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Abstract

We introduce an original dataset based on the qualitative content of the Regional Economic Outlook (REO) reports published by the International Monetary Fund (IMF). Exploiting this rich database, we gauge several measures of IMF sentiment based on the REO reports towards 16 countries in three regions, Asia and Pacific, Europe and Western Hemisphere, from 2007 to 2018 and examine their impact on financial markets. We find that the qualitative content of the REO reports have significant repercussions on stock market returns in Europe and bond yields in Asia and Pacific over short time horizons, these impacts disappearing over time. We also demonstrate that the impact of IMF sentiment is robust to the use of an alternative sentiment measure that focuses exclusively on negative words.

Keywords: Financial markets, High frequency, IMF, Sentiment index, Text analysis

JEL classification: F53, G15, Z13

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1. Introduction

The International Monetary Fund (IMF) remains one of the key players of the international monetary system, and its monitoring capacities at a country and cross-country levels have increased over time. As an illustration, the variety and the frequency of IMF publications have grown constantly over the period 1993-2019. From 1993 to 2000, the IMF published annually two main reports, the World Economic Outlook (WEO) and the report of the Executive Board. In addition to the increase of frequency of the existing reports, the IMF has added the publication of one Global Financial Stability report (since 2002), ten Regional Economic reports (since 2005) and two Fiscal Monitor reports (since 2011) per year.[1] This evolution is explained by governments' calls for the IMF to assess potential systemic risks and spillovers across countries since the Asian crisis, the promotion of economic policy reform agenda (Hillman, 2004; Kern et al., 2019), and, more generally, to safeguard economic and financial stability over the longer term.[2] The IMF has responded to this need of expertise by providing better access to members' macroeconomic data and more frequent publications of its surveillance reports conducted at the global (WEO, Financial Stability Report), regional (Regional Economic Outlook), and national (Article IV Public Information Notice) levels.

In these reports, the IMF staff produces assessments and forecasts of the growth of the world economy and its member countries, and usually supplement them by an analysis of the potential risks that could undermine the forecasts. These reports also provide IMF's insights of the macroeconomic situation at the global and regional levels to economists, market participants, and governments. In addition to quantitative data, IMF reports contain the positive or negative views and opinions – the sentiment – that the international organization expresses on countries' economic performance. As a case in point, Breen et al. (2019) suggest that positive sentiment in an IMF report might indicate the validation of member states' economic policies. In contrast, a negative sentiment brings with it an obligation to alter the status quo. This, in turn, can affect market expectations about countries' current and future economic conditions. Indeed, recent theoretical and empirical evidence show that sentiment deter-

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[1] According to the IMF archives available to the public on the website https://www.imf.org/en/Publications/

[2] See the statement of G7 Finance Ministers and Central Bank Governors (http://www.g7.utoronto.ca/finance/fm103098.htm), and the memorandum on the Work Program on Strengthening the Architecture of the International Monetary System, issued by the IMF Executive Directors of the G7 countries, to the IMF Director and Executive Board, October 30, 1998 (https://www.imf.org/external/np/g7/103098ed.htm)

mines how market participants change their expectations and thus, affects asset prices in financial markets (Hirshleifer, 2001; Angeletos and La'O, 2013; Fraiberger et al., 2018).

Nevertheless, very few studies have examined the effect of the qualitative information, such as sentiment, contained in IMF reports on financial markets. Instead, the literature has mainly focused on the investor relation to IMF news during financial crises, usually proxied by dummy variables.[3] For instance, Ganapolsky and Schmukler (1998) examine the impact of the IMF program-related news during the Tequila crisis in Argentina and find a positive effect on bond and stock returns. Kho et al. (2000) investigate the impact of IMF assistance on banks in the United States (US) during the currency crises in emerging markets (Mexico, Brazil, Korea, and Russia) and conclude that the US banks with high exposure to crisis countries benefited from the IMF bailouts' news while others do not. Brealey and Kaplanis (2004) use a broader sample of IMF programs and cover an extensive range of financial assets. They detect a significant decline in asset prices around announcements of IMF programs. Hayo and Kutan (2005) examine the reaction of financial stock returns in a group of emerging markets to a set of IMF events during the Asian, Russian, and Brazilian crises of 1997-1999. They find that IMF-related news affects daily stock returns while only bad news affects foreign exchange market returns. Finally, Kutan et al. (2012) expand this line of research on the stock market into various economic sectors and conclude that IMF decisions play an important role in affecting sectoral returns.

Thus far, only Fratzscher and Reynaud (2011) have analyzed the impact of IMF's publications on financial markets. They assess the degree of favorableness in the Public Information Notices (PINs) issued after Executive Board discussions of Article IV consultations with member countries on seven topics: economic growth, labor markets, monetary policy, fiscal policy, international policies, financial markets, and the institutional environment of the country. They find, for a set of emerging market economies over the period 2001-2007, that the degree of favorableness significantly influences the sovereign spreads for most of the countries. As a result, they conclude that the IMF's PINs provide additional information to market participants about countries' economic conditions. However, the methodology used by Fratzscher and Reynaud (2011) raises several concerns about the accuracy of their evaluation. Indeed, as the classification of the assessment of each PIN, in terms of their favorableness, relies on a scale from -2 to +2, the codification is likely to depend on the authors' interpretation of IMF information.

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[3]Such as program announcements, program approvals, bailouts, and financial support.

As a consequence, one coder's view of what constitutes favorableness may differ from another's, especially in documents that cover multiple policy areas (Krippendorff, 2018).

Against this background, we extend and complement the analysis of Fratzscher and Reynaud (2011) to another category of IMF reports, the Regional Economic Outlook (REO) reports, and use a sentiment analysis that distinguishes more objectively between words with different tone to analyze financial market reaction to the release of these reports. The REO reports contain a large amount of qualitative and quantitative information about countries' economic performance and, thus, convey relevant information regarding IMF sentiment about the economic outlook of its member countries. Moreover, the REO reports also focus on the same topics than those of the PINs, but on a regional scale. We thus explore how the IMF sentiment conveyed by the REO reports affects market expectations by assessing their effect on stock market returns and government bond yields. The underlying idea is that market participants not only pay attention to quantitative data, such as growth and inflation forecasts but also to the sentiment of IMF reports, that is how the IMF communicates the economic outlook of its member countries.

Specifically, we consider that the REO reports are likely to affect asset prices at least through two channels. First, they may convey new information about the economic situation of a country that was not known before. Second, they may indicate how the IMF is going to act in response to a country's crisis. Unanticipated IMF news should move asset prices on the day of publication of the REO report. For instance, a favorable market response to the REO report implies that the IMF assessment is more favorable than investors expected, while a sustained decline in stock market returns would evidence that unanticipated unfavorable IMF statements have undermined investor confidence in markets. In this respect, the IMF sentiment can be considered as additional information – a qualitative one – transmitted through the tone of the REO reports, which is likely to affect financial market expectations, given that a more positive assessment by the IMF can entail gains for countries in the form of more favorable financing conditions and higher foreign investment. Quantifying the sentiment of IMF REO reports is thus essential to assess if these reports move asset prices and, therefore, market expectations about countries' economic conditions.

For that purpose, we construct a unique and novel database by extracting text contents from each of the REO report for a sample of 16 countries over the period

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2005-2018. Second, we measure the IMF sentiment expressed for each country's text content in the REO reports using the lexicon of positive and negative words defined by the General Inquirer Dictionary. We then assess the relationship between IMF sentiment contained in the REO reports and stock market returns as well as government bond yields, relying on a high frequency methodology such as in Kuttner (2001) and Cochrane and Piazzesi (2002). Finally, we conduct several robustness tests of the main findings, accounting for an alternative sentiment measure, a larger time window, and the possible influence of the dictionary used to extract the sentiment of the REO reports.

Our main result shows that financial markets in Europe are significantly − although temporarily − related to IMF sentiment conveyed in the REO reports. More precisely, we find that the qualitative information expressed by the REO reports is positively and significantly related to stock market returns during the day of the release of the REO reports and one day after. Furthermore, we identify a significant and negative short-term relationship between IMF sentiment and bond yields in the Asia and Pacific region. This result is, however, sensitive to the time window under consideration since several days after the release of a REO report, IMF sentiment toward the main trading partner (i.e., China) is more likely to affect the government bond yields of countries located in this area. Finally, we provide evidence that a general dictionary, such as the General Inquirer Dictionary, is much more useful in detecting relevant IMF's sentiment on economies than a more financial oriented dictionary as the one developed by Loughran and McDonald (2011). This suggests that the REO reports are mostly based on general economic topics.

The rest of the paper is structured as follows. Section 2 provides an overview of the contents of the REO reports. In Section 3, we detail the approach we use to measure IMF sentiment based on the REO reports. Section 4 presents the financial data, the econometric setup, and the main results on the relationship between IMF sentiment and asset prices. Section 5 conducts some extensions and robustness checks. Finally, the last Section offers some concluding remarks.

2. The Regional Economic Outlook: An overview

The IMF produces four main reports: the World Economic Outlook, the Global Financial Stability Report, the Fiscal Monitor, and the Regional Economic Outlook.[4] These reports are usually published twice a year, but they differ on the date of their

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[4]These reports can be downloaded at `https://www.imf.org/en/Publications`.

first publication. The publication of the World Economic Outlook has started in 1993 and since 1998, the report is published twice a year. The Global Financial Stability report was launched in March 2002 and has a bi-annual frequency since March 2003.[5] The Fiscal Monitor is prepared twice a year by the IMF's Fiscal Affairs Department since 2009. The publication of the REO has started in October 2004 and is bi-annual. In our empirical analysis, we choose to focus on the REO reports because, besides the frequency and regularity of their publications, they disseminate more targeted information on member countries than the global reports do. They are thus more likely to reflect new qualitative information regarding countries' economic conditions.

The REO reports provide an analysis of the economic situation of member countries from every region of the world. In particular, they offer presentations and discussions on both economic developments and structural reforms to provide a reliable economic outlook of member countries, which are distributed across five regions: Asia and Pacific, Europe, Middle East and Central Asia, Sub-Saharan Africa and Western Hemisphere. The REO reports are published twice a year in April/May and in October/November. The first report of the year is usually the largest document (80 to 120 pages) and provides many observations and economic policy analyses. The second one, smaller (around 30 pages), corresponds to the updated version of the previous report. The countries examined from one report to the next are usually quite similar.[6]

2.1. An Analysis of the Regional Economic Outlooks

The time period of the study is determined on the basis of the release of the REO, that is, from October 2004 until November 2018. Since the reports focus on countries' economic situation at the regional level, they put greater emphasis on the largest countries in terms of GDP. Hence, given that the countries with the higher average level of GDP over the period 2004-2018 were mainly located in three regions – Asia and Pacific, Europe, and Western Hemisphere –, we rule out the REO reports of the two other regions – Middle Eastern and Central Asia, and Sub-Saharan Africa – from our analysis. Therefore, the time period of the study shifted accordingly since the first publication of a REO report in our selection happened a year later, that is, on September 2005. We thus collect all REO reports of a region from its starting date of

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[5]Fourth issues were published in 2002.

[6]However, for the European region, the reports are organized into two categories: the REO and the Regional Economic Issues (REI). The REI display a specific outlook for Central, Eastern, and South-Eastern Europe countries. Although titled differently, the objectives of these two outlets are similar, and the IMF, therefore, classifies them in the REO reports.

publication to the end of 2018.[7]

As a first step, we extract the words/expressions that are mostly used for each selected region. Specifically, we plot a word cloud for each region with the most frequently used words in these reports over the sample period. The idea underlying this procedure is to highlight regional-specific patterns by identifying the main topics raised in the reports of each region. In Fig. 1, each cloud plots the 200 most prominent words/expressions over a total of 5 to 6 million words for each region. The size of the words indicates the frequency of use across all reports of a specific region; that is, larger words have a larger count in the REO reports of a particular region over the sample period 2005-2018.

Figure 1: Word clouds per region, average over the sample period (2005-2018)

Asia and Pacific

Europe

Western Hemisphere
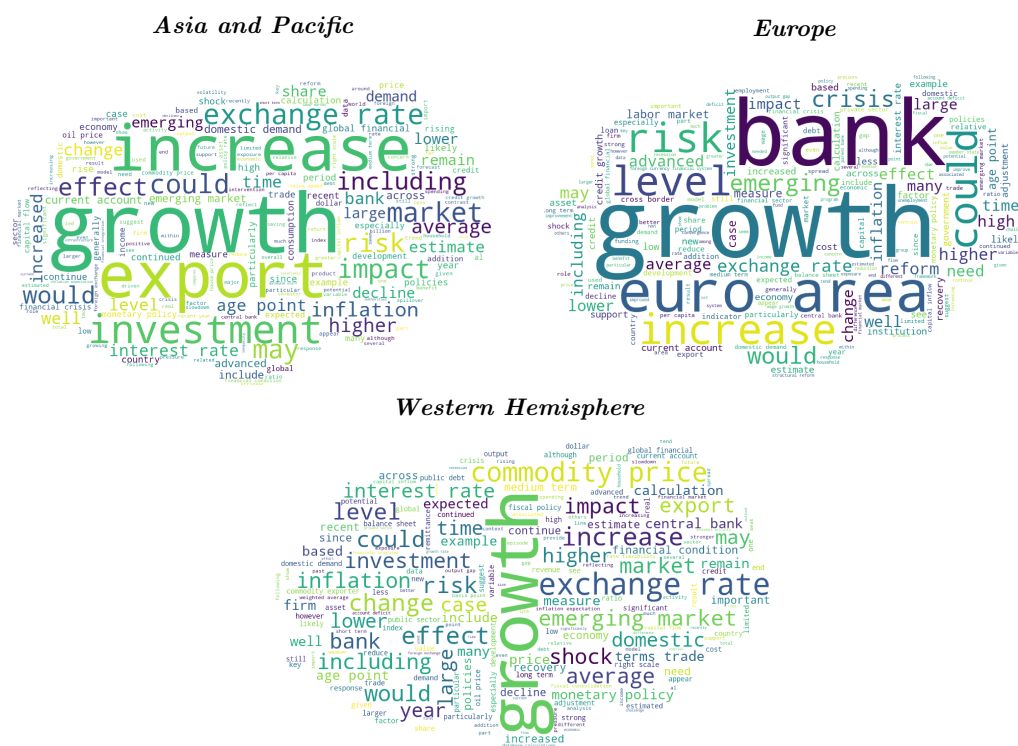
Fig. 1 shows that the word "growth" is often quoted in the REO reports of the three regions, although related expressions differ among regions. In Europe, the main concerns raised by the IMF seem to be related to financial issues, banks, and risks in particular. The euro area emerges as a clear specific sub-region, as the reports treat

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[7]Even though the publication of each REO report is bi-annual, it starts at different dates for the selected regions: in September 2005 for the Asia and Pacific reports, in April 2006 for the Western Hemisphere reports, and finally in November 2007 for the Europe reports.

this area as a whole. Several other topics seem also to be important, such as "exchange rate", "crisis", and "labor market", which are all closely related to macroeconomic fundamentals and the ECB monetary policy. Information from the cloud of the Western Hemisphere region appears dispersed with no real word/expression standing out. We note that there are, however, more references to some words/expressions, such as "commodity prices", "investment", "inflation", "exchange rate", and "interest rates". These words refer to fundamentals that either exert a strong influence on economic growth in Latina America or are of particular concern for policymakers, such as the interest rates that may pose serious challenges to the sustainability of public finances in most of the countries in this region. Finally, the cloud of the region Asia and Pacific shows some similarities with the one of Latin America, with a high frequency of the words "exchange rate" and "inflation". We also observe a high recurrence of the words "export", "exchange rate", and "investment". This is not surprising given that growth in this region is mainly driven by exports. Words that indicate fluctuations such as "increase", "decline", "lower", and influences such as "effect" and "impact" are also common to the three regions. These last observations are, however, more prominent in the Asia and Pacific and the Western Hemisphere regions. This specificity may suggest higher economic and financial instability and a stronger dependence of these countries to external conditions.

To complete this first analysis, we also report, in Fig. 2, the evolution of the main words' occurrences – the frequency with which each word appears relatively to the total number of words – in the reports of each region over the sample period. By plotting the occurrence of these words over time, we can relate the appearance of some words to the economic and financial environment of each region. For instance, the increasing concerns about the banking system in Europe at the start of 2013 coincides with the evolution of banking regulations and supervisory practices towards the Basel III agreement. The second increase observed in 2014 comes with a surge of concerns about rising risks and can be related to the ECB's bond-buying plan. Furthermore, we observe the high frequency of the word "risk" during the period of the financial and sovereign debt crisis (from 2007 to 2010) and its recurrence in 2015, during which inflation expectations began to plummet. The observations in the two other regions are more difficult to interpret since the occurrence of words fluctuates less. However, we observe an increased focus on "exchange rate" and "risk" between 2015 and 2017, which appears consistent with the FED decision to raise the US interest rates. This decision has affected exchange rates during a period corresponding to a high level of uncertainty. This may explain the focus

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of the REO reports on the Western Hemisphere on risks in Latin American countries. Finally, Fig. 2 also suggests that all reports gather information, meaning that there is no cluster of information held by a subgroup of reports. We thus assume that each REO report adds new information on countries' economic fundamentals.[8]

Figure 2: Frequency of the most quoted words/expressions by region (in %)
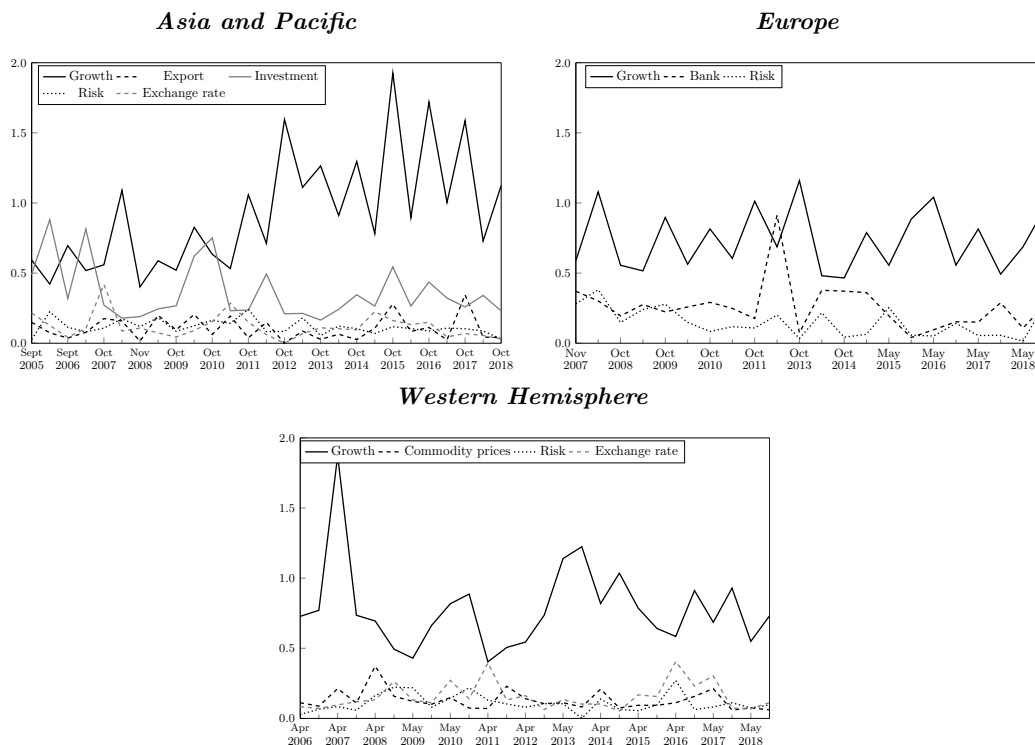
Note: The figures show the frequency of the most quoted words/expressions by region, expressed in percentage of the total of words included in the REO reports.

2.2. An Analysis of the Selected Sample Countries

We select, in each of the three regions (Asia and Pacific, Europe, and Western Hemisphere), the countries which represent the region's largest economies, and/or those that attract most of the attention of the IMF staff. For that purpose, we first extract, within each region, any country whose name appears most frequently in the REO reports. By capturing the relative importance of each country quoted in the reports (including text content, figures, and the frames), this measure can be considered as providing a

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[8]This set of qualitative information complements the quantitative forecasts and indicators provided by the IMF and other (inter)national institutions, such as Central banks and the Organisation for Economic Co-operation and Development.

relevant proxy of the IMF's interest towards each economy. Table A.1 in the Appendix reports the list of those countries as well as the summary statistics related to this first selection criteria. As can be seen, the countries that receive more attention from the IMF within a region are usually the largest economies. This is particularly true for China, India, and Japan in the Asia and Pacific region, for Russia and Germany in Europe, and for the United-States, Brazil, and Mexico in the Western Hemisphere region. However, there are some exceptions to this correlation, like e.g., for Australia, Argentina, Canada, France, and the United Kingdom. Conversely, the IMF's attention has been pronounced for some smaller countries, like Poland, Turkey, and South Korea.

Therefore, we select in the three regions the countries that represent (i) the region's largest economies, even if they have not not received a great deal of attention from the IMF (such as Australia, France, and Argentina) and (ii) smaller economies that have been most frequently mentioned (such as South Korea, Poland, and Turkey). We finally obtain a sample of 16 countries: Argentina, Australia, Brazil, Canada, China, France, Germany, India, Japan, South Korea, Mexico, Poland, Russia, Turkey, the United Kingdom, and the United States. Fig. 3 maps the selected countries in our sample as well as their regional affiliation.

Figure 3: Selected sample of countries

Europe   Western Hemisphere   Asia & Pacific
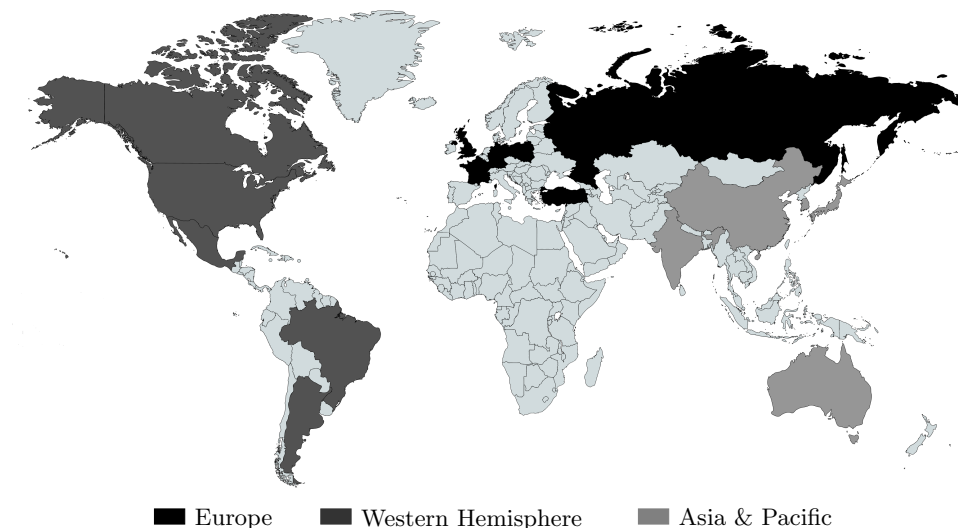
3. Extracting IMF sentiment from the REO reports

3.1. A content analysis of the REO reports

The REO reports display a highly structured content that includes titles, frames, graphs, boxes, and dots. As a consequence, we cannot apply standard text mining approaches to analyze this information since the organization of ideas is structured by sections and chapters. Indeed, text mining is more adapted to speeches where the content appears as a succession of ideas. Some authors, like Sharpe et al. (2017), overcome this issue by using the table of contents to select automatically the content mentioned in some sections. However, this method implies that the table of contents does not change over time, such as in the IMF Article IV. It is, therefore, not relevant for the REO reports since their tables of content are not constant over time.

Given that the unstable structure of the REO reports makes the automatic extraction of the text related to a specific country impossible to achieve, we develop a country-based dataset according to the following steps. We first manually extract the text content related to each of the countries included in our sample. This process enables us to convert the information provided at a regional scale to a country-specific level. As a precaution, we manually identify the relevant paragraphs and sentences following the principle of parsimony, that is, by selecting (i) paragraphs and frames that focus exclusively on the country of interest and the (ii) sentences that quote a specific pattern of the country (adding the previous or the following sentences if they are tightly related). We obtain a time-varying transcript for each country included in our sample. Next, we prepare the transcripts of each country for textual analysis as follows: we remove (i) the upper words, (ii) special characters, (iii) figures, (iv) punctuations and (v) very common words, often called "stop words".[9] Finally, we extract and quantify IMF sentiment contained in the REO reports for each country. To quantify IMF sentiment, we use a bag-of-words approach with a rule-based method of extraction from the texts of each country. More precisely, this method represents all words appearing in the REO reports as a document-term matrix. The matrix elements capture the information value of each word in each REO report, which could be the relative frequencies of the words that convey a positive and negative sentiment within the REO report.

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[9]The stop words are high-frequency words like "the", "to", or "also" that have little lexical content and a minimal meaning to the texts.

We rely on the General Inquirer (GI), mostly built on the Harvard-IV and Lasswell dictionaries, to identify words that convey a positive and negative sentiment. The GI dictionary contains 1,915 (2,291) words describing a positive (negative) outlook. We use these word-lists to count the number of positive and negative words in each REO report analysing the economic situation of each of the selected countries. We make the simplifying assumption that all positive and negative words in the predetermined dictionary are equally informative, while other words are uninformative. This procedure is similar to Tetlock (2007) and Tetlock et al. (2008) and many studies in various fields (sociology, psychology) using the GI or one of the two sub-dictionaries. Therefore, by not relying on subjective judgment such as in Fratzscher and Reynaud (2011), our words measures are parsimonious, objective, reliable and transparent.

Table B.1 in the Appendix displays some descriptive statistics on the average share of positive and negative words identified by the GI dictionary across countries and over the sample period (from the second half of 2005 to the end of 2018). We note that, on average, the share of positive words is higher than the share of negative words, except for Russia. This suggests that, on average, the REO reports have provided more positive sentiments than negative ones. Poland exhibits the highest share of positive words (7.6%) and the United Kingdom the lowest (2.8%). The share of negative words is the highest for Russia (6.3%) and the lowest for France (2.1%). Accordingly, the region Europe shows the highest dispersion in the positive and negative words. We also observe a substantial dispersion in the words measures within each country. For example, in Poland, the share of positive words ranges from 0.0 to 18.2%, while the share of negative words in Russia is even more pronounced with a range of 0.0 to 21.0%.

3.2. Measuring IMF sentiment

We combine positive and negative words to produce two different sentiment measures for each country i at each publication date t. We use two relative measures as they allow a better identification of whether a piece of text is relatively positive or relatively negative, and the magnitude of sentiment relative to the length of the text.

The first relative sentiment measure, $T_{i,t}^1$, consists in subtracting the share of positive words from the share of negative words over the total number of words:

$$T_{i,t}^1 = \frac{Pos_{i,t} - Neg_{i,t}}{Total_{i,t}};$$

(1)

The second relative measure, $T_{i,t}^2$, subtracts the share of positive words from the share of negative words over the sum of positive and negative words:

$$T_{i,t}^2 = \frac{Pos_{i,t} - Neg_{i,t}}{Pos_{i,t} + Neg_{i,t}};$$ (2)

where $Pos_{i,t}$ and $Neg_{i,t}$ reflect the number of positive and negative words respectively, while $Total_{i,t}$ is the total number of words. A higher value of $T_{i,t}^n$ ($n = 1$ to 2) is indicative of a more positive sentiment about the economic situation of a given country i in the REO report published at a particular time t.

To allow for a more reliable comparison over time and across countries, the two sentiment measures are standardized to adjust for changes in the distribution of words that convey the tone through the different reports, as in Tetlock et al. (2008).[10] Figs. B.1, B.2, and B.3 in the Appendix report the evolution over time of the standardized scores (Z-scores) for the two sentiment measures – denoted $t_{i,t}^1$ and $t_{i,t}^2$, respectively – for each country over the sample period.[11] Positive (negative) Z-scores indicate that the degree of optimism (pessimism) in the text is above (below) average.

Unsurprisingly, the figures show that the two sentiment measures are highly correlated. The 2008 financial crisis leads to relatively synchronous troughs since it severely hit the global economy, followed by the sovereign debt turmoil, which posed a threat to the recovery of the major European countries. However, the sentiment measures display some differences across countries and time variation. In particular, countries' sentiment were particularly negative (more pessimistic sentiment) in the period following the global crisis of 2008, especially in Russia and Turkey. In fact, the minimum sentiment realization has not been just confined to this episode. In Germany, for example, the minimum sentiment occurred during the sovereign debt episode. In Asia and Pacific, the sentiment measures exhibit a greater amplitude since the early 2000s. The economic downturn of China in 2011 has coincided with the peak reached by the IMF's negative sentiment towards this country. This confidence drop has contaminated other Asian economies and emerging countries, due to the central role played by China in world trade. A significant deterioration in IMF sentiment towards the US can be seen in october 2013. This deterioration reflects a change in the description of the US economy,

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[10]Theses changes are mostly explained by changes in the writing style due to changes in the IMF's writing teams.

[11]The standardization consists, for each sentiment measure, in subtracting the sample period's mean and dividing by the sample period's standard deviation of the sentiment measure.

with a reduction in the proportion of positive words used and, in particular, a sharp rise in the use of negative terms. Almost all countries' sentiment became negative at the end of the period, mainly as a result of increased trade tensions between the US and China.

4. IMF sentiment and financial markets

We use a high frequency methodology to assess the relationship between the sentiment of the REO reports and asset prices. The aim is to assess changes in stock market returns and government bond yields in very narrow time window around a specific event - the release of the IMF REO. There are two main assumptions underlying this approach: (i) on the day it is made, the release of the IMF REO dominates all other news to financial markets; and (ii) asset prices are forward-looking and react immediately and accurately to news provided in the IMF REO reports. Hence, this methodology allows to gauge the contemporaneous relation of the statements included in the REO reports. Since the REO reports are regularly published but not necessarily on the same dates, we focus on the publication dates of the reports and the near-term developments in financial markets around these dates.

4.1. Financial Data

We extract daily data on stock market indexes from September 2005 to March 2019 for our sample countries.[12] Table C.1 in the Appendix reports the stock market indexes selected for each country as well as their respective definition.

We compute for each stock market index of each country i (i) the one-day return calculated between the day of publication (t) and the previous day ($Ret_{i,t}$), (ii) the cumulative return calculated over h days following the day of publication ($Ret_{i,t+h}$) with $h = 1, ..., 5$. Evans and Lyons (2005) provide evidence that the market still absorbs news after several days, meaning that the relation may increase during the trading week.

To assess the relationship of IMF sentiment conveyed by the REO reports with market expectations about countries' economic conditions, we also extract yields on government bonds for each country. The underlying idea is that IMF sentiment contained in the REO reports conveys qualitative information on future economic fundamentals, beyond the quantitative data corresponding to the economic forecasts.

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[12]Argentina, Australia, Brazil, Canada, China, France, Germany, India, Japan, Mexico, Poland, Russia, South Korea, Turkey, the United Kingdom and the United States.

This information may affect market expectations about countries' future economic performance, and thus, government bond yields. Hence, we collect the 5-year and 10-year government bonds yields (i^{5y}, i^{10y}). We compute the cumulative changes in government bond yields over the same horizons as those selected for stock returns.

Overall, we calculate the returns of three financial variables over six time scales and use two sentiment measures for each country. All data are extracted from Thomson Reuters back to 2005, i.e. the start of our sample period, for all the countries in our sample.[13]

4.2. Econometric set-up

We use a high frequency methodology to examine the extent to which changes in IMF sentiment is related to countries' changes in stock market returns and government bond yields, around the publication of a REO report and during the post-publication period. This procedure consists in focusing on movements in asset prices in a narrow window around the release of the REO report. The assumption underlying this empirical procedure is that, if IMF reports affect the returns on stock and bond markets, the variability of these returns should be higher on days of the release, because the latter contains news. The specification, for each country i, is as follows:

$$r_{i,t+h} - r_{i,t-1} = \alpha^{h,n} + \beta^{h,n}\Delta T_{i,t}^n + u_{i,t} \tag{3}$$

where $r_{i,t+h} - r_{i,t-1}$ reflects cumulative changes over h days of i's stock market returns or yields of i's government bonds.[14] h stands for the different timing conventions discussed above (with h= 0,..., 5). $\Delta T_{i,t}^n$ is the first difference of the two sentiment measures ($n = 1$ to 2) for country i at time t, between two subsequent reports. Finally, $u_{i,t}$ is a stochastic error term that captures the effects of other factors that influence the asset price.

The word clouds depicted in Fig. 1 show that, in some regions, there is a strong dependence to external economic and financial conditions. Therefore, we control for the potential influence exerted by the sentiment measure of the main regional trading partner j of each country i, $T_{j,t}^n$:

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[13]Due to data availability, this analysis is not carried out for Turkey, Argentina, and Australia. Similarly, it is not possible to extend the analysis to the 20-year and 30-year government bond yields.

[14]$\sum_{i=0}^{h} (r_{i,t+i} - r_{i,t-1}) = (r_{i,t+h} - r_{i,t+h-1}) + ... + (r_{i,t} - r_{i,t-1}) = r_{i,t+h} - r_{i,t-1}$.

$$r_{i,t+h} - r_{i,t-1} = \alpha^{h,n} + \beta_1^{h,n}\Delta T_{i,t}^n + \beta_2^{h,n}\Delta T_{j,t}^n + u_{i,t} \qquad (4)$$

Table C.2 in the Appendix reports the selected trading partner for each country. Since the number of observations is not large for each country - 22 to 27 observations per country, the regression is performed in panel data for each region. We use a similar specification to assess the relationship between the IMF sentiment and the 5-year and 10-year government bond yields.

For each regression, we compare the three degrees of cross-sectional heterogeneity by estimating the fixed and random effects model and the pooled model. To choose between the fixed and random effect models, we use the Hausman test (Hausman, 1978), while we use the Breush-Pagan test (Breusch and Pagan, 1979) to choose between the pooled and the random effect model. Since the tests show a strong significant heterogeneity amongst countries for most regressions, we select a fixed effects specification matches better the data generating process. We then perform a modified Wald test to detect for the existence of groupwise heteroskedasticity in the residuals of our fixed-effect regression. To test for cross-sectional dependence in the error term, we run a Breusch-Pagan LM test. The above tests suggest that we might not use the standard fixed effect procedure without taking into account spatial correlation and panel heteroskedasticity. As a consequence, we use panel corrected standard errors (PCSEs) regression developed by Beck and Katz (1995) for all estimations. PCSEs estimator suits best to small panels and accounts for finite sample bias while producing panel-corrected standard errors that allow heteroskedasticity and correlation within panels.[15]

4.3. Results

In this section, we present evidence that is consistent with the notion that IMF sentiment is related to asset prices. This result lends further credence to the view that IMF sentiment contains price-relevant information for market participants, and captures how the IMF shapes its judgment of countries' economic conditions. Hence, market participants adjust their expectations for the stock market returns and government bond yields in response to changes in IMF sentiment contained in the REO reports. We present and discuss the main findings below.

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[15]Beck and Katz (1995) underlined that the Feasible Generalized Least Squares (FGLS) estimator used to improve inference and estimation efficiency does not perform very well in finite samples.

Tables 1, 2 and 3 report estimation results of eq. (4) according to the region analysed by the REO reports, the sentiment measure and the time horizon over which cumulative changes of respectively stock market returns, 5-year government bond yields, and 10-year government bond yields are calculated.

The qualitative information contained in the IMF reports appears to have significant explanatory power for stock market returns in European financial markets at short horizons. For the Europe region, we find that a more positive IMF sentiment is correlated with a higher return of the stock market the day of the release of the REO report and one day after. Specifically, a one standard-deviation (SD) increase in IMF sentiment, as expressed by $\Delta T_{i,t}^1$, is associated with an increase of 0.19% of a SD in European stock market returns at t, and 3.3% SD at $t+1$. This effect remains significant even when we control for the sentiment of the main trading partner in the empirical specification. Interestingly, this result is in accordance with Evans and Lyons (2005) who suggest that the relationship between news and financial markets may increase over time. Finally, the results related to the Asia and Pacific region and the Western Hemisphere region do not exhibit any significant pattern across the different horizons or sentiment measures. All in all, these first findings suggest that stock markets in Europe are the most sensitive to the qualitative information contained in the REO reports.

Regarding the 5-year bond yields, the sentiment conveyed through the IMF reports of the Asia and Pacific region affects negatively and significantly the 5-year bond yields in the short-term, i.e. at t, $t+4$ and $t+5$. Hence, a one SD increase in IMF sentiment, as expressed by $\Delta T_{i,t}^1$ ($\Delta T_{i,t}^2$), is associated with a decrease of 0.69% (0.11%) SD in the 5-year bond yields five days after the publication. The effect is still significant when controling for the sentiment of the main trading partner of this region, i.e. China. For the Europe region, the coefficient associated with IMF sentiment is positively and significantly related to European bond yields three and four days after the release of the REO report regardless of the sentiment measure used in the specification. This unexpected sign might be explained by the over-optimistic expectations that financial markets have, on average, about the economic and financial outlook of the European region, and which are not met by the economic and financial analysis provided in the REO reports for this region. Finally, the results for the Western Hemisphere region do not exhibit any significant coefficient. Indeed, in this region, the 5-year bond market seems not affected by the sentiment conveyed by the REO reports.

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Table 3 suggests similar evidence on the effect of IMF sentiment for the 10-year bond yields as those for the 5-year bond yields. The results related to the Asia and Pacific region show that the 10-year yields tend to be negatively affected by a positive change of IMF sentiment following the release of the REO report. This effect is persistent over the first week of the release. Specifically, a one SD increase in IMF sentiment, as expressed by $\Delta T_{i,t}^1$ ($\Delta T_{i,t}^2$), is associated with a decrease of 0.28% (0.03%) SD in the 10-year bond yields the day of the release of the REO report. However, three days after the release, 10-year yields are significantly related to IMF sentiment of the main trading partner of this region; that is, China. These findings can be explained by the fact that the REO reports of the Asia and Pacific region deal mostly with the Chinese economy and its impact on neighboring countries. Indeed, financial markets in these countries are mostly driven by the Chinese economy, hence, a positive assessment of China in the IMF REO is associated, on average, to a decrease of the 10-year bond yields in Japan, South Korea, India and Australia. The results also show that a positive change of the sentiment conveyed in the IMF REO reports is positively associated to the 10-year government bond yield for the Europe region 4 days after the publication of the report.

Overall, the empirical evidence show that the sentiment conveyed by the IMF REO reports moves asset prices, and thus, provides relevant qualitative information to financial market participants about countries' economic performance, in particular for the Europe region. In this region, the sentiment-effect in stock market returns is consistent with the notion that market participants interpret a more positive IMF sentiment as a signal for better economic conditions. In constrast, in the Asia and Pacific, bond markets seem more sensitive to the IMF sentiment than stock markets. Bonds markets respond significantly to a change in the IMF sentiment towards domestic economies and towards the main trading partner in the short run. This last finding is not surprising, given the weight and the influence of China in the Asia and Pacific region. In the Western Hemisphere region, financial markets seem not affected by the sentiment conveyed by the REO reports.

Table 1: Testing the effect of changes in the IMF sentiment on cumulative changes in stock market returns

Asia and Pacific

	Ret_t		Ret_{t+1}		Ret_{t+2}		Ret_{t+3}		Ret_{t+4}		Ret_{t+5}	
$\Delta T^1_{i,t}$	-0.0449	-0.0196	0.00987	0.0241	0.00173	0.0418	0.00161	0.0375	0.0303	0.0603	0.0406	0.0749
	(0.183)	(0.486)	(0.829)	(0.569)	(0.969)	(0.287)	(0.973)	(0.428)	(0.548)	(0.243)	(0.498)	(0.206)
$\Delta T^1_{j,t}$		-0.107		-0.0614		-0.166**		-0.149		-0.127		-0.152
		(0.112)		(0.469)		(0.043)		(0.110)		(0.200)		(0.184)
$\Delta T^2_{i,t}$	-0.00718*	-0.00318	-0.000360	0.00175	-0.00208	0.00386	-0.00233	0.00263	0.00158	0.00507	0.00260	0.00666
	(0.084)	(0.347)	(0.950)	(0.740)	(0.706)	(0.424)	(0.695)	(0.653)	(0.801)	(0.435)	(0.724)	(0.360)
$\Delta T^2_{j,t}$		-0.0181**		-0.00996		-0.0258**		-0.0219*		-0.0158		-0.0194
		(0.037)		(0.376)		(0.016)		(0.076)		(0.231)		(0.200)
N	130	130	130	130	130	130	130	130	130	130	130	130

Europe

	Ret_t		Ret_{t+1}		Ret_{t+2}		Ret_{t+3}		Ret_{t+4}		Ret_{t+5}	
$\Delta T^1_{i,t}$	0.0455**	0.0457**	0.0684*	0.0677**	0.0137	0.0131	-0.0254	-0.0250	-0.0747	-0.0746	-0.0796	-0.0796
	(0.023)	(0.019)	(0.057)	(0.050)	(0.735)	(0.734)	(0.637)	(0.629)	(0.249)	(0.236)	(0.256)	(0.237)
$\Delta T^1_{j,t}$		-0.00557		0.0329		0.0189		0.0171		-0.00164		0.00575
		(0.826)		(0.486)		(0.693)		(0.792)		(0.984)		(0.954)
$\Delta T^2_{i,t}$	0.00303	0.00308*	0.00492	0.00474*	0.00175	0.00135	0.00194	0.00149	0.00138	0.000795	0.00205	0.00132
	(0.102)	(0.083)	(0.112)	(0.097)	(0.615)	(0.660)	(0.676)	(0.715)	(0.778)	(0.857)	(0.709)	(0.785)
$\Delta T^2_{j,t}$		-0.000638		0.00104		0.00244		0.00329		0.00504		0.00622
		(0.762)		(0.794)		(0.541)		(0.546)		(0.476)		(0.457)
N	105	105	105	105	105	105	105	105	105	105	105	105

Western Hemisphere

	Ret_t		Ret_{t+1}		Ret_{t+2}		Ret_{t+3}		Ret_{t+4}		Ret_{t+5}	
$\Delta T^1_{i,t}$	0.0317	0.0251	0.0392	0.0367	0.0605	0.0448	0.0583	0.0471	-0.0401	-0.0360	-0.0896	-0.0802
	(0.590)	(0.678)	(0.574)	(0.618)	(0.557)	(0.679)	(0.645)	(0.718)	(0.672)	(0.722)	(0.348)	(0.435)
$\Delta T^1_{j,t}$		0.0351		0.0112		0.0687		0.0518		-0.0177		-0.0375
		(0.710)		(0.919)		(0.684)		(0.813)		(0.895)		(0.771)
$\Delta T^2_{i,t}$	0.00330	0.00284	0.00513	0.00479	0.00458	0.00320	0.00437	0.00304	-0.00241	-0.00276	-0.00623	-0.00629
	(0.549)	(0.598)	(0.427)	(0.455)	(0.621)	(0.727)	(0.706)	(0.788)	(0.778)	(0.749)	(0.461)	(0.457)
$\Delta T^2_{j,t}$		0.00399		0.00236		0.00933		0.00939		0.00220		0.000370
		(0.588)		(0.784)		(0.482)		(0.586)		(0.830)		(0.971)
N	125	125	125	125	125	125	125	125	125	125	125	125

Note: Prais-Winsten (PSCE) estimates (Beck and Katz, 1995). ***, **, and * indicate respectively 1%, 5%, and 10% significance.

Table 2: Testing the effect of changes in the IMF sentiment on cumulative changes in 5-year bond yields

Asia and Pacific

	i_t^{5y}		i_{t+1}^{5y}		i_{t+2}^{5y}		i_{t+3}^{5y}		i_{t+4}^{5y}		i_{t+5}^{5y}	
$\Delta T_{i,t}^1$	-0.262**	-0.195	-0.321	-0.197	-0.0271	0.0353	-0.500*	-0.449*	-0.603**	-0.462	-0.689**	-0.548*
	(0.045)	(0.147)	(0.138)	(0.376)	(0.864)	(0.833)	(0.053)	(0.088)	(0.044)	(0.135)	(0.026)	(0.079)
$\Delta T_{j,t}^1$		-0.240		-0.439		-0.226		-0.201		-0.497		-0.492
		(0.132)		(0.105)		(0.172)		(0.511)		(0.176)		(0.163)
$\Delta T_{i,t}^2$	-0.0360**	-0.0261	-0.0428	-0.0257	-0.00101	0.00643	-0.0726**	-0.0611*	-0.0869**	-0.0608	-0.108***	-0.0830**
	(0.038)	(0.139)	(0.146)	(0.389)	(0.961)	(0.771)	(0.034)	(0.078)	(0.028)	(0.130)	(0.007)	(0.036)
$\Delta T_{j,t}^2$		-0.0341		-0.0577		-0.0262		-0.0439		-0.0894*		-0.0844*
		(0.105)		(0.109)		(0.239)		(0.275)		(0.060)		(0.059)
N	104	104	104	104	104	104	104	104	104	104	104	104

Europe

	i_t^{5y}		i_{t+1}^{5y}		i_{t+2}^{5y}		i_{t+3}^{5y}		i_{t+4}^{5y}		i_{t+5}^{5y}	
$\Delta T_{i,t}^1$	0.334	0.334	0.424	0.420	0.495	0.491	1.144***	1.139***	0.982**	0.985**	0.763*	0.773*
	(0.313)	(0.311)	(0.429)	(0.438)	(0.207)	(0.214)	(0.004)	(0.005)	(0.011)	(0.011)	(0.076)	(0.073)
$\Delta T_{j,t}^1$		0.0251		-0.124		-0.0999		-0.0367		0.117		0.170
		(0.922)		(0.795)		(0.697)		(0.899)		(0.682)		(0.605)
$\Delta T_{i,t}^2$	0.0288	0.0299	0.0356	0.0337	0.0452	0.0444	0.0885***	0.0884***	0.0790**	0.0791**	0.0607	0.0611
	(0.282)	(0.282)	(0.364)	(0.402)	(0.109)	(0.117)	(0.009)	(0.009)	(0.020)	(0.018)	(0.120)	(0.113)
$\Delta T_{j,t}^2$		-0.0176		0.0398		0.0186		-0.00501		0.00420		0.00928
		(0.410)		(0.262)		(0.329)		(0.834)		(0.853)		(0.717)
N	105	105	105	105	105	105	105	105	105	105	105	105

Western Hemisphere

	i_t^{5y}		i_{t+1}^{5y}		i_{t+2}^{5y}		i_{t+3}^{5y}		i_{t+4}^{5y}		i_{t+5}^{5y}	
$\Delta T_{i,t}^1$	1.218	1.683	1.157	1.646	-0.474	-0.352	1.275	1.885	1.524	2.081	1.597	2.073
	(0.224)	(0.188)	(0.278)	(0.219)	(0.150)	(0.313)	(0.295)	(0.208)	(0.206)	(0.152)	(0.179)	(0.134)
$\Delta T_{j,t}^1$		-0.960		-1.065		-0.419		-1.352		-1.240		-1.157
		(0.533)		(0.506)		(0.322)		(0.464)		(0.478)		(0.491)
$\Delta T_{i,t}^2$	0.103	0.121	0.102	0.121	-0.0341	-0.0272	0.110	0.135	0.127	0.150	0.135	0.154
	(0.212)	(0.185)	(0.249)	(0.211)	(0.209)	(0.322)	(0.271)	(0.215)	(0.212)	(0.172)	(0.178)	(0.145)
$\Delta T_{j,t}^2$		-0.0498		-0.0604		-0.0365		-0.0830		-0.0723		-0.0701
		(0.610)		(0.575)		(0.281)		(0.537)		(0.564)		(0.566)
N	100	100	100	100	100	100	100	100	100	100	100	100

Note: Prais-Winsten (PSCE) estimates (Beck and Katz, 1995). ***, **, and * indicate respectively 1%, 5%, and 10% significance.

Table 3: Testing the effect of changes in the IMF sentiment on cumulative changes in 10-year bond yields

Asia and Pacific

	i_t^{10y}		i_{t+1}^{10y}		i_{t+2}^{10y}		i_{t+3}^{10y}		i_{t+4}^{10y}		i_{t+5}^{10y}	
$\Delta T_{i,t}^1$	-0.279***	-0.223**	-0.217	-0.0519	-0.0864	0.0316	-0.544**	-0.442*	-0.639**	-0.411	-0.632**	-0.450
	(0.004)	(0.025)	(0.164)	(0.743)	(0.604)	(0.861)	(0.038)	(0.093)	(0.025)	(0.155)	(0.032)	(0.109)
$\Delta T_{j,t}^1$		-0.172		-0.522**		-0.392**		-0.388		-0.836**		-0.701**
		(0.176)		(0.012)		(0.035)		(0.208)		(0.012)		(0.038)
$\Delta T_{i,t}^2$	-0.0431***	-0.0348***	-0.0309	-0.0101	-0.0152	0.00108	-0.0862**	-0.0679**	-0.0917**	-0.0548	-0.0945**	-0.0659*
	(0.001)	(0.010)	(0.157)	(0.653)	(0.481)	(0.964)	(0.013)	(0.048)	(0.015)	(0.147)	(0.016)	(0.074)
$\Delta T_{j,t}^2$		-0.0232		-0.0632**		-0.0533**		-0.0658		-0.133***		-0.107**
		(0.166)		(0.027)		(0.037)		(0.100)		(0.002)		(0.013)
N	104	104	104	104	104	104	104	104	104	104	104	104

Europe

	i_t^{10y}		i_{t+1}^{10y}		i_{t+2}^{10y}		i_{t+3}^{10y}		i_{t+4}^{10y}		i_{t+5}^{10y}	
$\Delta T_{i,t}^1$	0.00224	-0.000411	0.250	0.249	0.586*	0.593**	0.616**	0.620**	0.791**	0.800**	-0.457	-0.434
	(0.979)	(0.996)	(0.159)	(0.171)	(0.056)	(0.048)	(0.045)	(0.044)	(0.015)	(0.014)	(0.109)	(0.136)
$\Delta T_{j,t}^1$		-0.0268		-0.0146		0.194		0.153		0.236		0.236
		(0.801)		(0.925)		(0.422)		(0.533)		(0.394)		(0.439)
$\Delta T_{i,t}^2$	0.00452	0.00436	0.0270	0.0270	0.0484**	0.0489**	0.0512*	0.0511*	0.0591*	0.0593*	-0.00454	-0.00307
	(0.549)	(0.560)	(0.107)	(0.117)	(0.040)	(0.048)	(0.080)	(0.078)	(0.053)	(0.050)	(0.875)	(0.915)
$\Delta T_{j,t}^2$		0.00775		-0.00697		-0.00620		0.00469		0.0117		0.0237
		(0.357)		(0.563)		(0.762)		(0.818)		(0.615)		(0.328)
N	105	105	105	105	105	105	105	105	105	105	105	105

Western Hemisphere

	i_t^{10y}		i_{t+1}^{10y}		i_{t+2}^{10y}		i_{t+3}^{10y}		i_{t+4}^{10y}		i_{t+5}^{10y}	
$\Delta T_{i,t}^1$	-0.492	-0.347	-0.225	-0.0936	0.309	0.461	-0.272	0.0191	-0.0199	0.290	-0.365	-0.139
	(0.247)	(0.512)	(0.594)	(0.841)	(0.543)	(0.412)	(0.676)	(0.978)	(0.975)	(0.663)	(0.550)	(0.823)
$\Delta T_{j,t}^1$		-0.382		-0.393		-0.400		-0.911		-0.879		-0.673
		(0.551)		(0.257)		(0.377)		(0.234)		(0.255)		(0.334)
$\Delta T_{i,t}^2$	-0.0493	-0.0409	-0.0184	-0.0103	0.0329	0.0405	-0.0261	-0.0108	-0.0142	0.00396	-0.0427	-0.0278
	(0.159)	(0.301)	(0.581)	(0.765)	(0.415)	(0.334)	(0.614)	(0.840)	(0.786)	(0.939)	(0.392)	(0.568)
$\Delta T_{j,t}^2$		-0.0350		-0.0366		-0.0306		-0.0737		-0.0750		-0.0659
		(0.440)		(0.173)		(0.380)		(0.207)		(0.204)		(0.222)
N	100	100	100	100	100	100	100	100	100	100	100	100

*Note: Prais-Winsten (PSCE) estimates (Beck and Katz, 1995). ***, **, and * indicate respectively 1%, 5%, and 10% significance.*

5. Extensions

In this section, we undertake several additional checks, by including the use of an alternative sentiment measure, allowing for a larger time window to test the persistence of the IMF sentiment-asset prices relationship, and investigating the possible sensitivity of our results to the adoption of another dictionary.

5.1. An alternative normalization

It is not clear whether the sentiment measures used above, $T_{i,t}^1$ and $T_{i,t}^2$, capture accurately the tone of a written document. To address this potential bias, we examine the robustness of our results to the use of an alternative measurement of sentiment proposed by Loughran and McDonald (2011). This alternative measure, $T_{i,t}^3$, focuses exclusively on the use of negative words. The hypothesis underlying this approach is that positive words are often negated and thus, they are easily compromised. The alternative sentiment measure is as follows:

$$T_{i,t}^3 = 1 - \left(\frac{Neg_{i,t}}{Total_{i,t}} \right); \tag{5}$$

A higher index stands for a decrease in IMFs pessimism about the economic situation of a given country i in the REO report published at a particular time t. This alternative measure is also standardized to adjust for changes in the distribution of words that convey the tone through the different reports. Its evolution over time is reported, along with $t_{i,t}^1$, in Figs. B.1, B.2, and B.3 in the Appendix. We observe that, while the previous standardized measures $t_{i,t}^1$ and $t_{i,t}^2$ are highly correlated with one another, they are less correlated with this new standardized measure, $t_{i,t}^3$.

We replace the initial sentiment measures by the one computed in eq. (5) in our baseline regression:

$$r_{i,t+h} - r_{i,t-1} = \alpha^{h,3} + \beta_1^{h,3} \Delta T_{i,t}^3 + \beta_2^{h,3} \Delta T_{j,t}^3 + u_{i,t}; \tag{6}$$

The results of the regression are shown in Tables 4, 5, and 6.

Table 4: Testing the effect of changes in the IMF sentiment on stock returns
Alternative sentiment measure

Asia and Pacific

	Ret_t		Ret_{t+1}		Ret_{t+2}		Ret_{t+3}		Ret_{t+4}		Ret_{t+5}	
$\Delta T^3_{i,t}$	-0.143***	-0.0865*	-0.0604	-0.0124	-0.164**	-0.0850	-0.183**	-0.129	-0.123	-0.0911	-0.123	-0.0857
	(0.009)	(0.062)	(0.404)	(0.850)	(0.023)	(0.185)	(0.021)	(0.104)	(0.139)	(0.274)	(0.204)	(0.362)
$\Delta T^3_{j,t}$		-0.294***		-0.237*		-0.361***		-0.270*		-0.155		-0.189
		(0.004)		(0.091)		(0.005)		(0.079)		(0.350)		(0.373)
N	130	130	130	130	130	130	130	130	130	130	130	130

Europe

	Ret_t		Ret_{t+1}		Ret_{t+2}		Ret_{t+3}		Ret_{t+4}		Ret_{t+5}	
$\Delta T^3_{i,t}$	0.0604**	0.0613**	0.0966*	0.0930*	0.0495	0.0417	0.0617	0.0516	0.0510	0.0312	0.0473	0.0227
	(0.029)	(0.023)	(0.096)	(0.099)	(0.414)	(0.470)	(0.458)	(0.515)	(0.630)	(0.759)	(0.687)	(0.839)
$\Delta T^3_{j,t}$		-0.0193		0.0390		0.0878		0.101		0.214		0.260
		(0.703)		(0.692)		(0.372)		(0.453)		(0.208)		(0.198)
N	105	105	105	105	105	105	105	105	105	105	105	105

Western Hemisphere

	Ret_t		Ret_{t+1}		Ret_{t+2}		Ret_{t+3}		Ret_{t+4}		Ret_{t+5}	
$\Delta T^3_{i,t}$	-0.0223	-0.0306	-0.00107	-0.0119	-0.0228	-0.0476	0.00520	-0.0203	-0.0596	-0.0543	-0.0701	-0.0665
	(0.803)	(0.715)	(0.992)	(0.903)	(0.883)	(0.742)	(0.979)	(0.911)	(0.641)	(0.658)	(0.556)	(0.558)
$\Delta T^3_{j,t}$		0.0494		0.0648		0.133		0.130		-0.0279		-0.0225
		(0.619)		(0.588)		(0.462)		(0.578)		(0.846)		(0.871)
N	125	125	125	125	125	125	125	125	125	125	125	125

*Note: Prais-Winsten (PSCE) estimates (Beck and Katz, 1995). ***, **, and * indicate respectively 1%, 5%, and 10% significance.*

Table 5: Testing the effect of changes in the IMF sentiment on 5-year bond yields
Alternative sentiment measure

	Asia and Pacific											
	i_t^{5y}		i_{t+1}^{5y}		i_{t+2}^{5y}		i_{t+3}^{5y}		i_{t+4}^{5y}		i_{t+5}^{5y}	
$\Delta T_{i,t}^3$	-0.285	-0.181	-0.289	-0.131	-0.204	-0.232	-0.696*	-0.568	-0.663	-0.420	0.731	-0.435
	(0.150)	(0.355)	(0.381)	(0.687)	(0.405)	(0.358)	(0.073)	(0.144)	(0.132)	(0.334)	(0.113)	(0.323)
$\Delta T_{j,t}^3$		-0.589**		-0.767*		0.153		-0.743		-1.221**		-1.415**
		(0.032)		(0.057)		(0.620)		(0.145)		(0.042)		(0.018)
N	104	104	104	104	104	104	104	104	104	104	104	104
	Europe											
	i_t^{5y}		i_{t+1}^{5y}		i_{t+2}^{5y}		i_{t+3}^{5y}		i_{t+4}^{5y}		i_{t+5}^{5y}	
$\Delta T_{i,t}^3$	0.429	0.430	1.233	1.312	1.044	1.088	1.629**	1.633**	1.346**	1.340**	0.901	0.899
	(0.519)	(0.521)	(0.298)	(0.267)	(0.194)	(0.177)	(0.016)	(0.016)	(0.037)	(0.038)	(0.219)	(0.221)
$\Delta T_{j,t}^3$		-0.374		1.732*		0.906*		0.148		-0.223		-0.0436
		(0.493)		(0.073)		(0.087)		(0.811)		(0.719)		(0.951)
N	105	105	105	105	105	105	105	105	105	105	105	105
	Western Hemisphere											
	i_t^{5y}		i_{t+1}^{5y}		i_{t+2}^{5y}		i_{t+3}^{5y}		i_{t+4}^{5y}		i_{t+5}^{5y}	
$\Delta T_{i,t}^3$	1.590	1.648	1.432	1.464	-0.471	-0.336	1.833	1.978	1.947	2.119	1.757	1.884
	(0.269)	(0.258)	(0.329)	(0.328)	(0.296)	(0.463)	(0.271)	(0.256)	(0.235)	(0.214)	(0.273)	(0.255)
$\Delta T_{j,t}^3$		-0.287		-0.135		-0.698		-0.543		-0.664		-0.502
		(0.858)		(0.939)		(0.185)		(0.805)		(0.741)		(0.799)
N	100	100	100	100	100	100	100	100	100	100	100	100

Note: Prais-Winsten (PSCE) estimates (Beck and Katz, 1995). ***, **, and * indicate respectively 1%, 5%, and 10% significance.

Table 6: Testing the effect of changes in the IMF sentiment on 10-year bond yields
Alternative sentiment measure

	i_t^{10y}		i_{t+1}^{10y}		i_{t+2}^{10y}		i_{t+3}^{10y}		i_{t+4}^{10y}		i_{t+5}^{10y}	
Asia and Pacific												
$\Delta T_{i,t}^3$	-0.352**	-0.282**	-0.262	-0.190	-0.219	-0.168	-0.935**	-0.735*	-0.787*	-0.494	-0.733*	-0.488
	(0.016)	(0.049)	(0.267)	(0.431)	(0.366)	(0.513)	(0.015)	(0.053)	(0.077)	(0.263)	(0.094)	(0.243)
$\Delta T_{j,t}^3$		-0.345*		-0.345		-0.343		-1.089**		-1.642***		-1.314**
		(0.093)		(0.318)		(0.275)		(0.036)		(0.003)		(0.027)
N	104	104	104	104	104	104	104	104	104	104	104	104
Europe												
$\Delta T_{i,t}^3$	0.0981	0.116	0.274	0.268	0.623	0.606	0.758	0.754	1.102*	1.094*	-1.338***	-1.345***
	(0.540)	(0.459)	(0.427)	(0.448)	(0.235)	(0.242)	(0.175)	(0.180)	(0.055)	(0.057)	(0.003)	(0.003)
$\Delta T_{j,t}^3$		0.340*		-0.138		-0.512		-0.282		-0.447		-0.230
		(0.091)		(0.657)		(0.330)		(0.593)		(0.462)		(0.702)
N	105	105	105	105	105	105	105	105	105	105	105	105
Western Hemisphere												
$\Delta T_{i,t}^3$	-0.568	-0.455	-0.549	-0.400	0.328	0.453	-0.224	0.100	-0.157	0.259	-0.872	-0.497
	(0.293)	(0.411)	(0.268)	(0.435)	(0.559)	(0.444)	(0.786)	(0.908)	(0.844)	(0.749)	(0.235)	(0.497)
$\Delta T_{j,t}^3$		-0.578		-0.739*		-0.676		-1.410		-1.495*		-1.557**
		(0.358)		(0.057)		(0.199)		(0.125)		(0.086)		(0.044)
N	100	100	100	100	100	100	100	100	100	100	100	100

Note: Prais-Winsten (PSCE) estimates (Beck and Katz, 1995). ***, **, and * indicate respectively 1%, 5%, and 10% significance.

As can be seen, using this alternative measure does not significantly change the coefficient related to the IMF sentiment towards the domestic economy for the European region. Estimates for this area show similar results to previous ones; that is, the IMF sentiment appears to influence stock market returns at the short term (t and $t+1$). Results for Asia and Pacific countries still provide evidence of the negative response of domestic bond markets to an increase in the IMF sentiment, but only for 10-year bond yields. Our findings also confirm that the coefficient on the IMF sentiment towards the main trading partner is still negative and significantly related to 5-year and 10-year bond yields. This supports the importance of the perception the IMF has about the Chinese economy on the financial markets of this region.

5.2. The persistence of the IMF sentiment-asset price relationship

Since the qualitative information conveyed by the REO reports on countries' economic conditions may have a persistent effect or be conditional to the introduction of specific policies,[16] we also consider cumulative returns over one calendar month (a total of 20 trading days), two calendar months (a total of 40 trading days), and three calendar months (a total of 60 trading days).

The results[17] indicate that all the coefficients associated with the IMF sentiment towards the domestic economy become insignificant or non robust, compared to the results based on narrow time windows. This finding is not surprising since within larger time windows, the effect of the REO reports on financial-market prices may be contaminated with other news or the implementation of fiscal and or monetary policies.

5.3. An alternative dictionary

So far, we have used the GI dictionary to compute the sentiment measures given that this dictionary is commonly used in many research. However, as demonstrated by Loughran and McDonald (2011), it may not be appropriate to apply a general dictionary for a specific context, such as a financial context. For instance, Loughran

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[16]These are examples of the existence of a persistent effect "*In some countries (Ukraine and Russia, for example), inflation will remain relatively high, despite a projected decline.* Regional Economic Outlook − Europe − Russia 03/10/2009, and of the influence that economic policies may play "*To restore stability and lay the ground for sustainable growth, policies should focus on reining in the fiscal deficit, reducing distortions caused by pervasive administrative controls, and improving the business climate.* Regional Economic Outlook − Western Hemisphere − Argentina − 10/10/2014.

[17]For the sake of brevity, the results are not reported in the paper but are available from the authors upon request.

and McDonald (2011) find that negative words do not necessarily have a negative meaning in the context of corporate annual reports. To overcome this issue, Loughran and McDonald (2011) construct a new dictionary that is specifically suited for financial documents.[18] Accordingly, we repeat the textual and regression analyses described in Sections 4.2. and 3.2., except that we replace the GI dictionary with the Loughran and McDonald (2011) positive and negative word-lists.

Our results provide evidence that the Loughran and McDonald (2011) dictionary based sentiment measures lose most of their significance.[19] Hence a general dictionary as the GI seems much more powerful in detecting relevant IMF's views on economies than a more financial oriented dictionary, suggesting that the REO reports are mostly based on general economic topics rather than specific financial and/or corporate issues. Furthermore, the REO reports highlight some economic issues related to (geo)political events (such as Brexit, trade tensions between the US and China, Trump's election) which are likely to be not captured by the corporate-oriented LM dictionary.

6.   Conclusion

The effect of communication from international organisations such as the IMF on financial markets has garnered almost no attention in the literature. In this paper, we use the General Inquiry dictionary to compute a sentiment index based on the text from the Regional Economic Outlook (REO) reports published by the IMF. The IMF sentiment is supposed to signal staff' views about the economic and financial health of a country, and can thus be interpreted by investors as signaling more optimism or pessimism. We, therefore, test whether the qualitative content of the REO reports, as captured by the IMF sentiment index, influences the financial markets of 16 countries in three regions, Asia and Pacific, Europe, and Western Hemisphere, over the 2005-2018 period.

Our findings suggest that the qualitative content of the REO reports may have significant repercussions on stock market returns and bond yields. However, such impacts are temporary and there are clear differences across regions. Results suggest that in the short term, a more positive IMF sentiment has a significant positive

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[18]The LM dictionary contains 354 (2355) words that convey a positive (negative) tone in financial and economic contexts.

[19]For the sake of brevity, the results are not reported in the paper but are available from the authors upon request.

relationship with stocks markets returns in Europe and a significant negative one with bond yields in Asia in the short run. Equally important, 10-year yields in Asia seem to gradually incorporate the information embedded in the IMF report of the main trading partner of the region (China) several days after the release of the REO reports. However, financial markets in the Western Hemisphere region seem not influenced by the IMF sentiment conveyed in the REO report. These results are robust across different sentiment definitions.

This paper also demonstrates that estimates become mostly insignificant when using a financial dictionary such as Loughran and McDonald (2011)' dictionary. It seems, therefore, that the IMF, through its REO reports, seeks to communicate with a broader audience, and not just with experts.

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Appendix A

Table A.1: Summary statistics – Number of times a country is identified in the REO reports

Countries	Number of reports	Mean	Std	Min	25%	50%	75%	Max
Asia and Pacific								
Australia	27	40.3	27.2	6	18.5	36.0	52.5	106
China	27	155.2	114.0	18	87.0	142.0	209	600
India	27	70.9	40.7	13	37.5	71.0	96.5	148
Indonesia	27	54.4	34.0	10	28.0	46.0	80.0	114
Japan	27	82.2	52.2	10	37.0	77.0	130.0	173
Philippines	27	45.9	30.2	8	23.0	42.0	57.5	112
Singapore	27	42.0	26.6	4	19.0	42.0	56.5	97
South Korea	27	63.2	38.0	9	38.5	63.0	93.5	151
Taiwan	27	30.7	18.4	2	17.0	33.0	40.0	67
Thailand	27	49.5	30.6	8	26.0	46.0	63.5	116
Europe								
France	22	16.9	26.7	0	2.0	7.0	17.8	95
Germany	22	24.4	36.5	2	3.0	7.5	30.5	129
Greece	22	18.9	32.0	0	2.0	7.0	20.5	116
Italy	22	20.0	31.8	0	2.3	8.0	23.5	135
Netherlands	22	15.7	28.8	0	1.0	5.0	14.3	125
Poland	22	43.0	28.0	5	27.0	34.5	53.5	115
Russia	22	42.9	25.5	3	26.5	37.5	62.5	93
Spain	22	22.2	37.4	0	1.3	8.5	28.8	145
Switzerland	22	8.5	15.4	0	1.0	4.5	10.8	73
Turkey	22	41.5	29.3	0	19.5	37.5	67.0	95
United-Kingdom	22	21.3	27.3	0	2.0	12.0	31.5	113
Western Hemisphere								
Argentina	26	31.8	21.3	5	16.5	28.5	35.0	92
Brazil	26	64.6	36.3	15	28.3	68.5	93.5	132
Canada	26	20.3	18.2	1	6.0	15.0	29.8	59
Chile	26	54.8	30.2	12	28.5	56.5	79.0	110
Colombia	26	49.9	28.4	12	23.0	49.4	63.5	104
Ecuador	26	16.5	10.1	5	9.0	13.5	20.0	44
Mexico	26	62.3	32.3	14	34.0	65.0	85.8	133
Peru	26	49.9	26.9	12	26.3	46.5	70.0	105
United-States	26	43.5	29.5	6	24.0	47.5	56.0	148
Venezuela	26	22.7	12.5	6	14.0	19.0	30.5	50

Note: this table displays the number of reports, the mean, the standard deviation, the minimum, the maximum and the 25%, 50%, and 75% quantiles for the number of times a country is identified in the REO reports.

Appendix B

Table B.1: Share of sentiment words (in % of the total number of words)

	Share of positive words				Share of negative words			
	Mean	Std	Min	Max	Mean	Std	Min	Max
Asia and Pacific								
Australia	6.84	3.01	0.00	14.81	4.13	2.01	0.00	7.41
China	6.74	1.45	5.05	11.11	4.60	0.91	3.38	7.30
India	5.79	2.02	0.00	9.85	5.25	1.77	0.00	8.35
Japan	7.16	1.89	3.30	11.49	5.38	1.41	2.20	8.43
South Korea	6.65	2.11	3.25	12.50	5.01	2.15	1.30	12.96
Europe								
France	2.95	3.71	0.00	12.12	2.14	2.85	0.00	9.09
Germany	5.00	4.38	0.00	17.65	3.26	2.65	0.00	7.69
Poland	7.59	3.77	0.00	18.18	4.48	2.96	0.00	13.16
Russia	5.93	2.96	0.00	12.50	6.29	4.31	0.00	21.05
Turkey	5.60	2.73	0.00	9.68	4.32	2.86	0.00	10.61
United Kingdom	2.78	2.54	0.00	6.50	3.68	3.23	0.00	9.09
Western Hemisphere								
Argentina	6.13	3.00	2.41	14.81	4.25	2.46	0.00	7.81
Brazil	5.84	1.47	3.49	8.44	4.82	1.20	2.97	7.59
Canada	4.86	2.80	0.00	9.09	3.70	2.51	0.00	8.00
Mexico	5.92	1.88	0.00	8.90	4.12	2.08	0.00	11.18
United States	5.75	1.31	3.00	7.92	4.87	1.56	1.00	9.55

Note: std, min and max stand respectively for standard deviation, minimum and maximum. this table reports, for each country, descriptive statistics for the share of positive and negative words, as a percentage of all distinct words included in the REO reports.
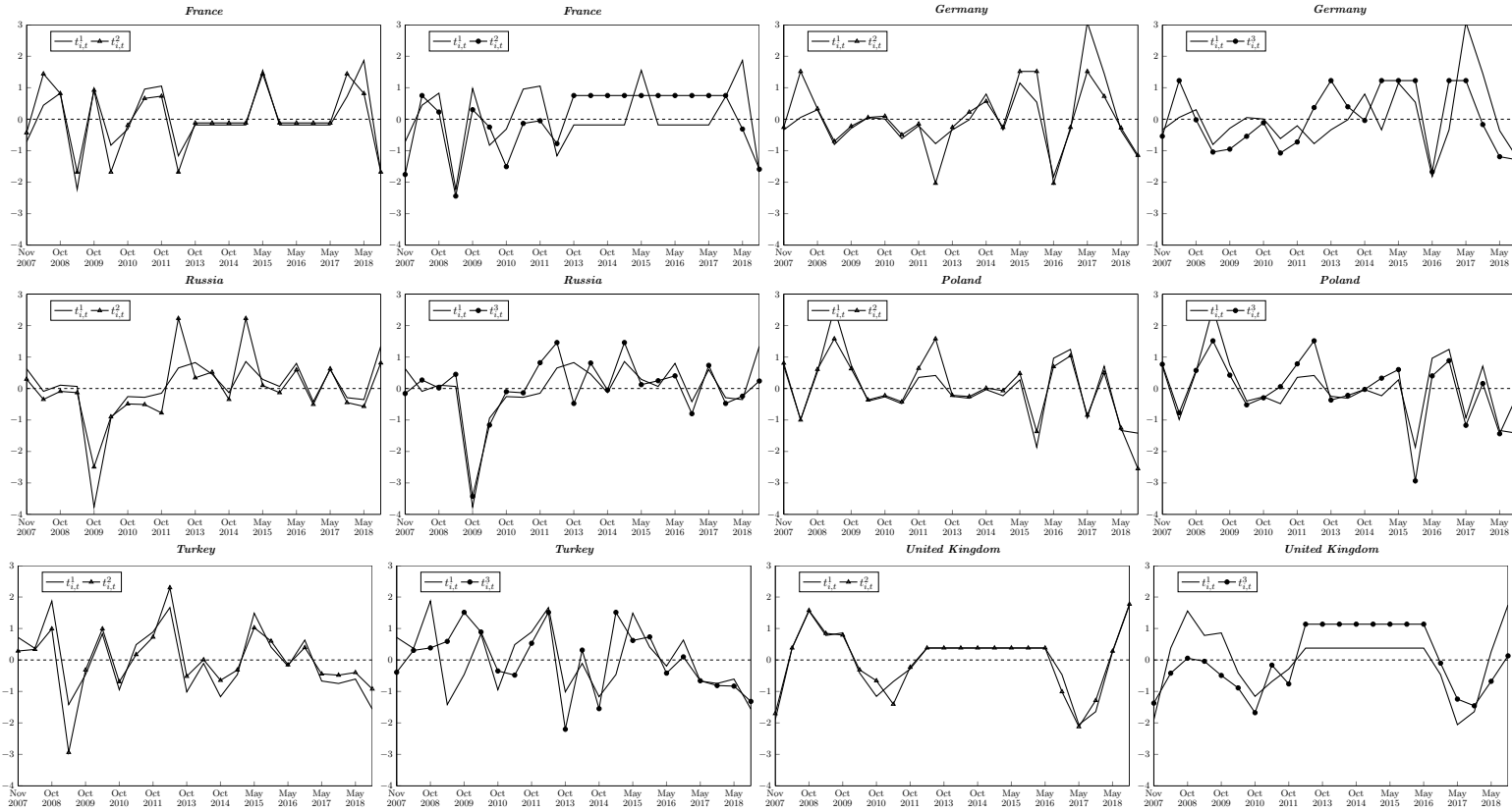
Figure B.1: IMF Sentiment towards each country, Asia and Pacific
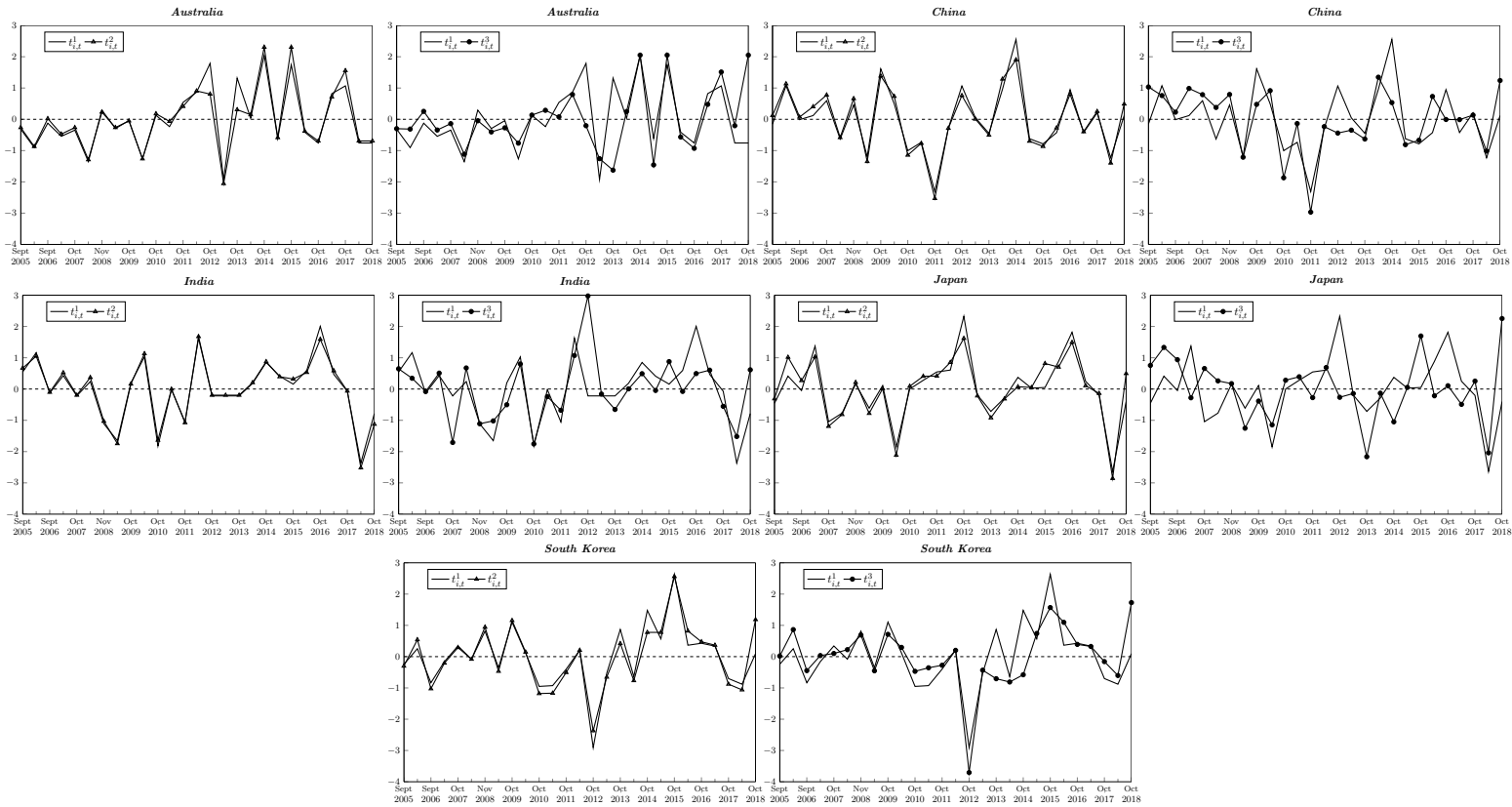
Note: The figures show the evolution of Z-score for each sentiment index – $t^1_{i,t}$, $t^2_{i,t}$ (left graph) and $t^1_{i,t}$, $t^3_{i,t}$ (right graph) – and for each selected country within the Asia and Pacific region.
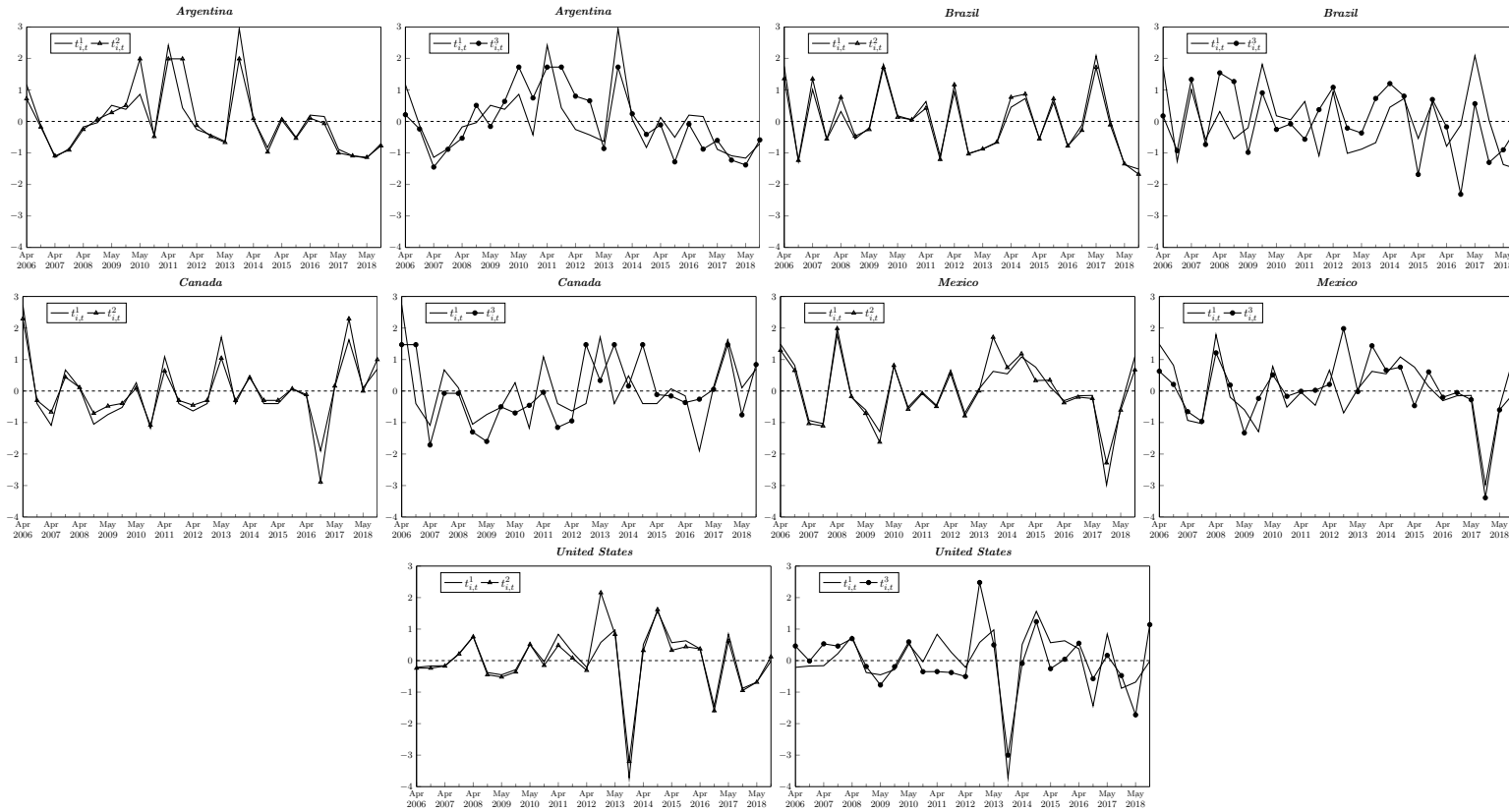
Figure B.2: IMF Sentiment towards each country, Europe

Note: The figures show the evolution of Z-score for each sentiment index – $t_{i,t}^1$, $t_{i,t}^2$ (left graph) and $t_{i,t}^1$, $t_{i,t}^3$ (right graph) – and for each selected country within the Europe region.

Figure B.3: IMF Sentiment towards each country, Western Hemisphere

Note: The figures show the evolution of Z-score for each sentiment index – $t_{i,t}^1$, $t_{i,t}^2$ (left graph) and $t_{i,t}^1$, $t_{i,t}^3$ (right graph) – and for each selected country within the Western Hemisphere region.

Appendix C

Table C.1: List of stock market index selected for each country

Countries	Stock market index	Definition
Argentina	S&P MERVAL Index	Measures the performance of the largest, most liquid stocks trading on the Bolsas y Mercados Argentinos Exchange
Australia	S&P/ASX 300 Index (XKO)	Consists of all S&P/ASX 200 companies plus 100 smaller-cap companies that have market capitalisations above $100 million (AUD)
Brazil	IBOVESPA Index	Tracks the performance of around 50 most liquid stocks traded on the Sao Paulo Stock Exchange in Brazil classified as domestic stocks
Canada	S&P/TSX Composite index	Capitalization-weighted index designed to measure market activity stocks listed on the Toronto Stock Exchange (TSX)
China	Shanghai A-Share Stock Price index	Tracks the daily price performance of all A-shares listed on the Shanghai Stock Exchange that are restricted to local investors and qualified institutional foreign investors
France	CAC 40	Capitalization-weighted measure of the 40 most significant stocks among the 100 largest market caps on the Euronext Paris
Germany	DAX 30 Stock Market Index	Total return index of 30 selected German blue chip stocks traded on the Frankfurt Stock Exchange
India	Nifty 500	Represents the top 500 companies based on full market capitalisation
Japan	Tokyo Stock Price Index (TOPIX)	Capitalization-weighted index of all companies listed on the First Section of the Tokyo Stock Exchange
Mexico	IPC (Indice de Precios y Cotizaciones)	Tracks the performance of leading companies listed on the Mexican Stock Exchange
Russia	MOEX Russia Index	Tracks the performance of the 50 largest and most liquid Russian companies from 10 main economy sectors, listed on The Moscow Stock Exchange
South Korea	Korean Composite Stock Price Index (KOSPI 200)	Comprises the 200 largest publicly-traded common stocks traded in Korea, tracking roughly 70 of the market value of the overall Korean Stock Exchange
Turkey	Borsa Istanbul Index (BIST)	Capitalization-weighted index composed of National Market companies, except investment trusts
United Kingdom	FTSE All-Share Index	Capitalisation-weighted index, comprising around 600 of more than 2,000 companies traded on the London Stock Exchange
United States	Dow Jones Industrial Average Index	Consists of the 30 most important market-leading companies on the American stock exchange

Table C.2: Main trading partners

	First position	Second position	Third position
Asia and Pacific			
Australia	China*	Japan	Korea
China	United-States	Japan*	Korea
India	China*	United-States	United Arab Emirates
Japan	China*	United-States	Korea
South Korea	China*	Japan	Vietnam
Europe			
France	Germany*	United-States	Spain
Germany	United-States	France*	China
Poland	Germany*	China	Russia
Russia	China	Germany*	Netherlands
Turkey	Germany*	United-Kingdom	Italy
United Kingdom	United-States	Germany*	Netherlands
Western Hemisphere			
Argentina	Brazil*	China	United-States
Brazil	China	United-States*	Argentina
Canada	United-States*	China	United-Kingdom
Mexico	United-States*	China	Canada
United States	Canada*	Mexico	China

Note: Within each region, a specific country plays an hegemonic role in the regional trade: Germany for Europe, United-States for Western Hemisphere, and China for Asia and Pacific. For each country, we select the hegemonic country to test whether its sentiment index alters the financial markets of the other countries, except for Argentina. For the three hegemonic countries, we select the main regional trading partner, that is Japan for China, France for Germany, Canada for the United-States. For each country, the selected main regional trade partner is marked with an asterisk. Source: Authors' calculation based on World Integrated Trade Solution (WITS) dataset.