility of low-inflation monetary policy, procedural transparency could ameliorate the performance of decision-making and policy transparency could enhance the efficiency of interest rate setting.

However, the effect of monetary policy on the growth of inflation and output (output) is determined not only by monetary policy decisions but also by the expectations and behavior of the public, according to their understanding of the bank's strategy [5]. The media as intermediaries between the central bank and the public greatly influences the understanding of this policy. In this sense, Svensson [6] proposes to central banks to disseminate their monetary rule including the weighting of inflation and real objectives to facilitate the public's understanding of their decisions.

Throughout this work, we will focus on a communication tool of Bank Al-Maghrib (BAM), namely the press releases made by the governor.

In what follows, we will first analyze the speech of these releases with Tropes and Sphinx software. Then we will shell them manually to quantify the communication. Finally, we will test the predictive power of the transparency indicators created.

SPEECH ANALYSIS WITH TROPES AND SPHINX IQ 2 SOFTWARE

The discourse analysis is a branch of textual analysis. It is the search for information relating to a specific context to examine their meaning and classify them in an objective way while being interested in the context, the receiver and the sequence of the sentences of the ad.

In order to have a general idea about the document, we will expose an analysis of the speech of the press releases using successively the software Tropes and Sphinx Quali. We note that press releases are written in French; so the output of the software is in French.

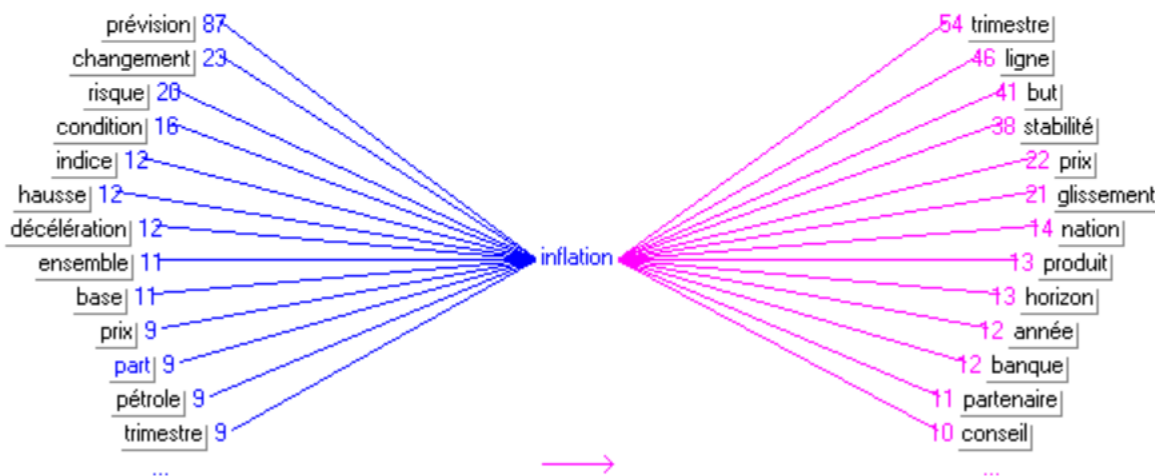
Analysis with Tropes software

The Tropes software is specialized in propositional discourse analysis. Without prior coding, Tropes analyzes all the text's propositions (level of generality, act, adjective, verb, scenario ..., etc.).

According to this software, the general style of press releases is rather narrative with a dynamic staging. It has detected 135 remarkable proposals each classified by decreasing frequency. The result is set out in Appendix 2.

Inflation is the most detailed context cited in the paper. It has been associated with the references shown in the graph below. We note that the references displayed to the left of the central class are his predecessors, those shown on his right are his successors.

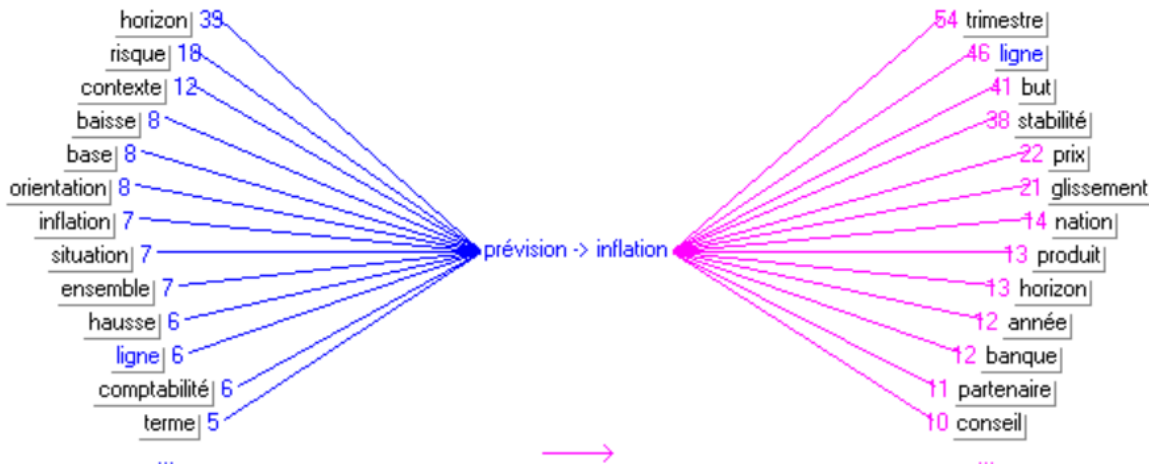
Figure 2: Star chart that displays the relationships between references.



Source: Tropes release.

We note that inflation is often associated with the word forecast, which has pushed us to analyze the relationship between the two words, in the same proposal and same order. The result is shown in the graph below:

Figure 3: Star chart that displays the relationships between a category of words and references.



Source: Tropes release.

Finally, the Tropes software raised the point of the length of the last press releases compared to the first. This communication feature could play a role assuming that preparing the ground for a change in interest rates might require more words than a situation of continued passivity.

Analysis with Sphinx Quali software

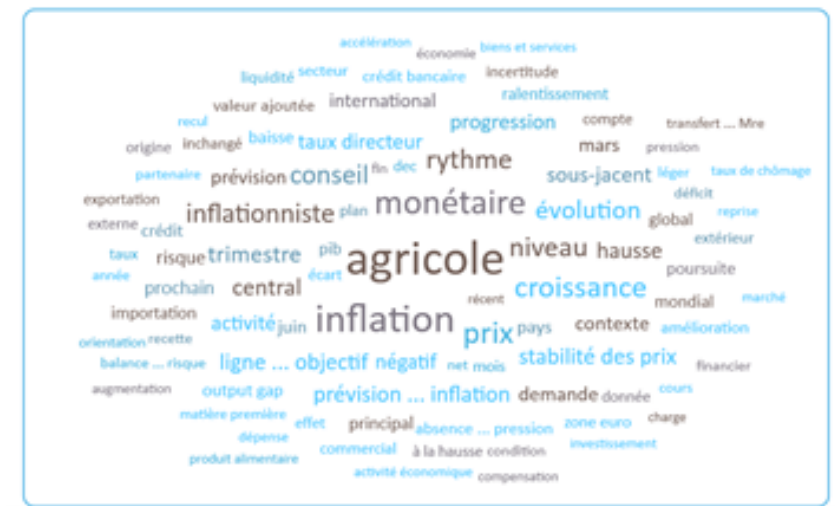
Sphinx Quali software enables textual and semantic¹ analysis through manual coding of content.

¹ It is a lexical analysis of sentences to determine the meaning of the document.

The qualitative information we processed includes 1,907 sentences, 7,116 words, and 127 detailed concepts.

The word cloud below outlines the main keywords of press releases. This allows a first appropriation of the content. As we can see, we attach a big importance to the objective of price stability and the agricultural sector.

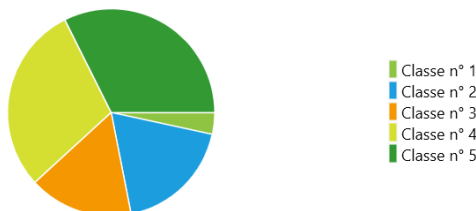
Figure 4: word cloud.



Source: Sphinx software release.

After a construction of a codebook, the software has identified five themes treated in the document with the feeling felt in each class:

Figure 5: characterization of the themes.



	Effectifs	Longueur moyenne	Les 5 mots spécifiques	Concept spécifique	Sentiment spécifique	Contexte spécifique	Orientation spécifique	Indice de richesse relative
Classe n° 1	46	4 mots	conseil - décembre				Sans opinion	0,37
Classe n° 2	250	12 mots	réunion - prévision - inflation - taux - évolution		Intérêt		Sans opinion	1,14
Classe n° 3	221	12 mots	milliard - fin - pib - recette - déficit		Blamer		Sans opinion	1,13
Classe n° 4	399	12 mots	inflation - trimestre - prix - annuel - prévision		Offense		Nettement négative	1,11
Classe n° 5	439	14 mots	agricole - croissance - trimestre - rythme - monétaire		Evaluation		Plutôt positive	1,25

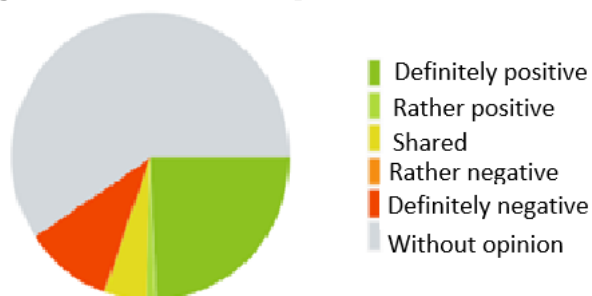
Source: Sphinx software release.

The answers to the last four categories are richer than the average because the index of wealth is greater than one. As regards the negative orientation of the fourth class, it is thought that the software detected the concern of BAM on the stability of inflation.

The last analysis to do with Sphinx is the analysis of feelings. Based on the passages expressing a feeling, a judgment or an evaluation, the software makes it possible to define the overall

opinion of the document. In our case, the direction of the press releases is not very polarized and the dominant trend reflects a neutral and ambiguous orientation.

Figure 6: Orientation of press releases and feelings.



Source: Sphinx software release.

QUANTIFYING THE COMMUNICATION OF BANK AL-MAGHRIB

Blinder [7], Fry [7], and Geraats [9] provided a measure of the five types of transparency for nine central banks. The sub-index for each of the five aspects is based on three questions, each of which has equal weight and does not exceed score one. A complete measure of transparency is obtained by summing the five sub-indexes so that we have a maximum score of fifteen.

In this work, we could follow their method to calculate the index of transparency of BAM, but this method will not allow us to have a series of data to integrate into our model. This is why, we thought to evaluate the press releases of our central bank and thus to introduce the importance of the media, the anticipation of the economic agents; and measure the impact of transparency on central bank decisions.

The degree of transparency can be measured by analyzing formal disclosure requirements or actual practices. We choose to create our own index of transparency since central banks' public communications vary greatly in their informational nature.

Proposal of a lexicon specific to the press releases

The most common content analysis methods are based on either the dictionary (documentary approach) or machine learning [10]. During this part, we will focus on the first approach. Although there is a general method for content analysis, classification and counting methods vary between studies.

Drawing on the work of Kohn & Sack [11], and Sturm & De Haan [12], we will quantify BAM's communication by creating a dictionary specific to press releases that the governor provides quarterly after each board meeting, to communicate to the general public the decisions that were made. Our data range is from December 2006 to March 2018.

This approach consists of a manual classification of all the phrases of the press release into two categories [13] (monetary and financial sphere / real sphere) and six inclinations (accommodative, restrictive, neutral/positive, negative, stable) and groups them by date.

This program of personalized words will allow us not only to know the effect of our indicators on the decisions of the central bank but also the meaning and the amplitude of the communication of the governor of BAM, unlike the LM or Harvard IV dictionaries that propose a raw list of English words inclined in two categories (positive / negative), and which do not take into account the financial context. For example, the word tax and liability are classified in

the negative category or it does not always translate a negative situation in the financial market [14].

A copy of the sentences used in our dictionary is given in Appendix 3. We note that sentences that are neither monetary nor economic were ignored. For example: "the Board of Bank Al-Maghrib held its quarterly meeting on Tuesday, March 27, 2011" or "the Board has, moreover, analyzed and approved the accounts of the Bank and the management report, as well as the allocation of income for the 2010 financial year.

After classifying press releases according to BAM's focus, we performed a standard textual analysis using the Krippendorff [15] methodology. This consists of the transformation of all the words into lower case, to remove the punctuations, the statistics, as well as all the definite and indefinite articles. Finally, we used the French algorithm of stemming [16] to have only the roots of words (for example continue (continuer) and will continue (continuera) will be replaced by the same word continue (continu)).

Then, in response to the limitation previously announced of LM or Harvard IV dictionaries, we will reason; in the construction of our dictionary; in terms of N-gram (coding of a sequence of words often used in the processing of natural languages) instead of uni-gram (one word). Indeed, for example, the word growth appears on the positive part of these dictionaries, but if we take the example of June 2013 (see Appendix 3 part real sphere), we note that the word "growth" is preceded by the word "deceleration", which gives it an opposite meaning, thus we woot it as negative information. This is an example of a bi-gram.²

In total, our dictionary contains 118 key N-gram. In Appendix 4 we have exposed a sample of N-grams with their occurrence frequency in each category.

Validation of the dictionary

After determining the list of N-grams, still ranked in two categories and six tilts, a quantitative analysis is needed to count the units and calculate their frequency in each category studied to derive their importance.

Loughran and McDonald [17] use two weighting methods: simple proportional and inversely proportional to the frequency of each document. Jegadeesh and Wu [18], meanwhile, use a weighting system for each word particularly suitable for financial applications. They assign weights for each word depending on how the market reacted to them in the past.

On our part, we will apply a basic formula in probabilistic statistics to count the proportion of each N-gram:

$$P(A) = \frac{\text{Card}(A)}{\text{Card}(\omega)}$$

With:

A is the N-gram. Card (A) is the number of times the N-gram has been cited in a particular category and inclination. Card (ω) is the number of times the N-gram has been repeated throughout the document.

² We note that we retained up to 6-gram.

In practice, it is enough to divide each element of the column "inclination" by its correspondent in the column "total" (See Appendix 4).

For an N-gram to be significant there must be at least a probability greater than 50% in an inclination. This is why we deleted 11 N-grams. For example, the 4-gram "close to its rhythm" has been spotted 15 times in the document with a probability that varies between 0.07 and 0.27, so the probabilities are less than 0.5.

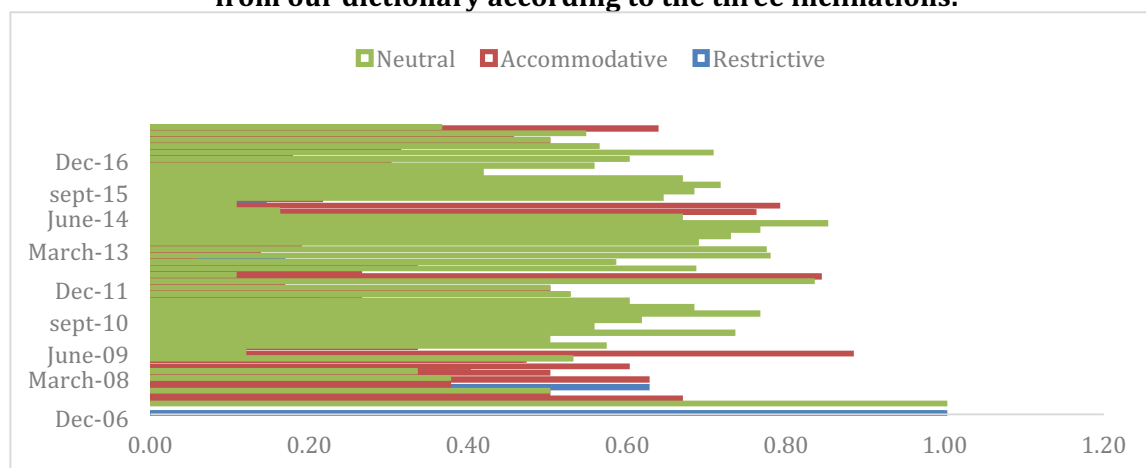
Our final dictionary thus contains 107 N-gram.

Weighting and counting

After having specified and validated our dictionary, we can use it to calculate the weighting of each N-gram in a particular category, inclination, and date. The methodology used is the weighted term approach. The probabilities obtained are between 0 and 1.

The results obtained for each category are illustrated in the following graphs:

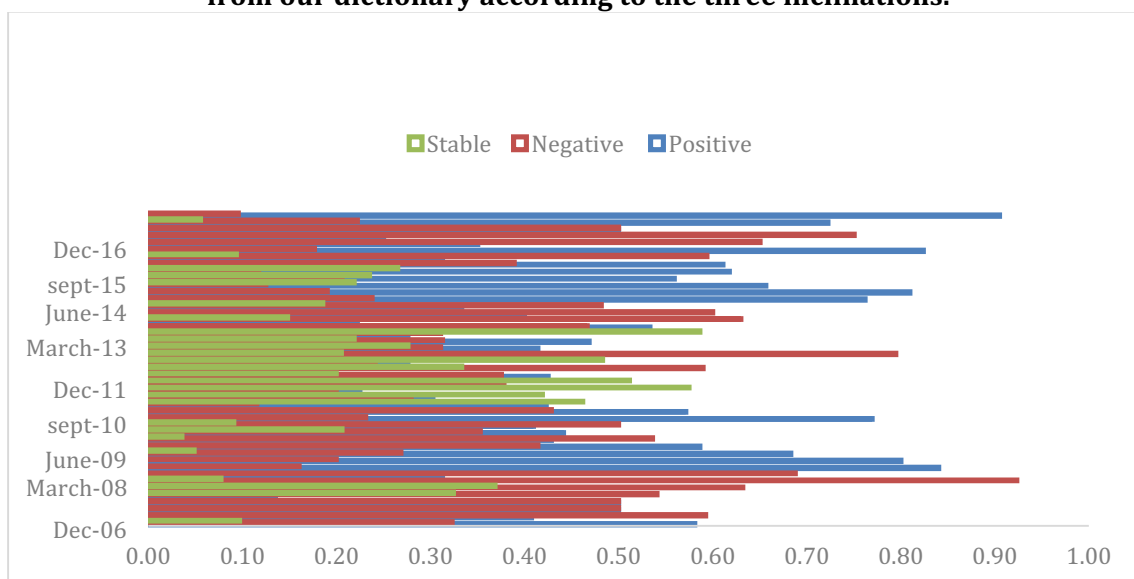
Figure 7: Evolution of the probabilities of the indices of the monetary transparency resulting from our dictionary according to the three inclinations.



During our sampling period, BAM made interest rate decisions: one restrictive in June 2008; five accommodative in March 2009, March 2012, September 2014, December 2014, March 2016; and forty neutral decisions.

Our dictionary reflects these decisions. Indeed, it is clear that the central bank's communication on monetary policy is mostly neutral (the dominant gray). The only time monetary policy is restrictive is in 2008 (blue color). The communication becomes accommodating (orange color) in the quarters announced above.

Figure 8: Evolution of the probabilities of the indices of the economic perspective transparency from our dictionary according to the three inclinations.



As for the real sphere, our probabilities reflect the repercussions of the financial crisis in 2008 on the Moroccan economy, notably growth, investment and employment through the channel of exports, foreign investment flows, tourism and transfers of Moroccans living abroad. Although Morocco was spared during the first half of 2008 from the consequences of the global crisis, our indicators have managed to capture it since March 2007 since we have retained in our dictionary the notion of economic prospects. In 2012, the central bank's communication was also negative since the growth rate was estimated at 2.4%. The tone of communication is positive in 2017 because of the changing of the global economic landscape and the willingness of our country to draw inspiration from certain countries to improve our economic performance.

Indicators of monetary and economic transparency

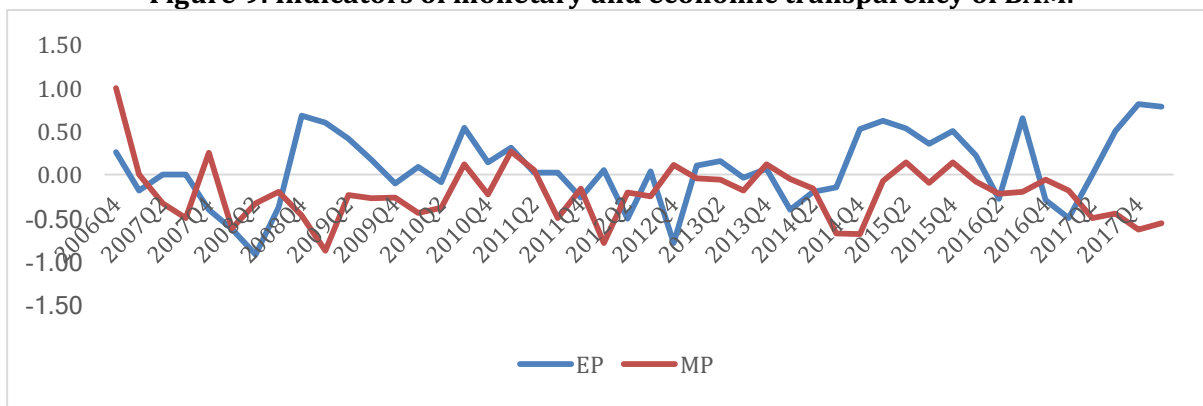
Now that we have analyzed and validated our probabilities, we must establish transparency indicators so that we can integrate them into the prospective Taylor rule.

This is how we will make the first difference between the end tilts of each category³: the monetary policy indicator will be equal to the probability of the "restrictive" policy - the likelihood of the "accommodative" policy. While the economic policy indicator will be equal to the probability of the "positive" perspective - the probability of the "negative" perspective:

$$I_{MP} = P_{restrictive} - P_{accommodative} \quad \text{and} \quad I_{EP} = P_{positive} - P_{negative}$$

³ These transparency indicators are between -1 and 1.

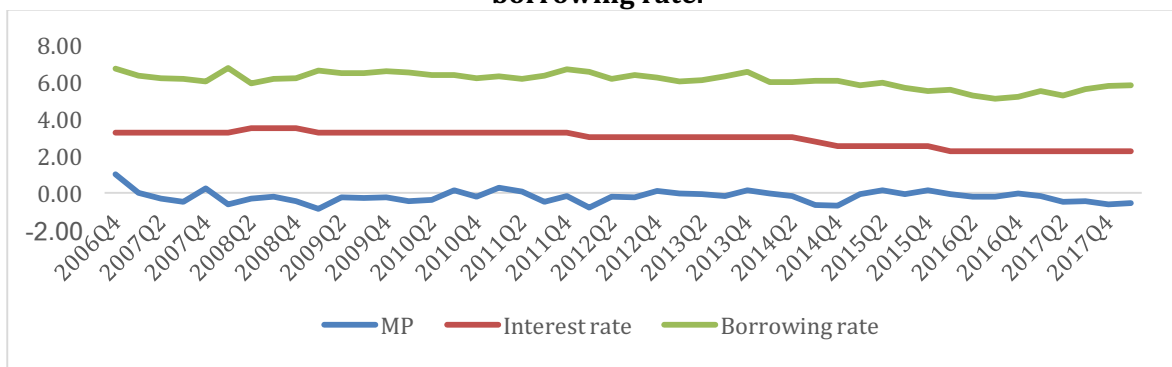
Figure 9: Indicators of monetary and economic transparency of BAM.



The following is a comparison of our indicators of monetary and economic transparency with the key rate, the borrowing rate, and real GDP.

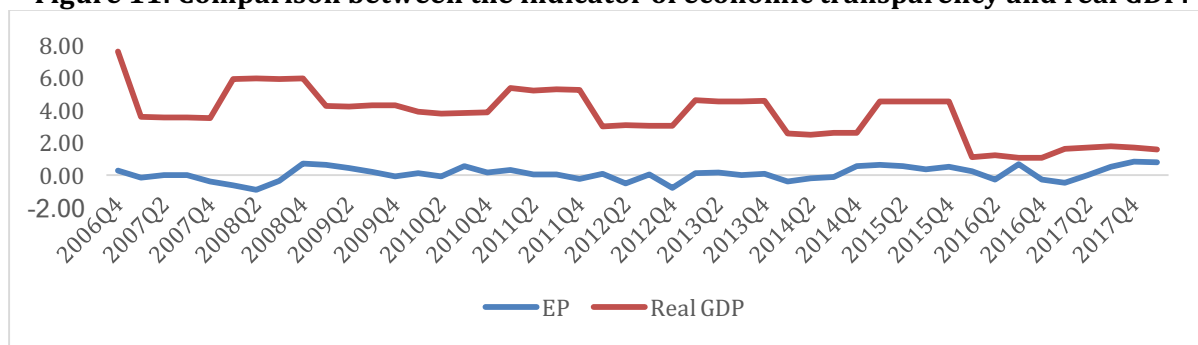
The interest rate is the rate set by the central bank. The borrowing rate is the percentage set in a loan. Real GDP measures the change in the production of goods and services by volume and take into account inflation.

Figure 10: Comparison between the monetary transparency indicator, the interest rate, and the borrowing rate.



Source: Bank Al-Maghrib website and author's calculation.

Figure 11: Comparison between the indicator of economic transparency and real GDP.



Source: Ministry of Finance website and author's calculation.

TESTING THE POWER OF MONETARY AND ECONOMIC INFORMATION IN INFLATION TARGETING: ORDERED PROBIT MODEL

We will successively present the ordered Probit model and the results of the estimation.

Presentation of the model

In order to empirically test the explanatory and predictive power of our indicators for monetary policy decisions in an inflation-targeting regime, we will include them in the prospective Taylor equation of type:

$$i_t = \rho i_{t-1} + (1 - \rho) r^* + \alpha (E_t(p_{t+1}) - p^*) + \beta (y_t - y^*) + \nu I_{MP} + \delta I_{EP} + \varepsilon_t.$$

Where i_t is the short-term nominal rate fixed by the BC (its instrument), r^* : short-term equilibrium interest rate, p^* : the inflation target (set at 2%), $(y_t - y^*)$ is the output gap, and (p_{t+1}) is the forecast of the inflation rate in $t + 1$ announced in t by BAM, since we evaluate the information quality given by the central bank (the publication of inflation forecasts is part of the arsenal of communication), I_{MP} is the index of monetary transparency, and I_{EP} is the index of economic transparency.

Therefore, if our transparency indicators are significant, they should have positive coefficients, since they reveal information to economic agents.

After performing the ADF test, we differentiated all variables once to stabilize them.

The indicators of transparency are qualitative variables, so to be able to estimate this equation we must use either the Probit model or the Logit model. However, it has already been announced that during the period of our sample the central bank used its instrument once (five times) to increase (decrease) the key rate by 25 points and 40 times to keep it neutral. Thus the change in the key rate fluctuates between -25, 0 and 25; which brings us back to an ordered model where the values taken by the variable are given discretely on a scale comprising a limited number of choices [19].

The variable to be explained in the ordered Probit model is therefore multimodal and hierarchical. For the coding we will use 1 for the variation -25; the 0 point variation will be 0, and the variation +25 points will be equal to 2.

RESULTS AND DISCUSSION

The distribution function of our model is Normal. Log-likelihood maximization algorithms carry out the estimation of the parameters [19].

To know the importance and benefit of communication, we tested the Taylor rule with/without transparency indicators. The results of the estimation are presented in Appendix 5.

The tests are statistically validated since the statistics of the log likelihood (6.344 / 9.854) are greater than the value of chi Deux $\chi^2_{3; 0,95} = 0,352$, as well as all the coefficients found are different from zero. However, they must be interpreted with caution, only the signs indicate whether the variable acts positively or negatively on the latent variable.

Note that after introducing the indicators of transparency, the pseudo- R^2 increased from 0.089 to 0.238. This model is more robust. Also, these indicators are significant (critical probabilities less than 0.05) and positive: an increase in restrictive and positive communication leads to an increase in the policy rate by Bank Al-Maghrib; vice versa an accommodating and negative communication leads to a lowering of the rate.

Now we want to know if the BAM governor's communication helps us to predict the next central bank's policy decisions, or the Taylor rule components provide sufficient information about expected inflation and output.

A test of the predictive qualities of both models was performed (see Appendix 6). The results are satisfactory. We found that the error rate of the model containing the communication channels is smaller than the one in the simple Taylor rule. Indicators of transparency are therefore informative, especially for the neutral value of the policy rate. However, we have not been able to predict the change in the restrictive policy; this may be due to the low (only one) number of values in our sample.

Then we made a forecast of the next interest rate (June 2018). Eviews generates datasets corresponding to:

$i-t_i$ = the realization of the estimate of the latent variable.

$t_i - (1)$ = the probability associated with the modality -1.

$t_i - (0)$ = the probability associated with modality 0.

$t_i - (2)$ = the probability associated with modality 1.

The result of the estimation is:

Table 1: Result of the forecast.

	$T_i = 1$	$T_i = 0$	$T_i = 2$
Probability	0,018	0,709	0,273

We have a 70% chance that the next interest rate belongs to class 0.

Indeed, in the press release of June 20, 2018, the board decided to keep the interest rate unchanged at 2.25%. Forecast checked.

CONCLUSION

In response to changes in the monetary policy environment, Bank Al-Maghrib has moved towards greater transparency in recent years. However, quantification of communication is problematic for researchers because of its qualitative nature.

This article presents a new investigation on the measure and extent of transparency of our central bank. We propose to examine whether the words pronounced by decision-makers can influence future monetary policy decisions in addition to prospective macroeconomic variables. We conducted a textual analysis of the speech to have a general idea of our communication tool, namely the press releases made quarterly by the Wali of BAM. The results of the propositional analysis state that the general style is rather narrative with dynamic staging, while semantic and feelings analysis show that the direction of the releases is not very polarized as well as the dominant trend reflects a neutral and ambiguous orientation. The common thread between the two analyzes is the emphasis on inflation and production, which fuels a flexible targeting policy. In order to understand the subtlety of the central bank's communication, we propose a dictionary specific to the lexicon of so-called releases. Manually we have classified the statements of the decision makers into two categories (monetary policy stance / economic perspective) and six inclinations (restrictive, accommodative, neutral/positive, negative, stable) to construct two-time series corresponding to the two indicators of transparency. We have then incorporated these indicators into the prospective Taylor rule.

Our results demonstrate a globally favorable and positive significance. Even if the

communication channels are not equitably significant (the index of monetary transparency is more significant than that of economic transparency), but at two, we can predict the next decision of the interest rate and thus proving the importance of adding information to market players in relation to the anticipation of inflation and production contained in Taylor's Prospective rule.

While the decision to leave interest rate unchanged can be correctly predicted, this model can hardly predict restrictive monetary decisions.

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