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Investor Attention to Market Categories and Market Volatility: The Case of Emerging Markets

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Abstract

This paper examines the impact of *investor attention* on stock market and FX market volatility in emerging economies using newly constructed innovative *attention* proxies that capture the full spectrum of the dynamics of the information processing stages. Our results show that the new practical proxies are better at capturing the complex nature of *investor attention* to market categories. We find that *investor attention* explains stock market volatility and shocks to attention but not FX market volatility in emerging markets. Thus, the emerging stock market, an important segment of the global equity market, is particularly sensitive to changes to investor attention.

Keywords: category-learning, investor attention, volatility, emerging markets JEL Classification: 7; 12

1. Introduction

In the immediate aftermath of the *Brexit* vote in the UK in June 2016, various news outlets reported that the most searched words and phrases by individuals in the UK, according to Google Trends, were based on terms related to the vote. The reports brought to the fore the usefulness of an important variable garnered to capture individuals' *attention* to specific events, thus, validating the use of the Google-based search volume index (*SVI*)to investigate some financial market phenomena, e.g., market performance, in the finance literature. Nevertheless relating the *SVI* to observed financial market patterns has been empirically problematic because we cannot be certain that trading decisions are made on the basis of information gathered from a Google search.

In this paper, we estimate three (3) practical innovations of the *investor attention* variable that incorporate investors' trading decisions and apply them to equity and currency (FX) markets volatility in a specific market category, emerging markets (EMs). These innovations are as follows: First, based on the Multiple Resource Theory (Wickens, 1992), we estimate a refined proxy for *attention* from the *SVI* and abnormal trading volumes (*ATV*) in the market. We do this by taking the first principal component of the *SVI* and *ATV*. Thus, we reinforce an obvious online query with market-based information on trading volumes, thereby increasing the possibility that information from an internet search is used when making trading decisions. This maximizes the amount of variation captured from both variables and accentuates the signal-value regarding investment activity. Second, we disentangle the variation in the *SVI* variable most likely to affect EM-specific volatility. To this effect, we take the first principal component of the *SVI* and excess *ATV*, the difference between abnormal trading volume in EMs and the United States. In additionally, we adapt a method by Bessembinder and Seguin (1993) and split the *SVI* and the new PCA-based proxy for *investor attention* into *expected* and *unexpected* attention. This exercise informs on the component of *attention* that most likely impacts on price behavior. We expect the innovations to have stronger economic significance in estimated models relative to the *SVI* proxy.

An inherent assumption in asset pricing models is that financial markets extract and instantaneously include new information in asset values. Nevertheless relevant news cannot be reflected in prices until agents pay attention to and act on the information

(see e.g., Peng and Xiong, 2006; Huberman and Regev, 2001). The Multiple Resource Theory suggests that *investor attention* to specific events can be broken down into three stages: P*erception, processing,* and *action* (see Wickens, 1992). As noted above, filtering trading-related *attention* to any market category is challenging as *investor attention* to a financial asset does not automatically translate into trading decisions, *action* (see Vozlyublennaia, 2014). We attempt to capture and apply the full spectrum of the dynamics in the information processing in the innovations we estimate. Proxies for *attention* in the extant literature have, to date, mainly focused on the individual stages of *investor attention*. For example, the *SVI* captures *perception* and *processing* whilst the *ATV* focuses on *action*, with no established links between the two.

We apply our practical innovations of the *investor attention* to the, emerging markets (EMs) market category. *Attention* is a scarce cognitive resource (Kahneman, 1973), implying investors with limited time and effort utilize only a limited set of information (Grossman and Stiglitz, 1980; Barber and Odean, 2008). Implicitly, to efficiently allocate scarce attention, investors categorize assets or markets at the initial step of the portfolio allocation decision (see Bernstein 1995; Swensen, 2000). This makes categorization, based on shared commonalities, crucial from the viewpoint of information processing as it enables, with reasonable efficiency, the processing of a large volume of information (Mullainathan and Thaler, 2001; Barberis and Shleifer, 2003). Nevertheless, the literature that looks into the important role *investor attention* plays in determining stock price volatility is silent on the impact of *attention* on the volatility of returns

in important market categories (see e.g. Vlastakis and Markellos,2012; Smith, 2012; Aouadi et al., 2013; Andrei and Hasler, 2015).

While the emerging market category encompasses a wide variety of countries with different characteristics, it is a recognized and important market category. The literature has, for instance, established that the EM's risk profile is,' inherently,' different from developed markets (Bekaert and Harvey, 1997; Aggarwal et al., 1999), and is a segregated part of the global stock market (e.g., Graham et al., 2016). Thus the EM category merits an in-depth understanding, in order to further enhance its contribution to global stock portfolio diversification.[1] Therefore, we re-examine the hypothesis that *investor attention* explains stock market volatility and apply it specifically to the emerging market category using our newly developed measures of *attention*.[2] We hypothesize that EM equity market volatility increases with *investor attention* to EM economies.

In this paper, we also examine whether *investor attention* exerts any measurable influences on volatility in the EM foreign exchange (FX) market. The focus on the EM currency category has some merits as some EM currencies are currently included in the top most traded currencies.[3] in addition EM currencies are documented to be an important risk factor in EM equity returns (see Carrieri et al. 2006; Ladekarl and Peters, 2013).[4] In the market itself, recent reports in the financial press speculate on an increase in foreign exchange instability as a result of policy divergence across countries.[5] The Bank for International Settlements has also noted significant and deep swings in capital flows to and from EMs, resulting in a reappraisal of their FX market intervention strategies.[6] These suggest important changes in the patterns in the EM category of the FX market. However, empirical evidence on the impact of investors' information acquisition on currency price dynamics, including volatility, is limited and has not considered the EM currency category (see e.g., Smith, 2012; Goddard et al., 2015). Evidence on whether or not *investor attention* is a significant driver of price behavior or volatility in EM currency markets should have practical applications for trading and predicting the direction of the EM economies.

Our results show that our practical innovations of the *investor attention* variable have higher economic significance and improve the explanatory power of the variable in the estimated models in contrast to the extant measures. In addition we report differing importance in *investor attention* in when explaining EM stock and EM FX market volatilities. We document that attention significantly affects stock market volatility as well as excess volatility (the volatility of EM stock markets above or below that of the US market) in EMs. For FX volatility, however, we find no evidence that EM attention exerts any measurable effects on market volatility. Even though targeted *investor attention* may have predictive power in relation to individual currency

[1] This market category is momentous and constitutes 10 of the 20 largest economies of the world (See http://www.dailyreckoning.com.au/emerging-markets-are-still-a-buy/2010/02/26/). In addition, investments in these markets, primarily by mutual funds based in developed countries, have increased exponentially since the 1990s (Kaminsky, et al., 2001, IMF, 2013).

[2] Huang and Liu (2007), in a related study, show that rational inattention to important news may make investors over- or underinvest. This impacts on the positive association between EM equity market volatility and *investor attention* to EM economies.

[3] See http://www.euromoney.com/Article/3260551/Emerging-market-currency-volatility-challengesmultinationals-risk-management.html

[4] The literature is not in agreement on common global currency market factors. This makes currency volatility important in understanding the risk-return profile in currency markets (Nolte et al. 2015). Given the differing risk-return profiles across market segments, a focus on market category provides an outlet to understand unique features of the segment.

[5] See, for example, http://www.ft.com/intl/cms/s/0/a82d9c14-2ce4-11e4-911b00144feabdc0.html#axzz3q2DpWLQ9. Accessed on September 01, 2015.

[6] See http://www.bis.org/publ/bppdf/bispap73.pdf Accessed on September 01, 2015

pairs' volatility (see e.g., Smith, 2012; Goddard et al. 2015), this cannot be generalized to market categories within currencies.

Our study contributes to the literature in several ways. First, we make a methodological contribution to the literature in terms of variable measurement by providing a theoretically motivated and enhanced practical proxy for *investor attention* that increases the potential for capturing investor information processing that leads to trading decisions. Second, Peng and Xiong (2006) and Jame and Tong (2014) suggest that investors have a proclivity towards processing market and sectorwide information. This literature motivates an investigation into whether attention to the emerging market, as a distinct category, has relevance in explaining stock return volatility in EM stock markets. This is interesting due to the proposed segregated role of emerging markets (see Graham et al., 2016) and informs on how changes in global investor attention affect emerging markets.

The remainder of this study is organized as follows. Section 2 reviews the relevant literature related to our study. Section 3 presents the data and methods employed in the empirical analyses. Section 4 presents our empirical results and Section 5 concludes.

2. Literature Review

The theoretical literature on the implications of limited attention for asset pricing shows that attention constraints lead to lagged investor responses to fundamental shocks and predictable consumption changes (Peng, 2005). In addition, when selecting a portfolio in the presence of rational inattention, investors exhibiting greater risk aversion or longer investment horizons tend to update news less frequently, but select more precise news updates (Huang and Liu, 2007). Moreover, the propensity to concentrate on market and industry-level information, rather than firm-specific information, is characteristic of investor inattention (Peng and Xiong, 2006).

The empirical literature has examined the relationship between *investor attention* and asset returns using different proxies for *attention*. Earlier papers took advantage of the important role mass media outlets play in disseminating information to investors and inferred indirect measures of *attention* such as headline news (Chan, 2003), media coverage (Fang and Peress, 2009; Engelberg and Parsons, 2011), and advertising expenses (Grullon et al., 2004). These proxies all show important effects on financial variables. Another set of studies infer *investor attention* from abnormal trading volumes (*ATV*). Using these proxies, Barber and Odean (2008) provide evidence that investors' propensity to buy stocks that catch their attention is greater than the propensity to sell.[7] Further, Hou et al. (2009), also inferring investor attention from trading volume, show that price momentum profits (earnings momentum profits) are higher among high volume stocks (low volume stocks). They also show variations in investor attention in that price momentum profits (earnings momentum profits) are higher in up (down) markets.

Recognizing the growth and importance of the internet as an information hub for investors, a strand of research has explored internet-based attention proxies. While proxies such Wikipedia updates (Rubin and Rubin, 2010) and blogposts (Hu et al., 2003) have been used, the literature has lately converged around Google-based search queries (*SVI*), introduced by Da et al. (2011), as a measure of *attention*. The *SVI* is correlated to, but different from, other proxies for *attention* such as trading volume and media coverage.[8] Importantly, the *SVI* is shown to be positively

[7] An additional proxy, whether the firm appeared in that day's news (media attention), was also used in their paper.

[8] Da et al. (2011) suggest that this is a superior measure compared to trading volumes, as an example. This is because, as institutional investors assumingly use a more sophisticated information environment,

associated with future stock returns (Da et al. 2011). Vozlyublennaia (2014), the internet based proxy for *investor attention*, further documents that an increase in attention improves market efficiency and leads to a significant change in short term index returns. The paper also notes a long term change in *attention* following a shock to index returns. Klemola et al. (2016) also show strong evidence that internet search volumes regarding market states include relevant information about *investor attention* and that they perform well at predicting future market performance.

The *SVI* variable actively incorporates expressed interests by economic agents. However, as noted by Vozlyublennaia (2014), researchers cannot be sure that investors who source their information from the internet use it to make trading decisions. For that reason we measure *investor attention* through a using approach.
We combine the proxies through PCA to extract information from several variables.

A strand of the literature on *investor attention* has focused on its relation to the volatility of stock market returns. Vlastakis and Markellos (2012), Aouadi et al. (2013), and Andrei and Hasler (2015) all show a positive association between an increase in attention and equity return variance. In contrast, Vozlyublennaia (2014) documents a weak effect of attention on volatility in stocks. As indicated above, we examine this question in the context of the EM category and hypothesize that volatility in EMincreases with attention to emerging markets. In the FX market volatility literature, Goddard et al. (2015) show two important results. First, attention commoves with contemporaneous FX market volatility. Second attention predicts FX market volatility. In addition Carrieri et al. (2006) and Ladekarl and Peters (2013) note that EM currency return is a significant risk factor of EM equity returns.[9] Given this explanatory role of currency returns for emerging equity markets, we relate our initial hypothesis to EM foreign exchange volatility to test a second hypothesis: FX market volatility in emerging markets increases with *investor attention* to emerging markets.

3. Data and Method

The data used in the empirical analyses are obtained from varied sources. The data on the *MSCI Emerging Market Index*, the *S&P 500 Index*, and the *MSCI Emerging Market Currency Index*[10] used to estimate the market returns and return volatilities are drawn from the Thomson Reuters DataStream. Two currencies are pegged in the
MSCI Emerging Market Currency Index; the Jordanian Dinar and the Chinese Yuan[11]. However, following the de-pegging of the Yuan in 2005 and the move towards a managed float,

the SVI captures retail investor attention as they are most likely to use Google as a source of information. It should be noted that without proper definitions of differentiation between trader categories the Barber and Odean (2008) measure of investor attention is different from the SVI in that it is likely to capture attention from individual investors as well of that of mutual funds and institutional investors.

[9] Goddard et al. (2015) also document that attention is related to currency premium.

[10] The MSCI Emerging Markets Currency Index consists of 25 currencies against the U.S. dollar. In July 2008 the main constituents were BRL (16.9%), MXN (4.9%), CLP (1.1%), RUB (10.7%), ZAR (6.6%), ILS (2.3%), TRY (1.3%), PLN (1.6%),CNY (14.5%), KRW (13%), TWD (10.7%), INR (6.4%), MYR (2.3%), IDR (1.5%), and THB (1.4%), and currencies with individual weights of less than 1% were PEN, ARS, COP, HUF, EGP, CZK, MAD, JOD, PHP and PKR.

[11] The Jordanian Dinar represents 0.1% of the index weight in 2008 and the Chinese Yuan 14.5%. In 2005 the Chinese Yuan was de-pegged from the dollar and allowed to vary around a gradually increasing band against the USD. It was also moved to a managed float against a basket of international currencies.

[12] The span of the data is limited to the availability of the Google Trends data (2004-01-09) and that of the MSCI Emerging Market ETF (2003-04-14). When creating the variables, a 52 weekly mean is extracted from the MSCI Emerging Market ETF price series, making it the first observation to be used in the analysis 2004-04-14, or to specify at the end of the week, 2004-04-16.

we see no reason for this to introduce significant bias into our analysis. The data period is between 16 April 2004 and 12 December 2014.[12]

We use end-of-the-week[12] observations to calculate returns and volatility variables. Returns are calculated as the first log difference of weekly price indexes. Returns on the EM equity market and the US equity market are denoted *EMRT* and *USRT*, respectively. Following Andrei and Hasler (2015) and Goddard et al. (2015), we estimate equity and FX volatility by daily GARCH(1,1), and annualize the average volatility for each week.[13] The choice of using the weekly averages of volatility stems from the Google data capturing weekly average search volumes. We also include estimates of EM excess volatility, EM*VOLEXSS*, in our empirical analyses, calculated as the log of *MSCI Emerging Market Index* volatility, *EMVOL*, minus the *S&P500 Index* volatility, *USVOL*. *MSCI Emerging Market Currency Index* volatility is denoted as *EMFXVOL*.

3.1. Measures of Investor Attention and Volatility

The Multiple Resource Theory, a theory of multiple task performance, asserts that individuals have several different capacities of resources that are differentiated according to information processing stages. The resources used for perceptual activities differ from those that underline the selection and execution of responses. Wickens (1992) represents these stages as *perception*, *processing*, and *action*. From this distinction, we can decipher three layers of *investor attention*. The first is the visual or auditory *perception* of a subject matter, e.g., EMs based on a news item, a headline, or a discussion (see e.g., Barber and Odean, 2008; and Yuan, 2015). Da et al. (2011), however, suggest that proxies for attention based on headlines do not actively incorporate expressed investor interest. This interest may be expressed when the investor uses an internet search query using key words to gather more information for *processing* (the second layer). This is the basis of the Google-based search volume index (*SVI*) proxy for *investor attention* used in the finance literature (see e.g.,

Mondria et al., 2010; Joseph et al., 2011; Da et al., 2011, 2015; Dzielinski 2012; Vlastakis and Markellos 2012; Ding and Hou, 2015). Vozlyublennaia (2014), nevertheless, argues that the measure of *investor attention* based on an internet search query negate the possibility that the agents who search for the information do not utilize it in making trading decisions (*action*, the third stage). The action stage may be captured by the attention proxy inferred from abnormal trading volumes (*ATV*) (see e.g. Barber and Odean, 2008).

In this paper we include 4 proxies for *attention* in our empirical analyses. We use the U.S Google-based Search Volume Index (*SVI*), employing the search word *emerging markets* to represent attention to the EMs category.[14] This search term typically relates to information of a financial nature, which minimizes the level of noise in the search word.[15] The Google data is normalized as the probability of a search on the particular search word for a specific region and time and measures the probability of a search during an entire week. We label this variable the

[12] Friday adjusted closing prices are used to the extent they are available. When the Friday prices are not available, the closing prices from the first trading day prior to that are used.
[13] For robustness, we also estimated volatility using EGARCH(1,1), which did not change the results of this paper.
[14] We also used a global Google-based Search Volume Index with the same search phrase, which yielded qualitatively similar results.
[15] For instance, if instead we were to use specific country names, the chances are that the majority of the attention attracted by the proxy would consist of individuals seeking non-financial information, such as population, politics, etc. On the other hand, if we were to use the actual index names, such as "JSE" for the Johannesburg Stock Exchange, it would be likely that a representative global investor would not search for this particular name. Thus, this search word would attract attention from within, or geographically close to, the particular category.

Emerging Market Search Volume Index (*EMSVI*) and, in line with Da et al. (2011), interpret it as capturing the attention of retail investors. This measures the overall interest in the asset category displayed by potential and actual retail investors. Applying the multiple resource theory, Wickens (1992) separates the information processing stages into three which leads to actively expressed investor interest by gathering more information for *processing* (the second layer).

Bessembinder and Seguin (1993) apply an ARMA(p,q) process to perform an analysis on the expected and unexpected trading volume's effects on volatility. We adapt this approach to further split the *EMSVI* variable into expected and unexpected components. The expected *EMSVI, EXPEMSVI,* represents expected attention to emerging markets while the unexpected *EMSVI, UNEXPEMSVI,* represents shocks to attention not anticipated by the market. We model *EMSVI* with an AR(1) process as: $EMSVI_t = \rho EMSVI_{t-1} + \theta_t$.
(1)

We then define the expected attention, *EXPEMSVI*, as:

$$EXPSVI_t = \rho EMSVI_{t-1}, \quad (2)$$

where $EMSVI_t$ is the actual *EMSVI* value and θ_t is the residual from the AR(1) model. Shocks to attention, or unexpected attention (*UNEXPEMSVI*), are thus defined as the residual from the AR(1) process as follows:

$$UNEXPEMSVI_t = \theta_t. \quad (3)$$

Following Barber and Odean (2008) we also include the abnormal trading volume (*ATV*), defined as the ratio of the daily trading volume over the yearly average, as an alternative proxy for attention in our empirical analyses. From Wickens' (1992) information processing stages, this *investor attention* variable should capture the last stage, *action*, in the information processing procedure, where investors have paid enough attention to make a buy/sell/keep investment decision. This measure of attention complements the *SVI*. We adapt the *ATV* definition to weekly basis to match the *SVI* variable and calculate it as the weekly trading volume of the *MSCI Emerging*

ETF and the *SPDR S&P 500 ETF* over the yearly average:

$$EMATV_t = \frac{Weekly\ Volume_t}{\sum_{i=t-52}^{t-1} Weekly\ Volume_i/52}, \quad (4)$$

Where $EMATV_t$is the EM abnormal trading volume and $Weekly\ Volume_t$ is the sum of each week's daily trading volume. We state Equation (4) so that the *ATV* is the weekly trading volume over the yearly average weekly volume up until, but not including, time *t*. *EMATV* and *USATV* represent abnormal trading volumes in emerging markets and the US, respectively. The trading volumes in emerging markets and the US are represented by the respective trading volumes of the *MSCI Emerging*

Market Exchange Traded Fund and the *Standard and Poor Depositary Receipt*

Exchange Traded Fund, for which the data accessed from Yahoo! Finance.

Nevertheless a measure of *investor attention* based on an internet search query cannot explicitly state that the agents who search for the information act on it to make trading decisions (Vozlyublennaia 2014). In this paper we also utilize a refined measure for investor attention, which increases the probability that internet search results are incorporated into investor decisions, thus taking into consideration the final layer in the Wickens (1992) information processing stages, *action*. To do this, we extract a combined measure from the *EMSVI* and *EMATV* variables to capture a wider spectrum of investor attention. This was done by taking the first principal component of the *EMSVI* and *EMATV* variables, which we label *ENHASVI*. This is significant given that the *EMSVI* and *ATVEM* contain information from different stages on the information accumulation procedure (see e.g., Wickens 1992). The first principal component heightens the signal-value regarding investment decisions after gathering and processing information. As with the *EMSVI* variable, we separated the *ENHASVI* variable into two parts, the expected and the unexpected components following the same method as explained in Equation (1) through (3).

Furthering the approach of extracting enhanced measures from combined attention proxies, we also take the first principal component of the *EMSVI* and the excess *EMATV*, i.e. the difference between *EMATV* and *USATV*, labeled *ENHASVI2*. In contrast to the *ENHASVI*, it is captures more EM-specific attention, unrelated to the US market. Thus *ENHASVI2* disentangles the variation in the variables that are most likely to affect EM-specific volatility.

3.2 Control Variables

We acknowledge that *investor attention* to other markets can affect EM flows, resulting in changes in EM volatility. For example, the monetary policy announced by the US Federal Reserve Bank (FED) during the recent global financial crisis substantially affected fund flows to EMs (IMF, 2013). To control for this effect, we also gather search queries data from Google for the search words *fed*, *monetary policy*, *qe*, *central bank*, *boe*, *boj*, and *ecb*. We sum up the standardized values derived from the search and divide the result by the number of variables to create a measure that captures attention towards global Central Banks actions (*CBSVI*). This is formally presented in equation (5).

$$CBSVI_t = \frac{\sum_{i=1}^{n} SVI_{i,t}}{n}, \qquad (5)$$

where n equals 7 and $SVI_{i,t}$ represents the values of the different search words for week *t*. We use standardized values so that any one search phrase does not drive the variation of the *CBSVI* variable. Our results do not change if we use non-standardized values.

In addition the literature suggests that bad news increases volatility (see e.g., Fostel and Geanakoplous, 2012). Thus we gather search volumes data on the search phrase *market crash* to control for investors' demand for negative information and label this variable *CRASHSVI*. EMs have also, generally, experienced significant upsurge in media attention during the last decades. Therefore we employ a control variable, *emerging market news*, labeled *EMdNEWS*, in our study (see e.g. Vlastakis and Markellos, 2012; Barber and Odean, 2008; Andrei and Hasler, 2013). We estimated the *EMdNEWS* variable by counting the total number of news stories using the phrase *emerging market* in the LexisNexis database and taking the first log difference of the number of news items.

Furthermore we take into account possible spillovers from mature markets to EMs and control for market sentiment (see e.g., proxied by the CBOE Put-Call ratio, labeled *PUT-CALL*), the level of expected market volatility in the US, proxied by the VIX index (*VIX*), and the level of US-based financial distress, proxied by the Cleveland Financial Stress Index (*CFSI*). Data on

the CBOE Put-Call and the VIX index are also sourced from DataStream. The *CFSI*, sourced from the Federal Reserve Bank of St. Louis (FRED), is divided into several types of stress component originating from different financial markets in the US. In this study, we utilize the stress index of stock markets and that of weighted dollar crashes, labeled

STOCKSTRESS and *USDSTRESS*, respectively. We use end-of-the-week observations (see Appendix A for the variable definitions).

Descriptive statistics on the variables utilized in this study are presented in Table 1.
We note that the mean return for emerging markets for the stated sample period, 0.1%, is identical to that of the US market. However, consistent with the literature, we detect greater stock market volatility in EMs (a mean value of 18.4%) relative to both the US stock market volatility (16.8%) and FX emerging market volatility (11.5%). The abnormal trading volumes are also shown to be higher for EMs. We also note that the *EMSVI* variable has a mean of 41.77. Market sentiment over the sample period is largely bullish, despite the inclusion of the period encompassing the financial crisis, as shown by the mean of the *PUT-CALL* ratio of 0.652, indicating that more call than put options were traded on average.

-Insert Table 1 here-

Table 2 presents the pairwise correlations for all pairs of variables included in our study. We note that the correlation between the return on the *MSCI Emerging Market Index* and *S&P500 Index* is 0.754. Additionally all measures of volatility, apart from excess volatility (*VOLEXSS*), exhibit high and positive correlations (over 0.8) with each other. The VIX index is also highly correlated with *EMVOL* (0.855) and

EMFXVOL (0.793). Furthermore the VIX index shows a correlation of 0.933 with *USVOL*. The attention variables *ENHASVI* and *ENHASVI*2 are highly correlated with each other (0.857) and with the *EMSVI* attention proxy (0.829 and 0.786, respectively). *EMSVI* and *UNEXPEMSVI* show a high correlation of 0.782. In addition, the enhanced attention variables both show correlations in excess of 0.5 with both the expected, *EXPEMSVI*, and unexpected, *UNEXPEMSV*, components of attention to emerging markets. It is also worth noting that *ENHASVI* exhibits a relatively high correlation with abnormal trading volume in the US, *USATV*, (0.574) compared to that between *ENHASVI*2 and *USATV* (0.080). VIX and the equity volatility measures are negatively correlated with all the variables measuring returns.

-Insert Table 2 here-

3.4. Empirical Methods

We estimate equation (6) to examine the relation between *investor attention* to EMs and volatility for emerging equity and currency markets. Previous studies presume that changes in investor attention should have an impact on price volatility (see e.g., Vlastakis and Markellos, 2012; and Aouadi et al., 2013). So far, this proposition has not considered the importance of market categories, a prevalent characteristic of global financial markets. We examine this hypothesis for the emerging market category using newly constructed proxies for *attention*.

$$VOL_{t+1} = \alpha + \beta_1 VOL_t + \beta_2 Attention_t + \beta_3 CBSVI_t + \beta_4 CRASHSVI_t + \beta_5 EMdNEWS_t +$$

$$\beta_6 STOCKSTRESS_t + \beta_7 USDSTRESS_t + \beta_8 USRT_t + \beta_9 SPRDRT_t + \beta_{10} PUT - CALL_t +$$

$$\beta_{11} VIX_t + \epsilon_t, \qquad (6)$$

where VOL is the natural logarithm of a volatility variable: (1) EM stock volatility (*EMVOL*), (2) excess volatility (*VOLEXSS)*, and (3) EM currency index volatility (*EMFXVOL)*; *ATTENTION* is an *investor attention* proxy: (1) Abnormal trading volume in EMs (*EMATV*), (2) the EM Search Volume Index (*EMSVI*), (3) the enhanced attention variable (*ENHASVI*), estimated by taking the first principal component of the *EMSVI* and *EMATV* variables, and (4) the EM-specific attention variable (*ENHASVI2*) obtained from the first principal component of the *EMSVI* and the excess *EMATV*, i.e., the difference between *EMATV* and *USATV*. In Equation (6), a positive and statistically significant value for the *attention* coefficient would support our hypothesis that investor attention to the EM category has an impact on EM price volatility. In relation to the studies by Peng and Xiong (2006) and Jame and Tong (2014), it would suggest that investors' proclivity towards processing market and sector-wide information applies to emerging versus developed market-wide information.

The control variables included in the model are *CBSVI* and *CRASHSVI*, attention to the activities of central banks and negative news, respectively; *EMdNEWS* is the volume of news on EMs; *EMVOL* and *EMFXVOL* are emerging market stock and

currency index volatility, respectively; $STOCKSTRESS$ and $USDSTRESS$ are US stock market and dollar stress, respectively; $USRT$ and $SPRDRT$ are returns on the equity market and the spread of return between EMs and the US equity market, respectively; and *PUT-CALL* and *VIX* capture market stress and the level of risk in the US, respectively.

4. Empirical Results

4.1 Investor Attention and Volatility

The results of examining whether investor attention to emerging market has an impact on the volatility of EMs stock returns, equation (6), are presented in Table 3. Panel A in Table 3 estimates 4 models using our different *investor attention* proxies. First we detect from the models estimated, (1) to (4), that the coefficients of all the attention proxies are positive and statistically significant at the 1% level. Thus a higher degree of investor attention can be said to positively impact on volatility within the EM investment category, confirming our hypothesis as well as results from the extant studies (see e.g., Vlastakis and Markellos, 2012; Smith, 2012; Aouadi et al., 2013;Andrei and Hasler, 2015).

We expect that the newly constructed and enhanced *investor attention* variable would have stronger economic significance relative to the Google-based search volume index (*SVI*) proxy. Given that our dependent variables are log values, we examine the economic significance of the attention proxies by estimating the ratio of the product of a standard deviation increase in attention and the regression coefficient to the standard deviation of the dependent variable, i.e., the log of volatility. The results indicate that a standard deviation increase in the *EMATV* and *EMSVI* leads to a 0.1153 and 0.0662 standard deviation increase, respectively, in the log annualized EM volatility. The estimated economic impact is, however, generally greater for our enhanced variables relative to the *EMSVI*. Confirming our expectation, we show that ratios for the *ENHASVI* and *EHANSVI2* are 0.1085 and 0.0794, respectively, which accentuates the importance of the enhanced variables constructed. This finding implies that the signaling value of different measures of investor attention can be improved by combining different variables, which is in line with the Multiple

Resource Theory.

Panel A in Table 3 also shows that lagged volatility, the *VIX* index, and the *SPRDRT* all consistently exert positive and statistically significant influences on EM volatility. On the other hand, the coefficient for the return on the *S&P 500 Index* is consistently negative and

statistically significant for all estimated models. The *PUT-CALL* and the stress in the US dollar market (USDSTRESS) show varying levels of statistical significance.

We re-estimate equation (6) using excess EM volatility, the difference between log equity EM and log US equity volatility, as the dependent variable to address EM volatility over the US market and report the results in Panel B of Table 3. The reported results indicate that excess EM volatility increases with investor attention to EMs. This relation is robust as all proxies of attention show positive and statistically significant coefficients. We further examine the economic significance of the attention proxies by investigating the ratio of the product of a standard deviation increase in the attention proxies and the regression coefficient to the standard deviation of excess volatility. The results show that a standard deviation increase in our enhanced attention variables, *ENHASVI* and *EHANSVI2*, generates a 0.0764 and 0.0979 standard deviation increase, respectively, in the log annualized excess EM volatility. We find that the estimated economic impact of the *EMATV* and *EMSVI* are relatively lower with estimated ratios of 0.0788 and 0.0408, respectively.

In Panel C of Table 3, we report the results of regressing investor attention variables on emerging market FX volatility. The reported results indicate positive and statistically insignificant measures of attention in all the estimated models. Thus, unlike equity market volatility, *investor attention* has no explanatory power in explaining EM currency volatility. This result is contrary to that reported by Smith (2012) and Goddard et al. (2015) who find that investor attention has predictive power in relation to FX market volatility. Market categorization can, therefore, be said to bring out important differences between the attention-currency volatility relations which may be of relevance to style investors.

-Insert Table 3 here-

To alleviate potential issues with multicollinearity, we re-estimated the empirical models excluding a variety of control variables, the VIX variable being the most noteworthy. As the results were largely unchanged, we do not report the results of this exercise.

4.3. Shocks to Attention

Our results show that investor attention explains volatility. However, this effect may not be homogenous if we segment the attention variable into *expected* and *unexpected*. Therefore we extend our analyses and re-estimate Equation (6), examining whether investor attention explains volatility, with the *expected* and *unexpected* components of investor attention, *EMSVI* and *ENHASVI*. We follow Bessembinder and Seguin (1993) to distinguish between the two components of attention (see Equations (2) and (3)). The unexpected component represents shocks to attention that are not anticipated by the market. Table 4 presents the results of this estimation for the *EMSVI* (Panel A) and *ENHASVI* (Panel B). Panel A shows that the *expected* component of *EMSVI* is positive and significant for *EMVOL*, EM equity volatility, and also for the excess EM equity volatility, *EMVOLEXSS*. However, the *unexpected* part is only significant for EM equity volatility (model 1). This result may suggest that the impact of unexpected investor attention on volatility is bounded by ex-post rational stock prices (see Shiller, 1981). In examining the economic significance of the results, we find that a standard deviation increase in *EXPEMSVI (UNEXPEMSVI)* leads to a 0.0591 (0.0245) standard deviation increase, respectively, in the log annualized EM volatility. Regarding excess volatility, the estimated ratios suggested that a standard deviation increase in *EXPEMSVI (UNEXPEMSVI)* leads to a 0.0510 (0.030) standard deviation increase, respectively, in the log annualized excess EM volatility. However, similar to the earlier results reported in Table 3, there is no explanatory power of either expected or unexpected attention to EM FX volatility.

In Panel B of Table 4 we can see that the *expected* component of the enhanced attention variable, the *EXPENHASVI*, is positive and significant for both EM equity volatility and excess EM equity volatility. The economic significance of this variable on the outcome variable is 0.0672 and 0.0428, respectively. For the *unexpected* part of the enhanced variable, the *UNEXPENHASVI*, we find that it is positive and significant for EM equity volatility, as was the case with the *UNEXPEMSVI*. However, for the enhanced variable, the unexpected component is also significant in explaining excess EM equity volatility. The economic significance of the unexpected part of this attention variable is 0.0855 for EM equity volatility and 0.0603 for excess EM equity volatility. Comparing the economic significance between Panel A and B, the enhanced variable consistently improves the measure compared to the Google searchbased *EMSVI* variable. Similarly, we find higher R-squared values for all models in Panel B compared to those in Panel A, highlighting the potential of enhancing the attention-capturing variables through a multi-layer approach.

-Insert Table 4 here-

In a further unreported analysis, we find that the enhanced *ENHASVI* variable maintains its significance for a wider range of quantiles than the *EMSVI*, most importantly for the 10th% and 90th% quantiles, in a quantile regression framework.

Furthermore, creating a dummy variable for negative returns in the *MSCI Emerging*

Market Index and interacting with the attention variables and re-estimating equation (6) indicates that the effect of attention on volatility is generally more pronounced with negative returns.[16]

5. Conclusion

This paper examines whether *investor attention* has explanatory power regarding emerging market equity and currency volatility. *Attention* is a scare resource and investors, making portfolio allocation decisions, categorize the market based on shared commonalities to gain incremental knowledge. Thus, from an information processing viewpoint, large volume of information in certain categories can be processed efficiently to enable efficient trading decisions to be made.

In this paper we estimate and apply three (3) attention innovations to examine the information processing and actions in relation to emerging markets; Google-based search volume index (*EMSVI*) and abnormal trading volumes (*EMATV*) in the market. First, we take the first principal component of the *EMSVI* and the *EMATV* to form a new attention variable, based on Multiple Resource Theory. We argue that this new *attention* variable is better in capturing the potential that retail investors who see headlines and search for information (proxied by *SVI*) use that information in their trading decisions (*ATV*). Second, we disentangle the variation in the *SVI* variable that is most likely to affect EM-specific volatility by taking the first principal component of *SVI* and excess *ATV*. Thus the enhanced *investor attention* variables potentially have stronger economic significance relative to the Google-based search volume index (*SVI*) proxy. Third, we split attention into an expected and an unexpected component to inform on the component attention that most likely impacts on price behavior. Our results indicate that the economic significance of the enhanced attention variables is higher than the traditionally used Google-based *SVI* proxy.

[16] Both the coefficient for the attention variables and the coefficient for the interaction of the dummy variable with the attention variables are positive and highly significant.

We find that *investor attention* exerts positive and significant influence on stock market volatility as well as excess volatility in EMs. This finding has three implications. First, in line with Peng and Xiong (2006) and Jame and Tong (2014), the categorization matters, as the EM category is linked to investor information processing. Second, *investor attention* to the EM category of the global stock market is a relevant determinant of stock market volatility in EMs. Third, the finding suggests that EM equities have a segregated role in the global market, which is in line the evidence in Graham et al. (2016). Our results also show that both *expected* and *unexpected* (shocks to) attention are significant when explaining changes in excess EM equity volatility. However, *investor attention* to EMs does not show any measurable impact on EM FX volatility, thus suggesting that the predictive power of attention in relation to FX volatility, cannot be generalized. This finding implies that information processing about the EM category does not affect FX similar to equities.

Overall, our results show that investors in EM equities should be aware that the riskiness of their investment is exposed to *investor attention* to the EM category. We also make it evident that the measuring of investor attention in research can benefit from adopting a multi-dimensional approach, taking into account several aspects and levels of attention. It will be interesting to see how future research further develop this approach.

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Appendix A. Variable Descriptions

Variable	Description	Data source
USRT	The weekly end-of-the week return of the SPDR S&P 500 ETF.	Thomson Reuters DataStream
EMRT	The weekly end-of-the week return of the MCSI Emerging Market ETF.	Thomson Reuters DataStream
RTSPRD	The difference between *EMRT* and *USRT*.	Constructed
EMVOL	Annualized volatility estimated with GARCH(1,1) of the return series *EMRT*.	Constructed
USVOL	Annualized volatility estimated with GARCH(1,1) of the return series *USRT*	Constructed
EMVOLEXSS	Annualized volatility estimated with GARCH(1,1) of the return series *EMRT* minus the same of *USRT*.	Constructed
EMFXVOL	Annualized volatility estimated with GARCH(1,1) of the return series from of MSCI Emerging Market Currency Index.	Constructed, Thomson Reuters DataStream
EMSVI	Weekly data of the normalized probability of a search on the search phrase "emerging markets" on Google.	Google Trends
EXPEMSVI	The fitted values of an AR(1) on *EMSVI*.	Constructed
UNEXPEMSVI	The residuals from an AR(1) on *EMSVI*.	Constructed
EMATV	The weekly trading volume of the MSCI Emerging Market ETF over the yearly average.	Constructed, Yahoo! Finance
USATV	The weekly trading volume of the SPDR S&P 500 ETF over the yearly average.	Constructed, Yahoo! Finance
ENHASVI	The first principal component of the *EMSVI* and *EMATV*.	Constructed
ENHASVI2	The first principal component of the *EMSVI* and the difference between *EMATV* and *USATV*.	Constructed
EXPENHASVI	The fitted values of an AR(1) on *ENHASVI*	Constructed
UNEXPENHASVI	The residuals from an AR(1) on *ENHASVI*	Constructed

CBSVI	The average of the weekly data of the normalized probability of a search on the search phrases "fed", "monetary policy", "qe", "central bank", "boe", "boj", "ecb" on Google.	Google Trends	
CRASHSVI	Weekly data on the normalized probability of a search on the search phrase "market crash".	Google Trends	
EMdNEWS	The log difference of the total amount of news stories with the phrase "emerging market" at any given week.	LexisNexis	
PUT-CALL	The Put-Call Ratio of traded Puts to Call options.	Thomson DataStream	Reuters
VIX	VIX measuring implied volatility of the S&P 500 index options.	Thomson DataStream	Reuters
STOCKSTRESS	The stock market stress component of the Cleveland Financial Stress Index (CFSI).	Thomson DataStream	Reuters
USDSTRESS	The weighted U.S dollar crash component of the Cleveland Financial Stress Index (CFSI).	Thomson DataStream	Reuters

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Table 1. Descriptive Statistics

This table contains descriptive statistics for all variables used in this study. *EMRT* and the *USRT* are end-of-theweek returns for the MSCI Emerging Market Index and S&P500 Index, respectively. *RTSPRD* is the difference between weekly returns on the MSCI Emerging Market Index and the S&P500 Index. Volatility of return for emerging stock markets (*EMVOL*), the US stock market (*USVOL*), and emerging market foreign exchange index (*EMFXVOL*) are weekly averages of annualized daily volatility estimated through a GARCH(1,1) based on the daily returns of the ETFs mentioned above. The excess volatility (*EMVOLEXSS*) is the log difference between MSCI Emerging Markets Index volatility, *EMVOL*, and the S&P500 Index volatility, *USVOL*. *EMSVI*, *CBSVI*, and *CRASHSVI* denote investor attention to emerging markets, central banks, and market crash, respectively, and are the average probability of a search on Google on a specific search phrase during a given week. *EXPEMSVI* and *UNEXPEMSVI* represent expected and unexpected attention towards the emerging markets, respectively. *EMATV* and *USATV* are abnormal trading volumes for the SPDR ETF and the MCSI Emerging Market ETF, respectively. *ENHASVI* is the first principal component of *EMSVI* and *EMATV*. *ENHASVI2* is the first principal component of *EMSVI* and the difference between *EMATV* and *USATV*. *EXPENHASVI* and *UNEXPENHASVI* represents an unexpected and expected components of the PCA variable. *EMdNEWS* is the first log difference of news on emerging markets. *VIX* and CBOE *PUT-CALL* ratio proxy for market risk in the US and the US market sentiment, respectively. *STOCKSTRESS* and *USDSTRESS* proxy for stress in the stock and foreign exchange market (USD) originating from the US. The data is in weekly form and is between 2004-04-16 and 2014-12-12.

Variable	N	Mean	St. Dev.	Min	Max
EMRT	532	0.001	0.034	-0.226	0.187
USRT	532	0.001	0.025	-0.201	0.114
RTSPRD	532	-0.0001	0.022	-0.099	0.112
EMVOL	532	0.184	0.104	0.080	0.883
USVOL	532	0.168	0.108	0.075	0.758
EMVOLEXSS	532	0.115	0.233	-0.409	0.966
EMFXVOL	532	0.131	0.063	0.070	0.479
EMSVI	532	41.771	12.546	19	85
CBSVI	532	-0.017	0.328	-1.077	1.423
CRASHSVI	532	11.829	7.494	3	100
EXPEMSVI	532	41.977	7.842	27.785	69.018
UNEXPEMSVI	532	-0.206	9.289	-39.269	37.347
EMATV	532	1.232	0.591	0.409	4.591
USATV	532	1.084	0.464	0.334	3.742
ENHASVI	532	0.009	1.175	-2.195	4.799
ENHASVI2	532	-0.0004	1.115	-2.870	5.776
EXPENHASVI	531	-0.004	0.878	-1.636	3.576
UNEXPENHASVI	531	0.013	0.772	-2.239	3.268
EMdNEWS	532	0.009	0.143	-0.592	0.594
VIX	532	19.721	10.017	10.020	79.130
PUT-CALL	532	0.652	0.119	0.370	1.160
STOCKSTRESS	532	13.031	6.783	1.278	25.035
USDSTRESS	532	7.084	3.632	0.387	13.391

Table 2. Pearson Correlation

This table contains Pearson correlation values for all variables used in this study. *EMRT* and the *USRT* are end-of-the-week returns for the MSCI Emerging Market Index and the S&P500 Index, respectively. *RTSPRD* is the difference between weekly returns on the MSCI Emerging Market Index and the S&P500 Index. Volatility of return for emerging stock markets (*EMVOL*), the US stock market (*USVOL*), and emerging market foreign exchange index (*EMFXVOL*) are weekly averages of annualized daily volatility estimated through a GARCH(1,1) based on the daily returns of the ETFs mentioned above. The excess volatility (*VOLEXSS*) is the log difference between MSCI Emerging Markets Index volatility, *EMVOL*, and the S&P500 Index volatility, *USVOL*. *EMSVI*, *CBSVI*, and *CRASHSVI* denote investor attention to emerging markets, central banks, and market crash, respectively, and are the average probability of a search on Google on a specific search phrase during a given week. *EXPEMSVI* and *UNEXPEMSVI* represent expected and unexpected attention towards the emerging markets, respectively. *EMATV* and *USATV* are abnormal trading volumes for the SPDR ETF and the MCSI Emerging Market ETF, respectively. *ENHASVI* is the first principal component of *EMSVI* and *EMATV*. *ENHASVI2* is the first principal component of *EMSVI* and the difference between *EMATV* and *USATV*. *EXPENHASVI* and *UNEXPENHASVI* represents an unexpected and expected components of the PCA variable. *EMdNEWS* is the first log difference of news on emerging markets. *VIX* and CBOE *PUT-CALL* ratio proxy for market risk in the US and the US market sentiment, respectively. *STOCKSTRESS* and *USDSTRESS* proxy for stress in the stock and foreign exchange market (USD) originating from the US. The data is in weekly form and is between 2004-04-16 and 2014-12-12.

	VOLEXSS	EMFXVOL	EMVOL	USVOL	USRT	EMRT	SPRDRT	EMSVI	CBSVI	CRASHSVI	UNEXPEMSVI	EXPEMSVI	EMATV	USATV	ENHASVI	ENHASVI2	EMdNEWS	VIX	PUT-CALL	USDSTRESS	STOCKSTRESS	EXPENHASVI	UNEXPENHASVI
VOLEXSS	1																						
EMFXVOL	-0.148	1																					
EMVOL	0.056	0.807	1																				
USVOL	-0.336	0.841	0.904	1																			
USRT	-0.023	-0.035	-0.110	-0.085	1																		
EMRT	-0.027	-0.015	-0.108	-0.080	0.754	1																	
SPRDRT	0.014	-0.017	0.039	0.025	-0.009	-0.663	1																
EMSVI	0.323	-0.089	0.126	-0.018	-0.074	-0.025	-0.046	1															
CBSVI	-0.033	0.334	0.362	0.363	-0.056	-0.061	0.029	0.110	1														
CRASHSVI	0.030	0.157	0.349	0.300	-0.352	-0.312	0.074	0.196	0.302	1													
UNEXPEMSVI	0.154	-0.061	0.044	-0.023	-0.052	-0.024	-0.023	0.782	0.061	0.139	1												
EXPEMSVI	0.334	-0.069	0.149	-0.002	-0.058	-0.012	-0.047	0.676	0.105	0.149	0.069	1											
EMATV	0.383	0.099	0.314	0.126	-0.182	-0.249	0.173	0.390	0.168	0.409	0.196	0.392	1										
USATV	0.019	0.154	0.356	0.304	-0.285	-0.310	0.147	0.261	0.177	0.408	0.122	0.273	0.691	1									
ENHASVI	0.424	0.008	0.266	0.066	-0.154	-0.167	0.078	0.829	0.167	0.365	0.582	0.638	0.839	0.574	1								
ENHASVI2	0.524	-0.074	0.109	-0.110	-0.009	-0.021	0.021	0.786	0.094	0.200	0.575	0.577	0.644	0.080	0.857	1							
EMdNEWS	0.050	-0.029	-0.009	-0.031	-0.127	-0.157	0.094	0.098	0.072	0.122	0.145	-0.015	0.139	0.093	0.142	0.118	1						
VIX	-0.303	0.793	0.855	0.933	-0.273	-0.247	0.066	0.010	0.380	0.308	-0.002	0.019	0.126	0.338	0.083	-0.116	0.024	1					
PUT-CALL	-0.114	0.217	0.342	0.356	-0.465	-0.369	0.032	-0.042	0.140	0.203	-0.056	-0.001	0.272	0.364	0.140	-0.038	0.021	0.446	1				
USDSTRESS	-0.005	-0.147	-0.016	-0.022	0.007	0.044	-0.059	0.369	0.154	-0.086	0.184	0.373	-0.012	0.028	0.211	0.200	0.014	0.054	0.052	1			
STOCKSTRESS	-0.208	0.395	0.500	0.519	-0.056	-0.049	0.010	0.116	0.344	0.010	0.041	0.137	0.055	0.238	0.102	-0.044	-0.005	0.567	0.358	0.393	1		
EXPENHASVI	0.448	0.048	0.322	0.105	-0.043	-0.033	0.001	0.610	0.119	0.260	0.125	0.828	0.648	0.449	0.755	0.640	-0.065	0.076	0.112	0.211	0.129	1	
UNEXPENHASVI	0.137	-0.043	0.038	-0.019	-0.186	-0.217	0.117	0.569	0.120	0.260	0.745	0.030	0.541	0.365	0.665	0.578	0.291	0.039	0.086	0.082	0.008	0.013	1

Table 3. Investor attention and volatility

This table presents the results from estimating equation (7): $VOL_{t+1} = \alpha + \beta_1 VOL_t + \beta_2 Attention_t + \beta_3 CBSVI_t + \beta_4 CRASHSVI_t + \beta_5 EMdNEWS_t + \beta_6 STOCKSTRESS_t + \beta_7 USDSTRESS_t + \beta_8 USRT_t + \beta_9 SPRDRT_t + \beta_{10} PUT - CALL_t + \beta_{11} VIX_t + \epsilon_t$, where VOL is the natural logarithm of a volatility variable: (1) EM stock volatility (*EMVOL*), (2) excess volatility (*EMVOLEXSS)*, and (3) EM currency index volatility (*EMFXVOL)*; *ATTENTION* is an *investor attention* proxy: (1) abnormal trading volume in EMs (*EMATV*), (2) the EM Search Volume Index (*EMSVI*), (3) the enhanced attention variable (*ENHASVI*) estimated by taking the first principal component of the *EMSVI* and *EMATV* variables, and (4) the EM-specific attention variable (*ENHASVI2*) obtained from the first principal component of the *EMSVI* and the excess *EMATV*, i.e. the difference between *EMATV* and *USATV*. The control variables are included in the model are *CBSVI* and *CRASHSVI*, attention to activities of central banks and negative news, respectively; *EMdNEWS* is the volume of news on EM; $STOCKSTRESS$ and $USDSTRESS$ are US stock market and dollar stress, respectively; $USRT$ and $SPRDRT$ are the returns on the US equity market and the spread of return between EMs and the US equity market, respectively; and *PUT-CALL* and *VIX* capture market stress and level of risk in the US, respectively. Finally, lagged values of the volatility measure is included. Newey-West corrected standard errors are used in the estimations. The data is in weekly form and is between 2004-04-16 and 2014-12-12. Standard errors are in parentheses and ***, **, * indicate significance at 1%, 5% and 10% levels, respectively.

Panel A: EM Equity Volatility

	$EMVOL_{t+1}$			
EMATV	0.074***			
	(0.013)			
EMSVI		0.002***		
		(0.0005)		
ENHASVI			0.035***	
			(0.006)	
ENHASVI2				0.027***
				(0.006)
EMdNEWS	0.022	0.039	0.022	0.029
	(0.026)	(0.026)	(0.026)	(0.027)
PUT-CALL	0.026	0.146***	0.090*	0.116**
	(0.049)	(0.053)	(0.049)	(0.050)
EMVOL	0.767**	0.810***	0.768***	0.784***
	(0.026)	(0.022)	(0.023)	(0.022)
VIX	0.185***	0.142***	0.185***	0.175***
	(0.027)	(0.026)	(0.026)	(0.026)
CBSVI	0.007	0.011	0.010	0.007
	(0.020)	(0.021)	(0.020)	(0.020)
CRASHSVI	0.001	0.002***	0.001	0.002**
	(0.001)	(0.001)	(0.001)	(0.001)
STOCKSTRESS	-0.0001	-0.001	-0.0003	-0.00003
	(0.001)	(0.001)	(0.001)	(0.001)
USDSTRESS	-0.0005	-0.002	-0.003*	-0.002
	(0.001)	(0.001)	(0.002)	(0.002)
USRT	-0.682***	-0.647**	-0.590***	-0.686***
	(0.246)	(0.289)	(0.235)	(0.256)
RTSPRD	0.882***	1.205***	1.040***	1.128***
	(0.215)	(0.265)	(0.225)	(0.243)
CONSTANT	-1.064***	-0.923***	-0.995***	-0.973***
	(0.119)	(0.112)	(0.104)	(0.104)
Observations	531	531	531	531
Adjusted R^2	0.941	0.936	0.940	0.938

Panel B: Excess EM Equity Volatility

	$EMVOLEXSS_{t+1}$			
EMATV	0.041***			
	(0.013)			
EMSVI		0.001***		
		(0.0004)		
ENHASVI			0.020***	
			(0.005)	
ENHASVI2				0.027***
				(0.007)
EMdNEWS	0.029	0.036	0.029	0.026
	(0.026)	(0.027)	(0.027)	(0.026)
PUT-CALL	-0.054	0.012	-0.019	-0.008
	(0.050)	(0.054)	(0.054)	(0.050)
EMVOLEXSS	0.814***	0.839***	0.813***	0.791***
	(0.024)	(0.021)	(0.022)	(0.024)
VIX	-0.053**	-0.054***	-0.053***	-0.048**
	(0.022)	(0.016)	(0.018)	(0.021)
CBSVI	0.012	0.015	0.014	0.012
	(0.019)	(0.020)	(0.019)	(0.019)
CRASHSVI	-0.0005	0.0002	-0.0004	-0.0003
	(0.001)	(0.001)	(0.001)	(0.001)
STOCKSTRESS	0.0001	0.0001	0.00003	0.0003
	(0.001)	(0.001)	(0.001)	(0.001)
USDSTRESS	0.001	-0.001	-0.001	-0.001
	(0.002)	(0.001)	(0.001)	(0.002)
USRT	-0.144	0.048	-0.094	-0.163
	(0.200)	(0.184)	(0.189)	(0.203)
RTSPRD	0.958**	1.124***	1.045***	1.085***
	(0.200)	(0.261)	(0.226)	(0.224)
CONSTANT	0.160***	0.124***	0.198***	0.176***
	(0.053)	(0.042)	(0.046)	(0.053)
Observations	531	531	531	531
Adjusted R^2	0.802	0.798	0.802	0.807

Panel C: EM FX Volatility

	$EMFXVOL_{+1}$			
EMATV	0.013			
	(0.011)			
EMSVI		0.0001		
		(0.0004)		
ENHASVI			0.004	
			(0.005)	
ENHASVI2				0.003
				(0.004)
EMdNEWS	0.042	0.047	0.044	0.045
	(0.037)	(0.038)	(0.037)	(0.037)
PUT-CALL	-0.085	-0.064	-0.070	-0.067
	(0.054)	(0.053)	(0.052)	(0.052)

EMFXVOL	0.853***	0.858***	0.856***	0.856***
	(0.027)	(0.026)	(0.026)	(0.027)
VIX	0.130***	0.123***	0.127***	0.127***
	(0.034)	(0.032)	(0.033)	(0.034)
CBSVI	0.011	0.012	0.011	0.011
	(0.015)	(0.015)	(0.015)	(0.015)
CRASHSVI	0.001	0.002	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
STOCKSTRESS	-0.001	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
USDSTRESS	-0.003**	-0.003*	-0.003**	-0.003**
	(0.001)	(0.002)	(0.002)	(0.002)
USRT	-0.604*	-0.594*	-0.591*	-0.597*
	(0.314)	(0.314)	(0.313)	(0.311)
RTSPRD	0.877**	0.932***	0.915***	0.926**
	(0.339)	(0.345)	(0.341)	(0.343)
CONSTANT	-0.620***	-0.597***	-0.599***	-0.606***
	(0.128)	(0.126)	(0.123)	(0.127)
Observations	531	531	531	531
Adjusted R^2	0.920	0.919	0.920	0.919

Table 4. Shocks to Attention

This table presents the results from estimating an extended version of equation (7): $VOL_{t+1} = \alpha + \beta_1 VOL_t + \beta_2 Attention_t + \beta_3 CBSVI_t + \beta_4 CRASHSVI_t + \beta_5 EMdNEWS_t + \beta_6 STOCKSTRESS_t + \beta_7 USDSTRESS_t + \beta_8 USRT_t + \beta_9 SPRDRT_t + \beta_{10} PUT - CALL_t + \beta_{11} VIX_t + \epsilon_t$, where VOL is the natural logarithm of a volatility variable: (1) EM stock volatility (*EMVOL*), (2) excess volatility (*EMVOLEXSS)*, and (3) EM currency index volatility (*EMFXVOL)*; *ATTENTION* is *EXPEMSVI* (equation (2)) and *UNEXPEMSVI* (equation (3)), separating the expected and unexpected evolution of the *EMSVI* through AR(1), respectively. The same procedure is applied to ENHASVI to achieve a similar seperation, labeled *EXPENHASVI* and *UNEXPENHASVI* (included in Panel B). The control variables are included in the model are *CBSVI* and *CRASHSVI*, attention to activities of central banks and negative news, respectively; *EMdNEWS* is the volume of news on EM; $STOCKSTRESS$ and $USDSTRESS$ are US stock market and dollar stress, respectively; $USRT$ and $SPRDRT$ are the returns on the US equity market and the spread of return between EMs and the US equity market, respectively; and *PUT-CALL* and *VIX* capture market stress and level of risk in the US, respectively. Finally, lagged values of the volatility measure is included. Newey-West corrected standard errors are used in the estimations. The data is in weekly form and is between 2004-04-16 and 2014-12-12. Standard errors are in parentheses and ***, **, * indicate significance at 1%, 5% and 10% levels, respectively.

Panel A: Shocks in EMSVI

	$EMVOL_{t+1}$	$EMVOLEXSS_{t+1}$	$EMFXVOL_{t+1}$
EXPEMSVI	0.003***	0.002***	0.0003
	(0.001)	(0.001)	(0.001)
UNEXPEMSVI	0.001***	0.001	-0.0001
	(0.0004)	(0.001)	(0.0004)
EMdNEWS	0.048*	0.043	0.048
	(0.026)	(0.028)	(0.039)
PUT-CALL	0.145***	0.012	-0.064
	(0.052)	(0.054)	(0.053)
VIX	0.153***	-0.054***	0.124***
	(0.026)	(0.017)	(0.033)
CBSVI	0.011	0.015	0.012
	(0.021)	(0.020)	(0.015)
CRASHSVI	0.002***	0.0002	0.002

	(0.001)	(0.001)	(0.001)
STOCKSTRESS	-0.001	0.0001	-0.001
	(0.001)	(0.001)	(0.001)
USDSTRESS	-0.003**	-0.001	-0.003**
	(0.002)	(0.001)	(0.002)
USRT	-0.612**	-0.050	-0.593*
	(0.271)	(0.176)	(0.314)
RTSPRD	1.207***	1.129***	0.932***
	(0.262)	(0.260)	(0.344)
EMVOL	0.799***		
	(0.022)		
EMEXSSVOL		0.830***	
		(0.023)	
EMFXVOL			0.858***
			(0.026)
CONSTANT	-1.030***	0.091*	-0.605***
	(0.118)	(0.047)	(0.130)
Observations	531	531	531
Adjusted R^2	0.937	0.799	0.919

Panel B: Shocks in ENHASVI

	$EMVOL_{t+1}$	$EMVOLEXSS_{t+1}$	$EMFXVOL_{t+1}$
EXPENHASVI	0.029***	0.015**	0.001
	(0.008)	(0.007)	(0.006)
UNEXPENHASVI	0.042***	0.024***	0.009
	(0.006)	(0.007)	(0.006)
EMdNEWS	0.011	0.020	0.035
	(0.027)	(0.028)	(0.040)
PUT-CALL	0.094*	-0.016	-0.067
	(0.050)	(0.052)	(0.052)
VIX	0.175***	-0.053***	0.126***
	(0.028)	(0.017)	(0.033)
CBSVI	0.009	0.014	0.010
	(0.020)	(0.019)	(0.015)
CRASHSVI	0.001	-0.0003	0.001
	(0.001)	(0.001)	(0.001)
STOCKSTRESS	-0.0003	0.0001	-0.001
	(0.001)	(0.001)	(0.001)
USDSTRESS	-0.003*	-0.0004	-0.003**
	(0.002)	(0.001)	(0.002)
USRT	-0.585***	-0.063	-0.570*
	(0.234)	(0.183)	(0.310)
RTSPRD	1.028***	1.034***	0.899***
	(0.220)	(0.224)	(0.339)
EMVOL	0.780***		
	(0.025)		
EMEXSSVOL		0.820***	
		(0.023)	
EMFXVOL			0.858***
			(0.026)

CONSTANT	-0.948***	0.192***	-0.596***
	(0.109)	(0.043)	(0.122)
Observations	530	530	530
Adjusted R^2	0.940	0.802	0.920