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Macroeconomic Attention and Announcement Risk Premia

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We construct macroeconomic attention indexes (MAI), which are new measures of attention to different macroeconomic risks, including unemployment and monetary policy. Individual MAI tend to increase around related announcements and following changes in related fundamentals. Further, bad news raises attention more than good news. For unemployment and FOMC, attention predicts announcement risk premiums and implied volatility changes with large economic magnitudes. Our findings support theories of endogenous attention and announcement risk premiums, while demonstrating future research directions, including that announcements can raise new concerns. Macroeconomic announcements are important not only for contents and timing but also for attention. (*JEL* E20, G12)

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The finance literature has long sought to connect asset prices to the macroeconomy (e.g., Fama 1981).[1] In an important step forward, Savor and Wilson (2013, 2014) document that macroeconomic announcements have strong effects on asset prices. Theoretically, Ai and Bansal (2018) show that scheduled macroeconomic announcements can receive expected return compensation under preferences characterized by "generalized risk sensitivity," such as recursive preferences.

We propose and test a new empirical instrument for macroeconomic announcement risk premiums, prior investor attention to related macroeconomic news. Theories of endogenous attention attempt to explain investor willingness to pay a cost or exert costly effort to learn about fundamentals. Bansal and Shaliastovich (2011) and Kacperczyk, Van Nieuwerburgh, and Veldkamp (2016) show that endogenous attention increases with (a) economic uncertainty,[2] and (b) risk aversion, or equivalently, the price of risk.[3] These same variables are primary determinants of macroeconomic announcement premiums, according to Ai and Bansal (2018).[4] This link between theories of endogenous attention and announcement risk premiums motivates us to study the empirical relationships between macroeconomic attention, fundamentals, and announcement returns and volatility.

To enable the study of attention to macroeconomic news, we construct macroeconomic attention indexes (MAI), new measures of attention to different macroeconomic risks, such as employment and monetary policy. The indexes are based on news article counts from the *New York Times* (NYT) and *Wall Street Journal* (WSJ), starting in June 1980 for NYT and January 1984 for WSJ, and ending in December 2020. The near-40-year sample allows for multiple cycles in macroeconomic variables and covers much of the period over which announcement risk premiums have been studied. We create word lists that capture attention to each category of news and count the number of articles each day that relate to each category. For example, for U.S. output growth, we use "gross domestic product," "GDP," "gross national product," and "GNP." We count articles that include any of these search terms. Scaling by the total number of articles published gives our measure of attention to each category of macroeconomic news.[5] Motivated by the literature on macroeconomic

[1] See also Fama and Schwert (1977) and Chen, Roll, and Ross (1986).

[2] We use "uncertainty" to mean any risk. "Knightian uncertainty" distinguishes between risks with unknown probability distributions and risks with known probability distributions (e.g., Epstein and Wang 1994).

[3] See results 3 and 4 in Bansal and Shaliastovich (2011) and propositions 1 and 2 in Kacperczyk, Van Nieuwerburgh, and Veldkamp (2016). Other theories of attention that emphasize different phenomena include Sims (2003), Peng and Xiong (2006), Van Nieuwerburgh and Veldkamp (2006, 2009, 2010), Veldkamp (2006a,b), Abel, Eberly, and Panageas (2007), Huang and Liu (2007), Mondria (2010), and Andrei and Hasler (2020).

[4] See their equation (36). See also Wachter and Zhu (2021), who focus on disaster risk rather than uncertainty as a source of announcement risk premiums.

[5] Frequency counts are a well-accepted approach to measuring importance (e.g., Mitchell and Mulherin 1994; Liu and Matthies 2022).

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announcements and other important indicators, we consider eight individual categories of macroeconomic news: unemployment, monetary policy, output growth, inflation, the housing market, credit ratings, oil, and the U.S. dollar.

We associate each MAI with a related macroeconomic variable, and, where possible, a scheduled announcement. For example, we associate the unemployment MAI with the unemployment rate reported by the Bureau of Labor Statistics and the Employment Situation announcement occurring on the first Friday of every month. Daily variations in attention strongly relate to scheduled announcements, and we document which announcements most influence attention.

The MAI differ from prior indexes based on news counts, in particular the Economic Policy Uncertainty (EPU) index of Baker, Bloom, and Davis (2016). First, attention relates to but is theoretically distinct from uncertainty, which is the target of the EPU measure. Specifically, attention additionally contains information about the price of risk, since investors pay more attention to more highly priced risks. Second, each MAI relates to a different category of macroeconomic news, as opposed to the general economic policy uncertainty that is the target of the EPU measure. The MAI are therefore conceptually distinct from prior measures.[6]

We show empirically that the MAI are not only imperfectly correlated with one another but also show modest correlation with general measures of uncertainty and volatility, such as the EPU index and the Volatility index (VIX). Attention shifts over time and across the different categories of macroeconomic news, consistent with the need for separate attention measures for distinct types of macroeconomic news. The MAI also relate to measures of information flow. Andrei and Hasler (2014) posit that attention should relate to information flow, and therefore volatility and trade volume (e.g., Andersen 1996). Controlling for macroeconomic announcements, we show that attention to macroeconomic news correlates positively with changes in aggregate volume and volatility.

Lower-frequency movements in MAI relate to macroeconomic fundamentals. We decompose each of the economic series (e.g., unemployment, inflation) into simple moving averages over different window sizes. Attention relates to variations and absolute variations in simple moving averages of fundamentals over different horizons. All significant coefficients for absolute variations are positive, showing that changes in fundamentals in either direction increase attention. The MAI increases even more when fundamentals move in "negative" directions. For example, attention to unemployment increases when unemployment increases, and attention to housing increases when house prices decrease. Thus, consistent with theories of endogenous attention and a countercyclical price of risk,[7] bad news leads to higher attention.

[6] The MAI also differ from studies emphasizing the link between sentiment and media coverage (e.g., Tetlock 2007; Garcia 2013).

[7] Harvey (1989), Campbell and Cochrane (1999), and others provide evidence of the countercyclical price of risk.

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For employment and FOMC (e.g., Boyd, Hu, and Jagannathan 2005; Lucca and Moench 2015; Ai and Bansal 2018), preannouncement attention positively predicts the announcement-day risk premium and decline in VIX. Intuitively, attention rises before important announcements, forecasting larger announcement returns and declines in VIX. The economic magnitude of predictability is large. A one-standard-deviation change in prior MAI predicts a 12- to 26-basis-point (bps) increase in the excess market return, as large or larger than the average excess return earned on announcement days in prior literature and in our sample (e.g., Savor and Wilson 2013). These results are robust to controlling for changes in macroeconomic fundamentals on announcement days, the general measure of uncertainty EPU, and to including or excluding the highly volatile COVID-19 period.

The relationship between prior attention and announcement-day returns and VIX changes is truly a predictive one, not simply because of the correlation between prior attention and postannouncement attention. When we control for the postannouncement change in attention, even though these data are subsequent to the announcement, the predictive relationship between prior increase in attention and both the announcement risk premium and change in VIX remains robust and strong, both statistically and economically. Intuitively, high attention prior to an announcement suggests concern for the announcement, predicting high returns and a decline in VIX. If high returns are realized, investor relief weakens attention.[8] This explains why preannouncement attention is a robustly positive predictor of announcement risk premiums even controlling for postannouncement attention.

Another lens through which one might consider our analysis of attention is the idea of future information risk in Farboodi and Veldkamp (2020). While their study is not a theory of announcement risk premiums, it does contain the idea that future data need not only resolve uncertainty but also reveal new concerns and thereby raise uncertainty. The high average attention we document before announcements could relate to future information risk.

To explore this channel, we show that after announcements with negative returns, attention increases relative to announcements with positive returns. In other words, bad news on announcement dates raises attention more than good news. The leading existing theories of announcement risk premiums focus on resolution of uncertainty on announcement dates, and imply that investors have no motive to pay attention immediately after an announcement. Future theoretical work on announcement risk premiums should find it fruitful to incorporate future information risk. This could be done by modeling the possibility that new concerns can be revealed on announcement dates.

[8] An asymmetric relationship between pre- and postannouncement attention and returns can be related to empirical studies and theories in which high uncertainty predicts high risk premiums, but uncertainty increases following bad news (e.g., French, Schwert, and Stambaugh 1987; Campbell and Hentschel 1992).

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Our findings validate the usefulness of macroeconomic attention, adding a new tool to the study of macroeconomic announcements. Prior research has documented the importance of (a) the contents of macroeconomic announcements (e.g., Andersen et al. 2003) and (b) the dates of those announcements, when risk premiums are earned (e.g., Savor and Wilson 2013). We document a third novel and informative characteristic of macroeconomic announcements, attention.

We summarize three important contributions to the literature. First, we develop the MAI, new measures of attention to specific macroeconomic fundamentals. Second, the existing empirical literature on macroeconomic announcements focuses on average returns on macroeconomic announcement days, while we show that preannouncement attention predicts announcement risk premiums and changes in VIX. Third, our findings broadly support some of the key elements of existing theories of endogenous attention and announcement risk premiums, while also suggesting directions for future research. For example, partly motivated by our findings, Ai, Bansal, and Han (2021) develop a model combining endogenous attention and macroeconomic announcement premiums based on asymmetric information. Another fruitful direction would be to extend theories of announcement risk premiums to include the idea of future information risk (Farboodi and Veldkamp 2020). Such an extension should better align with postannouncement patterns in attention.

1. Macroeconomic Attention Indexes

We create indexes of investor attention to the following macroeconomic risks: unemployment, monetary policy, GDP (output growth), inflation, housing, credit conditions, oil, and the U.S. dollar. For each fundamental, we create a keyword list, shown in Table 1. We search for articles containing these keywords in the print editions of the *New York Times* (NYT) and *Wall Street Journal* (WSJ).[9] The sample period begins on June 1, 1980, for NYT, on January 1, 1984, for WSJ, and ends on December 31, 2020, for both publications. Section A in the Internet Appendix presents a sample of the retrieved articles. Our choice of the NYT and WSJ is consistent with prior literature.[10] Using these leading newspapers in New York City, the financial capital of the United States, enables our comparison with U.S. macroeconomic fundamentals.

We retrieve articles from print editions only for two reasons. First, print editions are published before markets open, whereas digital-only articles can be published at any time. Second, print editions impose a stable constraint on editorial decisions. The size of the print editions varies much less over time than the number of online-only articles, which changes considerably when

[9] The macroeconomic attention indexes are available on the authors' personal websites.

[10] Other studies using these sources include George and Waldfogel (2006), Tetlock (2007), Dougal et al. (2012), Garcia (2013), and Manela and Moreira (2017).

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newspapers first experimented with online-only content.[11] The space constraint helps to ensure that coverage variations are driven by efforts to satisfy reader demand, rather than by differences in the types of articles that are published in print versus online-only format.[12]

While the MAI are derived from newspapers, they provide useful empirical proxies for *investor* attention. The news media have strong incentives to produce articles that interest readers (Mullainathan and Shleifer 2005), and the market for information should on average balance the news supply with reader demand (Hamilton 2004). Editors must therefore adjust coverage of macroeconomic topics over time to meet the information demands of customers.[13]

1.1 Construction of the attention indexes

Each day in the sample period, we count the number of articles in each publication that satisfy the search criteria for each macro fundamental. This provides a daily count $N_{p,f,t}$, where p indexes the publication (NYT or WSJ) of articles demonstrating attention to each fundamental f. We normalize these counts by dividing by the average number of articles per day $\hat{N}_{p,t}$ for publication p during the calendar month including observation t.[14]

The macroeconomic attention index for each individual publication P is

$$\text{MAI-}p_{f,t} = \frac{N_{p,f,t}}{\hat{N}_{p,t}}. \tag{1}$$

The indexes measure the percentage of articles on a given day that have content related to the macroeconomic fundamental of interest.

We also define a composite attention index for each topic by combining information in the two newspapers. We first demean each NYT and WSJ index by its full sample mean. After January 1, 1984, the composite index $\text{MAI}_{f,t}$ is the average of the demeaned NYT and WSJ indexes for topic f. Prior to January 1, 1984, when only NYT coverage is available, the composite index simply took the value of the demeaned NYT index.[15]

[11] Online-only articles grew dramatically from 2007 to 2009 and have since declined.

[12] Other studies use measures of attention from other online-only sources, such as Google Search (e.g., Da, Engelberg, and Gao 2011). These time series are shorter, with Google Search data, for example, starting in 2004 and Bloomberg search (Ben-Rephael et al. 2021) available from 2010 for individual firms, but not at all for macro keywords. Further, changes in online search technology over time have been significant. Nonetheless, in the Internet Appendix, we explore whether Google Search data may be useful for measuring macroeconomic attention and show that these data do not predict risk premiums or changes in VIX on macroeconomic announcement days.

[13] A branch of the literature focuses on establishing a causal role of news media for financial markets (e.g., Huberman and Regev 2001; Peress 2014). The challenge in this literature is to find examples in which financial news supply can be separated from investor demand for information. The natural experiments used in this literature therefore relate to specific events or stories that, unlike scheduled macroeconomic announcements, are nonrepeated and as close as possible to unanticipated.

[14] We divide the total number of articles in each publication per month by the number of business days in the month.

[15] The motivation for demeaning prior to combining is to ensure that when the index switches from a single newspaper to two, the overall coverage tendencies of the two newspapers do not make a large impact. In practice,

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Table 1
Macroeconomic attention indexes and fundamentals

Category	Newspapers search words	Fundamental	Announcement (frequency)
Credit rating	credit rating or bond rating	Corporate bond spread	
GDP	(U.S. or United States) and (gross domestic product or gdp or gnp or gross national product)	Quarter-to-quarter real GDP	Gross domestic product (quarterly)
Housing market	housing market or house sale or new home start or home construction or residential construction or housing sale or home price	National home price	
Inflation	inflation or consumer price index or producer price index and (U.S. or United States)	Consumer Price Index	CPI and PPI (monthly)
Monetary	(federal reserve or federal open market committee or fomc) and (interest rate or monetary or inflation or economy or economic or unemployment)	Federal fund rate and balance sheet	FOMC statement (8 meetings per year)
Oil	oil	Crude oil spot price	
U.S. dollar	U.S. dollar or U.S. exchange rate or U.S. currency	Trade-weighted U.S. dollar index	
Unemployment	(unemployment or jobless) and (U.S. or United States) and (economy or economic)	Unemployment rate	Employment situation (monthly)

This table reports search words to select articles related to eight specific macroeconomic fundamentals in the *Wall Street Journal* (WSJ) and the *New York Times* (NYT) to construct the macroeconomic attention indexes (MAI). We retrieve the articles for which the search words appear either in the headline or in the article. The eight macroeconomic fundamentals are credit rating, gross domestic product (GDP), housing market, inflation, monetary, oil, U.S. dollar, and unemployment. It also reports the related macroeconomic fundamentals and announcements. The corporate bond spread is computed as the difference between BAA and AAA in corporate bond yields divided by AAA corporate bond yield. The bond yields, real GDP, national home price (Case-Shiller index), Federal fund rate, Federal Reserve's balance sheet, U.S. dollar index, and crude oil spot prices are retrieved from the Federal Reserve Economic Data (FRED) website. The Consumer Price Index and unemployment rates have been retrieved from the U.S. Bureau Labor and Statistics (BLS) website.

The MAI build on simple article counts. Many elaborations are possible, for example, weighting articles by number of words, or by intensity of relevance rather than binary coding. We take a basic approach for simplicity. The indexes measure attention only, and we do not attempt to distinguish other article attributes, such as sentiment.

1.2 Theories of attention and announcement risk premiums

In the attention theories that motivate our study, a fixed technology determines information supply and investors' uncertainty drives information demand. For example, Bansal and Shaliastovich (2011) model an information technology in which paying a fraction of income reveals the true state. Kacperczyk, Van Nieuwerburgh, and Veldkamp (2016) model investors who

demeaning has very little effect because, other than the overall mean, it affects changes in the index only at a single date in the beginning of 1984. Our results are robust to (a) demeaning using the first month of WSJ coverage to normalize average levels of the indexes and then discarding that month of WSJ data and (b) no demeaning prior to combining.

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choose how to allocate information production across different sources of risk under a constraint of fixed information processing capacity. In both cases, information production technology (supply) is constant, and variations in information demand determine the equilibrium information production.[16]

The assumption of a stable information production technology is appropriate for the NYT and WSJ over our sample. Information is produced by an editor and editorial team, full-time staff reporters and opinion writers, and freelance writers hired to write occasional pieces. Of course, there have been many changes in the newspaper industry over time, but the most important of these are distribution (shifting from print to online), and the role of advertising, which has significantly declined over time.[17] Nonetheless, producing information by investigating and writing articles requires much the same high-cost human labor today as it did at the beginning of our sample. Our key identifying assumption is that changes in attention are driven not by unexpected changes in information production technology, but by editorial efforts to meet variation in reader demand for different types of macroeconomic information.[18]

The primary product market for NYT and WSJ is subscribers. Subscribers drive revenues, directly and through advertising, in both print and online eras. Small transactions, such as purchasing an individual newspaper or clicking through to an individual story, compose a minor part of the business model for leading newspapers.[19] Further, economies of scale are large, newspapers are differentiated products, and subscribers are sticky. A critical dimension along which editorial teams compete for subscribers is the decision of what topics to publish, which builds a reputation for matching attention to reader demand.[20]

Theories of announcement risk premiums help to explain variation in investor attention *within* macroeconomic announcement cycles. In the simplest model of Ai and Bansal (2018), incomplete information about an underlying state is fully resolved on announcement dates. Uncertainty builds between

[16] Constant information production technology is of course not assumed in all models of attention. For example, Bansal and Shaliastovich (2011) consider changes in the cost of information production; lower information production costs lead to more information, a supply effect rather than a demand effect. See their result 3. Another issue is the possibility of multiple equilibria, as proposed in, for example, Veldkamp (2006b), who develops a theory of frenzies and herding. That theory seems particularly well-suited to the individual emerging markets that are the focus of the accompanying empirical study, in contrast with the systematic macroeconomic risks that are the focus of our study.

[17] See, for example, Pattabhiramaiah, Sriram, and Sridhar (2018).

[18] For example, if attention to employment increases between two announcements, we assume this is unlikely to be due to an unexpected shock to the information production technology, such as the appearance of a new team of writers highly trained in the economics of unemployment. We instead assume that changes in attention are efforts by the editor to match reader demand for information.

[19] Click-through decisions of individuals can be used as a measure of attention and is an approach complementary to ours. Benamar, Foucault, and Vega (2021) construct an attention measure based on clicks through newspaper headlines. From their point of view, newspaper articles are a measure of supply, while investor demand determines the equilibrium click through rate. We instead focus on the coverage decision within newspapers. Additionally, Benamar, Foucault, and Vega (2021) focus on the strength of price reactions to contemporaneous unemployment surprises, whereas we focus on predictability of announcement risk premiums and changes in VIX.

[20] See Hamilton (2004) for a further discussion of the newspaper industry.

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announcements until the state is revealed again at the next announcement. Investors cannot pay to receive signals about the state between announcements. These assumptions equate to an infinite cost of gaining an additional signal between announcements, and a zero cost on the announcement date. Motivated by findings in Cieslak, Morse, and Vissing-Jorgensen (2019), Ai and Bansal (2018) also consider the possibility of partial information leakage, allowing some learning immediately prior to announcement. Ai, Bansal, and Han (2021) develops a theory of increased attention immediately prior to announcement. They are partly motivated by our empirical finding of increased macroeconomic attention several days prior to a macroeconomic announcement (see our Section 3). They hypothesize asymmetric information between informed and uninformed investors, giving uninformed investors an incentive to pay for a costly signal in the days before an announcement.

Beyond uncertainty and general movements in the price of risk, the asset pricing literature considers additional specific sources of risk premiums, such as distributional asymmetries, captured by, for example, skewness and conditional skewness, semi-variance-related measures of downside and upside risk, variance risk premiums related, for example, to the volatility of volatility, and combinations thereof.[21] With the exception of Wachter and Zhu (2021), we are not aware of theories of endogenous attention or announcement risk premiums that incorporate such channels, although we expect future work to do so. For simplicity, in the remainder of this paper we focus our interpretation and empirical methods on uncertainty and a countercyclical price of risk as drivers of macroeconomic attention and announcement risk premiums, and anticipate that future work will pursue additional specific channels.

1.3 Empirical properties of the attention indexes

Table 2, panel A, provides summary statistics for the daily MAI. Across topics, the NYT index means are lowest for U.S. dollar (0.08%), and highest for monetary (0.94%). The WSJ index averages range from a low of 0.44% for credit rating to over 2% for inflation, monetary, and oil. Holding the topic constant, the means and standard deviations are uniformly higher for the WSJ than the NYT. The WSJ therefore drives composite MAI fluctuations more so than the NYT.[22] By day of week, the Saturday NYT has similar content to other days, whereas Sunday offers more coverage. The Saturday WSJ edition generally has less coverage of macro news than other days. For simplicity in the remainder of our analysis we discard all nontrading days (weekends and holidays). To account for day-of-week seasonalities, we use day-of-week

21 See, for example, Kraus and Litzenberger (1983), Sortino and Price (1994), Harvey and Siddique (1999), Ang, Chen, and Xing (2006), Bollerslev, Tauchen, and Zhou (2009), Drechsler and Yaron (2011), and Kilic and Shaliastovich (2019).

22 That our results are not sensitive to an alternative composite index that demeans and standardizes the NYT and WSJ indexes before combining shifts more weight to NYT.

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Table 2
Descriptive statistics

A. Descriptive statistics for the NYT and WSJ MAI

	Obs.	Mean	SD	Min	Max	Day of the week: M	T	W	Th	F	Sa	Su
MAI-NYT												
Credit rating	14,824	0.19	0.36	0	7.82	0.12	0.19	0.22	0.21	0.19	0.16	0.24
GDP		0.31	0.44	0	5.65	0.29	0.25	0.27	0.27	0.32	0.24	0.54
Housing		0.29	0.47	0	3.98	0.13	0.19	0.27	0.28	0.27	0.20	0.70
Inflation		0.84	0.84	0	9.86	0.71	0.62	0.77	0.76	0.83	0.77	1.41
Monetary		0.94	0.78	0	8.68	0.66	0.79	0.98	1.05	1.07	0.97	1.07
Oil		0.75	0.83	0	9.09	0.49	0.73	0.81	0.84	0.81	0.70	0.86
Unemployment		0.84	0.86	0	7.70	0.66	0.59	0.71	0.69	0.90	0.91	1.42
U.S. dollar		0.08	0.19	0	3.49	0.01	0.07	0.06	0.07	0.07	0.07	0.18
MAI-WSJ												
Credit rating	13,515	0.44	0.79	0	15.45	0.49	0.56	0.68	0.56	0.59	0.23	0
GDP		1.00	1.22	0	12.05	1.45	1.16	1.22	1.24	1.33	0.60	0
Housing		0.71	1.17	0	10.42	0.65	0.68	1.35	0.81	1.00	0.45	0
Inflation		2.10	1.99	0	16.59	3.10	2.32	2.71	2.59	2.87	1.11	0
Monetary		2.04	2.02	0	18.62	2.81	2.23	2.66	2.75	2.66	1.21	0
Oil		2.25	2.52	0	20.32	2.73	2.85	3.20	2.88	3.01	1.11	0
Unemployment		1.37	1.58	0	12.97	2.00	1.34	1.76	1.45	2.06	0.98	0
U.S. dollar		0.75	1.04	0	9.60	0.91	1.00	1.03	0.97	1.05	0.29	0
Other variables												
EPU	9,393	102.27	76.61	3.32	807.66	114.87	105.72	99.23	93.72	97.83		
VIX	7,809	19.47	8.11	9.14	82.69	19.75	19.49	19.44	19.41	19.29		
Volume	10,235	0.01	0.20	−3.30	1.16	−0.06	0.02	0.05	0.05	0.01		

B. Correlations

	MAI: Credit	GDP	Housing	Inf	Mon	Oil	Unemp	USD	Other variables: EPU	VIX	Vol
Credit rating	1.00	0.16	0.20	0.06	0.15	0.18	0.11	0.17	0.09	0.22	0.03
GDP	0.16	1.00	0.15	0.20	0.24	0.13	0.28	0.13	0.10	0.13	−0.02
Housing	0.20	0.15	1.00	0.13	0.28	0.19	0.14	0.08	0.01	0.10	0.04
Inflation	0.06	0.20	0.13	1.00	0.40	0.38	0.15	0.28	−0.06	−0.01	0.02
Monetary	0.15	0.24	0.28	0.40	1.00	0.26	0.27	0.21	0.17	0.20	0.10
Oil	0.18	0.13	0.19	0.38	0.26	1.00	0.00	0.38	−0.01	0.10	0.06
Unemployment	0.11	0.28	0.14	0.15	0.27	0.00	1.00	−0.02	0.26	0.25	−0.02
U.S. dollar	0.17	0.13	0.08	0.28	0.21	0.38	−0.02	1.00	−0.03	0.16	0.04
EPU	0.09	0.10	0.01	−0.06	0.17	−0.01	0.26	−0.03	1.00	0.40	0.04
VIX	0.22	0.13	0.10	−0.01	0.20	0.10	0.25	0.16	0.40	1.00	0.11
Volume	0.03	−0.02	0.04	0.02	0.10	0.06	−0.02	0.04	0.04	0.11	1.00

Panel A reports the daily descriptive statistics for the *New York Times* (NYT) and *Wall Street Journal* (WSJ) macroeconomic attention indexes (MAI), the Economic Policy Uncertainty (EPU) index, the implied volatility (VIX), and the 60-day detrended log trade volume for the S&P 500 index. Columns "M" to "Su" are the day-of-the-week averages for each MAI. The WSJ does not offer Sunday coverage. The units for MAI indexes are in percentage. Panels B reports the daily correlations between composite MAI, EPU, VIX, and the detrended S&P 500 trade volume. The sample period for MAI-NYT and MAI-WSJ is from June 1, 1980, to December 31, 2020, and from January 1, 1984, to December 31, 2020, respectively.

dummy variables where indicated, and our results are not sensitive to this choice.

Figure 1 plots the unemployment MAI for NYT and WSJ separately, and Figure 2 plots all composite MAI. Each attention index is associated

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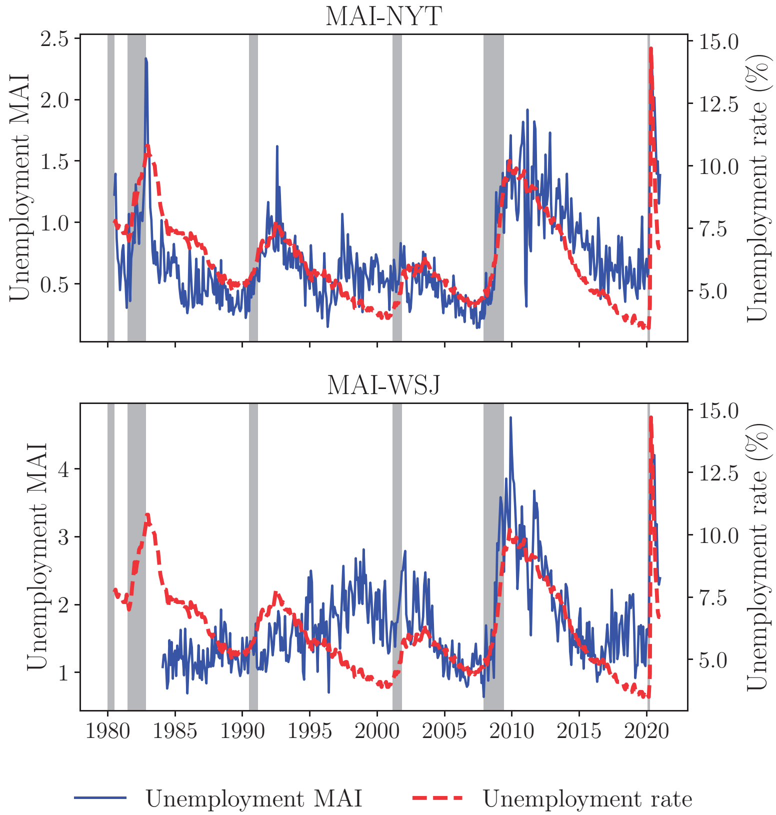

Figure 1
Attention to unemployment and the unemployment rate
This figure shows the monthly unemployment attention indexes for the *New York Times* (MAI-NYT) and the *Wall Street Journal* (MAI-WSJ) and the monthly unemployment rate. The solid line represents the attention index (MAI), and the dotted line represents the unemployment rate. Units are in percentage. The gray vertical bars represent NBER recessions. The sample periods for MAI-NYT and MAI-WSJ are June 1, 1980, to December 31, 2020, and January 1, 1984, to December 31, 2020, respectively.

with a series of related macroeconomic fundamentals.[23] For example, the unemployment attention index is plotted on the same axes with the unemployment rate. Table 1 fully lists the attention indexes versus the associated macroeconomic fundamentals.

Figures 1 and 2 demonstrate that macroeconomic attention cannot be captured by a single factor. Over time attention shifts and the MAI are imperfectly correlated. The individual MAI are also highly persistent, showing fluctuations at least as long as several years, including gradual trends and sharp changes.

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[23] Carroll (2003) similarly plots a monthly news count index of inflation from the *New York Times* and the *Washington Post* against CPI, from 1981 to 2001.

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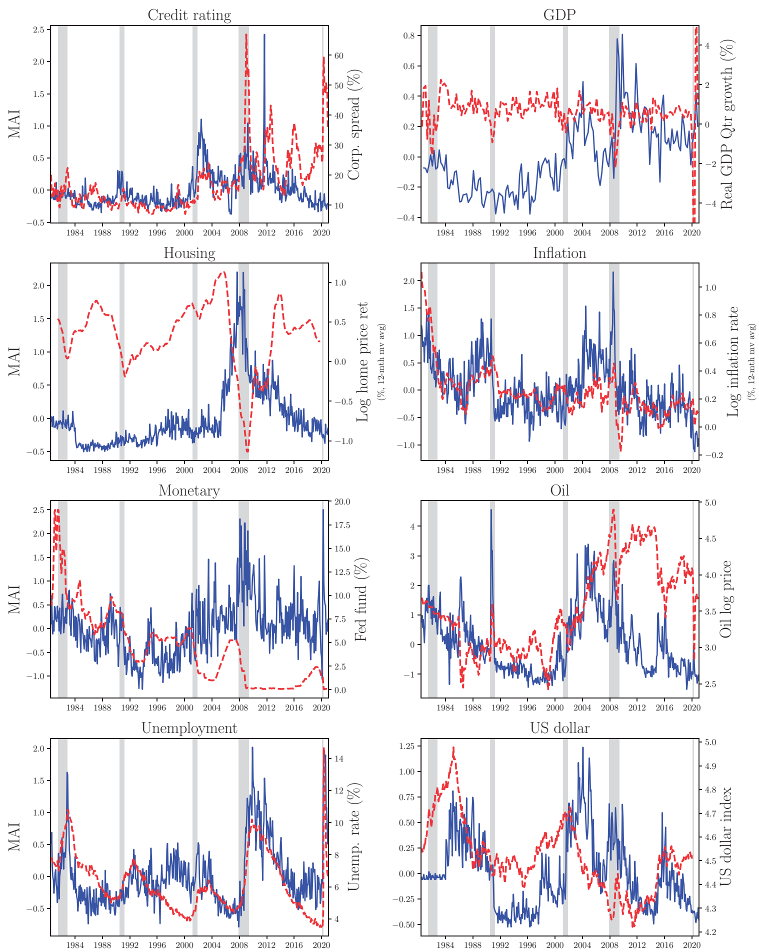

Figure 2
Macroeconomic attention indexes and macroeconomic fundamentals
This figure shows the monthly macroeconomic attention indexes (MAI) and their related macroeconomic fundamentals described in Table 1. All figures are at the monthly frequency, except for the GDP MAI-Real GDP, which is at the quarterly frequency. Solid lines represent macroeconomic attention indices (left *y*-axis), and dotted lines (right *y*-axis) represent the related macroeconomic fundamentals (see Table 1). The gray vertical bars represent NBER recessions.

Higher-frequency cycles, including sharp bursts of attention, are visible as well. Finally, the MAI appear related to fundamentals. For example, Figure 1 shows that employment attention moves with the unemployment rate. Distinct measures of attention to different macroeconomic fundamentals are justified.

Statistical analysis confirms the first impressions. Table 2, panel B, shows correlations between the MAI and other daily series: implied volatility (VIX) from the Chicago Board Options Exchange, EPU, and detrended S&P 500 trade

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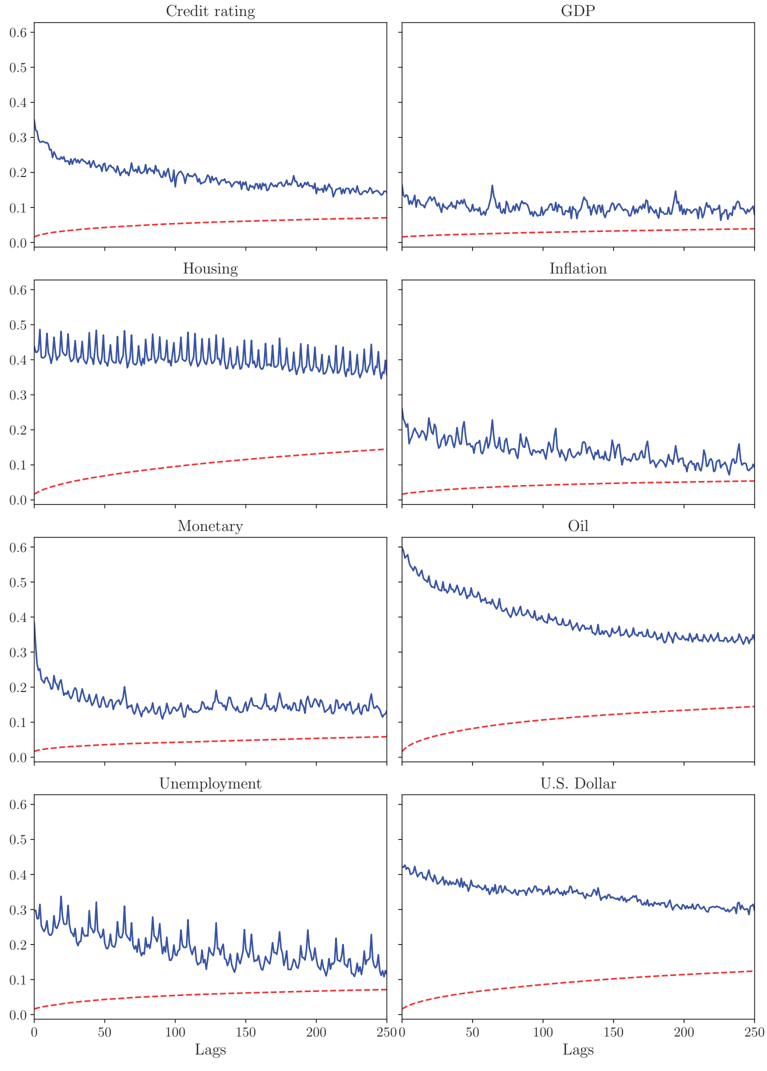

Figure 3
Autocorrelation in macroeconomic attention indexes
This figure shows the autocorrelations (ρ_k) for residuals after controlling for day-of-the-week dummies and month-of-the-year dummies for each of the composite macroeconomic attention index (MAI) for k lags ranging from 1 to 250 trading days. The dashed line represents the 95% critical value for the test $\rho_k \leq 0$, where we use the "large-lag" standard errors of Andersen (1976). These standard errors account for the observed autocorrelations for lags less than k.

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volume (Volume). The highest inter-MAI correlations are between monetary and inflation (0.40), and oil and inflation (0.38). The highest correlations with EPU are unemployment (0.26) and monetary (0.17), and the highest correlations with VIX are unemployment (0.25) and credit rating (0.22). The MAI are distinct from one another and from standard measures of uncertainty and implied volatility.

Figure 3 shows autocorrelations of the MAI up to 250 trading days, controlling for day-of-week and month-of-year dummy variables. The plots show cycles in dependence. For example, the GDP MAI autocorrelation rises at monthly intervals, consistent with increased attention to monthly GDP announcements.[24] The autocorrelations also decay slowly, and in all plots are significantly larger than zero at 250 lags.[25]

To further explore dependence, we use regressions that aggregate the MAI over different horizons, as in MIDAS (see Ghysels, Santa-Clara, and Valkanov 2006). We construct simple moving averages of attention over windows of 1, 5, 21 (monthly), 62 (quarterly), 250 (annual), and 1,000 days (business cycle). Table 3 shows the results. All MAI are persistent at multiple frequencies, with the majority having significant positive persistence in daily, weekly, monthly, quarterly, and annual-length moving averages. These results are consistent with the observed slow, approximately hyperbolic decay in the persistence of macroeconomic attention.[26] Next, we investigate the drivers of macroeconomic attention.

2. Macro Announcements, MAI, and Fundamentals

We show that macroeconomic announcements drive short-run fluctuations in the macroeconomic attention indexes. Longer-horizon variations in the MAI relate to changes in macroeconomic fundamentals.

2.1 Macroeconomic announcements

We use the following macroeconomic announcements: Consumer Price Index (CPI), Produce Price Index (PPI), Employment Situation, the quarterly GDP

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[24] GDP announcements pertain to quarterly performance, but advance, preliminary, and final announcements occur sequentially at monthly intervals.

[25] Despite persistence, the MAI cannot contain a unit root because they are bounded between zero and one. Nonetheless, in the Internet Appendix, we estimate monthly AR(p) models for each MAI. Following Campbell and Yogo (2006), we use the lag length that minimizes the Bayesian information criteria (BIC). Standard Dickey-Fuller tests reject unit roots, except for Housing and U.S. dollar MAIs, which show long swings around the financial crisis of 2008 (see Figure 2).

[26] Aggregation of autoregressive processes with heterogenous persistence can mimic long-memory dependence. See Robinson (1978), Granger (1980), Granger and Ding (1996), and Calvet and Fisher (2008).

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Table 3
Persistence of macroeconomic attention indexes

	MAI							
	Credit (1)	GDP (2)	Housing (3)	Inflation (4)	Monetary (5)	Oil (6)	Unemp (7)	USD (8)
Intercept	−0.07***	0.08***	−0.17***	0.21***	−0.04	−0.19***	0.14***	−0.07***
	(0.02)	(0.03)	(0.02)	(0.04)	(0.05)	(0.04)	(0.04)	(0.02)
L1	0.08***	0.04***	0.00	0.06***	0.18***	0.07***	0.01	0.01
	(0.03)	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)	(0.01)	(0.01)
L5	0.23***	0.09***	0.16***	0.14***	0.19***	0.41***	0.21***	0.16***
	(0.04)	(0.03)	(0.04)	(0.03)	(0.03)	(0.04)	(0.04)	(0.03)
L21	0.29***	0.25***	0.23***	0.26***	0.27***	0.26***	0.34***	0.45***
	(0.11)	(0.07)	(0.08)	(0.06)	(0.05)	(0.06)	(0.07)	(0.06)
L62	0.21***	0.07	0.28***	0.32***	0.06	0.18***	0.25***	0.19***
	(0.08)	(0.11)	(0.10)	(0.07)	(0.07)	(0.05)	(0.09)	(0.07)
L250	0.12	0.48***	0.38***	0.14**	0.24***	0.03	0.18***	0.20***
	(0.09)	(0.13)	(0.10)	(0.06)	(0.07)	(0.03)	(0.07)	(0.05)
L1000	0.01	0.04	−0.09**	0.02	0.02	0.03	−0.07*	−0.05*
	(0.05)	(0.08)	(0.04)	(0.05)	(0.04)	(0.02)	(0.04)	(0.03)
Obs.	9,589	9,589	9,589	9,589	9,589	9,589	9,589	9,589
Adj-R^2	.26	.12	.44	.18	.26	.53	.28	.39

This table reports estimates from an ordinary least squares (OLS) regression of daily composite macroeconomic attention indexes (MAI) on various moving average lags of itself. L1 corresponds to the lag of itself and L5, L21, L62, L250, and L1000 are moving averages for the 5, 21, 62, 250, and 1,000 days preceding the observed values at time t. We control for day-of-week fixed effects. The standard errors are reported in parentheses and are calculated using Newey-West standard errors (250 lags). The sample period is from June 1, 1980, to December 31, 2020. *p <.1; **p <.05; ***p <.01.

reports, and scheduled meetings of the Federal Open Market Committee (FOMC).[27]

Following Savor and Wilson (2013), we assume that FOMC decisions before 1994 became public 1 day after the meeting and, for each month, select the inflation announcement to be either CPI or PPI, depending on which occurs first.

To relate the MAI to macroeconomic announcements, we use the regression:

$$MAI_{f,t} = \alpha + \sum_{\delta=-4}^{\delta=4} \beta_\delta Ann_{j,t+\delta} + \varepsilon_t, \tag{2}$$

where $\mathrm{MAI}_{f,t}$ is the composite attention index corresponding to fundamental f. The variables $\mathrm{Ann}_{j,t+\delta}$ equal one if there is an announcement on day-$t+\delta$ and zero otherwise.

Figure 4 shows the results. The MAI reflect attention to macroeconomic fundamentals. They spike around macroeconomic announcements, most notably the day after the announcement. In some panels, average attention also increases significantly prior to the announcement. The first row shows that inflation and monetary MAI respond significantly to CPI/PPI announcements,

[27] The CPI, PPI, and Employment Situation announcement dates are from the Bureau of Labor Statistics, FOMC announcement dates are from the Federal Reserve Board, and the GDP report dates are from the Bureau of Economic Analysis.

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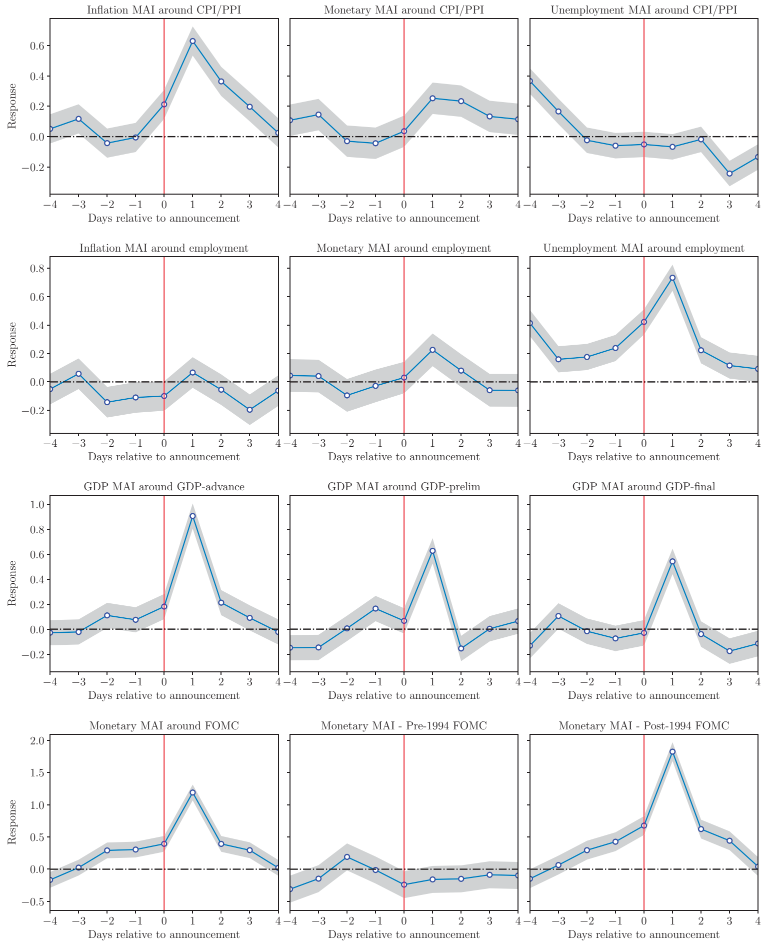

Figure 4
Macroeconomic attention around macroeconomic announcements
This figure shows the lag and forward estimated coefficients β_δ from the following regression:

$$MAI_{f,t} = \alpha + \sum_{\delta=-4}^{\delta=4} \beta_\delta Ann_{j,t+\delta} + \varepsilon_t,$$

where $MAI_{f,t}$ is the macroeconomic attention index for attention topic f. The variables Ann$_{j,t+\delta}$ equal one if there is an announcement on day-$t+\delta$ and zero otherwise for the corresponding attention topic f. We also include day-of-the-week fixed effects. The shaded area corresponds to the 95% confidence interval around the estimated coefficients. The x-axis corresponds to the number of days since the announcement. The announcements are the Consumer Price Index (CPI) / Producer Price Index (PPI) (first row), the Employment Situation (second row), U.S. Gross Domestic Product (GDP) (third row), and the Federal Open Market Committee (FOMC) (fourth row). For inflation announcements (CPI and PPI), we select on each month the announcement that occurs first for that given month. The vertical line represents the day of the announcement.

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but the unemployment MAI does not. The second row shows that the unemployment MAI responds significantly to employment announcements, but inflation and monetary MAI move modestly. A single marketwide measure of attention could not capture these distinctions, and the association of individual MAI with different macroeconomic fundamentals is further validated. The figure also illuminates which announcements most affect attention. The third row shows that among the several GDP-related announcements, attention rises most around the advance report, which is the first of three monthly reports about GDP in each quarter. Gilbert et al. (2017) find that only the advance report affects prices. The fourth row shows that attention spikes around FOMC announcements only after 1994, when the FOMC began making public announcements. Prior to 1994, FOMC decisions had to be inferred from open market operations, and there is no increase in attention around the known dates of FOMC policy changes in the pre-1994 period.

The MAI also relate to measures of stock market activity, trade volume and volatility, which are commonly associated with information processing.[28] Following Tetlock (2007), we define $Volume^d$ to be the logarithm of the daily aggregate trade volume of S&P 500 firms, detrended by its 60-day moving average. We regress detrended volume on similarly detrended attention, a dummy variable for announcements, and an interaction term. The interaction captures whether sensitivity of volume to attention is different on announcement days. The macroeconomic announcement literature has not developed a theory of differences in trade activity on announcement versus other days;[29] hence, our focus is on the coefficient for attention with the announcement and interaction as controls.

Table 4, panel A, shows that for six of the eight MAI, rising attention is associated with an increase in market volume. Panel B shows similar results regressing detrended VIX on attention, an announcement dummy, and an interaction term. Five of the eight MAI have a positive and significant relationship with detrended VIX. Thus, both volume and volatility positively relate to attention, consistent with the theoretical role of attention in information processing. We therefore expect that changes in macroeconomic fundamentals should predict attention, as we now show empirically.

2.2 Macroeconomic fundamentals

In models of endogenous attention, attention reflects the value of information, and is driven by both uncertainty about fundamentals and the price of risk (Bansal and Shaliastovich 2011;

[28] French and Roll (1986), Ross (1989), Andersen (1996), Beber, Brandt, and Kavajecz (2011), Andrei and Hasler (2014), and others relate volume and volatility to information flow.

[29] Such a theory might build on existing literature in other contexts that emphasizes differences between private versus public information channels of trade and price movements (e.g., Kim and Verrecchia 1994; Kandel and Pearson 1995; Brogaard, Hendershott, and Riordan 2019).

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Table 4
Macroeconomic attention indexes, trading volume, and implied volatility

MAI:	Inflation		Monetary		GDP		Unemployment		Credit Rating	Housing	Oil	USD
Ann.:	CPI / PPI		FOMC		GDP report		Employment					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
A. Dependent variable: $Volume_t^d$												
MAI^d	0.008***	0.008***	0.026***	0.026***	0.002	0.001	0.008**	0.009**	0.013**	0.003	0.009**	0.020***
	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.007)	(0.005)	(0.004)	(0.005)
$\mathbb{1}_{Ann}$		0.008		0.028**		0.008		0.012				
		(0.007)		(0.012)		(0.006)		(0.012)				
MAI$^d \times \mathbb{1}_{Ann}$		−0.004		−0.001		0.013		−0.010				
		(0.009)		(0.014)		(0.015)		(0.012)				
Obs.	10,186	10,186	10,186	10,186	10,186	10,186	10,186	10,186	10,186	10,186	10,186	10,186
Adj-R^2	.04	.04	.06	.06	.04	.04	.04	.04	.04	.04	.04	.04
B. Dependent variable: VIX_t^d												
MAI^d	−0.003	−0.031	0.628***	0.630**	0.279**	0.272**	0.411*	0.453*	0.589**	−0.271	0.408**	0.332
	(0.119)	(0.118)	(0.242)	(0.247)	(0.111)	(0.116)	(0.217)	(0.233)	(0.275)	(0.289)	(0.169)	(0.217)
$\mathbb{1}_{Ann}$		0.078		−0.793***		−0.166		0.136				
		(0.108)		(0.284)		(0.111)		(0.323)				
MAI$^d \times \mathbb{1}_{Ann}$		0.549**		0.221		0.165		−0.696				
		(0.273)		(0.231)		(0.348)		(0.478)				
Obs.	7,818	7,818	7,818	7,818	7,818	7,818	7,818	7,818	7,818	7,818	7,818	7,818
Adj-R^2	.00	.00	.02	.02	.00	.00	.00	.01	.00	.00	.01	.00

This table reports the results of the following regressions:

$$Volume_t^d = \alpha_f + \beta_{1,f} MAI_{f,t}^d + \beta_{2,f} \mathbb{1}_{Ann,f,t} + \beta_{3,f} MAI_{f,t}^d \times \mathbb{1}_{Ann,f,t} + \varepsilon_{f,t} \text{ in panel A and}$$

$$VIX_t^d = \alpha_f + \beta_{1,f} MAI_{f,t}^d + \beta_{2,f} \mathbb{1}_{Ann,f,t} + \beta_{3,f} MAI_{f,t}^d \times \mathbb{1}_{Ann,f,t} + \varepsilon_{f,t} \text{ in panel B.}$$

$Volume^d$ and VIX^d correspond to the daily log S&P 500 trade volume and the daily implied volatility, respectively, detrended by its 60-day moving average. MAI_f^d is the composite macroeconomic attention index (MAI) detrended by its 60-day moving average for attention topic f. $\mathbb{1}_{Ann}$ is an indicator variable for attention topic f equal to one if there is a related announcement specified in Table 1 and zero otherwise. In columns 1 and 2, the indicator variable is equal to one for either the PPI or CPI announcement, depending on which announcement occurs first in each month. For GDP announcements, we consider all announcements, that is, advance, preliminary, and final GDP announcements. We also control for day-of-week fixed effects. The standard errors are reported in parentheses and are calculated using Newey-West standard errors (250 lags). The sample period is from June 1, 1980, to December 31, 2020 (panel A), and from January 1, 1990, to December 31, 2020 (panel B). *p <.1; **p <.05; ***p <.01.

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Kacperczyk, Van Nieuwerburgh, and Veldkamp 2016). Changes in fundamentals in either direction should raise uncertainty and therefore attention. Further, this effect should be asymmetric, because risk aversion and the price of risk are countercyclical (e.g., Harvey 1989; Campbell and Cochrane 1999). Attention should therefore rise more following "bad news" than following good news of the same magnitude. We test these predictions and find support.

We decompose each series of macroeconomic fundamentals into detrended moving averages over different window sizes. Let F_t^M denote a fundamental (e.g., the unemployment rate) available at a calendar month frequency, where t indexes months.[30] Define moving averages F_t^Q, F_t^Y, and F_t^{4Y} over 3-, 12-, and 48-month windows, ending at t (i.e., $F_t^Q = \sum_{k=0}^{2} F_{t-k}^M/3$) and the decomposition:

$$F_t^M \equiv (F_t^M - F_t^Q) + (F_t^Q - F_t^Y) + (F_t^Y - F_t^{4Y}) + F_t^{4Y},$$

$$\equiv F_t^{M-Q} + F_t^{Q-Y} + F_t^{Y-4Y} + F_t^{4Y}. \tag{3}$$

The components of the decomposition are detrended moving averages over window sizes that correspond to natural calendar intervals (e.g., monthly, quarterly, annual), expanding approximately geometrically.[31]

We regress each MAI on (a) the detrended moving averages of fundamentals and (b) the absolute values of those detrended moving averages:

$$MAI_{f,t} = \alpha + \beta_1 F_t^{M-Q} + \beta_2 F_t^{Q-Y} + \beta_3 F_t^{Y-4Y}$$

$$+ \beta_4 |F_t^{M-Q}| + \beta_5 |F_t^{Q-Y}| + \beta_6 |F_t^{Y-4Y}| + \varepsilon_t, \tag{4}$$

where $MAI_{f,t}$ is average attention in month t for all fundamentals except GDP, where t indexes quarters.[32] Large changes in macro variables in either direction should increase uncertainty, captured by the absolute value terms in the regression (coefficients β_4, β_5, and β_6). The coefficients β_1, β_2, and β_3 capture asymmetry in the response to positive versus negative changes in fundamentals.[33] Attention should increase more for "badâ" than "goodâ"

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30 Table 1 completely lists the fundamentals, their sources, and the frequency of observation. For fundamentals observed at a daily frequency, we define F_t^M as the average of all observations within calendar month t.

31 Ortu, Tamoni, and Tebaldi (2013) use a similar decomposition to capture fluctuations of varying persistence in macroeconomic fundamentals. They focus on window sizes expanding in a geometric progression with base two. Our decomposition uses windows corresponding to natural calendar intervals: monthly, quarterly, annual, and four year, a progression in multiples of three or four. Geometrically expanding components with bases of different sizes are also the focus of Calvet and Fisher (2007) and can capture long cycles in dependence.

32 Since GDP growth is measured quarterly, we carry out a similar decomposition to Equation (3) but drop the first term on the right-hand side corresponding to the monthly versus quarterly difference, and also drop those terms from regression (4).

33 For further discussion of the coefficient interpretation, see Section B in the Internet Appendix. Table IA.2 in the Internet Appendix also shows similar results where the absolute values in (4) are replaced with squared terms. We do not use the sum of squared changes of individual increments as in realized volatility because a sequence of changes in the same direction should increase uncertainty more than increments of the same size that reverse one another.

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changes in fundamentals, because such changes should have larger effects on the price of risk.

Table 5 reports the results.[34] Attention responds to changes in macroeconomic fundamentals. Adjusted R^2 is as large as 61%. All regressions, except GDP, which has only quarterly fundamental observations, have at least one significant coefficient. The results also support key features of endogenous attention theories. All fourteen significant coefficients for *absolute* changes in fundamentals are positive. Large changes in fundamentals in either direction increase attention. The coefficients for *signed* changes show that attention increases more when the change is in a direction associated with bad versus good news. For example, attention to housing increases more when housing values fall, and attention to unemployment increases more when unemployment rises.[35]

In sum, changes in macroeconomic fundamentals in either direction tend to increase attention. Further, the effect is asymmetric. Bad news tends to raise attention more than good news of the same magnitude. These results are consistent with theories of endogenous attention and countercyclical pricing of risk.

3. Attention and Announcement Risk Premiums

Prior studies of macroeconomic announcement returns have focused on (a) the effects of contemporaneous surprises in fundamentals (e.g., Andersen et al. 2003) and (b) differences in average returns relative to other dates (e.g., Savor and Wilson 2013). For the prominent employment situation and FOMC announcements (e.g.,Boyd, Hu, and Jagannathan 2005; Lucca and Moench 2015; Ai and Bansal 2018), we show that preannouncement attention predicts the announcement risk premium and decline in VIX.

We separately analyze employment, FOMC, GDP, and inflation announcements.[36] As in the samples of Lucca and Moench (2015) and Ai and Bansal (2018), our FOMC sample contains scheduled announcements beginning in 1994, the year in which the Federal Reserve began to publicly announce

[34] The regressions are all monthly, except for GDP, whose fundamentals are measured over quarters. We correspondingly drop the β_1 and β_4 terms, corresponding to the monthly versus quarterly difference, from the GDP regression. Column 8, monetary MAI, uses two fundamentals, the Fed Fund rate and the Federal Reserve balance sheet, to allow variation during the period of the zero lower bound.

[35] Some of the fundamentals are available at the daily frequency. We report in Table IA.3 of the Internet Appendix results from regressing the daily MAI for credit rating, monetary, oil, and USD on their corresponding 60-day detrended fundamental and its absolute value. We find positive signs and statistically significant (at the 5 and 1% level) for all of the absolute values. Consistent with Table 5, increases in oil prices and decreases in the USD index raise their respective MAI.

[36] Many studies group all macroeconomic announcements together (e.g., Savor and Wilson 2013) or study a single type of announcement (e.g., Boyd, Hu, and Jagannathan 2005; Lucca and Moench 2015). Ai and Bansal (2018) partition their announcements into FOMC announcement days and other macroeconomic announcement days.

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Table 5
Fundamentals and macroeconomic attention

MAI:	Credit	GDP	Housing	Inflation	Oil	Unemp	U.S. dollar	Monetary	
Fund.:	Cred spread	GDP growth	House ret	Infl rate	Oil price	Unemp rate	USD index	Fed Fund	Bal sheet
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
F^{M-Q}	0.027*		−0.298*	−0.142	0.004	0.152	−0.009	−0.041	0.002
	(0.016)		(0.172)	(0.099)	(0.027)	(0.103)	(0.010)	(0.104)	(0.017)
F^{Q-Y}	0.005	0.025	−0.254***	0.006	0.026**	0.074	−0.020**	0.003	−0.014
	(0.005)	(0.019)	(0.082)	(0.127)	(0.010)	(0.093)	(0.009)	(0.043)	(0.010)
F^{Y-4Y}	−0.004	0.002	−0.281**	2.011***	0.024***	0.135***	−0.002	0.017	0.007**
	(0.011)	(0.077)	(0.129)	(0.514)	(0.009)	(0.042)	(0.005)	(0.035)	(0.003)
$\|F^{M-Q}\|$	−0.007		1.180***	−0.066	0.034	0.028	0.025	0.144	0.070***
	(0.022)		(0.221)	(0.209)	(0.046)	(0.133)	(0.019)	(0.126)	(0.015)
$\|F^{Q-Y}\|$	0.006	0.034	0.442***	0.308*	0.032***	0.215**	0.048***	0.166**	0.014
	(0.008)	(0.030)	(0.107)	(0.174)	(0.012)	(0.097)	(0.011)	(0.073)	(0.010)
$\|F^{Y-4Y}\|$	0.026*	0.054	0.968***	2.706***	0.026**	0.211***	0.033***	0.028	0.004
	(0.014)	(0.121)	(0.208)	(0.566)	(0.012)	(0.071)	(0.007)	(0.045)	(0.004)
Obs.	487	161	472	487	487	487	475	487	
Adj-R^2	.12	.01	.61	.18	.20	.51	.44	.23	

This table reports the results of the following ordinary least squares (OLS) regressions:

$$MAI_{f,t}=\alpha+\beta_1 F_t^{M-Q}+\beta_2 F_t^{Q-Y}+\beta_3 F_t^{Y-4Y}+\beta_4|F_t^{M-Q}|+\beta_5|F_t^{Q-Y}|+\beta_6|F_t^{Y-4Y}|+\varepsilon_t,$$

where $MAI_{f,t}$ is average attention in month t for all fundamentals, except GDP, where t indexes quarters. F_t^{M-Q}, F^{Q-Y}, and F^{Y-4Y} are defined by Equation (3). The model specification in column 8 includes both Fed Fund rates and the Federal Reserve balance sheet as independent variables. We also control for monthly fixed effects. The standard errors are reported in parentheses and are calculated using Newey-West standard errors (12 lags). The sample period is from June 1, 1980, to December 31, 2020. $^{*}p<.1$; $^{**}p<.05$; $^{***}p<.01$.

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monetary policy decisions.[37] Following Ai and Bansal (2018) and Hu et al. (2021), our other samples (employment, GDP, inflation) exclude observations that coincide with FOMC announcement days.[38]

3.1 Employment announcements

Employment situation announcements are releases of key employment statistics on the first Friday of each month. Boyd, Hu, and Jagannathan (2005) show that announcement-date returns depend on the contemporaneous announcement surprise, as well as interactions with the business cycle. Let τ index the employment announcements in our sample period. We define the preannouncement change in attention:

$$\Delta MAI_{\tau}^{pre} \equiv MAI_{\tau}^{pre} - MAI_{\tau}^{b}, \tag{5}$$

where MAI_{τ}^{pre} is the average MAI in a 3-day window prior to the announcement and the benchmark MAI_{τ}^{b} is the average attention from 4 days after the prior announcement to 4 days before announcement τ. The beginning of the benchmark period follows from Figure 4, which shows that on average abnormal attention dissipates by 4 days after announcements. The 3-day window for ΔMAI^{pre} allows consistent treatment of employment and FOMC announcements, which show statistically significant increases in average attention beginning 4 and 2 days before their respective announcements.[39] Detrending by the benchmark within each announcement cycle removes highly persistent components of attention, and isolates the preannouncement increase in attention. We control for EPU and define the variables $\Delta EPU_{\tau}^{pre} \equiv EPU_{\tau}^{pre} - EPU_{\tau}^{b}$ as averages of EPU over the same windows that the MAI variables are defined.

The regression framework we use is

$$R_{\tau} = \alpha + \beta_1 \Delta MAI_{\tau}^{pre} + \beta_2 \Delta EPU_{\tau}^{pre} + \beta_3 Surp_{\tau} + \beta_4 Surp_{\tau} \times \mathbb{1}_{\tau}^{NBER} + \varepsilon_{\tau}, \tag{6}$$

where R_{τ} is the announcement-date S&P 500 excess return, $Surp_{\tau}$ is the announcement surprise as defined in Boyd, Hu, and Jagannathan (2005),[40] and $\mathbb{1}_{\tau}^{NBER}$ is an NBER recession indicator. Increased attention may also

[37] Figure 4 confirms that after 1994, but not before, monetary policy MAI systematically increases before FOMC policy change dates. Since 1994, the Federal Reserve has scheduled eight FOMC announcements every year. The theory of announcement risk premiums (e.g., Ai and Bansal 2018) focuses on scheduled announcements, for which the date of the announcement is known in advance but the contents are unknown. Seventeen unscheduled FOMC announcements occurred between 1994 and 2020. These are interesting events in their own right but differ from scheduled announcements due to endogenous timing.

[38] This exclusion applies to 1 employment announcement, 13 GDP announcements, and 9 inflation announcements. Our results are robust to including these observations.

[39] See Figure 4. Our results are robust to nearby alternative choices of window length as well as to beginning the preannouncement window at the beginning of the calendar week of the announcement. See the Internet Appendix.

[40] Their expected unemployment model uses a variety of macroeconomic variables as predictors, including industrial production, the Treasury-bill rate, corporate bond yield spreads, and past unemployment.

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predict a larger resolution of uncertainty. We therefore run similar regressions with the left-hand-side variable of Equation (6) replaced with ΔVIX_τ, the announcement-date change in VIX.

Table 6 presents the results. Column 2, a univariate regression, shows that preannouncement attention positively predicts excess market returns on employment announcement days. The coefficient for ΔMAI^{pre} is statistically significant at the 5% level, and the economic magnitude is large. A one-standard-deviation increase in ΔMAI^{pre} predicts an increase of 12 bps in the announcement-date excess market return. For comparison, this point estimate is larger than the average difference of 10 bps per day reported by Savor and Wilson (2013) for all announcement days versus nonannouncement days. Further, it is more than twice as large as the average excess return on employment announcements shown in column 1, which is 5 bps and not statistically significant.[41] Preannouncement attention strongly predicts excess market returns on employment announcement dates.

Column 3 controls for the preannouncement change in EPU. The sample is shorter because the EPU series begins in 1985, but the coefficient for attention remains largely unchanged from column 2 and statistically significant at the 1% level. The coefficient for EPU is statistically insignificant. In column 4, we add the unemployment surprise and its interaction with the NBER dummy as advocated by Boyd, Hu, and Jagannathan (2005). The coefficient for attention remains largely unchanged and statistically significant. The coefficients for the employment surprise and its interaction with the NBER dummy have the same sign as in Boyd, Hu, and Jagannathan (2005)—an increase in unemployment is good news in normal times but bad news in recessions—but the coefficients for surprise are not statistically significant in our sample.

Columns 5–8 show the same set of model specifications with the change in VIX (ΔVIX) as the dependent variable. The results are robustly consistent with the impression given by the return regressions. A preannouncement increase in attention predicts larger decline in VIX and therefore resolution of uncertainty on employment announcement dates. A one-standard-deviation increase in preannouncement attention predicts a 21-bps decline, which is about two-thirds the size of the average announcement-date decline in VIX of 33 bps (column 5). The controls used in columns 7 and 8 do not alter the univariate result. Preannouncement attention is a powerful predictor of the announcement-date decline in VIX.

In columns 9 and 10, we explore the effect of removing 2020, the year of the COVID-19 pandemic, from our sample. Despite great fluctuations in

[41] The intercept (at 3 bps) in column 2 represents the average excess return for an announcement with no increase in attention prior to the announcement, that is, when $\Delta MAI^{pre}=0$. The change in the intercept from columns 1 to 2 is driven by the slope coefficient of 0.12 and $\overline{\Delta MAI}^{pre}$, the sample average of preannouncement attention, which is approximately 0.15 with a t-statistic of 3.3. The standard formula gives the change in the intercepts from columns 1 to 2 as $-\hat{\beta}_1 \times \overline{\Delta MAI}^{pre} = -.12 \times .15$, which equals the observed 2-bps drop in the intercept from regressions (1) to (2).

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Table 6
Employment situation announcements and returns

	1980-2020								1980-2019 (excl. COVID)	
Dep. var.:	R_τ				ΔVIX$_t$				R_τ	ΔVIX$_t$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Intercept	0.05	0.03	0.03	0.03	−0.33***	−0.31***	−0.31***	−0.32***	0.04	−0.29***
	(0.05)	(0.05)	(0.06)	(0.06)	(0.08)	(0.08)	(0.08)	(0.08)	(0.06)	(0.08)
ΔMAI^{pre}		0.12**	0.14***	0.14***		−0.21***	−0.21***	−0.22***	0.15***	−0.25***
		(0.05)	(0.05)	(0.05)		(0.08)	(0.08)	(0.08)	(0.05)	(0.08)
ΔEPU^{pre}			−0.01	−0.03			−0.04	0.02	−0.00	0.03
			(0.06)	(0.06)			(0.07)	(0.07)	(0.06)	(0.07)
Surp				0.08***				−0.12**	0.08	−0.02
				(0.02)				(0.05)	(0.06)	(0.10)
Surp$\times\mathbb{1}^{NBER}$				−1.15				2.73**	−0.50*	1.04**
				(0.72)				(1.32)	(0.26)	(0.48)
Obs.	485	485	430	430	371	371	371	371	418	359
Adj-R^2	.00	.01	.01	.02	.00	.02	.02	.05	.02	.06

This table reports the results of the following regressions

$$R_\tau = \alpha + \beta_1 \Delta MAI_\tau^{pre} + \beta_2 \Delta EPU_\tau^{pre} + \beta_3 Surp_\tau + \beta_4 Surp_\tau \times \mathbb{1}_\tau^{NBER} + \varepsilon_\tau \text{ and}$$

$$\Delta VIX_\tau = \alpha + \beta_1 \Delta MAI_\tau^{pre} + \beta_2 \Delta EPU_\tau^{pre} + \beta_3 Surp_\tau + \beta_4 Surp_\tau \times \mathbb{1}_\tau^{NBER} + \varepsilon_\tau.$$

he dependent variables R_τ and ΔVIX_τ correspond to the S&P 500 excess returns (in %) and the change in VIX on employment situation announcement dates, respectively. ΔMAI_τ^{pre} and ΔEPU_τ^{pre} are the preannouncement change in attention to unemployment and economic policy uncertainty, respectively (see Equation (5)). $Surp$ is the unemployment surprise computed as in Boyd, Hu, and Jagannathan (2005) and $\mathbb{1}_{NBER}$ is an indicator variable equal to one if the employment situation announcement occurs during a recession and zero otherwise. ΔMAI_τ^{pre}, ΔEPU_τ^{pre}, and $Surp$ are rescaled to have a standard deviation of one. The asymptotic heteroscedasticity-robust standard errors are reported in parentheses. *p <.1; **p <.05; ***p <.01.

financial markets and the macroeconomy, removing this year has little effect on the coefficients for preannouncement attention. In contrast, including or excluding the year 2020 changes the statistical significance of the employment surprise variable and its interaction with the NBER dummy, both of which are important in prior literature (Boyd, Hu, and Jagannathan 2005). Thus, while the extreme fluctuations of 2020 affect the long-studied relationship between the employment surprise and market returns, the predictive power of preannouncement attention is robust to including or excluding this year from our sample.

3.2 FOMC announcements

For FOMC announcements, we define the variables ΔMAI^{pre} and ΔEPU^{pre} similarly to employment announcements, with benchmark periods from 4 days after the prior scheduled announcement to 4 days before the current announcement, and preannouncement windows comprising the 3 days prior to the announcement, as in Equation (5). To ensure that the benchmarks are not influenced by unscheduled FOMC announcements, we replace any benchmark containing an unscheduled announcement with the previous

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Table 7
FOMC announcements and returns

	1994-2020			1994-2006			2007-2020		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
A. Dependent variable: R_τ									
Intercept	0.28***	0.19***	0.16**	0.20**	0.19**	0.09	0.36***	0.18*	0.19*
	(0.08)	(0.07)	(0.07)	(0.09)	(0.09)	(0.10)	(0.12)	(0.11)	(0.11)
ΔMAI^{pre}		0.26***	0.25**		0.02	0.02		0.45***	0.46***
		(0.10)	(0.10)		(0.09)	(0.09)		(0.15)	(0.17)
ΔEPU^{pre}			0.05			0.19***			−0.09
			(0.09)			(0.07)			(0.17)
Surp			−0.16			−0.15*			−0.13
			(0.11)			(0.09)			(0.22)
Obs.	214	214	214	103	103	103	111	111	111
Adj-R^2	.00	.05	.07	.00	−.01	.04	.00	.12	.11
B. Dependent variable: ΔVIX_τ									
Intercept	−0.55***	−0.37***	−0.34***	−0.49***	−0.49***	−0.37***	−0.60***	−0.27**	−0.28**
	(0.11)	(0.08)	(0.09)	(0.09)	(0.09)	(0.09)	(0.19)	(0.14)	(0.14)
ΔMAI^{pre}		−0.48**	−0.45**		0.00	0.01		−0.85***	−0.88***
		(0.20)	(0.18)		(0.09)	(0.09)		(0.32)	(0.33)
ΔEPU^{pre}			−0.09			−0.24***			0.14
			(0.11)			(0.07)			(0.16)
Surp			0.16			0.09			0.14
			(0.13)			(0.07)			(0.26)
Obs.	214	214	214	103	103	103	111	111	111
Adj-R^2	.00	.09	.10	.00	−.01	.05	.00	.18	.17

This table reports the results of the following regressions:

$$R_\tau = \alpha + \beta_1 \Delta MAI_\tau^{pre} + \beta_2 \Delta EPU_\tau^{pre} + \beta_3 Surp_\tau + \varepsilon_t, \text{ in panel A and}$$
$$\Delta VIX_\tau = \alpha + \beta_1 \Delta MAI_\tau^{pre} + \beta_2 \Delta EPU_\tau^{pre} + \beta_3 Surp_\tau + \varepsilon_t \text{ in panel B.}$$

The dependent variables R_τ and ΔVIX_τ correspond to the S&P 500 excess returns (in %) and the change in VIX on FOMC announcement dates, respectively. ΔMAI_τ^{pre} and ΔEPU_τ^{pre} are the preannouncement change in attention to monetary and economic policy uncertainty, respectively (see Equation (5)). $Surp$ is the Fed Fund surprise. ΔMAI_τ^{pre}, ΔEPU_τ^{pre}, and $Surp$ are rescaled to have a standard deviation of one. The asymptotic heteroscedasticity-robust standard errors are reported in parentheses. *p <.1; **p <.05; ***p <.01.

scheduled announcements benchmark. We use the regression framework:

$$R_\tau = \alpha + \beta_1 \Delta MAI_\tau^{pre} + \beta_2 \Delta EPU_\tau^{pre} + \beta_3 Surp_\tau + \varepsilon_t, \tag{7}$$

where R_τ is the S&P 500 excess return on announcement date τ, and the contemporaneous control $Surp_\tau$ is the “Fed Funds Surprise” from Kuttner (2001) and Bernanke and Kuttner (2005). We carry out subsample analyses, dividing into pre- and postcrisis periods, because of the enhanced role of monetary policy following the financial crisis (e.g., Gertler and Karadi 2011). To analyze announcement-date changes in implied volatility, we run similar analyses with the left-hand-side variable of Equation (7) replaced with ΔVIX_τ, the announcement-date change in VIX.

Table 7 presents the results, with panel A focusing on returns. Column 2, a univariate regression, shows that preannouncement attention positively predicts excess market returns on the FOMC announcement date. The coefficient for ΔMAI^{pre} is statistically significant at the 1% level, and the economic magnitude is large. A one-standard-deviation increase in ΔMAI^{pre} predicts an

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increase of 26 bps in the announcement-day excess market return. This point estimate is considerably larger than the 10-bps average difference between all announcement and nonannouncement days reported by Savor and Wilson (2013). Another useful comparison is that the coefficient for ΔMAI^{pre} is similar in size to the 28-bps average excess market return on scheduled FOMC announcement days in our sample (column 1). Finally, in column 2 versus column 1 the intercept is about one-third lower, 19 versus 28 bps. The column 2 intercept represents the expected risk premium when there is no preannouncement increase in attention, that is, $\Delta MAI^{pre}=0$. In other words, the average increase in attention prior to FOMC announcements explains about one-third of the total FOMC premium,[42] an object of considerable study (e.g., Lucca and Moench 2015; Ai and Bansal 2018). Predictability of FOMC announcement premiums by preannouncement attention is both statistically and economically important.

Panel A, column 3, controls for the preannouncement change in EPU and the Fed Funds surprise. The coefficient for attention remains largely unchanged and statistically significant at the 5% level. The coefficients for ΔEPU^{pre} and the Fed Funds surprise are both statistically insignificant, although the sign on the Fed Funds surprise is negative consistent with prior literature (e.g., Bernanke and Kuttner 2005).

The subsample results in panel A, columns 4–9, show interesting variation. Precrisis, from 1994 to 2006, attention does not predict the FOMC premium. However, the Fed Funds surprise is negative and statistically significant, consistent with Bernanke and Kuttner (2005). Prior EPU positively predicts excess announcement returns, suggesting that general economic policy uncertainty acts as an instrument for FOMC premiums in the precrisis period. Further, the intercept in column 6 falls to 9 bps, less than one-half of the mean in column 4, implying that the average increase in EPU prior to announcements explains about half of the subsample average FOMC premium. Postcrisis, the results are similar to the full sample results, but stronger. Prior attention strongly predicts FOMC premiums at the 1% level of significance. The economic magnitude is large. A one-standard-deviation change in ΔMAI^{pre} implies a 45-bps swing in the expected risk premium (column 8), larger than the sizeable and significant average FOMC premium of 36 bps in the postcrisis period (column 7). The intercept in column 8 is one-half as large as the subsample average (18 vs. 36 bps in column 7), implying that the average increase in attention prior to FOMC announcements explains about one-half the average premium in the subsample.[43] Neither EPU nor the Fed Funds surprise is statistically significant

42 The average increase in attention prior to announcements is $\overline{\Delta MAI}^{pre}=0.372$, statistically different from zero with a t-statistic of 5.44. From the standard formula, the change in the intercept from column 1 to column 2 is given by $-\hat{\beta}_1\times\overline{\Delta MAI}^{pre}=0.26\times 0.372$, which gives the observed drop of 9 bps.

43 The difference in the intercepts is given by $-\hat{\beta}_1\times\overline{\Delta MAI}^{pre}=0.45\times 0.390$, which equals the observed 18-bps drop.

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in the postcrisis period (column 9). Thus, the generalized uncertainty captured by EPU predicts FOMC premiums in the precrisis period, and attention is a powerful predictor in the entire sample and in the volatile postcrisis period where the FOMC premiums are largest.

Table 7, panel B, shows the same set of model specifications with ΔVIX as the dependent variable. The results are robustly consistent with the story presented by the return regressions. In the full sample, higher preannouncement attention predicts a larger decline in VIX on the announcement date, with significance at the 5% level. The economic magnitude is large, with a one-standard-deviation increase in attention forecasting a decline in VIX of 48 bps (column 2), of similar magnitude to the 55-bps average announcement-date decline in VIX (column 1). In the precrisis period, ΔEPU^{pre} predicts the decline in VIX and attention does not (column 6). In the postcrisis period, the predictive power of attention is very strong. A one-standard-deviation change in ΔMAI^{pre} forecasts an 85-bps decline in VIX (column 8), larger than the average decline in VIX on FOMC dates of 60 bps in the postcrisis period (column 7).

Overall, the employment and FOMC results show that prior attention can be an important predictor of the announcement-date excess market return and change in VIX. The economic magnitudes of the observed predictability are striking. For both employment and FOMC, a one-standard-deviation change in ΔMAI^{pre} predicts variation in announcement returns as large as the average announcement premium, which is an important focus of prior research (e.g., Savor and Wilson 2013; Ai and Bansal 2018).

3.3 Additional results and discussion

3.3.1 Postannouncement attention. Since attention is a persistent variable, one might wonder whether the predictive power of preannouncement attention relates to correlation between preannouncement and postannouncement attention. After all, Figure 4 shows that the spike in average attention is largest on the day *after* the announcement. One might then suspect that postannouncement attention has an even stronger correlation with announcement-date returns and change in VIX. To pursue this avenue, for both employment and FOMC announcements we create the additional variable $\Delta MAI_\tau^{post} \equiv MAI_\tau^{post} - MAI_\tau^{b}$, where MAI_τ^{post} is the level of attention on the day after the announcement, and MAI_τ^{b} is the same benchmark used for ΔMAI^{pre}. We also define $MAI_\tau^{post-pre} \equiv MAI_\tau^{post} - MAI_\tau^{pre}$, the difference between post- and preannouncement attention. Table 8 shows regressions that include these new variables, panel A for announcement returns and panel B for change in VIX.

The results of Table 8 are straightforward to summarize. Postannouncement attention is more weakly associated with announcement-date returns and change in VIX than preannouncement attention. For employment announcements (columns 2 and 3), postannouncement attention is not statistically

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Table 8
Pre- and post-attention to macroeconomic announcements

	Employment					FOMC				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
A. Dependent variable: R_τ										
ΔMAI^{pre}	0.12**		0.11**		0.08	0.26***		0.23**		0.26***
	(0.05)		(0.05)		(0.05)	(0.10)		(0.09)		(0.10)
ΔMAI^{post}		−0.08	−0.08				0.19*	0.08		
		(0.05)	(0.05)				(0.10)	(0.09)		
$\text{MAI}^{post-pre}$				−0.10**	−0.07				0.07	0.07
				(0.04)	(0.05)				(0.08)	(0.08)
Intercept	0.03	0.05	0.03	0.11*	0.08	0.19***	0.05	0.10	0.20**	0.10
	(0.05)	(0.05)	(0.05)	(0.06)	(0.06)	(0.07)	(0.11)	(0.11)	(0.10)	(0.11)
Obs.	485	485	485	485	485	214	214	214	214	214
Adj-R^2	.01	.00	.01	.01	.01	.05	.02	.05	−.00	.05
B. Dependent variable: ΔVIX_τ										
ΔMAI^{pre}	−0.21***		−0.21***		−0.17*	−0.48**		−0.39**		−0.48**
	(0.08)		(0.08)		(0.09)	(0.20)		(0.18)		(0.19)
ΔMAI^{post}		0.10	0.09				−0.37**	−0.19		
		(0.08)	(0.08)				(0.16)	(0.12)		
$\text{MAI}^{post-pre}$				0.14**	0.08				−0.17	−0.17
				(0.06)	(0.07)				(0.11)	(0.10)
Intercept	−0.31***	−0.33***	−0.30***	−0.41***	−0.35***	−0.37***	−0.08	−0.16	−0.34**	−0.16
	(0.08)	(0.08)	(0.08)	(0.09)	(0.10)	(0.08)	(0.17)	(0.15)	(0.14)	(0.15)
Obs.	371	371	371	371	371	214	214	214	214	214
Adj-R^2	.02	.00	.02	.01	.02	.09	.05	.10	.01	.10

This table reports the results of the following ordinary least squares (OLS) regressions:

$$R_\tau = \alpha + \beta_1 \Delta MAI_\tau^{pre} + \beta_2 \Delta MAI_\tau^{post} + \beta_3 MAI_\tau^{post-pre} + \varepsilon_t, \text{ in panel A and}$$

$$\Delta VIX_\tau = \alpha + \beta_1 \Delta MAI_\tau^{pre} + \beta_2 \Delta MAI_\tau^{post} + \beta_3 MAI_\tau^{post-pre} + \varepsilon_t \text{ in panel B.}$$

The dependent variables R_τ and ΔVIX_τ correspond to the S&P 500 excess returns (in %) and the change in VIX on Employment and FOMC announcement dates, respectively. ΔMAI_τ^{pre} is the preannouncement change in attention defined in Equation (5); ΔMAI^{post} is the change in macroeconomic attention 1 day after the announcement relative to the benchmark; and $MAI^{post-pre}$ is the difference between ΔMAI^{post} and ΔMAI_τ^{pre}. The variables are rescaled to have a standard deviation of one. The results for employment situation with the unemployment MAI and FOMC announcements with the monetary MAI are reported in columns 1âŁ"5 and 6âŁ"10, respectively. The asymptotic heteroscedasticity-robust standard errors are reported in parentheses. The sample period for employment situation announcements is from June 1, 1980, to December 31, 2020, and from January 1, 1994, to December 31, 2020, for FOMC announcements. *p <.1; **p <.05; ***p <.01.

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Table 9
Postannouncement attention following good and bad news

	$N=3$		$N=10$		$N=20$	
	(1)	(2)	(3)	(4)	(5)	(6)
A. Employment announcements						
$\mathbb{1}_{R_\tau<0}$	0.17***		0.10**		0.10**	
	(0.06)		(0.05)		(0.05)	
R_τ		−0.08***		−0.07***		−0.06***
		(0.03)		(0.02)		(0.02)
$\|R_\tau\|$		0.02		0.01		0.02
		(0.04)		(0.03)		(0.03)
Intercept	0.11**	0.17***	−0.04	−0.00	−0.05	−0.02
	(0.04)	(0.05)	(0.03)	(0.04)	(0.03)	(0.03)
Obs.	486	486	486	486	485	485
Adj-R^2	.01	.01	.01	.02	.01	.01
B. FOMC announcements						
$\mathbb{1}_{R_\tau<0}$	0.19*		0.18*		0.18**	
	(0.11)		(0.09)		(0.09)	
R_τ		−0.11**		−0.08*		−0.07*
		(0.05)		(0.04)		(0.04)
$\|R_\tau\|$		0.24***		0.08		−0.02
		(0.07)		(0.05)		(0.05)
Intercept	0.68***	0.59***	−0.07	−0.03	−0.18***	−0.07
	(0.08)	(0.07)	(0.07)	(0.06)	(0.06)	(0.06)
Obs.	215	215	215	215	214	214
Adj-R^2	.01	.04	.01	.00	.01	.01

This table reports the results of the following ordinary least squares (OLS) regressions:

$$MAI^{post,N-pre}=\alpha+\beta_1\mathbb{1}_{R_\tau<0}+\varepsilon_\tau \text{ and}$$
$$MAI^{post,N-pre}=\alpha+\beta_1 R_\tau+\beta_2|R_\tau|+\varepsilon_\tau.$$

$MAI^{post,N-pre}$ corresponds to the average postannouncement MAI from the day after the announcement until N minus MAI^{pre}, where MAI^{pre} is the average 3-day MAI prior to the announcement. We present the results for N equal to 3, 10, and 20 days. R_τ ($|R_\tau|$) is the announcement date (absolute) return and $\mathbb{1}_{R_\tau<0}$ is a binary variable equal to one if the announcement return is negative and zero otherwise. The results for employment and FOMC announcements are reported in panels A and B, respectively. The asymptotic heteroscedasticity-robust standard errors are reported in parentheses. The sample period for Employment Situation announcements is from June 1, 1980, to December 31, 2020, and from January 1, 1994, to December 31, 2020, for FOMC announcements. *p <.1; **p <.05; ***p <.01.

significant in any regression. For FOMC announcements, the univariate regressions with ΔMAI^{post} are statistically significant (column 7), but in bivariate regressions ΔMAI^{pre} drives postannouncement attention out (column 8). The other columns explain why ΔMAI^{post} has a weaker relationship with announcement returns and ΔVIX than ΔMAI^{pre}. The change in attention from preannouncement to postannouncement, $MAI^{post-pre}$, either moves negatively with announcement returns and positively with VIX (employment, column 4) or is noise (FOMC, column 9). In both cases, $MAI^{post-pre}$ does not reenforce the predictive ability of ΔMAI^{pre}, and as a result ΔMAI^{post} has a weaker association with announcement-date returns and changes in VIX, even though it contains postannouncement information.

To further understand the change in attention on the announcement date, we consider postannouncement attention over longer windows. Let $MAI_\tau^{post,N}$ be

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the average attention from one to N days after the announcement, and denote the change in attention $MAI_\tau^{post,N-pre} \equiv MAI_\tau^{post,N} - MAI_\tau^{pre}$. For simplicity, we partition employment and FOMC announcements into "good news" ($R_\tau \geq 0$) and "bad news" ($R_\tau < 0$) and use the indicator variable $\mathbb{1}_{R_\tau<0}$ for bad news. For postannouncement windows of size $N \in \{3, 10, 20\}$, Table 9 regresses the change in attention $MAI_\tau^{post,N-pre}$ on a constant and the bad news indicator. For comparison, we also use a specification where the right hand-side variables are the announcement-day return itself R_τ and its absolute value, similar to the fundamental regressions in Section 2.2. The results are striking. In all specifications, bad news on the announcement date raises attention relative to good news.[44]

We summarize the two key empirical results relating attention to announcement returns: (a) high *preannouncement* attention predicts high announcement-date market returns, and (b) oppositely, bad news ($R_\tau < 0$) raises *postannouncement* attention. This asymmetric relationship between pre- and postannouncement MAI and the announcement return recalls earlier empirical studies and theories of the relationship between ex ante versus ex post volatility and stock returns (e.g., French, Schwert, and Stambaugh 1987; Campbell and Hentschel 1992). In these studies, high uncertainty *predicts* high risk premiums and high returns, while increased uncertainty tends to *follow* bad news and low returns. A large literature has investigated and built on this phenomena both theoretically and empirically.[45] We document a similar but novel asymmetry in the relationship between pre- and postannouncement macroeconomic attention and announcement returns.

A final lens through which one might view our results is the idea of future information risk (Farboodi and Veldkamp 2020). While not a theory of announcement premiums, this research contains the idea that future data need not only resolve uncertainty but also reveal new concerns and raise uncertainty. The high preannouncement attention we document could relate to future information risk. Existing theories of announcement premiums focus on the information revealed on or immediately prior to the announcement date (e.g., Ai and Bansal 2018; Wachter and Zhu 2021; Ai, Bansal, and Han 2021). In these theories, there would be little benefit to investors paying attention immediately after announcement information is learned. Our results show that announcement-date bad news raises attention more than good news. It should be illuminating to incorporate future information risk, with endogenously higher change in attention following bad announcement news, into theories of announcement risk premiums.

44 The significance ranges from 1% to 10% across specifications in two-tailed test. One-tailed tests are appropriate under the null of no increase in attention after bad news, which is justified by theory, and would cut the significance levels in half.

45 See, for example, Pindyck (1984), Poterba and Summers (1985), Bekaert and Wu (2000), Bansal and Yaron (2004), Calvet and Fisher (2007), Bansal, Kiku, and Yaron (2012), Beeler and Campbell (2012), and Bansal et al. (2014).

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Table 10
GDP and inflation announcements and returns

	GDP announcements						*Inflation announcements*					
	R_τ			ΔVIX_τ			R_τ			ΔVIX_τ		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Intercept	0.08*	0.08*	0.08	−0.17**	−0.18**	−0.17**	−0.00	−0.00	−0.01	−0.02	−0.03	−0.02
	(0.05)	(0.05)	(0.05)	(0.08)	(0.08)	(0.08)	(0.05)	(0.05)	(0.06)	(0.09)	(0.09)	(0.09)
ΔMAI^{pre}		0.05	0.04		−0.07	−0.07		0.01	0.01		0.07	0.06
		(0.05)	(0.05)		(0.06)	(0.06)		(0.05)	(0.05)		(0.07)	(0.07)
ΔEPU^{pre}			0.02			−0.15			−0.06			0.05
			(0.08)			(0.11)			(0.09)			(0.15)
Obs.	448	448	407	345	345	345	472	472	418	361	361	361
Adj-R^2	−.00	−.00	−.00	.00	−.00	.01	.00	−.00	−.00	−.00	−.00	−.00

This table reports the results of the following regressions

$$R_\tau = \alpha + \beta_1 \Delta MAI_\tau^{pre} + \beta_2 \Delta EPU_\tau^{pre} + \varepsilon_t \text{ and}$$

$$\Delta VIX_\tau = \alpha + \beta_1 \Delta MAI_\tau^{pre} + \beta_2 \Delta EPU_\tau^{pre} + \varepsilon_t .$$

The dependent variables R_τ and ΔVIX_τ correspond to the S&P 500 excess returns (in %) and the change in VIX on GDP and inflation announcement dates, respectively. ΔMAI_τ^{pre} (see Equation (5)) is the preannouncement change in attention to GDP in columns 1–6 and inflation in columns 7–12. ΔEPU_τ^{pre} is the preannouncement change in EPU. The variables are rescaled to have a standard deviation of one. For inflation announcements (CPI and PPI announcements), we select on each month the announcement that occurs first for that given month. For GDP announcements, we consider all announcements, that is, advance, preliminary, and final GDP announcements. The asymptotic heteroscedasticity-robust standard errors are reported in parentheses. The sample period is from June 1, 1980, to December 31, 2020. *p <.1; **p <.05; ***p <.01.

3.3.2 GDP and inflation announcements. For comparison with the employment and FOMC announcements, we provide results for GDP and inflation. Consistent with the literature (e.g., Hu et al. 2021), we group all GDP announcements together.[46]

Table 10 reports results. For GDP, average returns are 8 bps, statistically significant at the 10% level, and the average change in VIX is -17 bps and statistically significant at the 5% level (columns 1 and 4). The coefficients for preannouncement attention are positive and negative in columns 2 and 5, respectively, but not statistically significant. For VIX, the coefficient for EPU is negative, but not statistically significant (column 6). These results are in the same direction as the results for employment and FOMC announcements, but none is statistically significant. For inflation, none of the results is statistically significant or in a similar direction to the other announcements.

Why are some types of macroeconomic announcements different than others? FOMC announcements are the most widely researched in the literature, have the largest average risk premiums, and the strongest predictability by prior attention. FOMC announcements differ from other announcements because they are not purely data releases, but also reflect policy. Employment announcements have been considerably emphasized (e.g.,

46 We also do not find significant results if we look at the advance, preliminary, and final GDP announcements separately.

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Boyd, Hu, and Jagannathan 2005; Ai and Bansal 2018), and employment concerns may be particularly salient to newspaper readers. Our approach of measuring attention through newspaper articles therefore may be well-suited to employment. In comparison, GDP announcements may have less variation in their importance, or our measure of GDP attention may not be as effective in identifying GDP concerns. Additionally, the sample period may matter. It would be interesting to have data extending back to the 1970s, when inflation concerns were stronger, to see whether attention might better predict inflation-announcement returns in that period.

Two of our earlier empirical results appear consistent with the differences in the predictive ability of the MAI measures across the different announcement types. First, Figure 4 shows that FOMC and employment announcements have the strongest average increase in attention prior to announcements, whereas the inflation and GDP MAI increase on average mostly on and after the announcement day. Second, Table 5 shows that the explanatory power of prior changes in fundamentals for attention is very high for employment ($R^2 = .51$), moderate for monetary (.23) and inflation (.18), and very low for GDP growth (.01). Methodological improvements, through alternative key words or other methods, could plausibly improve identification of variation in attention and announcement premiums.

In sum, our results may differ across the types of announcements for at least a few reasons: employment, FOMC, GDP, and inflation. First, different types of announcements may have different average risk premiums and variation in risk premiums. Second, the MAI may be more effective measures of attention for some types of risks compared to others. Third, the sample period may matter. We hope that future research will further illuminate these possibilities and any others that shed light on the connection between macroeconomic attention and announcement risk premiums.

4. Conclusion

We construct macroeconomic attention indexes (MAI), new measures of attention to different macroeconomic risks, such as unemployment and monetary policy, using news articles from the NYT and WSJ. On average, attention to a particular macroeconomic risk spikes around related scheduled announcements and responds to changes in related fundamentals. Large changes in fundamentals in either direction increase attention, and bad news raises attention more than good news. Our analysis validates distinct measures of attention to different types of macroeconomic news, which should be useful for many future applications in finance and economics.

For FOMC and employment announcements, average attention increases in the days before the related scheduled announcement. Further, for each type of announcement, higher preannouncement attention predicts higher returns and larger decline in VIX on the announcement date. The economic magnitude of

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the predictability from attention is large, with a one-standard-deviation swing in attention predicting variation in returns as large or larger than the average announcement premium, which has been a significant topic of study (e.g., Savor and Wilson 2013; Ai and Bansal 2018).

Our results are consistent with important aspects of theories of endogenous attention (e.g., Bansal and Shaliastovich 2011; Kacperczyk, Van Nieuwerburgh, and Veldkamp 2016) and announcement risk premiums (e.g., Ai and Bansal 2018; Wachter and Zhu 2021). Both endogenous attention and announcement premiums are driven by uncertainty and the price of risk, so higher preannouncement attention is a natural instrument for the announcement-date return and decline in VIX. We show this channel to be significant, both statistically and economically. Motivated partly by our empirical results, Ai, Bansal, and Han (2021) develop a theory of endogenous attention and announcement risk premiums based on asymmetric information.

Existing theories of announcement risk premiums imply greatest incentive for investors to acquire information immediately before scheduled announcements, but little incentive to acquire information immediately after announcements. Motivated partly by the idea of future information risk (e.g., Farboodi and Veldkamp 2020), we investigate attention *after* announcements. Bad news on the announcement date raises attention more than good news. Therefore, announcements may be important not only for resolving uncertainty but also for resolving new concerns. Extending theories of announcement risk premiums to capture future information risk should be fruitful.

While we show that attention predicts announcement risk premiums, we do not claim that attention *causes* the announcement-date returns and decline in VIX, in an economic sense. From a theoretical point of view, attention rises when risk premiums are high, and so it can be a useful empirical instrument, as our results show. But it does not explain what caused risk premiums to rise in the first place. We hope that by establishing a powerful instrument, macroeconomic attention, our work will help future researchers make further progress in understanding what causes macroeconomic risk premiums to rise.

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