Long Live Hermes! Mercury Retrograde and Equity Prices

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Abstract

Astrology suggests that Mercury Retrograde adversely affects financial gain. We study the effect of Mercury Retrograde on equity prices. Using 48 countries' stock market indexes, we find that stock market returns are annually 3.33% lower during Mercury Retrograde periods than in other periods. To explain this effect, we propose an investor belief channel: investors who hold an astrological belief that Mercury Retrograde can negatively affect their financial gain will stay away from the market. Such belief results in a higher risk premium required by the remaining investors for sharing more risk. We confirm that ancient Greek culture is the source of investors' astrological belief in Mercury Retrograde.

Keywords: Mercury Retrograde; culture; asset pricing; international finance
JEL classification: G12, G15, Z10

"*Mercury Is in Retrograde. Don't Be Alarmed*."

– Mar 16, 2019, The New York Times

1. Introduction

Since the recorded history, the motions of the planets have fascinated human beings. They are used to explain and predict how people behave in society and how the world works.[1] Among all the planets in the solar system, Mercury is the swiftest one and also the closest to the Sun. The backward motion of Mercury, called Mercury Retrograde, is a popular astronomical phenomenon observed from the Earth. In this study, we investigate the effect of Mercury Retrograde on equity markets.

Retrograde refers to a perceived reversal in the standard west-to-east movement of planets as viewed from the Earth. As the most famous retrograde, Mercury Retrograde occurs three to four times per year with each retrograde period lasting three to four weeks. During Mercury Retrograde periods, the fast-moving planet Mercury (a year on Mercury is 88 Earth days) laps Earth and appears to move "backward" (from east to west) across the sky.

The sentiment of "backward" is negative. Because in myths the planet Mercury represents the god of financial gain, commerce, communication, and traffic, astrologers draw an analogy between macrocosm and mythology and posit that Mercury Retrograde would cause disasters in financial gain, commerce, communication, and traffic (e.g., Gillen, 1979; Bost, 2012). In equity markets, investors' financial gain is positively linked with equity prices. If astrologers' conjecture is correct, we may expect equity prices to decline when Mercury is retrograde. In other words, stock market returns should be lower during Mercury Retrograde periods than during the remainder of the year. We call this possibility the *Mercury Retrograde hypothesis*.

To investigate how equity prices react to Mercury Retrograde, we regress daily realized stock market index returns on an indicator variable for Mercury Retrograde periods using a sample of 48 countries between January 1, 1973 and October 31, 2019. Consistent with the *Mercury Retrograde hypothesis*, we find that stock market returns are annually 3.33% lower during Mercury Retrograde periods than during the remainder of the year. This finding is robust to alternative time

[1] Throughout history, people believe that the motions of the planets can influence their lives. Such planetary motion theory has been bonding with ancient Greek mythology, thus it has been handed down and widely recognized by the modern world (e.g., Evans, 1999; Beck, 2008).

windows of Mercury Retrograde, various subsamples, controlling for other market return puzzles, and adjusting multiple comparison problems.

Does the above finding really show that the astrological theory of Mercury Retrograde is true? To understand the *Mercury Retrograde hypothesis*, we propose the two channels to underlie the potential explanation of the hypothesis, namely, the *astrological theory channel* and the *investor belief channel*. The *astrological theory channel* posits that the astrological theory of Mercury Retrograde is correct. That is, Mercury Retrograde would affect all the activities governed by Mercury such as financial gain, traffic, and commerce in an adverse way (McGuirk, 2016; Crockford, 2018; Boland and Farnell, 2019). If Mercury Retrograde has a negative effect on financial gain in terms of equity prices, it should also have the similar negative effect on traffic and commerce, and vice-versa.

The *investor belief channel* assumes that investors believe the astrological theory of Mercury Retrograde no matter whether the theory is correct. Investors form the belief that they are likely to lose money from buying when Mercury is retrograde. To avoid financial loss in equity markets, they are better off not participating in the market (Gillen, 1979; Bost, 2012; Boland and Farnell, 2019). This belief would cause low investor participation. For example, on February 20, 2013, Seeking Alpha, Jeff Pierce suggests that "During the Mercury retrograde I will advise caution while executing trades so as not to make an error in executing the trade or acting on impulse."[2] To compensate the remaining investors for sharing more risks, equity markets need to offer a higher risk premium, which results in low equity prices (e.g., Merton, 1987; Duffie, 2010).

We start with the *astrological theory channel*. The study of this channel is similar to testing whether Mercury Retrograde has a negative impact on traffic- and commerce-related activities. We use traffic accidents to proxy for traffic-related activities and firm-specific news to proxy for commerce-related activities. We find an insignificant effect of Mercury Retrograde on traffic accidents. We also show that firm-specific news, as measured by the average firm-specific news sentiment and firms' earnings surprises, is not more negative during Mercury Retrograde periods. These results together are not consistent with the *astrological theory channel*.

To explore the *investor belief channel*, we identify the likelihood of investors holding the astrological belief in Mercury Retrograde. First, we use a country's average daily return in the

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[2] See, https://seekingalpha.com/instablog/284362-jeff-pierce/1573371-financial-astrology-mercury-retrograde-coming.

previous year's Mercury Retrograde periods to measure the strength of investors' belief in Mercury Retrograde. The motivation comes from 1) the persistence of investors' astrological belief (Sales, 1973; Padgett and Jorgenson, 1982), and 2) the increase in investors' astrological belief if stock market returns are consistent with the predictions of astrological theory (e.g., low returns during Mercury Retrograde periods). We find that a country that has performed poorly relative to other countries in the previous Mercury Retrograde periods offers an even lower return relative to other countries in the current Mercury Retrograde periods. This result provides the initial evidence supporting the *investor belief channel*.

Second, we measure investors' astrological belief based on Google Trends' search volume intensity. Investors' Internet search behavior reflects their attitudes and cognition towards an event (e.g., Da, Engelberg, and Gao, 2011; Gao, Ren, and Zhang, 2018). In particular, we use Google Trends' search volume intensity for the topic "Retrograde motion" to capture investors' belief in Mercury Retrograde. We find that the search volume index of the topic "Retrograde motion" negatively predict future market returns. Furthermore, we perform a cross-country difference test by using the "interest by region" function in Google Trends to track the cross-country search interests in the above topic. The Mercury Retrograde effect is stronger in countries with a higher level of this search topic. These results provide support for the *investor belief channel*.

After identifying the *investor belief channel* that underlies the *Mercury Retrograde hypothesis*, we further explore why investors form the astrological belief in Mercury Retrograde. We consider ancient Greek culture as the source of the astrological belief for three reasons. First, the planet Mercury was associated with the swift messenger of the gods, Hermes, in Greek myth (Highet, 1949; Campion, 2009; Rothery, 2014). Second, astrological theory of Mercury Retrograde has been bonding with ancient Greek culture (Guttman, Guttman, and Johnson, 1993; Beck, 2008).[3] Third, ancient Greek culture is one of foundational elements to Western culture and becomes an accepted part of popular culture after the New Age (Highet, 1949). Collectively, investors influenced by ancient Greek culture are more likely to hold the belief in Mercury Retrograde.

We construct both *ex post* and *ex ante* proxies for the degree of people influenced by ancient Greek culture. Specifically, we use each country's Google search volume for the topics "Ancient

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[3] Beck (2008) notes that astrological beliefs in planet motions are about how the ancient Greeks searched for meaning and significance in the phenomena of the visible heavens. They linked the phenomena of the visible heavens to their myths, and therefore, astrological beliefs in planet motions also called mythic astrology (Guttman, Guttman, and Johnson, 1993).

Greece," "Mythology," and "Hermes (the god of messenger in Greek myth)" to measure the *ex post* influence of ancient Greek culture.[4] Consistent with our prior, we find that countries with a greater *ex post* influence of ancient Greek culture experience a larger decline in equity prices during Mercury Retrograde periods.

Next, we follow the historical literature to develop the *ex ante* proxy for the influence of ancient Greek culture. We define a country as the one with the *ex ante* influence of ancient Greek culture if 1) the country has even been an ancient Greek colony and 2) the country's primary religion is Christianity. The rationale is as follows: first, colonialism deprives the colonized people of their cultural rights and identities, and builds a new culture for the colonized country (Ferro, 2005); second, the common way to build a new culture is to introduce new religious beliefs because religion plays a central role in shaping people's beliefs and actions (Page and Sonnenburg, 2003); third, among various religions, Christians hold values and wrote works that rest on ancient Greek culture, suggesting that Christianity is closely related to ancient Greek culture (e.g., Dowden and Livingstone, 2011; Gleaves, 2015). Consistently, we find that countries with an *ex ante* influence of ancient Greek culture have a stronger Mercury Retrograde effect on equity prices.

We further investigate the reason why the above ancient culture still has a long-lasting effect on investors from some countries nowadays. One explanation we provide is the heterogeneity in scientific development across countries. Astrology was a permanent ingredient in ancient Greek culture, because it was scientific in ancient times (e.g., Thorndike, 1955; Alfvén, 1984; Campion, 2015). However, after the Scientific Revolution in the 15th century, astrology lost its scientific validity under the natural law of gravitation (e.g., Carlson, 1985; Zarka, 2009). Such change fundamentally shakes astrology and leads to a negative relationship between the astrological belief and scientific development in modern societies.[5] Consistent with this negative relationship, we find that the Mercury Retrograde effect is stronger in countries with a lower level of scientific development level. Importantly, this impact of scientific development on the Mercury Retrograde effect is more pronounced in countries with the *ex ante* influence of ancient Greek culture. Furthermore, given that scientific development and superstition beliefs are negatively correlated, great superstition beliefs should also enhance the Mercury effect. Such prediction is confirmed in

[4] More discussion about the names of the god of messenger and the planet (Hermes) is discussed in section 2.1 below.
[5] Specifically, after the impetus of the Scientific Revolution, the planetary motions have gradually developed into modern astronomy (e.g., the universal law of gravitation), parting ways from the planetary theory of mythology view.

our further test. Overall, these results suggest that investors' *astrological belief* comes from the influence of ancient Greek culture.[6]

Finally, we provide additional tests to validate our *investor belief channel*. First, our *investor belief channel* predicts low trading volume in Mercury Retrograde periods because in these days investors avoid participation in equity markets. We provide direct evidence that trading volume is significantly lower during Mercury Retrograde periods than other periods. Second, we find that market reaction to aggregate news is significantly reduced in Mercury Retrograde periods, further confirming the low market participation those days. Third, the *investor belief channel* implies an increase in the price of risk rather than the level of risk, which is also documented in our analysis. Fourth, we find no evidence that the Mercury Retrograde effect relates to investor sentiment.

We contribute to two streams of the literature. Our paper is among the first to investigate the effect of Mercury Retrograde on global equity markets. Astrology studies show that Mercury Retrograde is a feature of the social spiritual since people believe that "it is the time when everything goes crazy" (e.g., Guttman, Guttman, and Johnson, 1993; Crockford, 2018; Boland and Farnell, 2019). However, despite the attention Mercury Retrograde has received, evidence for the Mercury Retrograde effect in general is not conclusive due to the lack of precise tests. By studying the relationship between Mercury Retrograde and equity prices, this paper shows direct evidence of the Mercury Retrograde effect on behavior. Broadly speaking, we also add to the early studies in celestial phenomena such as moon phases. These studies show that celestial phenomena affect stock market returns either through biological issues such as investor sentiment (e.g., Dichev and Janes, 2003; Yuan, Zheng, and Zhu, 2006; Keef and Khaled, 2011), or due to spurious regressors (Novy-Marx, 2014). However, our study differs from these studies in the following ways. First, instead of showing the biological effect of celestial phenomena, we find that investors' belief in a celestial phenomenon affects market returns. Second, any spurious regressors in prior celestial phenomena studies are likely due to the lack of economic mechanisms,[7] making investor belief channel useful in revisiting return predictability of celestial phenomena.

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[6] Given that scientific development could be positively correlated with financial literacy, our results are consistent with Rooij, Lusardi, and Alessie (2011), who find that investors with high literacy have better financial decision-making: Those with high literacy are more likely to invest in stocks. These results are also consistent with Bikhchandani, Hirshleifer, and Welch's (1992) cascade theory: the adoption of a nonstandard belief depends on its early exponents' reputation.

[7] In the early version of Novy-Marx (2014), he presented celestial phenomena in the context of spurious regressors since there is no prior motivation for the properties that celestial phenomena themselves exhibit empirically as predictors of anomaly returns.

Second, we contribute to the literature that studies the role of culture on equity prices. These cultural characteristics include the cultural framework from Hofstede and Schwartz, religion, and local festivals (e.g., Chui, Titman, and Wei, 2010; Kumar, Page, and Spalt, 2011; Hillert, Jacobs, and Muller, 2014; Bergsma and Jiang, 2016; Cheon and Lee, 2018). A unique feature of our setting is to study both a cross-country and time-varying cultural effect, which allows us to mitigate the influence of national and institutional factors. The repeated exogenous shocks of Mercury Retrograde on investors' trading behavior help us draw a causal inference and emphasize the importance of culture in equity returns. Importantly, our results imply that any cultural factors can influence the stock market as long as investors believe it and behave accordingly.

The remainder of this paper is organized as follows. Section 2 describes the research design. Section 3 presents our baseline results and channels. Section 4 discusses whether culture drives our results. Section 5 explains the tests for the effect of Mercury Retrograde on other market variables. The last section concludes.

2. Research design

2.1. Mercury Retrograde and hypothesis development

The belief that motions of the planets affect people's lives has prehistoric origins and flourishes in the modern world.[8] Such planetary motions can be summarized into two motions: prograde (forward) and retrograde (backward). In astrology, "retrograde" typically means negative, and therefore, astrologers believe that the magnetic field of planets' retrogradations can adversely affect people's lives in a substantial and unambiguous way (Guttman, Guttman, and Johnson, 1993). Even though there are many planets' retrogradations, it is Mercury Retrograde, which happens in the highest frequency, has earned a reputation in astrological beliefs (Guttman, Guttman, and Johnson, 1993; Crockford, 2018).

Scientifically, Mercury Retrograde is an astronomical phenomenon from Earth, nonetheless Mercury Retrograde is nothing but an optical illusion. Figure 1 shows the concept of Mercury Retrograde. Both Mercury and Earth move in the same direction. Because Mercury is closer to the sun, it moves faster than Earth. A year on Mercury is typically 88 Earth days, and a year on Earth

[8] For example, Gallup polls reports that more than 25% of the U.S. population believes the position of the stars and planets could affect people's lives. The National Science Foundation (2002) finds that more than 15% of the survey respondents admitted reading newspaper astrology every day or "quite often."

is 365 days. Therefore, Mercury can lap Earth (next to Earth on the same side of the sun) three to four times annually. When Mercury laps Earth, Mercury appears to move east to those on Earth (retrograding). The dash lines in Figure 1 show our view of Mercury against the fixed background of stars. As Mercury passes us, our line of sight shifts so that for about three to four weeks, Mercury appears to loop back on itself when viewed from Earth. Hence, the phenomenon is simply a function of two objects orbiting in the same direction at different speeds. If we stood on Mercury, we would see Earth make an apparent loop too.

[Figure 1 here]

Astrologically, Mercury Retrograde is when everything goes crazy, and individuals should not buy anything or make any decisions. This belief receives well attention in the modern time. For example, a Mar 2019 issue of The New York Times instructed its readers: "Mercury Is in Retrograde. Don't Be Alarmed."[9] Such astrological belief has been bonding with ancient Greek mythology (e.g., Evans, 1999; Beck, 2008).[10] Hence, the name and roles of the planets come from Greek gods. The ancient Greeks noticed that the planet Mercury is the swiftest planet among all others, so the planet was named after the god of messenger, Hermes (Rothery, 2014).[11] According to the Greek myths, Hermes rules financial gains, commence, communication (decision makings), and traffic (Brown, 1990).[12] Based on Hermes' roles, astrologers believe that Mercury Retrograde has negative impacts in those areas as well (Gillen, 1979; Bost, 2012; Crockford, 2018).

Given that Mercury Retrograde has a negative impact on financial gains (one of Hermes' roles), the importance of Mercury Retrograde for equity markets has been known for some time (Dewey, 1970; Gillen, 1979; Bost, 2012). For instance, the famous astrology analyst Raymond Merriman

[9] "Do not sign contracts. Do not buy electronics, or anything with moving parts or gears. Do not be surprised if the mail is screwed up, or something goes awry when you're in transit. And be mindful: You're liable to forget something, like your glasses or phone." https://www.nytimes.com/2019/03/14/style/mercury-retrograde-facts.html. Such Mercury Retrograde belief that reported in newspapers can at least dates from the 1970s. For example, an April 1979 issue of The Baltimore Sun instructed its readers: "Don't start anything when Mercury is retrograde. https://www.newspapers.com/newspage/373462725/."

[10] While these astrological beliefs were first recorded in Babylon's history, they were developed by ancient Greeks. Thus ''ancient astrology'' means essentially ''Greek astrology.'' (Beck, 2008).

[11] After the ancient Roman's conquest of the Mediterranean area, they started to promote the Latin language. They were impressed by the ancient Greek culture, so they followed the ancient Greek Olympian pantheon, but renaming the gods in Roman style with Latin words (Eyres, 2017). The planet Hermes started to be known as Mercury, which has the same meanings in the Roman myths (Bird, 1992; NASA, 2019).

[12] Hermes rules financial gains because he is Guide of Souls, who appears as the thief, and in people's sense of loss money in order for the equation "money = psyche" to return again (Hillman, 1982). Moreover, Hermes also carries a purse, which signifies his role as the Greek god of riches, trade, and good fortune, for example, see https://www.eso.org/public/outreach/eduoff/vt-2004/mt-2003/mt-mercury-mythology.html.

often used Mercury Retrograde to analyze the performance of financial markets.[13] In equity markets, investors' financial gain is positively linked with equity prices. Therefore, if astrologers' conjecture is correct, we may expect equity prices to decline when Mercury is retrograde. In other words, stock market returns should be lower during Mercury Retrograde periods than during the remainder of the year. We call this possibility the *Mercury Retrograde hypothesis*:

H1: Mercury Retrograde negatively affects market returns.

Ex ante, accepting the *Mercury Retrograde hypothesis* does not necessarily indicate that the astrological theory of Mercury Retrograde is true. It could come from two channels. Suppose the astrological theory of Mercury Retrograde is true. In that case, all these fields ruled by Mercury will be negatively affected by Mercury Retrograde, not only financial losses made during that period of time. For example, as suggested by astrologers, Mercury Retrograde might indeed have a negative effect on traffic- and commence-related activities. Then, the number of flight accidents would increase, firms would generate certain fundamental losses, and market return will be lower associated with financial losses. We will test this *astrological theory* channel to see whether the astrological theory of Mercury Retrograde holds.

Alternatively, it could also be the belief to the investors. Astrologers believe that if investors are buying assets during Mercury Retrograde periods, they are more likely to make financial losses. Hence, they suggest that investors are better off staying away from the market to avoid buying (Gillen, 1979; Bost, 2012; Boland and Farnell, 2019). For example, Gillen (1970, pp xviii) notes, "Retrograde motion is usually an unfavorable period as far as buying stocks ··· Retrograde motion means that movement of event will go backward. Therefore, when you purchase a stock at that time, it will not go the way you want." This belief could result in low market returns.

To see this effect, we assume that two groups of investors bear the risk in the economy. The first group holds the above astrological belief (Mercury investors), and the remaining investors do not. Since Mercury investors believe that they should avoid buying during Mercury Retrograde, they do not participate in the market during Mercury Retrograde periods. This behavior causes an unanticipated negative shift in the number of the first group on those days, which decreases the risk-bearing capacity in the economy. Hence, the remaining investors in the market are only

[13] For example, see http://stariq.com/Main/Articles/P0005305.HTM.

willing to bear the risk if they compensate for a higher risk premium. This effect will reduce prices during Mercury Retrograde. Therefore, we would observe lower market returns during the Mercury Retrograde period than during the remainder of the year. We call this view the *investor belief* channel: market returns are low in Mercury Retrograde because investors who hold an astrological belief of Mercury Retrograde do not participate in the market during the period of Mercury Retrograde. The *investor belief* channel predicts that the negative Mercury Retrograde-stock market return relationship should be stronger in countries with higher belief in Mercury Retrograde.

Testing the *investor belief* channel needs to consider why some investors believe in Mercury Retrograde and others do not. We propose that ancient Greek culture could be a crucial driver for the investor belief channel. The main idea is that the astrological belief in Mercury Retrograde relates to ancient Greek culture, which is one of the foundational to Western culture in general (Highet, 1949). The ancient Greeks searched for meaning and significance in the phenomena of the visible heavens by linking the phenomena to their myths; therefore, astrological beliefs in planet motions, also called mythic astrology or ancient Greek astrology (Guttman, Guttman, and Johnson, 1993; Beck, 2008).[14] Because mythic astrology helped ancient Greeks' understanding of the nature of the universe, it was an important and permanent part of ancient Greek culture (e.g., Thorndike, 1955; Alfvén, 1984; Campion, 2015). Given that ancient Greek culture is popular worldwide, Mercury Retrograde might produce substantial astrological belief swings in a large proportion of a country's population. Combining the above intuition with evidence that culture has a significant effect on equity prices worldwide (e.g., Chui, Titman, and Wei, 2010; Cheon and Lee, 2018), ancient Greek culture could be a key driver for the *investor belief* channel.

2.2. Mercury Retrograde dates

[14] In ancient Greek times, this theory depended entirely upon the idea of a finite spherical and geocentric universe, viewed with Aristotelian physics and cosmology. The idea came from the ancient Greek astronomical belief that the Earth was stationary and the center of the solar system and their gods' cosmos, and everything in the heavens regularly moved about the central Earth in circular orbits (Guthrie, 1979). To gain an understanding of natural phenomena, ancient Greeks used myth to explain the beginnings of the universe. Hence, the names and the roles of planets were rooted in ancient Greek myths (Graf, 1993). The Greeks then combined the planetary motions with the macrocosm and mythology to imply through an analogy that people's souls reflected the cosmic soul, providing the rationale for direct stellar influence upon society and the individual (Guthrie, 1979). The mythology-macrocosm analogy is therefore embedded within the astrological interpretation of the planetary motion and people's relationships.

Following Astrologer Richard Nolle, we collect the Mercury Retrograde dates from Matrix's BLUESTAR software, which can produce planet stations, with nominal precision to the nearest minute. The Mercury Retrograde calendars are pre-determined based on the orbit of the planet.

[Figure 2 here]

Figure 2 displays the distribution of Mercury Retrograde in each year and month. Figure 2.A shows that the number of Mercury Retrograde days are evenly spread across each year, with an average of 73 calendar days annually (ranging from 47 to 62 trading days annually). As discussed, Mercury experiences retrograde motions three to four times annually, with around three to four weeks per time. Thus, an average of 73 calendar days annually is expected, resulting in around 3.15 Mercury Retrograde events annually. For the 47-year sample, we have 148 observed Mercury Retrograde events.

Figure 2.B illustrates that the percentage of Mercury Retrograde days are steadily spread across each month, suggesting that Mercury Retrograde is not necessarily driven by calendar anomalies, mood seasonality, or other time effects in the time series. However, to be conservative, we still control for the time fixed effect in our regression analysis, presented in the sections below.

2.3. Other data

Our market return data is from DataStream. We download the country-level daily total return index (RI) in local currency.[15] The daily volatility is the absolute value of the return. When a price index is not available for a given trading day (i.e., holiday, the market is closed, or the data are not available), DataStream inserts the previous day's value. Hence, to eliminate such invalid observations, a total return index observation is not used if the price index exactly matches the previously reported day's price index (Pukthuanthong and Roll, 2015). [16] Our sample consists of 48 countries from January 1973 to October 2019. Table 1 shows the country distribution of returns.

[Table 1 here]

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[15] We use RI from each country indices with the DataStream classification that start with "TOTMK." We use the local currency as the main test to avoid the concern that Mercury Retrograde could affect the movement of the currency value and the macroeconomic value. Also, the level of astrological beliefs we have in mind most likely associated with local investors, for which local returns are relevant to the main analysis. In all regressions, we include the country fixed effect, and hence the local returns are comparable country by country in our study. We also download the total return index in U.S. dollars to test the robustness of our results.

[16] As discussed by Pukthuanthong and Roll (2015), a potential bias is introduced by the nontrading phenomenon. Such potential bias should be downward bias in our results, which underestimate the true Mercury Retrograde effect. For example, eliminating nontrading dates in the Mercury (non-Mercury) Retrograde period result in larger (smaller) average daily returns in this period.

For the other country-date variables, we collect data from several sources. From DataStream, we download the daily aggregate trading volumes on the stocks in the national index, daily three-month and ten-year government benchmark bond yields, and daily implied volatility index (VIX) values.[17] We obtain the aviation disasters from the Aviation Safety Network of the Flight Safety Foundation database and car accidents from the Fatality Analysis Reporting System from the National Highway Traffic Safety Administration (January 1975 to December 2017 for the U.S.).[18] We also collect data for cash flow information. Specifically, we collect the news sentiment score (ESS) from the RavenPack News Analytics, and the earnings surprise from I/B/E/S.[19]

We also collect some variables that might affect investors' trading behaviors globally. Following Novy-Marx (2014), we download sunspot data from Solar Influences Data Analysis Center,[20] and quasiperiodic Pacific Ocean temperature data from the National Oceanic and Atmospheric Administration (NOAA).[21] Novy-Marx (2014) shows that sunspot and global temperature can affect stock returns globally. We download full moon data from the United States Naval Observatory (USNO) website to control for the moon effect of Yuan, Zheng, and Zhu (2006) in our robustness tests.

We employ a broad set of country-level variables in our cross-country tests. We obtain information on a country's primary religion from Stulz and Williamson (2003) and the CIA Factbook 2003. To measure a country's scientific development, we use the time-series average value of the Estimated Civil Gross domestic expenditure on R&D as a percentage of GDP (EGERD) from MSTI database.[22] We collect the colonization data from Heritage History Library and Page and Sonnenburg (2003).[23] The number of countries in the tests using the above data is based on data availability.

[17] The countries have VIX data are Australia, Belgium, Canada, Germany, France, Hong Kong, India, Japan, Korea, Mexico, the Netherlands, Russia, Sweden, Switzerland, South Africa, the United Kingdom, and the United States.

[18] The aviation disasters download from http://aviation-safety.net. The disasters contain descriptions of over airliner, military transport category aircraft, and corporate jet aircraft safety that occurred at any time during the day, all around the world. The car accident data download from ftp://ftp.nhtsa.dot.gov/fars/, which covers all traffic fatality in the U.S.

[19] We scale the ESS variable to vary between 1 and 1. Positive, negative, and zero values indicate positive, negative, and neutral sentiments of a particular news article, respectively. The RavenPack data is from 2000-2018.

[20] https://solarscience.msfc.nasa.gov/greenwch/spot_num.txt.

[21] https://www.cpc.ncep.noaa.gov/data/indices/.

[22] https://stats.oecd.org/Index.aspx?DataSetCode=MSTI_PUB. Civil Gross domestic expenditure on R&D excludes R&D in defence.

[23] https://www.heritage-history.com/ssl/cds/ancient_greece/html/guide_maps.html.

3. Mercury Retrograde and equity prices

3.1. Baseline results

To test whether Mercury Retrograde has a negative effect on stock market returns, we run the following panel regression:[24]

$$Ret_{i,t} = \alpha + \beta_1 \times Mercury_t + Controls_{i,t} + FE + e_{i,t} \quad (1)$$

where, $Mercury_t$ a time dummy variable takes the value of one if day t falls on the event window of Mercury Retrograde, and zero otherwise. The event window of Mercury Retrograde in our main analysis is from the beginning of the Mercury Retrograde day to the beginning of the Mercury Prograde (direct motion) day $[Retrograde_t, Prograde_t]$. We also use other event windows to test the robustness of our results. Data mining impact is limited by using a simple dummy variable to address a market return (Jacobsen and Marquering, 2008). Furthermore, a dummy variable can capture a large signal-to-noise ratio in returns (Edmans, Garcia, and Norli, 2007). We cluster standard errors at the country and date levels.[25]

In Table 2, we test whether the coefficient of $Mercury_t$ is significantly negative. In Column (1), we use a simple regression as in Equation (1) and control for the weekday, year-quarter, and country fixed effects (FE). These fixed effects mitigate the potential concern that our results are driven by other country factors and time effects correlated with stock market returns.[26] We find that the coefficient of $Mercury_t$ is -5.370 with a t-statistic of -3.00 (we call this the "Mercury effect"). -5.370 bps is economically meaningful as it corresponds to 94% of the in-sample unconditional mean in daily returns (5.708). For the annually Mercury effect, the average returns in Mercury Retrograde periods range from 2.52% (5.370 bps×47 days÷100) to 3.33% (5.370 bps×62 days÷100) per year lower than those in other periods, corresponding to 17.66% to 23.34% of the in-sample unconditional mean in annual returns (i.e., 23.34% = 3.33×100÷(250×5.708)).

[24] Panel regression provides a less noisy estimate than the time-series estimate in international asset pricing studies (e.g., Hjalmarsson, 2010; Rapach, Strauss, and Zhou, 2013; Brogaard, Dai, Ngo, and Zhang, 2020). It also removes the Stambaugh bias, because independent cross-sectional information dilutes the Stambaugh bias in the time-series (Hjalmarsson, 2010).

[25] We use the two-way clustering of Cameron, Gelbach, and Miller (2012). Our results are similar if we cluster the standard errors at the date level (significant at the 1% level).

[26] Since the Mercury Retrograde window can include more than 90% trading days within a calendar month, we cannot control the year-month fixed effect.

The benefit of our research design is that we do not need to control for many economic factors since Mercury Retrograde is not affected by any economic factors.[27] However, one concern in Column (1) is that the daily returns have market microstructure phenomena, such as bid-ask bounce, which could sully the purity of the theoretical prediction. With these caveats in mind, in Column (2) of Table 2, we attempt to control for the influence of the lagged returns of indices and lagged return volatility (absolute return) acts as a proxy for the influence of several market frictions.[28] The return and volatility predictability regressions control for all lags up to 5 trading days (1 week of calendar time). The tenor of the results is essentially the same as in Column (1); the coefficient of $Mercury_t$ is -5.178 with a t-statistic of -2.96. Overall, our baseline results are consistent with the *Mercury effect hypothesis.*

[Table 2 here]

To visualize our main results, we plot the Mercury effect (Figure 3). Date 0 on the horizontal axis is the beginning calendar day of Mercury Retrograde. The grey vertical lines with "R" indicate the beginning to ending of one Mercury Retrograde period. On the vertical axis, we graph the daily cumulative residual market return. The residual market return is the residual in Equation (1) without controlling for $Mercury_t$. The vertical axis is in bps, so 5 means an excess return of 5 bps. The figure shows a surprising regularity: one-day stock market excess returns are low in Mercury Retrograde days, and these low excess returns fully reverse in the future non-Mercury Retrograde days.

[Figure 3 here]

In the Appendix Table IA1, we also run Equation (1) in each country without controlling for country fixed effect. The coefficient on $Mercury_t$ is negative for 46 out of 48 countries (only Thailand and Israel have a positive sign). Following Hirshleifer and Shumway (2003), we can examine the joint significance of these results with a simple nonparametric calculation. Assuming each regression's sign is an independent draw from the binomial distribution, and the probability of drawing a negative coefficient is 0.5. Given this binomial distribution, the probability of finding two positive coefficients out of 48 possible is close to zero, suggesting that our Mercury effect is

[27] Controlling for economic factors is likely resulted in a bad control problem because Mercury Retrograde could affect other economic outcomes.

[28] For shorter panels, including the lagged dependent variable and country fixed effects can lead to biased estimators in panel regressions (Nickell, 1981). However, our panel for daily returns contain 5,557 to 11,926 days and including the lagged dependent variable is thus unproblematic in our regressions. As predicted, in unreported results, excluding the lagged dependent variable leads to very similar results.

unlikely driven by sheer chance. This simple nonparametric joint test is strong evidence that market returns are lower in Mercury Retrograde periods than in other periods.

3.2. Economic channels

The low returns in Mercury Retrograde periods can depend on two channels: the *astrological theory effect* channel and the *investor belief* channel. In this section, we provide a number of tests attempting to enrich our insights into the two channels.

3.2.1. Mercury Retrograde and the astrological theory effect channel

To justify the *astrological theory effect* channel, we investigate whether Mercury Retrograde has a tangible impact on traffic- and commerce-related activities. We use traffic accidents to proxy for traffic-related activities and examine whether Mercury Retrograde has a real influence on traffic-related activities. To test the impact of the Mercury on traffic accidents, we run the following time-series regressions:

$$Accident_t = \alpha + \beta_1 \times Mercury_t + Five\ lags\ of\ Accident_t + FE + e_t\ , \qquad (2)$$

where, $Accident_t$ is the logarithm of the daily number of aviation disasters or the daily number of car accidents, $Five\ lags\ of\ Accident_t$ is the five lags of the dependent variable ($Accident_{t-5}$ - $Accident_{t-1}$) to control for the short-term pattern in $Accident_t$, and FE are the weekday and year-quarter fixed effects.[29]

[Table 3 here]

Table 3 presents OLS estimates of β_1, which represent Mercury Retrograde effects on traffic accidents, for all two measures of accidents. If Mercury Retrograde can adversely affect the traffic, β_1 should be significantly positive. However, the table indicates that β_1 is insignificantly negative in both columns, which is inconsistent with the prediction that Mercury Retrograde has a real influence on our human activities.

We also construct two other proxies for traffic based on Google Trends search volumes. We obtain an index of daily search volumes from Google Trends for the topic “Flight cancellation and delay” and “Traffic collision” in the worldwide. It seems plausible that individuals might conduct

[29] The car accident only covers all traffic fatalities in the U.S from January 1975 to December 2017. Because the *real effect* channel implies that Mercury Retrograde should have equal influence in each country, data from the U.S. can also help us to test the *real effect.*

online searches involving these phrases following flight delays and traffic collisions. In Columns (3) and (4) of Table 3, we re-run equation (2) using the daily Google Trends search volume for the above two topics as the dependent variable. We find that β_1 is insignificant in both columns, again suggesting that the Mercury effect is unlikely to be driven by the *astrological theory effect* channel.

Second, we use the aggregate fundamental loss to proxy for commence-related activities and test whether the Mercury Retrograde process engenders fundamental loss. We investigate this issue in the following way. We use the amount of negative aggregate cash flow information to capture the fundamental loss. Intuitively, if firms, on average, take losses during the Mercury Retrograde period, we then expect to see negative aggregate cash flow news in those days. The aggregate cash flow information can be reflected in news accounts. Specifically, we use the aggregate news sentiment ($News\ Sentiment_{i,t}$), aggregate corporate press release sentiment ($Corporate\ press\ Sentiment_{i,t}$), and aggregate earnings surprise ($SUE_{i,t}$) to capture the fundamental loss in each country-date. The aggregate value is then calculated as the equal-weighted average of all daily values of firms in each country-date.

We run the following regression:

$$Cash\ flow\ news_{i,t} = \alpha + \beta_1 \times Mercury_t + controls_{i,t} + FE + e_{i,t} \quad (3)$$

where, $Cash\ flow\ news_{i,t}$ is $News\ Sentiment_{i,t}$, $Corporate\ press\ Sentiment_{i,t}$, or $SUE_{i,t}$ in country i on date t. The control variables include five lags of the dependent variable, five lags of return, and five lags of volatility. The fixed effects are weekday, year-quarter, and country. If the Mercury Retrograde process engenders any fundamental loss, β_1 should be significantly negative. We present our results in Table 4.

[Table 4 here]

In Column (1), we use $News\ Sentiment_{i,t}$ as the dependent variable and find that the coefficient of $Mercury_t$ is 0.001 with a t-statistic of 0.94. A similar insignificant effect is observed using $Corporate\ press\ Sentiment_{i,t}$ as the dependent variable in Column (2). Turning to Column (3), we find that the Mercury retrograde process has an insignificant effect on $SUE_{i,t}$. $Corporate\ press\ Sentiment_{i,t}$ and $SUE_{i,t}$ capture not only the market-level information but also the seasonal factor in the provision of news from the firm insider. Hence, Columns (2) and (3) also indicate that our Mercury effect is unlikely to be driven by a seasonal factor in news. Overall, the results from Table 4 suggest that the Mercury Retrograde process does not engender fundamental loss, and hence our baseline results are less likely attributable to the *astrological theory effect* channel.

3.2.2. Mercury Retrograde and the belief channel

To explore the *belief* channel, we identify the likelihood of investors holding the belief in Mercury Retrograde. Although we do not have a direct measure of the belief in Mercury Retrograde held by investors, we are able to examine other behaviors that may signal the belief in Mercury Retrograde in the population.

First, we use a country's average daily return in the previous year's Mercury Retrograde periods to capture the belief in Mercury Retrograde held by investors. Our rationale is as follows. First, astrology studies suggest that people's astrological beliefs are persistent (Sales, 1973; Padgett and Jorgenson, 1982). Second, the increase in people's astrological belief if outcomes are consistent with the predictions of astrological theory (e.g., low returns during Mercury Retrograde periods). (Lillqvist and Lindeman, 1998). Therefore, if a country has performed poorly relative to other countries in the previous-year Mercury Retrograde periods, investors' belief in Mercury Retrograde increases, and we expect this country also to offer a low return relative to other countries in the current-year Mercury Retrograde periods. In contrast, the Mercury effect in the current-year periods should be unaffected by the low market returns in the previous-year non-Mercury Retrograde periods since these low returns are unrelated to investors' belief in Mercury Retrograde.

To test the above prediction, we perform the following analyses. We construct a dummy variable $Low\ Ret_{i,t}^{last\ year\ MR}$ equals to one (zero) if a country's average daily return in the previous year's Mercury retrograde period is at the bottom (top) 1/3 of all the sample countries in that year. The regression model specified in our baseline results includes $Low\ Ret_{i,t}^{last\ year\ MR}$ as well as their interaction terms with $Mercury_t$ as additional explanatory variables.

Table 5 Panel A presents the results. In Column (1), the coefficient on the interaction term between $Low\ Ret_{i,t}^{last\ year\ MR}$ and $Mercury_t$ is -3.366 with a t-statistic of -2.68, confirming that the Mercury effect is more pronounced in countries with a lower level of returns in the previous year Mercury Retrograde periods. In Columns (2) and (3), we divide the sample into Mercury Retrograde days and other days. We find that the coefficient of $Low\ Ret_{i,t}^{last\ year\ MR}$ is only significantly negative in Mercury Retrograde days, confirming the Mercury effect only comes from investors' belief in Mercury Retrograde.

[Table 5 here]

In Table 5, Panel B, we also construct another dummy variable $Low\ Ret_{i,t}^{last\ year\ Non-MR}$ that is equal to one (zero) if a country's average daily return in the previous year's non-Mercury Retrograde period is at the bottom (top) 1/3 of all the sample countries in that year. The regression model specified in our baseline results includes $Low\ Ret_{i,t}^{last\ year\ Non-MR}$ as well as their interaction terms with $Mercury_t$ as additional explanatory variables. As predicted, we find that the coefficient on the interaction term between $Low\ Ret_{i,t}^{last\ year\ MR}$ and $Mercury_t$ is insignificantly different from zero. The coefficient of $Low\ Ret_{i,t}^{last\ year\ MR}$ is insignificant for both Mercury Retrograde days and other days. Overall, the results in Table 5 are consistent with the *investor belief* channel.

Second, we use the search volume intensity for the relevant topic from Google Trends to capture investors' belief in Mercury Retrograde. Suggested by Da, Engelberg, and Gao (2011), Google search volume intensity measures the popularity of a search term relative to all other terms from the same location at the same time. In an international study, Gao, Ren, and Zhang (2018) show that the local Google search volume intensity is correlated with the local market returns. Hence, Google search volume clearly has the potential to capture investors' attitudes toward and reaction to Mercury Retrograde in each country.

We use search volume intensity for the topic "Retrograde motion." First, we use topics instead of search terms because of the former addressed misspellings and searches in different languages, as Google's algorithms can group different searches that have the same meaning under a single topic. Second, the definition of Mercury Retrograde is retrograde motion.[30] Hence, the topic "Retrograde motion" is a reasonable search topic for Mercury Retrograde. Insofar as Google search volume might be a noisy measure of investors' belief; for example, investors might simply type something for random reasons. Hence, the coefficients in our analysis should be biased toward zero, understating the true importance of the *investor belief* channel.

We first verify whether the search volume intensity (*SVI*) for the topic "Retrograde motion" increased in the Mercury Retrograde period. We download daily *SVI* for this topic from 01/01/2004

[30] The google trend also shows that "Mercury" is the top one related topic to the topic "Retrograde motion."

to 31/10/2019 country by country. We standardize the time series by each country to make them comparable. Then, we perform OLS regressions of the following form:

$$SVI_{i,t} = \alpha + \beta_1 \times Mercury_t + controls_{i,t} + FE + e_{i,t} \quad (4)$$

The control variables include five lags of the dependent variable, five lags of return, and five lags of volatility. The fixed effects are weekday, year-quarter, and country.

Table 6 Panel A presents our results. Column (1) indicates Mercury Retrograde leads to an increase in daily *SVI* for the topic "Retrograde motion." The evidence suggests that people are more likely to search for information for Mercury Retrograde during Mercury Retrograde periods. In Column (2), we test whether Mercury Retrograde leads to a jump in daily *SVI* for the topic "Retrograde motion," since the dummy variable of Mercury Retrograde captures a sudden change in beliefs. As predicted, Column (2) shows that the extreme value of *SVI* more likely occurs in Mercury Retrograde periods. Overall, *SVI* of the topic "Retrograde motion" mostly captures the belief in Mercury Retrograde held by investors.

We then replace $Mercury_t$ with SVI for the topic "Retrograde motion" in our baseline regression (1). Specifically, we perform OLS regressions of the following form:

$$Ret_{i,t} = \alpha + \beta \times L(5)SVI_{i,t} + controls_{i,t} + FE + e_{i,t} \quad (5)$$

where $L(5)SVI_{i,t}$ is the five lags of $SVI_{i,t}$ ($SVI_{i,t-5}$ - $SVI_{i,t-1}$). Thus, the regression examines whether, on average, the lagged $SVI_{i,t}$ can predict future market returns.

[Table 6 here]

The results, shown in Panel B of Table 6, show a statistically significant negative relationship between $SVI_{i,t-2}$ - $SVI_{i,t-1}$and the future market return. In terms of economic magnitude, the estimated coefficient suggests that a standard deviation increase in $SVI_{i,t-1}$ would result in a 0.51 bps decrease in the future market return. While the coefficients of $SVI_{i,t-5}$ - $SVI_{i,t-3}$ are insignificantly different from zero, the joint effect of $SVI_{i,t-5}$ - $SVI_{i,t-1}$ is significantly negative. In other words, $SVI_{i,t-5}$ - $SVI_{i,t-1}$ can jointly predict future returns. In Column (2), we control for both $Mercury_t$ and $L(5)SVI_{i,t}$, and find that the magnitudes and significance levels of $L(5)SVI_{i,t}$ are significantly reduced, confirming that the return predictability of $L(5)SVI_{i,t}$ is concentrated in the Mercury Retrograde period. These results suggest that the Mercury effect depends on the belief in Mercury Retrograde held by investors, which is consistent with the *investor belief* channel.

[Table 7 here]

To further test the *belief* channel, we perform a cross-country difference test. We expect the Mercury effect to display a significant cross-country variation along the dimension of investors' beliefs in Mercury Retrograde. To study the cross-country variation in Mercury Retrograde beliefs, we use the "interest by region" function in Google Trends to download the cross-sectional search interests in the topic "Retrograde motion" between 01/01/2004 to 31/10/2019. The country-level search volumes are calculated on a scale from 0 to 100. A higher value means a higher proportion of all search queries in that country, not a higher absolute query count. Therefore, these values are comparable across countries. We then construct a dummy variable $High\, SVI_i$ that is equal to one (zero) if a country's search volume intensity for the topic "Retrograde motion" is in the top (bottom) 1/3 of all the sample countries. The regression model specified in our baseline results includes $High\, SVI_i$'s interaction term with $Mercury_t$ as additional explanatory variables.

Table 7 reports the result. The coefficient of $Mercury_t$ is still significantly negative. Importantly, the coefficient on the interaction term between $High\, SVI_i$ and $Mercury_t$ is -2.996 with a t-statistic of -2.61, suggesting that the negative effect of Mercury Retrograde on market returns is more pronounced in countries with a greater belief in the topic "Retrograde motion." Economically, in countries with a stronger belief in Mercury Retrograde, the average returns in Mercury Retrograde periods are up to 4.15% ((3.705+2.996) bps×62 days÷100) per year lower than those in other periods. Overall, the results are consistent with our expectation that lower market returns during the Mercury Retrograde period result from the *investor belief* channel. Investors who are more interested in the astrological belief in Mercury Retrograde are most likely to stay away from the market during Mercury Retrograde, resulting in a higher risk premium required by remaining investors.[31]

3.3. Robustness checks

To ensure the robustness of our Mercury effect, we conduct several additional tests and summarize the main findings in Appendix IA2 to IA5.

[31] One might argue that the search interest for the topic "Retrograde motion" also capture individuals' interest in other retrograde motions. However, there is no evidence suggests that other retrograde motions can affect market returns. We confirm this insignificant prediction in the section of robustness checks below. Nevertheless, in unreported results, we also control for the interaction terms between other retrograde motions and $High\, SVI_i$, and the coefficient interaction term between $High\, SVI_i$ and $Mercury_t$ becomes -2.934 with a t-statistic of -2.50.

We begin by augmenting regression equation (1) with additional controls. Specifically, in Column (1) of Appendix IA2, we drop the January and control for the global temperature effect, sunspot effect, moon effect, other planet retrograde effects, major global financial crisis effect, and fixed effects for the day of the month and the last day of the month.[32] By controlling for these effects, we address a potential alternative explanation for our findings, i.e., the Mercury Retrograde periods could overlap with full moon days, and as a result, the Mercury effect could be caused by the moon effect. We find that these control variables have little effect on the coefficient of $Mercury_t$ (-5.903 with a t-statistic of -2.91). The stable coefficient of $Mercury_t$ with different control variables suggesting that our Mercury effect is unlikely affected by omitted variable biases.

In Column (2), we use the daily market returns in U.S. dollars and find that the coefficient of $Mercury_t$ is -5.665 with a t-statistic of -2.57. In Column (3), we re-run the regression by using the market returns from the WRDS market indexes database. We confirm our main results remain robust using returns from a different database and different countries (the coefficient is -6.488 with a t-statistic of -2.76), suggesting that data noise is unlikely an explanation of our findings. In Column (4), we control for country-year-quarter fixed effect to capture time-variant factors like local economic conditions at the country level. The coefficient of $Mercury_t$ is -5.495 with a t-statistic of -2.94, suggesting that our results are not driven by time-variant economic factors that are correlated with market returns. In Column (5), we consider weighted least squares using ex ante variance (WLS-EV) in addition to ordinary least squares (OLS), to deal with the correlation between the variance of the error term and the explanatory variable (Johnson 2019). In the spirit of Johnson (2019), we calculate the *ex ante* variance as fitted variances by regressing daily realized variance on the average of daily realized variance over the past month and the past year. WLS-EV estimate of Mercury's predictability remains statistically significant with a t-statistic of -2.26. This result indicates that the significant OLS estimates are unlikely be false positives driven by a few periods with high expected volatility.[33]

In Appendix IA3, we perform the analysis using different Mercury Retrograde windows and return frequencies. In Columns (1) and (2), the Mercury effect remains significant in the new event

[32] Crisis periods: the 1987 U.S. stock market crash (October 19, 1987), the Gulf War (January 17, 1991 to February 17, 1991), the Mexican Peso crisis (December 20, 1994 to January 31, 1995), the Asian financial crisis (July 2, 1997 to December 3, 1997), the Russian crisis (August 11, 1998 to January 15, 1999), and GFC (September 2008 to September 2009).

[33] In the section 6, we also investigate the relationship between Mercury Retrograde and market risks.

window, for example, the one week before the Mercury Retrograde day to the beginning of the Mercury Prograde day $[Retrograde_{t-7}, Prograde_{t}]$ and the beginning of the Mercury Retrograde day to one week after the Mercury Prograde day $[Retrograde_{t}, Prograde_{t+7}]$. The magnitudes in (1) and (2) are lower than those in the baseline results, suggesting that the Mercury effect is concentrated in the Mercury Retrograde period, confirming the results in Figure 3. Moreover, if Mercury Retrograde has a strong impact, one should expect that it shows up using weekly and monthly data as well. In Column (3), we use the Wed-Wed weekly market returns. In Column (4), we use the monthly market returns. If a week (month) has more than 50% Mercury Retrograde days, then we set this week (month) as the Mercury Retrograde week (month) ($Mercury_{t} = 1$). We find that the coefficient of $Mercury_{t}$ is -22.961 with a t-statistic of -2.55 in Column (3). In Column (4), the coefficient of $Mercury_{t}$ is -67.323 with a t-statistic of -1.92.[34] In Column (5), we re-run the monthly return regression using the ratio of Mercury Retrograde days to total days in a month as the main interest variable, and the Mercury effect remains significant.

In Appendix IA4, we perform the same analysis at different periods and for different regions. Columns (1) and (2) report the results for periods 1973-1995 and 1996-2019. The results show that all periods have a negative relationship between Mercury Retrograde and market returns, suggesting that the Mercury effect is persistent. Fig. 4 illustrates this persistence further by reporting the t-values associated with the Mercury effect for 23-year rolling windows. We reverse the sign on the t-statistics so that high values of t-values correspond to more significant effect. The first data points in the figure, for example, correspond to a 23-year window from January 1973 to December 1995. The t-values of the Mercury effect range from 1.90 to 3.06 over different 23-year windows, confirming that the Mercury effect is persistent throughout different sample periods. This persistence of the effect suggests that the Mercury effect is unlikely to be an artifact of sheer chance. Columns (3) and (4) of Appendix IA4 summarize the results for developed countries and emerging countries. The results show that all regions have a significant Mercury effect.

[Figure 4 here]

In Appendix IA5, we perform the placebo tests for the Mercury effect by using different event windows. First, we set the event window of Mercury Retrograde from the 30 days before the

[34] Given that our monthly Mercury Retrograde dummy is negatively autocorrelated, this result suggests that positively autocorrelated daily dummy variable does not affect the statistical significance of the Mercury effect in our baseline results (Powell, Shi, Smith, and Whaley,2009).

Mercury Retrograde day to the one week before the Mercury Retrograde day $[Retrograde_{t-30}, Retrograde_{t-7}]$. Second, we set the event window of Mercury Retrograde from the seven days after the Mercury Prograde day to the 30 days after the Mercury Prograde day $[Prograde_{t+7}, Prograde_{t+30}]$. We find that the coefficients of $Mercury_t$ are insignificantly different from zero for both cases. Third, we construct a time series of pseudo–Mercury Retrograde days. These days are assigned randomly with the mean of 73 calendar days annually. Repeating this step 1,000 times, we then build the distribution of coefficients and their t-statistics that result purely from random Mercury Retrograde windows. In Column (3) and (4), we find that none of the 1,000 simulations produce 10^{th} or 5^{th} percentiles of t-statistics (-1.24 or -1.59) as extreme as the t-statistics in our baseline results.[35] Overall, the evidence in Appendix IA5 further indicates that the lower returns in Mercury Retrograde cannot be attributed to random chance.

The results above are expected since the Mercury effect is based on individuals' belief in Mercury Retrograde rather than on cherry picking rules (selected from a large universe of calendar rules). The dummy variable $Mercury_t$ therefore is not cherry picked. Moreover, our study has a strong prior motivation and results have been predicted *ex ante* by the theory, which reduces concerns that the Mercury effect is simply a data-driven result (Campbell and Vinci, 1983; Kahn, Landsburg, and Stockman, 1996). However, one might still argue that researchers could study the return predictability of all eight planets' retrograde motions at the same time, and that Mercury Retrograde we uncover as being predictive could arise by chance. We address this multiple comparison problem using several adjustments.

First, we control for the false discovery rate using the Benjamini and Hochberg (1995) procedure. In Column (1) of Appendix IA2, we rank all eight retrograde motions from lowest to highest by their p-value and then compare the p-value with the adjusted p-value, given by $\frac{(\alpha \times rank)}{k=8}$. If the p-value is higher than the adjusted p-value, the variable is taken to be insignificant. The Mercury Retrograde is individually predictive after correction. Second, we apply the Bonferroni adjustment to each of retrograde motions in Column (1) of Appendix IA1. The Bonferroni inequality suggests that our Mercury effect hypothesis must be significant at the $\frac{\alpha}{k}$ level, where α is a pre-determined significance level and k is the number of Retrograde motions we could study. With k=8 Retrograde motions and a desired significance level of 5% (10%), this means requiring

[35] We get the same conclusion for the 1^{st} percentile of t-statistics.

a p-value of 0.63% (1.25%). In Column (2) of Appendix IA2, only Mercury Retrograde can pass the 5% level test after Bonferroni adjustment. Finally, In Appendix IA6, we calculate step-down adjusted p-values of Westfall and Young (1993), which control the family-wise error rate and allows for dependence among p-values by bootstrap re-sampling. 1,000 bootstrap replications are run for each of the eight multiple hypotheses (eight retrograde motions), and each bootstrap replication includes the same control variables as in Column (2) of Table 2. For Mercury Retrograde, the step-down adjusted p-value is 2.3%, which is significant at the 5% level. We do not find significant results for other retrograde motions.

4. Origin of belief

4.1. Ancient Greek culture

To this point, we have proposed that the *investor belief* channel drives the lower market returns in Mercury Retrograde periods. This effect is stronger in countries with a greater belief in Mercury Retrograde. However, what is the origin of such beliefs? Why do investors hold such beliefs? In this section, we propose that *ancient Greek culture* is the crucial driver for the *investor belief* channel of the Mercury effect since the belief in Mercury Retrograde is related to ancient Greek culture and ancient Greek culture is popular in the worldwide.

Culturally, it was diverse in western countries, but the predominant form was ancient Greek culture (Beck, 2008). The culture of ancient Greece has been influenced for thousands of years – from the Paleolithic era to the birth of the great civilizations of Minos, Mycenae and Cycladic in the classical period, which achieved great prosperity and led to unprecedented cultural prosperity. This culture is embodied in architecture, mythology, drama, science, and philosophy, and was nurtured in a democratic environment through a series of invasions and dominations: Macedonians, Romans, Byzantine Empire, and Ottoman Empire ruled for 400 years. The ancient Greek philosopher Plato Phaedo explains ancient Greece as “like frogs around a pond.” That is, ancient Greece succeeded in spreading and maintaining a common culture around the Mediterranean Sea and Europe (Figure 4).[36]

[Figure 5 here]

None surprisingly, ancient Greek culture then came to be one of the foundational to Western culture in general (i.e., mythology, philosophy, mathematics, astronomy, medicine, art, literature,

[36] The Figure comes from https://www.heritage-history.com/ssl/cds/ancient_greece/html/guide_maps.html.

and theatre), especially after the Renaissance period in the 14th century (Highet, 1949).[37] This culture is also an accepted part of popular culture in the New Age (Alfvén, 1984; Campion, 2009). For example, in mythology, the flexible tools of allegory and exemplum serve Greek myth well into the sixth century A.D. and set us up for the New Ages (Lear, 2012), i.e., the Olympic Games and the popular movie "Wonder Woman" are based on Greek myths. In terms of the Hermes myth, many countries placed the god Hermes on a postage stamp beginning in the 18th century (DeBlois, Harris, and Pedersen, 2012).

Therefore, ancient Greek cultures indeed affect our way of life. Given that ancient Greek culture is popular and reputed, individuals are more likely to adopt the beliefs that are related to ancient Greek culture. Thus, investors influenced by ancient Greek culture could have a greater understanding (and hence belief) in the roles of Hermes, the Greek god of the planet Mercury. Therefore, they are more likely to hold the astrological belief of Mercury Retrograde. As a result, these investors most likely do not to participate in the market accordingly.

Of course, ancient Greek culture is not directly observable. Thus, the best we can do is measure ancient Greek culture in a sufficiently narrow way, so that it becomes easier to identify a relationship between the culture and our *investor belief* channel. A direct proxy for this purpose is people's interest in ancient Greece. Other proxies can come from our early discussion on the roles of Mercury, which arise from mythology and the Greek god Hermes. Historical studies also suggest that the most important paths to investigate on culture is to investigate on the mythological basis and the mythical stories' roots (Chami, 2015). Individuals might conduct online searches involving these proxies if they are influenced by ancient Greek culture. Hence, to study the cross-country variation in investors' exposure to ancient Greek culture, we use the "interest by region" function in Google Trends to download the cross-sectional search interests in the topics "Ancient Greece," "Mythology," and "Hermes" during 01/01/2004 to 31/10/2019.[38] -These measures are *ex post* proxies for ancient Greek cultures.[39]

[Figure 5 here]

[37] A renowned English poet Percy Bysshe Shelley said, "We are all Greeks, Our laws, our literature, our religion, our arts have their roots in Greece."

[38] For "Hermes," we use the topic "Hermes – Deity" to avoid the search volume from company Hermes.

[39] The greater beliefs in Mercury Retrograde can also be a potential cause of higher search volumes for these cultural related topics. Therefore, the higher search volumes for these topics are useful to identify countries of greater cultural components in the Mercury Retrograde' beliefs.

Figure 6 plots the distribution of the above search topics. In all search topics, Greece is always in the top five. This result is consistent with the intuition that the Greeks should pay the most attention to ancient Greek cultures, suggesting that "Ancient Greece," "Mythology," and "Hermes" indeed capture individuals' exposure to ancient Greek culture. Figure 6 also shows that the top 16 countries are similar among the topics "Retrograde motion," "Ancient Greece," "Mythology," and "Hermes," suggesting that these topics capture similar characteristics.

In Appendix IA7, we report the top ten related Google Trends search topics to "Ancient Greece," "Mythology," and "Hermes." The top ten related topics are similar in each topic. For each topic, we find that in more than five topics among the top ten the word "Greek," "Greece," or "Ancient" appears. Moreover, "Mythology" is in the top ten related topics for "Ancient Greece" and "Hermes," and "Ancient Greece" is in the top ten related topics for "Mythology." Overall, we find that the above three topics indeed capture individuals' beliefs in ancient Greek cultures.

We construct a dummy variable for each search topic that is equal to one (zero) if a country's search volume intensity for this topic is in the top (bottom) 1/3 of all the sample countries. To reduce the variable-error in each google search topic, we also construct a combination culture index (*Combine*) by combining three topics that signal the ancient Greek culture. Our objective is to produce a single measure that diversifies away some noise in each topic and thereby increases the precision of our culture test. We assign countries to twenty groups based on each topic and conduct the three sorting independently to create 60 groups. Group 20 (1) contains the stocks with the highest (lowest) *Ancient Greece*, highest (lowest) *Mythology*, or highest (lowest) *Hermes* variables. We then add the group numbers of each country to a score between 3 and 60. Finally, we define *High Combine* as countries with top 1/3 scores and *Low Combine* as countries with bottom 1/3 scores. Countries in a *High Combine* index have a greater ancient Greek culture in the cross-section. The regression model specified in our baseline results includes each search topic's interaction terms with $Mercury_t$ as additional explanatory variables.

In Table 8, the coefficient on the interaction term between each Google search topic and $Mercury_t$ is significantly negative. For example, in Column (1), the interaction term between $High\ Ancient\ Greece_i$ and $Mercury_t$ is -2.341 with a t-statistic of -2.15. Similar significant effects are observed using $High\ Mythology_i \times Mercury_t$ and $High\ Hermers_i \times Mercury_t$ as the interaction terms in Columns (2) and (3), respectively. These results confirm that the Mercury effect is more pronounced in countries with a greater influenced by ancient Greek cultures.

[Table 8 here]

Column (4) of Table 8 reports the results for the *Combine* index. Since the *Combine* index reduces the variable-error, we find that the coefficient on the interaction term between $High\ Combine_i$ and $Mercury_t$ is more significantly negative than the coefficients in Columns (1) to (3) (–3.398 with t-statistic of -2.91). This result further confirms our expectation that the Mercury effect is caused by the cultural effect.

4.2. Spread of ancient Greek culture

4.2.1. Ancient Greek colonies

The Google search volume in the relevant ancient Greek culture topics is likely an *ex post* proxy for ancient Greek culture. We now examine the relationship between culture and the Mercury effect using an *ex ante* proxy for ancient Greek culture.

Resorting to the development in the historical literature, we define a country is an *ex ante* ancient Greek culture country if it meets two criteria: 1) this country is related to ancient Greek colonies, and 2) the primary religion in this country is closely related to ancient Greek culture. The rationale is as follows. First, colonialism denies history to the colonized, in the sense that it deprives subjects of their cultural rights and identity and builds a new culture for the colonized (Ferro, 2005). Second, Cohen and Hill (2007) model that different religions have different effects on people's culture toward others, confirming that one of the most important ways to deprive subjects of cultural rights and build a new culture is through religions (Page and Sonnenburg, 2003).

We first discuss which religion is closely related to ancient Greek culture. Ancient Greek culture plays an important role in Christianity (Jaeger, 1985). Weil (2020) finds that the vast corpus of inscriptions and sculptures associated with the cult of Mithras and Christianity provides the best known and most plentiful examples of religious uses of Greek myth ideas. Several studies suggest that Christians held values and wrote works that rested on ancient Greek culture (e.g., Thomas, 1988; Dowden and Livingstone, 2011).[40] Other studies show that Christianity is more interested in ancient astrology among 25 western countries (Allum, 2011), and Christianity constitutes a

[40] Recent studies argue that the New Testament originally was written relied heavily upon the ancient Greek language and ideas (Gleaves, 2015).

Mercurial belief (Smoller, 2017). Overall, the historical literature suggests that Christianity is closely related to ancient Greek culture.

Next, we discuss which countries are related to ancient Greek colonies. The ancient Greeks succeeded in spreading and maintaining colonies around the Mediterranean Sea, the Black Sea, and Europe by adopting immigration measures to solve the population growth problem. For example, in 7th century B.C., a severe drought occurred on Tierra Island, and the residents of the island had to use a lottery to select some of them to colonize the island of Pratiera in Libya. In addition, the ancient Greeks were good at doing business, often setting up business stations overseas. These business stations gradually evolved into commercial bases and eventually became colonies (Malkin, 1987). Because ancient Greek culture is one of the earliest cultures in Europe, these colonies helped ancient Greeks spread and maintain a common culture in Europe.[41]

We define a country as related to ancient Greek colonies if 1) it had ancient Greek colonies cities or 2) it was colonized by a country that had ancient Greek colonies cities. In our sample, the following Christian countries had ancient Greek colonies cities: France, Greece, Italy, Russia, and Spain (see Figure 5). France, Italy, Russia, and Spain experienced the Renaissance during 14-16th centuries. This evidence could imply that these countries have been exposed to the ancient Greek culture historically because the Renaissance in Europe is about renaissance of the ancient Greek culture (Woodward, 1943; Thomas, 1988). Moreover, it is well known that some European countries are called empires rather than countries around the rising time of ancient Greek culture (the Renaissance period). Hence, we expect to see countries in those European colonial empires also share a similar exposure to ancient Greek culture. We have two European colonial empires in our sample: Spanish and Russian empires. The Spanish empire includes the following countries: Spain, Argentina, Belgium, Chile, Colombia, Mexico, the Netherlands, Peru, the Philippines, and Venezuela. The Russian empire includes Russia, Finland, and Poland.

All these countries have Christianity as their primary religion. Hence, our *ex ante* ancient Greek culture countries include France, Greece, Italy, Russia, Spain, Argentina, Belgium, Chile, Colombia, Mexico, the Netherlands, Peru, the Philippines, Venezuela, Finland, and Poland (Panel

[41] There were about three ancient cultures around the Mediterranean Sea and Europe in the 5-7th century of B.C: ancient Greek culture, ancient Egyptian culture, and Phoenicia culture. Hence, ancient Greek culture was easy to spread and maintained by building colonies. After a list of Rome-Greek Wars, such as a series of Macedonian Wars, ancient Greece fell to Rome. Although Rome militarily conquest ancient Greece, Rome was spiritually assimilated by the ancient Greek culture. The ancient Greek culture was carried and promoted by Rome for another thousands of years quietly (Woolf, 1994), and came to be one of the foundational to Western culture in general.

A of Table 9). We use *ex ante* ancient Greek culture to investigate how the Mercury effect varies across this variable.

Since the classification of *ex ante* ancient Greek culture countries is based on the historical and sociological literature, we need to verify whether those countries most likely have ancient Greek culture in our sample. To test this, we run the following logistic regression:

$$q_i = E[High\ Google_i \mid Colonization_i]$$

$$logit(q_i) = \gamma 1 \times Colonization_i + \varepsilon_i \qquad (6)$$

where, $High\ Google_i$ is the dummy for high Google search volume for the topics defined in Table 8, and $Colonization_i$ is a dummy variable equal to one if a country is an *ex ante* ancient Greek culture country. The estimate of $\gamma 1$ shows how *ex ante* ancient Greek culture is related to the odds of observing *ex post* ancient Greek culture (i.e., the Google search topics in Table 8). A positive estimate for $\gamma 1$ would confirm that a country with *ex ante* ancient Greek culture most likely has ancient Greek culture in our sample.

[Table 9 here]

We present the results in Panel B of Table 9. Columns (1) to (4) reports the results using the topics "Ancient Greece," "Mythology," "Hermes," and their *Combine* index, respectively. As predicted, we find that estimates of $\gamma 1$ are positive and statistically significant, suggesting that our *ex ante* ancient Greek culture countries are indeed more likely to have ancient Greek culture. Since we have a small number of observations in each regression, we also run a panel logistic regression to improve the efficiency of our test.[42] Column (5) reports the results for our panel logistic regression. Consistently, we find significantly positive $\gamma 1$. Overall, these results confirm that the *ex ante* ancient Greek culture countries we defined above most likely have an interest in ancient Greek culture, which is consistent with the conclusions in the historical and sociological literature. We also plot each country's t-statistic (Figure 7) to visualize the distribution of our Mercury effect globally. We run equation (1) for each country without controlling for country fixed effect. Figure 7 has two findings. First, it shows that the most significant Mercury effects come from countries located around the Mediterranean Sea and countries colonialized by Spain and Russia, which is consistent with the findings in the historical and sociological literature that ancient Greek colonies

[42] The Google search volumes for all these topics are highly correlated (correlations are all above 30%). Thus, we can for simplicity use all topics in the one panel regression. To let the rank in each topic comparable, we control for the search topic fixed effect in the regression.

are located in these areas. Second, in Figure 7, we can see that only Spanish colonies in South America respond to the Mercury effect, compared to other countries in that continent. Due to the isolation of the continents, countries in South America have no way but through Spain to contact ancient Greek culture, including Western astrology during Age of Discovery after Renaissance. This is a strong support for our investor *belief* channel.

[Figure 6 here]

We now test whether the Mercury effect is stronger in *ex ante* ancient Greek culture countries than in other countries. We construct a dummy variable $Colonization_i$ that is equal to one if a country is an *ex ante* ancient Greek culture country. The regression model specified in our baseline results includes a $Colonization_i$ interaction term with $Mercury_t$ as an additional explanatory variable.

In Table 10 Column (1), the coefficient of the interaction term between $Colonization_i$ and $Mercury_t$ is -1.765 with a t-statistic of -1.76, suggesting that the negative effect of Mercury Retrograde on market returns is more pronounced in countries with *ex ante* ancient Greek culture. One concern here is that the result in Column (1) comes from a religious effect since our *ex ante* ancient Greek culture is conditioned on Christianity. To address this concern, in Column (2), we control for the interrelation term of $Christianity_i$ and $Mercury_t$, in which $Christianity_i$ is equal to one if a country's primary religion is Christianity. We find that the interaction term between $Colonization_i$ and $Mercury_t$ is -1.946 with a t-statistic of -1.97, but the interaction term between $Christianity_i$ and $Mercury_t$ is insignificant.

[Table 10 here]

Overall, these results further confirm that the Mercury effect comes from the cultural effect. The magnitudes and statistical levels in Table 10 are lower than those using Google search topics in Table 8. This difference is hardly surprising for two reasons. First, countries with an *ex ante* ancient Greek culture do not always have an *ex post* ancient Greek culture (i.e., the odds from Table 10 are smaller than 100%). The weaker cultural effect in Table 10 highlights the importance of a persistent culture (e.g., Stulz, and Williamson, 2003; Guiso, Sapienza, and Zingales, 2006), i.e., a country has both *ex ante* and *ex post* ancient Greek culture. In the next section, we explain why ancient Greek culture is persistent. Second, the regression analysis in Table 10 is subject to error-in-variable, because the *ex ante* ancient Greek culture is not directly observable and need to be determined based on historical literature.[43] Such error-in-variable is more likely biases our results in Table 10 towards zero. This downward bias suggests that our results likely underestimate the true amount of variation in the cultural effect of Mercury Retrograde.

4.2.2. Science and the influence of ancient Greek culture

To better understand the cultural effect, we test why the above ancient culture can persistently affect the *investor belief* channel. The one possible reason is that the astrological part of ancient Greek culture plays an important role in the *investor belief* channel, and people cannot verify the scientific validity of astrology.

Science had important links to philosophy and religion and served as the technical foundation for ancient Greek astrology from the second century B.C., through which it acquired political significance. In ancient times, most ancient Greeks only knew about naked-eye astronomy, believing the universe is Earth-centered and not Sun-centered. In that time, people believed in astrology because it had scientific validity. Specifically, astrology helped ancient Greeks' understanding of the nature of the universe; thus, it was a permanent part of ancient cultures (e.g., Thorndike, 1955; Alfvén, 1984; Campion, 2015).[44]

After the Age of Enlightenment, with the impetus of the Scientific Revolution, astrology lost scientific validity under the natural law of gravitation (e.g., Alfvén, 1984; Carlson, 1985; Zarka, 2011). The planetary positions have then gradually developed into modern astronomy, parting ways from the planetary theory of naked-eye astronomy and ancient Greek astrology. Astronomy became the mainstream science of that era. This effect fundamentally shakes astrology, leading to a negative relation between astrological belief and scientific development in modern societies.

The above historical background narrative provides motivation for empirical studies to invariably include astrology as a touchstone to identify pseudoscience in citizen scientific development. For example, according to the Science and Engineering Indicators (2011), most people in the U.S. consider astrology to be completely unscientific. Allum (2011) finds that

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[43] For example, there could be a concern that colonization effect would not be so long-lasting, since Greek colonization occurred so early. However, as noted, France, Italy, Russia, and Spain experienced the Renaissance during 14-16th centuries could imply that these countries have been exposed to the ancient Greek culture historically.

[44] For example, the retrograde motion was something that mystified ancient astronomers based on the Earth-centered universe. The social meaning of retrograde motion gave ancient Greeks more understanding of the universe. In a famous dialogue called the *Timaeus*, the ancient Greek philosopher Plato divides the world into two cosmic principles: the SAME and the OTHER. The OTHER was used to explain the retrograde motion when we were in the Earth-centered universe.

individuals in a poor scientific development country have greater beliefs in the validity of astrology. Overall, evidence suggests that in a poor scientific development environment, people believe that astrology is still scientific. Thus, they choose to believe in astrology persistently, as the ancient Greeks did.

Hence, critical to our interpretations of the empirical evidence in Tables 8 to 10, we test whether the lower scientific development could enhance the effect of ancient Greek culture on investors' reaction to Mercury Retrograde. We use the time-series average of EGERD (Sci) as the scientific development for each country. We construct a dummy variable $Low\ Sci_i$ that is equal to one (zero) if a country's Sci is in the bottom (top) 1/3 of all the sample countries.

[Table 11 here]

To test the above idea, we perform three tests. First, we verify whether a low level of scientific development is positively related to the odds of observing a persistent ancient Greek culture. That is, whether $\gamma 1$ in equation (6) is higher in countries with a low level of scientific development. In Column (1), Panel A of Table 11, we run a logistic regression using an *ex post* ancient Greek culture variable (all Google search topics in Table 8) as a dependent variable and $Low\ Sci_i$ as an independent variable. We find that countries with low scientific development have significantly positive odds of observing *ex post* ancient Greek cultures. We then include our main intertest variable, an interaction term between $Low\ Sci_i$ and $Colonzation_i$ in Column (2). We find that the interaction term between $Low\ Sci_i$ and $Colonzation_i$ is significantly positive, confirming a low level of scientific development is positively related to the odds of observing a persistent ancient Greek culture.

In Figure 8, we plot the cumulative daily residual Google search volume for the topic "Retrograde motion" among $Low\ Sci_i = 1$ countries. The residual value is from equation (4) without controlling for $Mercury_t$. We plot this residual value for the group of countries if $Colonization_i$ equals one and for another group of countries if $Colonization_i$ equals zero. We find that, before Mercury Retrograde occurs, these two groups have the same search volume. However, when Mercury Retrograde occurs, the search volume in countries with the *ex ante* ancient Greek culture is twice that than in countries without the *ex ante* ancient Greek culture. This finding further confirms that condition on $Low\ Sci_i$, the countries with *ex ante* ancient Greek culture most likely have an interest in ancient Greek culture (e.g., Mercury Retrograde) during our sample period.

[Figure 7 here]

Second, we investigate whether the effect of Mercury Retrograde on returns displays any variations along the dimension of Sci. The regression model specified in our baseline results includes the scientific development's interaction terms with $Mercury_t$ as additional explanatory variables. We report the results in Panel B of Table 11. In Column (1), we find that the coefficient on the interaction term between $Low\ Sci_i$ and $Mercury_t$ is -3.053 with a t-statistic of -2.04, confirming that the negative effect of Mercury Retrograde on market returns is more pronounced in countries with a lower level of scientific development. Given that the scientific development could be positively correlated with financial literacy, our results are also consistent with Rooij, Lusardi, and Alessie (2011) who find that investors with high literacy are more likely to invest in stocks.

Finally, in Column (2) of Panel B, we include the three-way interaction among $Colonzation_i$, $Low\ Sci_i$, and $Mercury_t$, and with other two-way interactions as controls. We find that the three-way interaction is significantly negative. Hence, among countries with a great influence by ancient Greek culture, low scientific development has an incremental effect on people's reaction to Mercury Retrograde. Individuals in these countries think astrology is still scientific. Thus, they will believe in Mercury Retrograde, as ancient Greeks. However, among countries with a low influence by ancient Greek culture, low scientific development does not affect people's reactions to Mercury Retrograde. The reason is that scientific development effects on how individuals react to the scientific validity of astrology. Given that individuals in these countries do not hold the astrological belief in the first place, the effect of Mercury Retrograde on returns should not display any variations along the dimension of *Sci* in these countries.

The above results also mitigate the concern that omitted variables could explain the documented cultural effect. For any omitted variable to explain our cultural effect, it needs to be affected by the scientific development as well. Otherwise, it would not generate a difference between the treated (with ancient Greek culture) and control (without ancient Greek culture) countries in terms of the relation between Mercury Retrograde and market returns. Overall, these results confirm the robustness of our cultural effect in Tables 8 to 10.

4.2.3. Superstition and the influence of ancient Greek culture

We have shown that the astrological belief in Mercury Retrograde declines as countries have better scientific development. We know that science and superstition are against with each other, and astrological belief could relate to superstition. Therefore, another way to assess the above results is to look at whether our cultural effect is stronger in countries with greater superstition beliefs.

We collect cross-country superstition data from Barro (2003). This superstition variable is the average of three beliefs that seem clearly to reflect superstition: belief in fortune tellers ("some fortune tellers really can foresee the future"), belief in horoscopes ("a person's star sign at birth, or horoscope, can affect the course of their future"), and belief in good-luck charms ("good luck charms sometimes do bring good luck").[45] We construct a dummy variable $High\,Superstition_i$ that is equal to one (zero) if a country's superstition is in the bottom (top) 1/3 of all the available sample countries. We perform two tests based on this superstition variable.

[Table 12 here]

First, we test whether the higher superstition beliefs could enhance the Mercury effect. As predicted, in Column (1) of Table 12, the coefficient of the interaction term between $High\,Superstition_i$ and $Mercury_t$ is -3.026 with a t-statistic of -1.73, confirming that the Mercury effect is more pronounced in countries with a higher level of superstition beliefs. Second, we test whether the higher superstition beliefs could increase the effect of ancient Greek culture on investors' reaction to Mercury Retrograde. In Column (2) of Table 12, we include the three-way interaction among $Colonzation_i$, $High\,Superstition_i$, and $Mercury_t$, and with other two-way interactions as controls. Consistently, we find that the coefficient of three-way interaction is -5.907 with a t-statistic of -3.95, confirming that high superstition beliefs have an incremental effect on people's reaction to Mercury Retrograde among countries with a great influence by ancient Greek culture.

Our findings are consistent with studies that show that superstition beliefs are important in capital markets (e.g., Hirshleifer, 2001), especially when such superstition beliefs are generated from investors' cultural background (e.g., Agarwal, Choi, He, and Sing, 2018; Bhattacharya, Kuo,

[45] Barro (2003) collects data from International Social Survey Programme (ISSP) 1991 and 1998. It includes the following countries: Austria, Canada, Czech Republic, France, Germany, Hungary, Ireland, New Zealand, Philippines, Portugal, Russia, Slovenia, Switzerland, and United Kingdom.

Lin, and Zhao, 2018; Hirshleifer, Jian, and Zhang, 2018). Overall, these results further confirm the robustness of our cultural effect in Tables 8 to 10.

5. Other tests

We have seen in the previous subsection that market prices, on average, decline during the Mercury Retrograde period. In this subsection, we analyze other effects that may be related to Mercury Retrograde and rates of return.

5.1. Trading volume

This section investigates whether Mercury Retrograde affects trading volume. Our *investor belief* channel posits that investors who hold the astrological belief of Mercury Retrograde stay away from the market during the Mercury Retrograde period. This effect results in lower market returns since markets need to offer higher returns to compensate remaining investors for sharing more risk. Although we do not have a direct measure of investors' equity demand during the Mercury Retrograde period, we examine other behaviors that may signal a low demand in the market. Intuitively, if investors do not want to participate in the stock market that day, the market, on average, becomes less active. For example, Griffin, Nardari, and Stulz (2006) find that market participation has positive effects on market trading volume. Thus, we expect to see low trading volumes during the Mercury Retrograde period. To investigate this effect, we use data on the aggregate trading volume on the stocks in the national index.

[Table 13 here]

For most countries, DataStream volume data do not start until 1985, which reduces the number of observations that can be included in the sample. As a measure of trading volume, we examine the detrended log of turnover (Turn), in which the turnover is calculated as aggregate traded value (turnover by value in DataStream) divided by the day's contemporaneous total market capitalization. We focus on detrended log turnover because the level of log turnover may be influenced by trends in some factors, including liquidity, commissions, and availability of information.[46] We use a detrending methodology in the spirit of Campbell, Grossman, and Wang

[46] In Appendix IA9, we also use aggregate traded volume (turnover by volume in DataStream) to proxy for market trading activity. The results are quantitatively similar.

(1993) and calculate the short-term turnover trend as a rolling average of the past 20 trading days (one month) of log turnover.[47]

Table 13 reports results using the abnormal volume as the dependent variable. As predicted, we find that the point estimates of trading volume are all significantly negative in both columns, suggesting a reduction in volume on the Mercury Retrograde period. In Column (1), the coefficient on $Mercury_t$ is -0.012 with a t-statistic of -2.25. In Column (2), after controlling for lagged market variables (return, volatility, and trading volume), the coefficient on $Mercury_t$ is -0.008 with a t-statistic of -1.99. To put the above results in perspective, there is a 0.8% reduction in daily trading volume by investors on the Mercury Retrograde period. We, therefore, conclude that Mercury Retrograde has a negative effect on trading volumes, confirming that some investors stay away from the market during the Mercury Retrograde period.

Moreover, Table 13 shows a positive relation between past five-day returns and stock market turnover (with a p-value of 0.007 under a joint test), which is consistent with the finding in Griffin, Nardari, and Stulz (2006). Griffin, Nardari, and Stulz (2006) show that such positive return–volume relation can be explained by investor participation effects. In our *investor belief* channel, the Mercury effect is related to investor participation effects, suggesting that the return–volume relation should be different in Mercury Retrograde and other periods. Specifically, if Mercury Retrograde induces investors to participate less in the stock market, we expect the positive return–volume relation is weaker in Mercury Retrograde period than in other periods.

To test the above prediction, we separately repeat return–volume relation analysis in days falls on the window of Mercury Retrograde and days outside the window of Mercury Retrograde. Columns (3) of Table 13 presents the regression results for days falls on the window of Mercury Retrograde. In this result, a joint test of the coefficient estimates on the past five-day returns are jointly insignificant (with a p-value of 0.320). Columns (4) presents the regression results for days outside the window of Mercury Retrograde. Unlike Columns (3), there is a significantly positive relation between past daily returns and trading volume during non-Mercury Retrograde periods. Specifically, a joint test of the coefficient estimates on the past five-day returns has a p-value of 0.0004. These results indicate that the positive return–volume relation is primarily driven by the

[47] We use past 20 days because a Mercury Retrograde period is around 20 days. Our result is robust to using 40 trading days (two months) averages. The long-term trend in trading volume is detrended by including country fixed effect in the regression analysis.

days outside the window of Mercury Retrograde, confirming that the Mercury effect is related to participation effects.[48] Overall, the results in Table 13 further confirm the robustness of our *belief* channel.

5.2. Market underreaction to news

To further confirm that some investors do not want to participate in the stock market during Mercury Retrograde, we test whether the equity market responses less strongly to the aggregate news. Previous studies show that investors' trading activities and market reaction to news are positively correlated (Barber and Odean, 2008). Therefore, if market becomes less active during the Mercury Retrograde period, we expect to see low market reaction to news that days. To investigate this effect, we use the aggregate news sentiment to capture the aggregate news in each country-date.

Appendix Table IA10 reports results by regressing daily market returns on the average of last five days aggregate news sentiment ($ESS_{t-1,t-5}$). Columns (1) presents the regression results for days falls on the window of Mercury Retrograde. In this result, the coefficient estimates on $ESS_{t-1,t-5}$ is 20.534 with a t-statistic of 2.11, suggesting that market underreacts to news during the Mercury Retrograde period. Columns (2) presents the regression results for days outside the window of Mercury Retrograde. Unlike Columns (1), there is a insignificantly negative relation between $ESS_{t-1,t-5}$ and daily returns during non-Mercury Retrograde periods. The coefficient estimates on $ESS_{t-1,t-5}$ has a t-statistic of -0.55, suggesting that market does not underreact to news during non-Mercury Retrograde periods. One concern here is that the above results could come from a seasonal factor in news, for example, news contain more information in Mercury Retrograde period than in other periods. However, such possibility has been rejected in our Table 4. Therefore, results in Appendix Table IA10 most likely result from a low trading activity during Mercury Retrograde, further confirming the robustness of our *investor belief* channel.

5.3. The price of risk

[48] While Griffin, Nardari, and Stulz (2006) show that the positive return–volume relation can also be attributed to other factors (e.g., short-sale restrictions and overconfidence), it is unclear that why Mercury Retrograde is associated with other factors.

Up to now, our evidence suggests that Mercury Retrograde is associated with lower market returns, primarily through the *investor belief* channel. Coupled with additional evidence of the lower trading volumes in Mercury Retrograde periods, we interpret our results as being consistent with investors who hold astrological beliefs stay away from the market. Therefore, markets need to offer a higher risk premium to compensate their remaining holders for sharing more risk. A higher risk premium indicates a higher price of risk if the market risk is not changed. Hence, a natural question is whether the Mercury effect is associated with increases in the price of risk.

To answer this question, we consider a conditional version of Merton's (1980) CAPM. For the expected excess return on the market, the conditional CAPM is:

$$E_t\left[ret_{i,t+1}\right] = \lambda \times E_t\left[VAR_{i,t+1}\right] \quad (7)$$

where $E_t\left[ret_{i,t+1}\right]$ is the expected excess return (total risk premium) on country i and $E_t\left[VAR_{i,t+1}\right]$ is the time variation in expected market variance on country i.[49] Therefore, λ reflects the expected reward per unit of risk in country i (Harvey, 1991).

To measure $E_t\left[VAR_{i,t+1}\right]$, we use the daily implied variance (IV) and $\widehat{VAR_{\iota,t+1}}$. IV is the square of VIX of the local market index which captures expected market risk over the next 30 days, and $\widehat{VAR_{\iota,t}}$ is the predicted market return variance, which is the predicted variance by regressing daily realized variance on the average of daily realized variance over the past month and the past year (e.g., Corsi, 2009; Johnson, 2019). To measure $E_t\left[ret_{i,t+1}\right]$, we use $\widehat{ret_{\iota,t}}$ from the following regression in each country:

$$ret_t = \alpha + \beta_1 \times Term\ Spread_t + \beta_2 \times DY_t + \beta_3 \times Bond_t + \beta_4 \times \log GP_t + \gamma \times L(5)ret_t + e_t \quad (8)$$

where, ret_t is the excess daily returns by subtracting the three-month Government bond rate from the raw daily index returns; $Term\ Spread_t$ is the difference between yields of the ten-year and three-month government benchmark bonds; DY_t is the dividend yield on the corresponding market index; $Bond_t$ is three-month Government bond rate; $\log GP_t$ is the natural logarithm of the ratio of gold to platinum prices; and $L(5)ret_t$ is the five lags of ret_t. Previous studies show that $Term\ Spread_t$, DY_t, $Bond_t$ $\log GP_t$, and past local market excess returns are important for the local market risk premium (e.g., Ang and Bekaert, 2007; Henkel, Martin, and Nardari, 2011;

[49] Merton (1980) uses contemporaneous, rather than ex ante, measures of volatility or variance, which include both ex ante market risk and the unexpected change in market risk. However, French, Schwert, and Stambaugh (1987) show that only ex ante market risk has a positive impact on expected market risk premium.

Rapach, Strauss, and Zhou, 2013; Huang and Kilic, 2019). All the variables above are obtained from DataStream.[50]

The natural question that follows from Equation (7) is whether the reward per unit of risk λ, is higher in Mercury Retrograde periods. To answer this question, we control for $Mercury_t$ and its interaction term with $E_t[VAR_{i,t+1}]$ in Equation (7). If Mercury Retrograde increases the price of risk, we should expect to see a positive coefficient (θ) on the interaction term between $Mercury_t$ and $E_t[VAR_{i,t+1}]$:

$$E_t[ret_{i,t+1}] = \begin{matrix} \lambda \times E_t[VAR_{i,t+1}];\ if\ Mercury_t = 0 \\ \lambda \times E_t[VAR_{i,t+1}] + \theta \times E_t[VAR_{i,t+1}];\ if\ Mercury_t = 1 \end{matrix}$$

We report the results in Table 13. Columns (1) and (2) of Table 13 show that the coefficients of $E_t[VAR_{i,t+1}]$ are significantly positive, confirming the positive risk-return trade-off. The coefficients of $Mercury_t$ are 0.407 and 0.594, with t-statistics of 1.88 and 2.18 without controlling for the interaction term. These results indicate that significant evidence for Mercury Retrograde remains in the risk premium after allowing market risk to vary over time, suggesting that Mercury Retrograde increases the price of risk. In Columns (3) and (4), we control for $Mercury_t \times E_t[VAR_{i,t+1}]$. We find that the coefficient of $Mercury_t \times E_t[VAR_{i,t+1}]$ is significantly positive. For example, the coefficient of $Mercury_t \times \widehat{VAR_{i,t}}$ is 0.506 with a t-statistic of 1.81 in Column (3) and $Mercury_t \times IV_{i,t}$ is 0.222 with a t-statistic of 1.81 in Column (4). These results further confirm that investors expect to receive a greater reward per unit of risk in Mercury Retrograde periods.[51] Overall, our results are consistent with the interpretation that Mercury Retrograde is associated with increases in the compensation required by remaining investors for bearing risk.

[Table 14 here]

5.3. Alternative explanations

[50] We use the three-month and ten year Government bond rates for each country with the DataStream classification that starts with "TR." It does not include the following countries: Austria, Colombia, Cyprus, Egypt, Finland, Ireland, Israel, South Korea, Slovenia, and Taiwan.

[51] The above results also mitigate the concerns that the negative effect of Mercury Retrograde on realized market returns comes from a spurious relationship of Ferson, Sarkissian, and Simin (2003). If our Mercury effect comes from a spurious relationship, then we should expect to see Mercury Retrograde also has a negative impact on expected market returns. Such possibility is rejected in Table 14.

Finally, we examine alternate explanations that could drive our results. Specifically, we identify market risk and investor bad mood (low sentiment) as two possible alternate causes of the Mercury effect. We go on to distinguish these alternate explanations for our empirical findings.

5.3.1. Market risk

A natural question is whether our results are risk-related. If the market is riskier in Mercury Retrograde periods, then we would observe a similar Mercury effect. The market could be risker in the following ways. First, market return volatility is time-varying, and hence, the market could coincide with some crashes. Second, astrologers believe that Mercury Retrograde is a cause of disaster. They suggest that everything can be uncertain in this period (Boland and Farnell, 2019). This uncertainty could be reflected in the stock markets. Therefore, testing whether our results are risk-related by using the market risk directly is worthwhile.

[Table 15 here]

To test this argument, we first test whether investors are responding to increases in expected market risk. We re-run equation (1) using the daily VIX to proxy for investors' expectations for market risk. The daily VIX can indicate investors' views on future market volatility. In Columns (1) and (2) of Table 15, we use the daily VIX as the dependent variable and find no change in the daily VIX in Mercury Retrograde periods. We then use daily return volatility (absolute return) as the dependent variable to test the effect on realized market risk. The results in Columns (3) and (4) of Table 15 show that Mercury Retrograde does not lead to an increase in realized market volatility. In addition to daily return volatility, we use the daily return covariance to proxy for the realized market covariance risk. The daily return covariance is the product of a daily country index return and a daily global index return divided by the absolute daily global index return. In Columns (5) and (6), the market covariance risk is unaffected by Mercury Retrograde. Collectively, the Mercury effect is unlikely to be driven by increases in market risk.

5.3.2. Investors low sentiment

Our results could also relate to investor low sentiment. Given that individuals believe that Mercury Retrograde adversely affect their daily lives they could have a "bad feeling" in this period. This bad feeling can cause low mood among investors, which leads to more pessimistic views on future returns (Hirshleifer, Jiang, and DiGiovanni, 2020). In this case, we would observe lower market returns in Mercury Retrograde periods.

Our previous findings in trading volume suggest that the Mercury effect is unlikely to be driven by investor low sentiment. In a behavioral story, there is ample psychological evidence that individuals typically take actions to fix their low mood. For example, Erber and Tesser (1992) find that a low mood is attenuated by performing challenging tasks. Edmans, Garcia, and Norli (2007) note that "trading is a plausible example of such a task: Not only is it a cognitively intense activity, but it also has the potential of generating profits to negate the negative mood." Therefore, low sentiment should predict higher trading volumes in the Mercury Retrograde period, but our results in trading volume reject this prediction.

To further test whether our results are related to investor low sentiment, we use two variables to proxy for investor sentiment: the weekly Google sentiment index of Gao, Ren, and Zhang (2018) and the daily Google search volume for the topic "Depression-Mood." The Google sentiment index is the weekly volume of search terms related to economics and finance across various countries in different languages since 2004 (Gao, Ren, and Zhang, 2018). Because internet searches can reflect investors' expectations, so we interpret the Google sentiment index as an indicator of the representative agent's pessimistic expectations of future market returns. The Google search volume for the topic "Depression-Mood" is the country-date variable that reflects individuals' feelings about depression. The depression mood is one of the most important feelings in the low mood (Carton, Jouvent, Bungener, and Widlocher, 1992). A higher search volume for the topic "Depression-Mood" indicates a lower sentiment in a country-date. We standardized this search volume in each country.

We use the above two variables as the dependent variable in our regressions. For the Google sentiment index, if a week has at least 50% Mercury Retrograde days, then we set this week as the Mercury Retrograde week. As Table 16 shows, in Mercury Retrograde periods, investors do not significantly reduce their sentiment in the equity market. The coefficients on $Mercury_t$ are insignificantly different from zero in both Columns. These results are inconsistent with the view of investor low sentiment.

[Table 16 here]

Overall, these results help present a crucial distinction between our work on celestial phenomena and related studies of Yuan, Zheng, and Zhu (2006) and Novy-Marx (2014). Each of these studies relates to celestial phenomena and mood and finds a significant link between mood shock and equity prices. Using the above two variables, we conclude that the low mood is unlikely the primary cause of our main results.

6. Conclusion

Motivated by the astrological belief that investors better off staying away from the market during the Mercury Retrograde period, this paper hypothesizes that market returns are lower during the Mercury Retrograde period than during the remainder of the year. By regressing daily realized stock market index returns on an indicator variable for the Mercury Retrograde periods, we find that market returns are 3.33% annually lower during the Mercury Retrograde period than during the remainder of the year.

We do not find evidence that the astrological theory of Mercury Retrograde is true. Therefore, the way that Mercury Retrograde effects market returns derives from the *investor belief* channel. Specifically, investors who hold the astrological belief will stay away from the market during the Mercury Retrograde period, and thus the market needs to offer a higher risk premium to compensate their remaining holder for sharing more risk. We find that the Mercury effect is indeed stronger among countries with a greater astrological belief in Mercury Retrograde.

Extending this *investor belief* channel, we find that this channel comes from ancient Greek culture. Given that ancient Greek culture is fundamental in western culture, Greek culture affects modern society. Since the belief of the motions of Mercury comes from ancient Greek culture, investors with a greater exposure to ancient Greek culture could be more interested in the astrological belief of Mercury Retrograde. Our results are consistent with this cultural effect. Collectively, the repeated exogenous shocks of Mercury Retrograde on investors' trading behaviors help us to draw a causal effect of culture in stock market returns. Our findings also suggest that for some artificial cultures, investors may deem them important, and behave accordingly.

It is important to remember that our results are based on market returns. Market level data might not provide direct evidence about how Mercury Retrograde affects investors trading activities and the share of wealth allocated of householders. Thus, further research at the individual trading level (e.g., using household-level data) will help us better understand the relationship between Mercury

Retrograde (or other ancient cultures) and individual investors' trading behavior. Future studies could also investigate the effect of Mercury Retrograde on other economic outcomes.

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Figure 1

This Figure is the simultaneous positions of Earth and Mercury based on their orbits around the sun at successive times. The apparent position of Mercury, as seen from Earth, is the point where the line passing through the position of both appears to intersect the background of fixed stars. These points are represented at the right. The blue color is Earth, and the grey color is Mercury. Both planets move in the same direction (west to east) at different speeds.

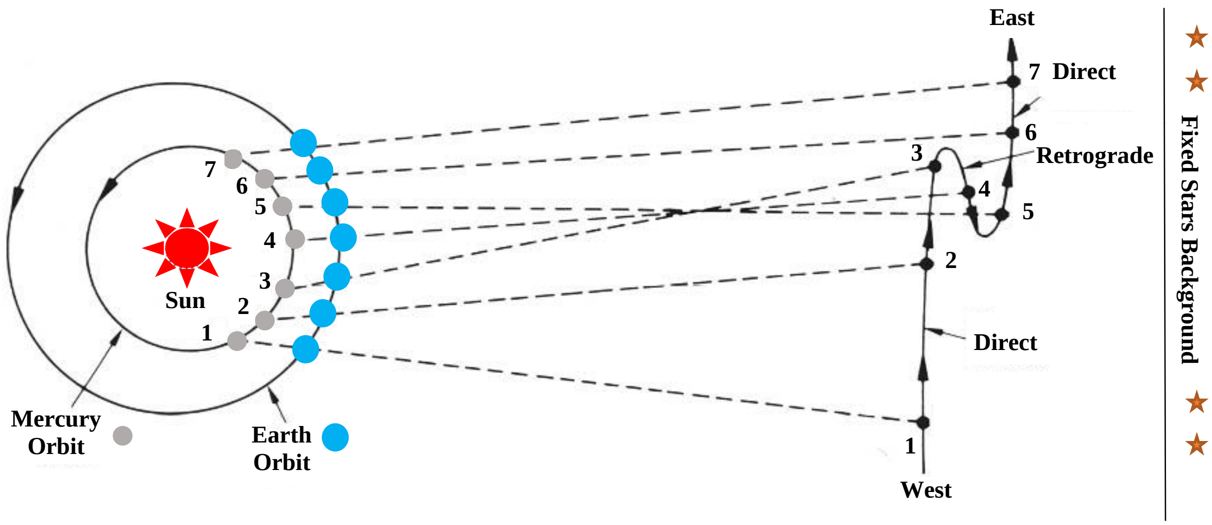

Figure 2

This Figure plots the distribution of Mercury Retrograde in each year (A) and month (B) from January 1973 to October 2019.

Figure 2.A

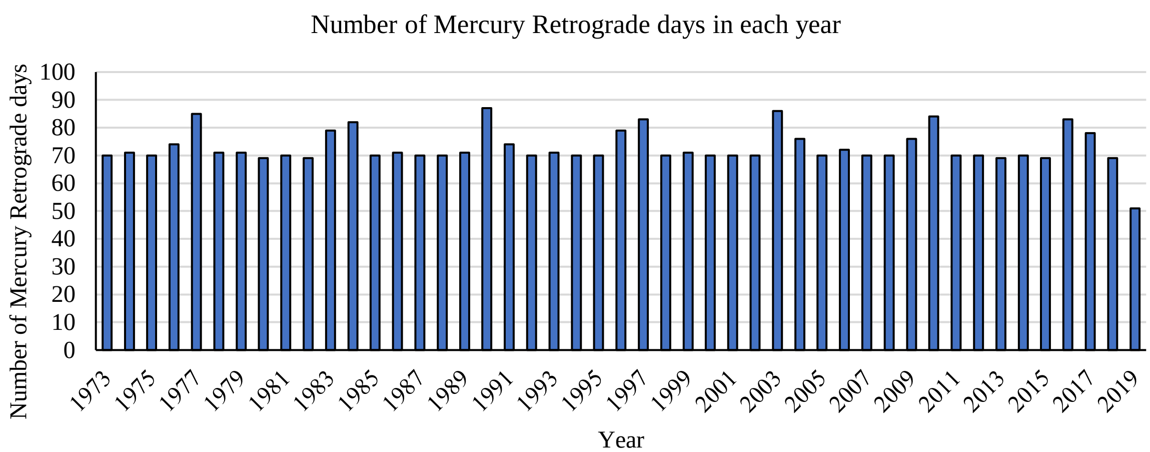

Figure 2.B

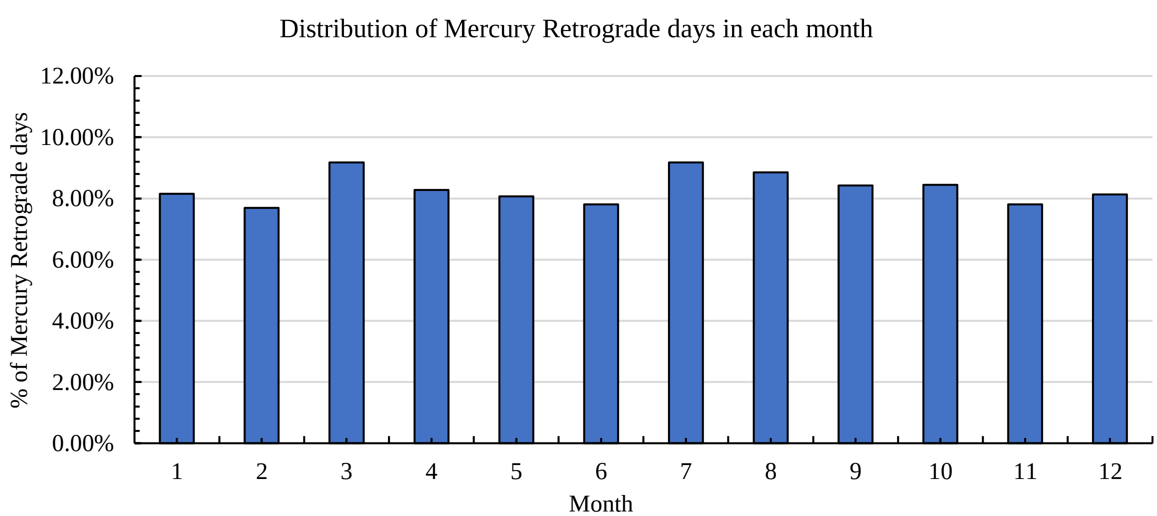

Figure 3

This Figure shows the cumulative residual market return. The y-axis represents the daily cumulative residual return. The daily residual return is the residual from the Equation (1) without controlling for $Mercury_t$. Day 0 is the beginning of Mercury Retrograde days. The Grey vertical lines with "R" indicate the beginning to ending of one Mercury Retrograde period. On average, one Mercury Retrograde period is about 23 calendar days in our sample $(73 \times 47 \div 148)$, and one non-Mercury Retrograde period (Prograde period) is about 93 calendar days $((365 - 73) \times 47 \div 148)$. Hence, the first Grey vertical line is in day 0, the second Grey vertical line is in day 23, the third Grey vertical line is in day 116, the fourth Grey vertical line is in day 139, the fifth Grey vertical line is in day 232, the sixth Grey vertical line is in day 255, and the final Grey vertical line is in day 348.

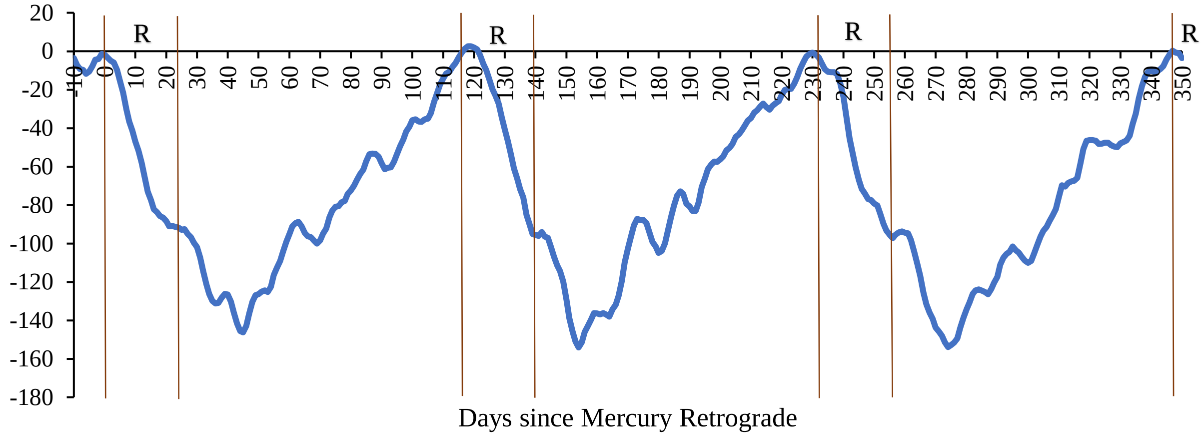

Figure 4

This figure plots the t-values associated with the Mercury effect. We test the Mercury effect as in Eq (1) using rolling 24-year windows and report the t-values for these rolling windows. The 1997 data points, for example, are the t-values of the Mercury effect for the 24-year period up to 1997. T-values is reversed the sign on the t-statistics so that high values of t-values correspond to more significant effect.

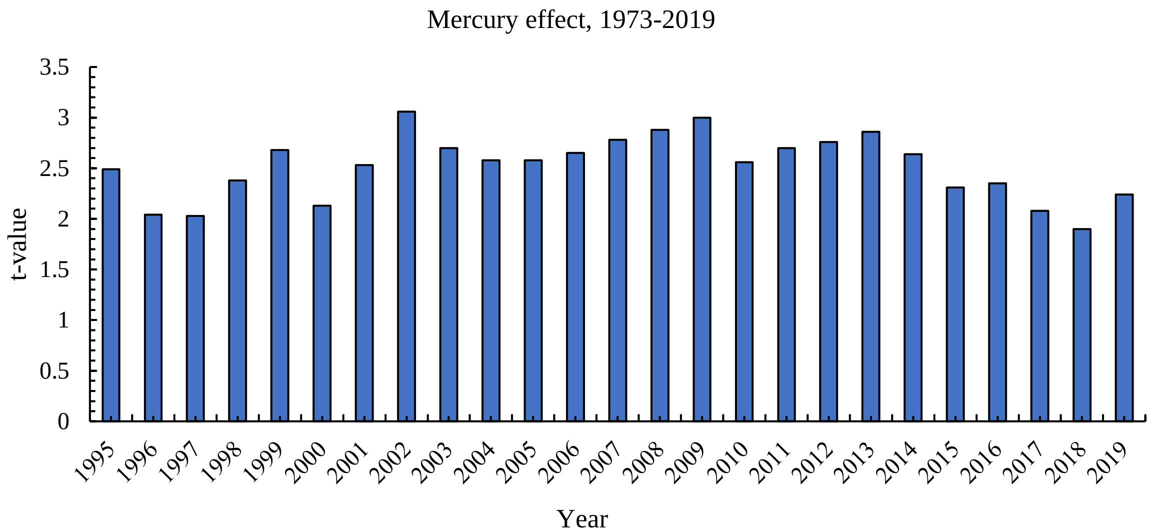

Figure 5

This Figure displays the map for ancient Greece in 550 B.C. The colorful areas are ancient Greece colonies.

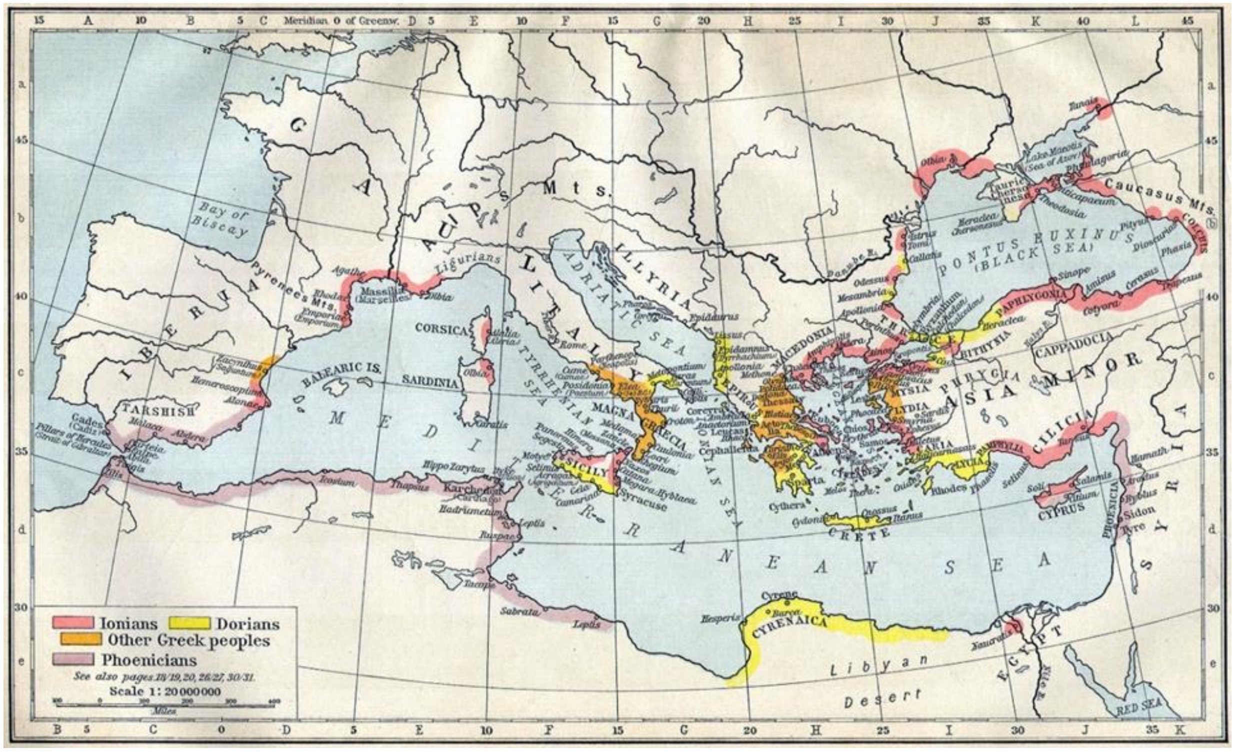

Figure 6

This Figure plots the google search volume index for topics "Retrograde motion" (A), "Ancient Greece" (B), "Mythology" (C), and "Hermes" (D) for each country. We use the "interest by region" function in Google Trends to download the cross-sectional search interests in each topic from 01/01/2004 to 31/10/2019.

Figure 6.A

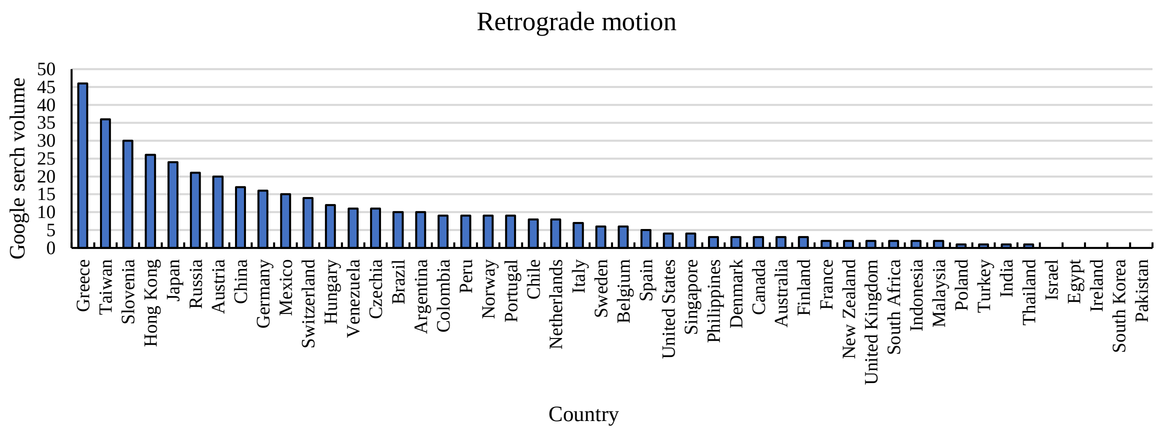

Figure 6.B

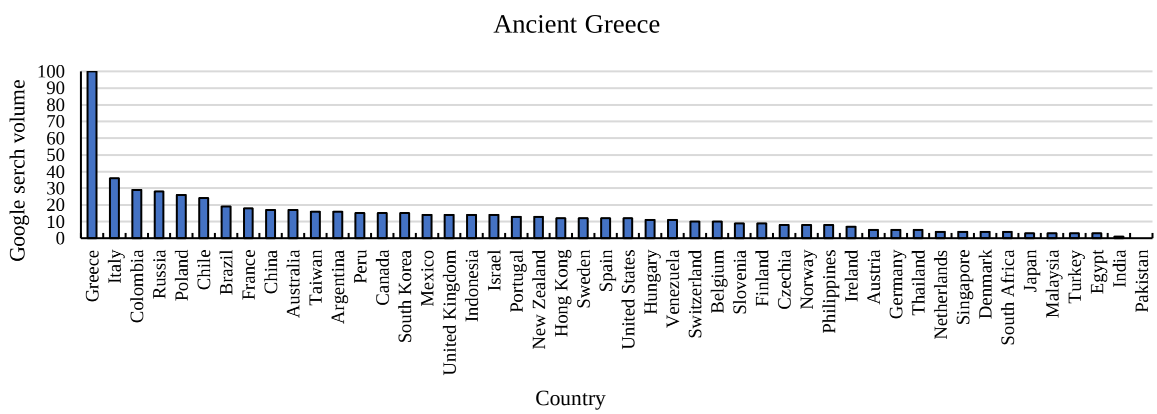

Figure 6.C

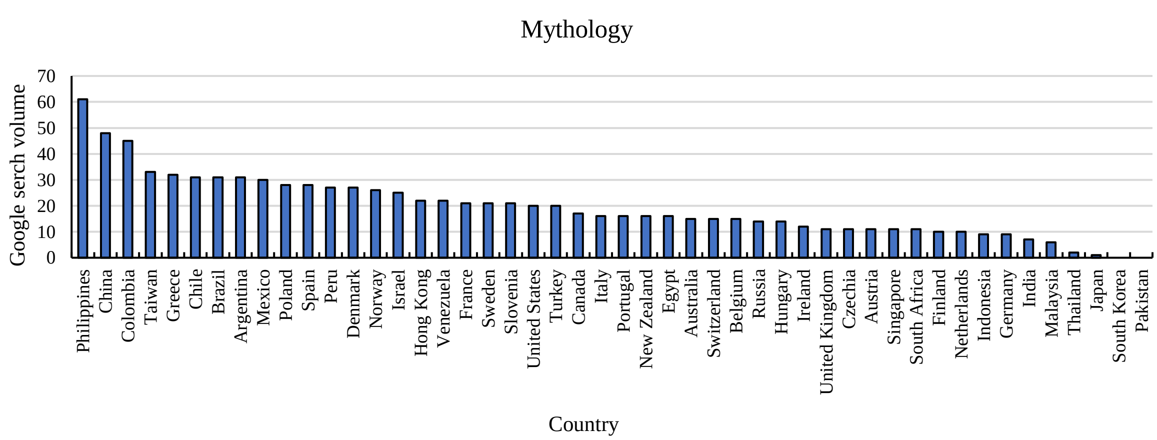

Figure 6.D

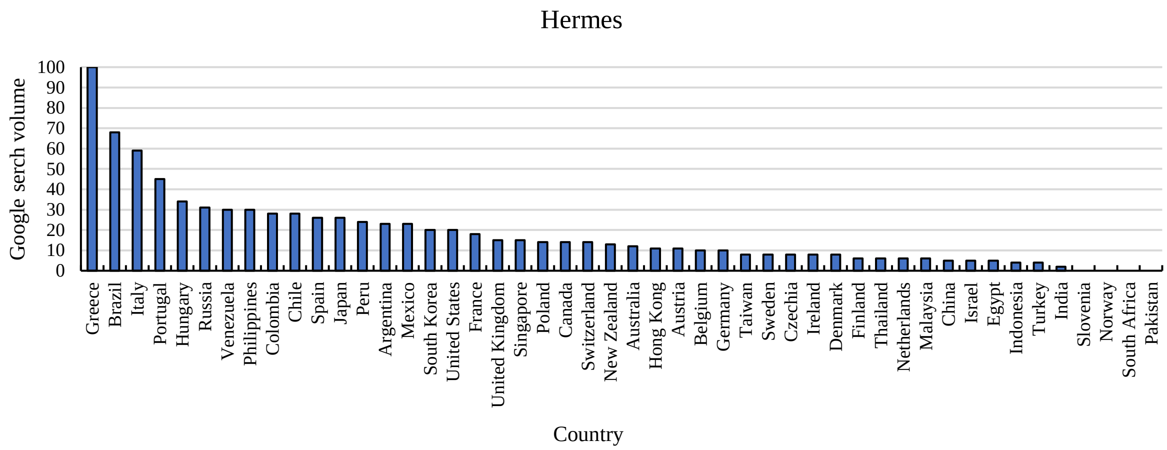
Hermes
Google serch volume
100
90
80
70
60
50
40
30
20
10
0
Greece
Brazil
Italy
Portugal
Hungary
Russia
Venezuela
Philippines
Colombia
Chile
Spain
Japan
Peru
Argentina
Mexico
South Korea
United States
France
United Kingdom
Singapore
Poland
Canada
Switzerland
New Zealand
Australia
Hong Kong
Austria
Belgium
Germany
Taiwan
Sweden
Czechia
Ireland
Denmark
Finland
Thailand
Netherlands
Malaysia
China
Israel
Egypt
Indonesia
Turkey
India
Slovenia
Norway
South Africa
Pakistan
Country

Figure 7

This Figure displays a global map for the Mercury effect using the t-statistic value in each country. Because only two countries have a positive reaction to Mercury Retrograde (Thailand with a t-statistic of 0.00 and Israel with a t-statistic of 0.07), we use the absolute value of the t-statistic (t-value). The gold color is for t- value between 2-4; the yellow color is for t-value between 1.65-2; the green color is for t-value between 1-1.65; the orange color is for t-value between 0-1; white color is for countries not covered in our sample.

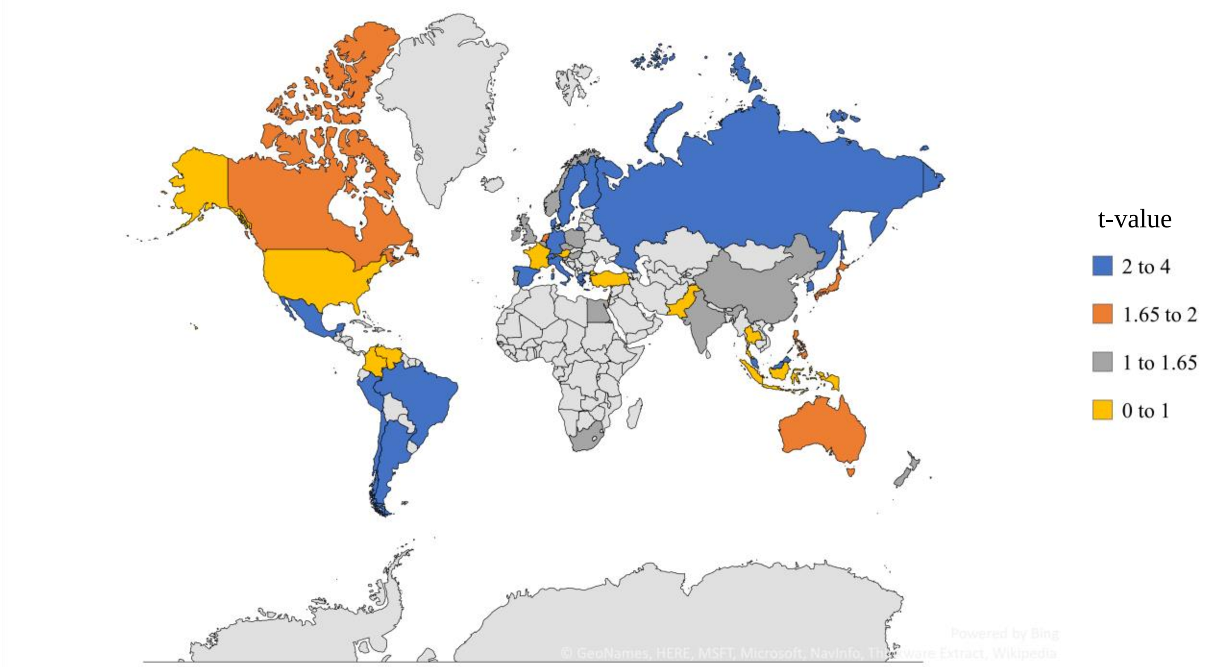

Figure 8

This Figure shows the cumulative residual Google Search Volume Index (SVI) for the topic "Retrograde motion." The y-axis represents the cumulative residual SVI. The daily residual SVI is the residual from the Equation (4) without controlling for $Mercury_t$. The blue line is the cumulative residual SVI for countries in non-*ex ante* ancient Greek culture group ($Colonization_i = 0$) and the gold dash line is the cumulative residual SVI for countries in ex ante ancient Greek culture group ($Colonization_i = 1$). $Colonization_i$ is a binary variable that is equal to one if a country has an *ex ante* ancient Greek culture. Day 0 is the beginning of Mercury Retrograde days.

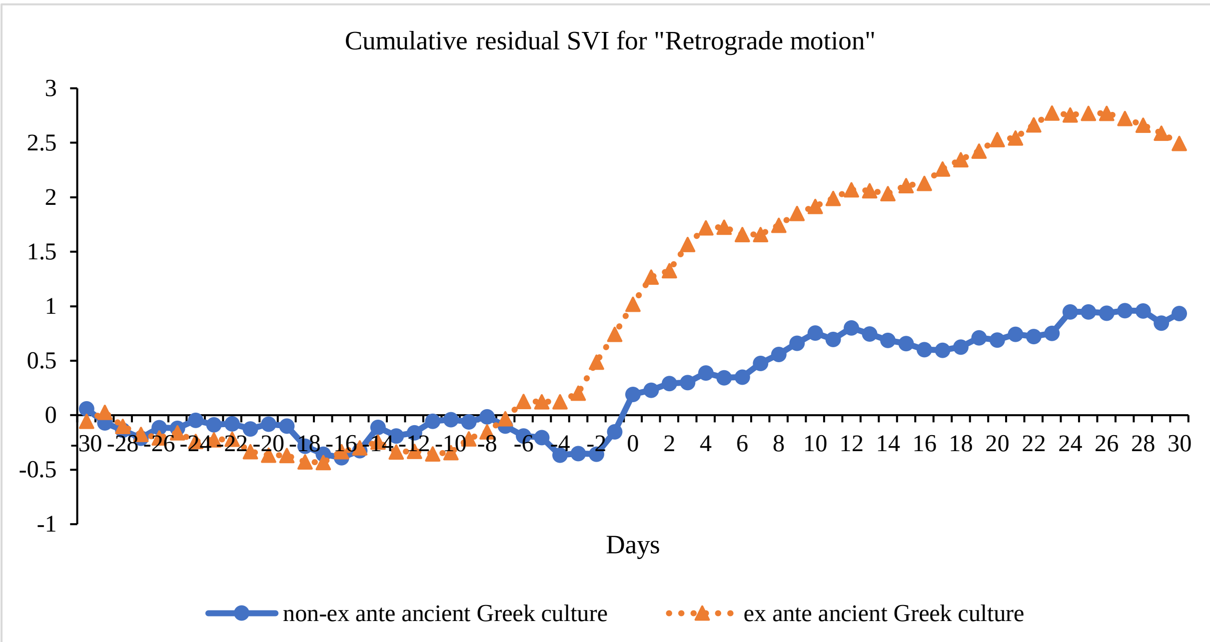

Table 1: Summary table

This table shows the summary statistics of our daily returns for 48 countries/regions over the sample period from January 1973 to Oct 2019. The summary statistics include the number of observations (Obs), the mean, standard deviation (Std), P25 (Q1), median (Median), and P75 (Q3) distributions of market returns (in bps). DEV means the developed markets (Panel A), and EM means the emerging markets (Panel B).

Panel A: Developed markets								
Country/Region	Market	Start date (m/y)	Obs	Mean	Std	Q1	Median	Q3
Australia	DEV	01/1973	11,850	4.77	105.09	-47.50	6.19	59.30
Austria	DEV	01/1973	10,896	3.58	99.95	-35.50	5.21	45.96
Belgium	DEV	01/1973	11,813	4.06	96.82	-38.66	5.23	49.50
Canada	DEV	01/1973	11,838	4.04	89.55	-36.65	6.53	48.98
Denmark	DEV	01/1973	11,078	5.47	111.48	-37.86	3.41	51.94
Finland	DEV	03/1988	7,940	5.06	165.81	-72.47	6.74	82.22
France	DEV	01/1973	11,845	5.04	117.43	-53.97	6.10	67.31
Germany	DEV	01/1973	11,801	3.62	106.22	-45.98	6.66	58.25
Hong Kong	DEV	01/1973	11,673	6.00	168.71	-65.90	6.60	83.02
Ireland	DEV	01/1973	11,770	4.97	118.39	-48.09	4.95	60.60
Israel	DEV	01/1993	6,581	3.60	120.88	-57.37	6.05	69.36
Italy	DEV	01/1973	11,838	4.64	135.63	-63.62	5.56	74.11
Japan	DEV	01/1973	11,642	2.63	114.25	-48.95	2.89	56.40
Netherlands	DEV	01/1973	11,917	4.38	108.58	-47.25	6.87	58.52
New Zealand	DEV	01/1988	7,985	4.15	88.09	-37.64	6.43	45.76
Norway	DEV	01/1980	10,036	5.39	141.76	-63.34	6.46	77.20
Portugal	DEV	01/1990	7,508	2.26	103.88	-43.72	3.84	51.69
Singapore	DEV	01/1973	11,796	3.24	127.30	-51.32	3.47	58.16
Spain	DEV	03/1987	8,265	3.99	123.75	-57.24	7.62	66.54
Sweden	DEV	01/1982	9,549	6.15	135.76	-61.49	7.52	76.00
Switzerland	DEV	01/1973	11,789	3.54	93.51	-36.37	5.71	47.72
United Kingdom	DEV	01/1973	11,962	4.77	106.23	-50.18	6.35	60.47
United States	DEV	01/1973	11,826	4.47	105.62	-44.38	5.86	55.57

Panel B: Emerging markets									
Country/Region	Market	Starting date (m/y)	Obs	Mean	Std	Q1	Median	Q3
Argentina	EM	08/1993	6,839	8.17	180.12	-69.53	2.98	89.10
Brazil	EM	07/1994	6,293	7.21	157.52	-72.24	8.52	87.60
Chile	EM	07/1989	7,615	6.28	89.05	-39.87	4.52	51.86
China	EM	07/1993	6,767	5.49	187.32	-83.13	2.34	91.49
Colombia	EM	03/1992	6,772	6.08	99.75	-36.00	4.22	49.01
Czech Rep	EM	11/1993	6,387	4.33	132.67	-55.78	5.59	64.94
Egypt	EM	10/1996	5,609	6.15	143.14	-57.20	7.94	74.12
Greece	EM	01/1990	7,432	2.98	188.80	-83.56	2.75	89.65
Hungary	EM	06/1991	7,059	6.29	154.31	-66.95	5.85	78.95
India	EM	01/1990	7,205	7.07	160.11	-64.22	7.92	79.92
Indonesia	EM	04/1990	7,205	5.50	195.29	-64.63	6.88	75.93
Korea, South	EM	09/1987	7,911	4.36	171.72	-75.78	2.85	81.87
Malaysia	EM	01/1986	8,366	4.75	126.69	-40.85	4.65	50.19
Mexico	EM	05/1989	7,858	7.91	122.23	-48.61	5.12	64.66
Pakistan	EM	07/1992	6,583	5.92	160.94	-59.90	6.71	77.71
Peru	EM	01/1994	6,550	5.14	100.86	-34.31	4.37	44.38
Philippines	EM	09/1987	7,988	5.62	130.83	-57.35	4.90	67.77
Poland	EM	03/1994	6,357	2.83	161.19	-73.94	4.23	78.74
Russia	EM	01/1998	5,557	11.16	240.42	-75.03	5.76	99.05
Slovenia	EM	01/1999	5,178	2.34	88.91	-38.61	2.62	45.40
South Africa	EM	01/1973	11,911	7.13	126.77	-56.26	6.90	74.55
Taiwan	EM	05/1988	7,716	3.78	172.29	-75.24	2.78	82.47
Thailand	EM	01/1987	8,089	5.87	166.98	-70.19	3.22	79.63
Turkey	EM	01/1988	8,227	15.81	235.08	-97.28	4.62	123.18
Venezuela	EM	01/1990	7,482	37.15	275.71	-45.30	5.36	82.96

Table 2: Mercury Retrograde and return

This table summarizes the estimation of equation (1) using different control variables. $Ret_{i,t}$ is the return (in basis points) of country i at day *t*. We include five lags of past returns and volatiles (absolute return), country fixed effect, year-quarter fixed effect, and weekday effect. In the parentheses below coefficient estimates are robust t-statistics based on standard errors adjusted for heteroskedasticity and country-level and date-level clustering. The sample period is from January 1973 to Oct 2019.

Dep. Variable=	$Ret_{i,t}$	
Variable	(1)	(2)
$\boldsymbol{Mercury_t}$	**-5.370**	**-5.178**
	(-3.00)	**(-2.96)**
$Ret_{i,t-1}$		0.081
		(5.19)
$Ret_{i,t-2}$		-0.002
		(-0.16)
$Ret_{i,t-3}$		0.001
		(0.08)
$Ret_{i,t-4}$		0.008
		(0.88)
$Ret_{i,t-5}$		-0.011
		(-1.25)
$VOL_{i,t-1}$		0.082
		(4.45)
$VOL_{i,t-2}$		0.016
		(1.17)
$VOL_{i,t-3}$		0.027
		(2.92)
$VOL_{i,t-4}$		0.000
		(0.00)
$VOL_{i,t-5}$		-0.006
		(-0.51)
Weekday Fixed	Yes	Yes
Year-Quarter Fixed	Yes	Yes
Country Fixed	Yes	Yes
Clustering	Country & Date	Country & Date
Obs	426,154	425,914
$Adj\ R^2$	0.011	0.024

Table 3: Mercury Retrograde and traffic

In Column (1), we work with a simple regression using the logarithm of the daily number of aviation disasters as the dependent variables. In Column (2), we work with a simple regression using the logarithm of the daily number of car accidents as the dependent variables. In Column (3), we work with a simple regression using the daily google search volume in the topic "Flight cancellation and delay" as the dependent variables. In Column (4), we work with a simple regression using the daily google search volume in the topic "Traffic collision" as the dependent variables. The control variables are the past five lags of the dependent variable. In the parentheses below coefficient estimates are robust t-statistics based on standard errors adjusted for heteroskedasticity.

Dep. Variable=	$Aviation_{i,t}$	$Car_{i,t}$	$Flight\ Delay_{i,t}$	$Trafic_{i,t}$
Variable	(1)	(2)	(3)	(4)
$\boldsymbol{Mercury_t}$	**-0.001**	**-0.003**	**0.164**	**0.056**
	(-0.16)	**(-1.15)**	**(0.41)**	**(0.25)**
Dep_{t-1}	-0.030	0.262	0.507	0.448
	(-3.83)	(28.70)	(22.14)	(12.81)
Dep_{t-2}	0.010	0.013	0.005	-0.019
	(1.27)	(1.49)	(0.26)	(-0.78)
Dep_{t-3}	0.007	-0.048	0.012	-0.002
	(0.91)	(-5.51)	(0.68)	(-0.18)
Dep_{t-4}	-0.003	-0.029	0.008	0.012
	(-0.34)	(-3.39)	(0.45)	(0.87)
Dep_{t-5}	-0.008	0.039	0.053	-0.002
	(-0.99)	(4.58)	(3.47)	(-0.19)
Weekday Fixed	Yes	Yes	Yes	Yes
Year-Quarter Fixed	Yes	Yes	Yes	Yes
Obs	16,732	15,701	5,778	5,778
$Adj\ R^2$	0.017	0.745	0.492	0.898

Table 4: Mercury Retrograde and fundamental information

In this table, we examine the change in fundamental information in Mercury retrograde periods. In Column (1), the dependent variable is the daily news sentiment $(News\ Sentiment_{i,t})$ of all news from the RavanPack dataset. The daily news sentiment is the aggregate of firm-level news sentiment in each country-day. In Column (2), the dependent variable is the daily corporate press release sentiment $(Press\ Sentiment_{i,t})$, which is the aggregate of all firm-level corporate press release sentiment in each country-day. In Column 3, the dependent variable is the aggregate earnings surprise ($SUE_{i,t}$), where the aggregate earnings surprise is the aggregate of all firm-level earnings surprises in each country-day. In the parentheses below coefficient estimates are robust t-statistics based on standard errors adjusted for heteroskedasticity and country-level and date-level clustering.

Dep. Variable=	$News\ Sentiment_{i,t}$	$Press\ Sentiment_{i,t}$	$SUE_{i,t}$
Variable	(1)	(2)	(3)
$\boldsymbol{Mercury_t}$	**0.001**	**0.001**	**-16.415**
	(0.94)	**(0.72)**	**(-0.94)**
Dep_{t-1}	0.072	0.026	
	(9.17)	(2.73)	
Dep_{t-2}	0.049	0.022	
	(10.51)	(2.73)	
Dep_{t-3}	0.041	-0.003	
	(8.41)	(-0.35)	
Dep_{t-4}	0.031	0.009	
	(5.04)	(1.41)	
Dep_{t-5}	0.041	0.007	
	(6.84)	(0.75)	
$Ret_{i,t-1}$	0.146	-0.011	0.018
	(2.48)	(-0.20)	(0.37)
$Ret_{i,t-2}$	-0.006	-0.081	0.185
	(-0.17)	(-1.82)	(1.02)
$Ret_{i,t-3}$	-0.008	-0.013	-0.050
	(-0.18)	(-0.24)	(-0.98)
$Ret_{i,t-4}$	0.019	0.056	0.089
	(0.60)	(0.97)	(1.11)
$Ret_{i,t-5}$	-0.002	-0.045	0.142
	(-0.04)	(-0.92)	(0.93)
$VOL_{i,t-1}$	-0.096	-0.093	-0.252
	(-1.47)	(-1.06)	(-0.90)
$VOL_{i,t-2}$	-0.050	-0.058	0.039
	(-0.89)	(-0.90)	(0.76)
$VOL_{i,t-3}$	0.053	0.167	-0.280
	(1.03)	(2.42)	(-0.98)
$VOL_{i,t-4}$	-0.126	-0.057	-0.053
	(-2.21)	(-0.68)	(-0.67)
$VOL_{i,t-5}$	-0.080	0.040	0.042
	(-1.03)	(0.52)	(0.71)
Weekday Fixed	Yes	Yes	Yes
Year-Quarter Fixed	Yes	Yes	Yes
Country Fixed	Yes	Yes	Yes
Clustering	Country & Date	Country & Date	Country & Date
Obs	116,002	63,381	55,943
$Adj\ R^2$	0.074	0.080	0.005

Table 5: Mercury effect and cross-country variation

This table summarizes the cross-country variations in the Mercury effect. In Panel A, $Low\ Ret_{i,t}^{last\ year\ MR}$ is a binary variable that is equal to 1 (0) if a country's average daily return in the previous year Mercury Retrograde period is in the bottom (top) 1/3 of all the sample countries. In Panel B, $Low\ Ret_{i,t}^{last\ year\ Non-MR}$ is a binary variable that is equal to 1 (0) if a country's average daily return in the previous year non-Mercury Retrograde period is in the bottom (top) 1/3 of all the sample countries. Sample with $Mercury_t = 1$ means that we only include days in the Mercury Retrograde period. Likewise, the sample with $Mercury_t = 0$ means that we only include days in the non-Mercury Retrograde period. In all columns, we include five lags of past returns and volatiles (absolute return), country fixed effect, year-quarter fixed effect, and weekday effect. The parentheses below coefficient estimates are robust t-statistics based on standard errors adjusted for heteroskedasticity and country-level and date-level clustering.

Panel A: Last year Mercury retrograde returns			
Dep. Variable =	$Ret_{i,t}$		
Sample =	Full	$Mercury_t$ =1	$Mercury_t$ =0
Variable	(1)	(2)	(3)
$\boldsymbol{Mercury_t \times Low\ Ret_{i,t}^{last\ year\ MR}}$	**-3.366**		
	(-2.68)		
$\boldsymbol{Low\ Ret_{i,t}^{last\ year\ MR}}$	**-0.875**	**-4.141**	**-1.022**
	(-0.99)	**(-2.29)**	**(-1.16)**
$Mercury_t$	-3.124		
	(-1.65)		
$Ret_{i,t-1}$	0.089	0.051	0.093
	(5.08)	(1.75)	(5.07)
$Ret_{i,t-2}$	0.003	-0.007	-0.001
	(0.24)	(-0.25)	(-0.13)
$Ret_{i,t-3}$	-0.003	-0.018	-0.005
	(-0.28)	(-0.95)	(-0.32)
$Ret_{i,t-4}$	0.009	0.002	0.005
	(0.88)	(0.12)	(0.35)
$Ret_{i,t-5}$	-0.011	-0.034	-0.010
	(-1.20)	(-1.61)	(-0.84)
$VOL_{i,t-1}$	0.076	0.160	0.058
	(4.35)	(4.87)	(3.41)
$VOL_{i,t-2}$	0.028	0.015	0.036
	(3.08)	(0.54)	(3.23)
$VOL_{i,t-3}$	0.032	0.014	0.040
	(3.22)	(0.59)	(3.12)
$VOL_{i,t-4}$	0.001	0.017	-0.001
	(0.09)	(0.49)	(-0.08)
$VOL_{i,t-5}$	-0.003	-0.004	-0.001
	(-0.33)	(-0.14)	(-0.07)
Weekday Fixed	Yes	Yes	Yes
Year-Quarter Fixed	Yes	Yes	Yes
Country Fixed	Yes	Yes	Yes
Clustering	Country & Date	Country & Date	Country & Date
Obs	275,537	55,222	220,315
$Adj\ R^2$	0.026	0.057	0.027

Panel B: Last year Non-Mercury retrograde returns			
Dep. Variable=	$Ret_{i,t}$		
Sample =	Full	$Mercury_t$ =1	$Mercury_t$ =0
Variable	(1)	(2)	(3)
$\boldsymbol{Mercury_t \times Low\ Ret_{i,t}^{last\ year\ Non-MR}}$	**-1.611**		
	(-1.12)		
$\boldsymbol{Low\ Ret_{i,t}^{last\ year\ Non-MR}}$	**0.221**	**-1.448**	**0.293**
	(0.28)	**(-1.03)**	**(0.38)**
$Mercury_t$	-4.373		
	(-2.22)		
$Ret_{i,t-1}$	0.091	0.046	0.096
	(5.64)	(1.37)	(5.68)
$Ret_{i,t-2}$	-0.000	-0.004	-0.006
	(-0.01)	(-0.12)	(-0.60)
$Ret_{i,t-3}$	-0.001	-0.012	-0.004
	(-0.07)	(-0.64)	(-0.42)
$Ret_{i,t-4}$	0.009	0.001	0.005
	(1.13)	(0.08)	(0.65)
$Ret_{i,t-5}$	-0.008	-0.031	-0.007
	(-0.94)	(-1.83)	(-0.73)
$VOL_{i,t-1}$	0.073	0.150	0.056
	(4.07)	(3.79)	(3.43)
$VOL_{i,t-2}$	0.028	0.024	0.034
	(3.21)	(0.72)	(3.20)
$VOL_{i,t-3}$	0.034	0.018	0.040
	(3.43)	(0.80)	(3.87)
$VOL_{i,t-4}$	0.003	0.012	0.003
	(0.42)	(0.33)	(0.38)
$VOL_{i,t-5}$	-0.005	-0.009	-0.002
	(-0.59)	(-0.34)	(-0.21)
Weekday Fixed	Yes	Yes	Yes
Year-Quarter Fixed	Yes	Yes	Yes
Country Fixed	Yes	Yes	Yes
Clustering	Country & Date	Country & Date	Country & Date
Obs	275,403	55,193	220,210
$Adj\ R^2$	0.026	0.055	0.027

Table 6: Mercury Retrograde and Google search interest

In Panel A, we regress search volume intensity for the topic "Retrograde motion" (SVI) on the Mercury retrograde period. SVI is the google search volume intensity after normalizing by each country. $Dummy_{i,t,svi>3}$ is a binary variable that is equal to one if a country's SVI is above three standard deviations. In Panel B, we regress market returns on the search volume intensity for the topic "Retrograde motion." In all columns, we include five lags of past returns and volatiles (absolute return), country fixed effect, year-quarter fixed effect, and weekday effect. The parentheses below coefficient estimates are robust t-statistics based on standard errors adjusted for heteroskedasticity and country-level and date-level clustering.

Panel A: Mercury and SVI		
Dep. Variable=	$SVI_{i,t}$	$Dummy_{i,t,svi>3}$
Variable	(1)	(2)
$\boldsymbol{Mercury_t}$	**0.096**	**0.009**
	(5.64)	**(5.16)**
$SVI_{i,t-1}$	0.063	0.003
	(7.27)	(4.60)
$SVI_{i,t-2}$	0.054	0.001
	(7.34)	(2.42)
$SVI_{i,t-3}$	0.053	0.001
	(7.09)	(2.15)
$SVI_{i,t-4}$	0.049	0.001
	(7.39)	(1.93)
$SVI_{i,t-5}$	0.050	0.002
	(7.79)	(2.80)
$Ret_{i,t-1}$	-0.250	-0.037
	(-1.80)	(-1.46)
$Ret_{i,t-2}$	-0.252	-0.023
	(-1.31)	(-0.91)
$Ret_{i,t-3}$	0.055	0.027
	(0.31)	(0.86)
$Ret_{i,t-4}$	-0.225	-0.002
	(-1.49)	(-0.08)
$Ret_{i,t-5}$	0.013	-0.024
	(0.07)	(-0.93)
$VOL_{i,t-1}$	0.051	-0.024
	(0.20)	(-0.60)
$VOL_{i,t-2}$	0.518	0.049
	(1.55)	(1.15)
$VOL_{i,t-3}$	-0.296	-0.013
	(-0.96)	(-0.34)
$VOL_{i,t-4}$	-0.441	-0.031
	(-1.51)	(-0.78)
$VOL_{i,t-5}$	0.120	0.007
	(0.43)	(0.20)
Weekday Fixed	Yes	Yes
Year-Quarter Fixed	Yes	Yes
Country Fixed	Yes	Yes
Clustering	Country & Date	Country & Date
Obs	191,731	191,731
$Adj\ R^2$	0.092	0.012

Panel B: SVI and Return Predictability		
Dep. Variable=	$Ret_{i,t}$	
Variable	(1)	(2)
$\boldsymbol{Mercury_t}$		**-5.709**
		(-1.81)
$\boldsymbol{SVI_{i,t-1}}$	**-0.509**	**-0.410**
	(-1.88)	**(-1.54)**
$\boldsymbol{SVI_{i,t-2}}$	**-0.580**	**-0.481**
	(-2.00)	**(-1.62)**
$SVI_{i,t-3}$	-0.384	-0.290
	(-1.31)	(-0.96)
$SVI_{i,t-4}$	-0.327	-0.237
	(-1.41)	(-1.00)
$SVI_{i,t-5}$	-0.213	-0.123
	(-0.65)	(-0.37)
$Ret_{i,t-1}$	0.062	0.062
	(2.26)	(2.25)
$Ret_{i,t-2}$	0.002	0.002
	(0.09)	(0.08)
$Ret_{i,t-3}$	-0.003	-0.003
	(-0.18)	(-0.20)
$Ret_{i,t-4}$	0.005	0.005
	(0.26)	(0.26)
$Ret_{i,t-5}$	-0.010	-0.010
	(-0.62)	(-0.65)
$VOL_{i,t-1}$	0.080	0.081
	(2.24)	(2.25)
$VOL_{i,t-2}$	0.040	0.040
	(1.81)	(1.85)
$VOL_{i,t-3}$	0.059	0.060
	(3.32)	(3.32)
$VOL_{i,t-4}$	0.015	0.016
	(0.95)	(0.97)
$VOL_{i,t-5}$	0.001	0.002
	(0.08)	(0.10)
$\boldsymbol{Sum\ of\ SVI_{i,t-5,t-1}}$[*Joint*]	**-2.013**	**-1.541**
[*p-value*]	**[0.013]**	**[0.068]**
Weekday Fixed	Yes	Yes
Year-Quarter Fixed	Yes	Yes
Country Fixed	Yes	Yes
Clustering	Country & Date	Country & Date
Obs	191,731	191,731
$Adj\ R^2$	0.025	0.025

Table 7: Cross-country SVI and Mercury effect

This table summarizes the cross-country variations in the Mercury effect. $High\ SVI_i$ is a binary variable that is equal to one (zero) if a country's search volume intensity for the topic "Retrograde motion" over the sample period (we use the "interest by region" function in Google Trends to download the cross-sectional search interests) is in the top (bottom) 1/3 of all the sample countries. In the parentheses below coefficient estimates are robust t-statistics based on standard errors adjusted for heteroskedasticity and country-level and date-level clustering.

Dep. Variable=	$Ret_{i,t}$
Variable	(1)
$\boldsymbol{High\ SVI_i \times Mercury_t}$	**-2.996**
	(-2.61)
$Mercury_t$	-3.705
	(-2.16)
$Ret_{i,t-1}$	0.082
	(4.10)
$Ret_{i,t-2}$	0.004
	(0.36)
$Ret_{i,t-3}$	0.004
	(0.39)
$Ret_{i,t-4}$	0.008
	(0.97)
$Ret_{i,t-5}$	-0.007
	(-0.82)
$VOL_{i,t-1}$	0.091
	(4.19)
$VOL_{i,t-2}$	0.010
	(0.84)
$VOL_{i,t-3}$	0.032
	(3.21)
$VOL_{i,t-4}$	-0.001
	(-0.11)
$VOL_{i,t-5}$	-0.005
	(-0.69)
Weekday Fixed	Yes
Year-Quarter Fixed	Yes
Country Fixed	Yes
Clustering	Country & Date
Obs	259,820
$Adj\ R^2$	0.025

Table 8: Ancient Greece Culture and Mercury effect

This table summarizes the cross-country variations in the Mercury effect. In Column (1), $High\ Ancient_i$ is a binary variable that is equal to one (zero) if a country's search volume intensity for the topic "Ancient Greece" over the sample period is in the top (bottom) 1/3 of all the sample countries. In Column (2), $High\ Mythology_i$ is a binary variable that is equal to one (zero) if a country's search volume intensity for the topic "Mythology" over the sample period is in the top (bottom) 1/3 of all the sample countries. In Column (3), $High\ Hermes_i$ is a binary variable that is equal to one (zero) if a country's search volume intensity for the deity "Hermes" over the sample period is in the top (bottom) 1/3 of all the sample countries. In the parentheses below coefficient estimates are robust t-statistics based on standard errors adjusted for heteroskedasticity and country-level and date-level clustering.

Dep. Variable=	$Ret_{i,t}$			
Variable	(1)	(2)	(3)	(4)
$\boldsymbol{High\ Ancient_i \times Mercury_t}$	**-2.341**			
	(-2.15)			
$\boldsymbol{High\ Mythology_i \times Mercury_t}$		**-2.402**		
		(-2.79)		
$\boldsymbol{High\ Hermes_i \times Mercury_t}$			**-2.680**	
			(-2.33)	
$\boldsymbol{High\ Combine_i \times Mercury_t}$				**-3.398**
				(-2.91)
$Mercury_t$	-4.411	-4.401	-4.316	-4.484
	(-2.64)	(-2.54)	(-2.27)	(-2.52)
$Ret_{i,t-1}$	0.080	0.070	0.087	0.084
	(7.87)	(5.04)	(3.86)	(4.26)
$Ret_{i,t-2}$	-0.009	-0.008	0.006	0.008
	(-1.21)	(-1.00)	(0.46)	(0.74)
$Ret_{i,t-3}$	-0.003	-0.006	-0.001	0.005
	(-0.44)	(-0.85)	(-0.12)	(0.62)
$Ret_{i,t-4}$	0.001	0.000	0.010	0.008
	(0.18)	(0.01)	(1.14)	(0.99)
$Ret_{i,t-5}$	-0.017	-0.019	-0.006	-0.009
	(-2.87)	(-3.00)	(-0.69)	(-1.01)
$VOL_{i,t-1}$	0.056	0.064	0.096	0.090
	(4.94)	(3.37)	(4.08)	(4.20)
$VOL_{i,t-2}$	0.011	0.013	0.008	0.010
	(0.81)	(1.51)	(0.61)	(0.85)
$VOL_{i,t-3}$	0.022	0.021	0.036	0.030
	(2.43)	(2.41)	(3.64)	(3.07)
$VOL_{i,t-4}$	-0.000	-0.008	-0.002	-0.002
	(-0.04)	(-1.04)	(-0.32)	(-0.33)
$VOL_{i,t-5}$	-0.011	-0.003	-0.001	-0.003
	(-1.35)	(-0.40)	(-0.17)	(-0.45)
Weekday Fixed	Yes	Yes	Yes	Yes
Year-Quarter Fixed	Yes	Yes	Yes	Yes
Country Fixed	Yes	Yes	Yes	Yes
Clustering	Country & Date	Country & Date	Country & Date	Country & Date
Obs	284,321	267,373	228,167	248,203
$Adj\ R^2$	0.020	0.019	0.027	0.026

Table 9: Ex ante ancient Greek culture

Panel A shows the colonized cities/countries by ancient Greece, Spain, and Russia. We manually collect data from Page and Sonnenburg (2003). In Panel B, we regress $High\ Google_i$ on $Colonization_i$ using a logistic regression. $High\ Google_i$ is a binary variable that is equal to one if a country's google search volume (topics in "Ancient Greece," "Mythology," and "Hermes") is in the top 1/3 of all the sample countries, else it is equal to zero. In the parentheses below coefficient estimates are robust t-statistics.

Panel A: Colonized cities/countries		
Ancient Greece	**Time/War**	**Religion**
France	550 B.C	Catholic
Italy	550 B.C	Catholic
Greece	550 B.C	Orthodox
Russia	550 B.C	Orthodox
Spain	550 B.C	Catholic
Spain	**Time/War**	**Religion**
Argentina	The Age of Discovery	Catholic
Belgium	Spanish Netherlands	Catholic
Chile	The Age of Discovery	Catholic
Colombia	The Age of Discovery	Catholic
Mexico	The Age of Discovery	Catholic
Netherlands	Spanish Netherlands	Catholic
Peru	The Age of Discovery	Catholic
Philippines	The Spanish Habsburgs	Catholic
Venezuela	The Age of Discovery	Catholic
Russia	**Time/War**	**Religion**
Finland	Great Northern War	Protestant
Poland	Catherine the Great	Catholic

Panel B: Ex ante and ex post ancient Greek culture					
Dep. Variable=	$High\ Ancient_i$	$High\ Mythology_i$	$High\ Hermes_i$	$High\ Combine_i$	*All Topics*
Variable	(1)	(2)	(3)	(4)	(5)
$\boldsymbol{Colonization_i}$	**2.420**	**2.351**	**2.803**	**2.565**	**2.524**
	(2.59)	**(2.51)**	**(2.87)**	**(2.69)**	**(4.63)**
Topic Fixed	No	No	No	No	Yes
Obs	32	31	29	30	92
$Pseudo\ R^2$	0.196	0.188	0.274	0.229	0.218

Table 10: Ex ante Ancient Greek Culture and Mercury effect

This table tests whether the Mercury effect is stronger among *ex ante* ancient Greek culture countries. $Colonization_i$ is a binary variable that is equal to one if a country has an *ex ante* ancient Greek culture. $Christianity_i$ is a binary variable that is equal to one if a country's primary religion is Christianity. In the parentheses below coefficient estimates are robust t-statistics based on standard errors adjusted for heteroskedasticity and country-level and date-level clustering.

Dep. Variable =	$Ret_{i,t}$	
Variable	(1)	(2)
$\boldsymbol{Colonization_i \times Mercury_t}$	**-1.873**	**-1.946**
	(-1.74)	**(-1.97)**
$\boldsymbol{Christianity_i \times Mercury_t}$		-0.133
		(-0.15)
$Mercury_t$	-4.589	-4.508
	(-2.69)	(-2.70)
$Ret_{i,t-1}$	0.081	0.081
	(5.18)	(4.96)
$Ret_{i,t-2}$	-0.002	-0.002
	(-0.15)	(-0.15)
$Ret_{i,t-3}$	0.001	0.001
	(0.08)	(0.08)
$Ret_{i,t-4}$	0.008	0.008
	(0.87)	(0.91)
$Ret_{i,t-5}$	-0.011	-0.011
	(-1.26)	(-1.20)
$VOL_{i,t-1}$	0.082	0.082
	(4.59)	(4.23)
$VOL_{i,t-2}$	0.016	0.016
	(1.18)	(1.37)
$VOL_{i,t-3}$	0.027	0.027
	(2.91)	(2.92)
$VOL_{i,t-4}$	0.000	0.000
	(0.00)	(0.00)
$VOL_{i,t-5}$	-0.006	-0.006
	(-0.62)	(-0.59)
Weekday Fixed	Yes	Yes
Year-Quarter Fixed	Yes	Yes
Country Fixed	Yes	Yes
Clustering	Country & Date	Country & Date
Obs	425,914	425,914
$Adj\ R^2$	0.024	0.024

Table 11: Science and Mercury effect

In Panel A, we run a logistic regression using Google search topics as dependent variables. Google search topics are "Ancient Greece," "Mythology," "Hermes," and combine index in Table 8. Panel B summarizes the cross-country variations in the Mercury effect across different levels of science. $Low\ Sci_i$ is a binary variable that is equal to one (zero) if a country's scientific indicator is in the bottom (top) 1/3 of all the sample countries. In the parentheses below coefficient estimates are robust t-statistics based on standard errors adjusted for heteroskedasticity and country-level and date-level clustering in Panel B and are robust t-statistics in Panel A.

Panel A: Science, ex ante, and ex post ancient Greek culture		
Dep. Variable=	$All\ google\ search\ topics$	
Variable	(1)	(2)
$\boldsymbol{Low\ Sci_i}$	**1.955**	-0.107
	(2.94)	(-0.54)
$\boldsymbol{Low\ Sci_i \times Colonization_i}$		**0.854**
		(2.81)
$Colonization_i$		-0.139
		(-0.53)
Topic Fixed	Yes	Yes
Obs	53	53
$Pseudo\ R^2$	0.149	0.411

Panel B: Science and Mercury effect		
Dep. Variable=	$Ret_{i,t}$	
Variable	(1)	(2)
$\boldsymbol{Low\ Sci_i \times Mercury_t}$	**-3.053**	0.655
	(-2.04)	(0.48)
$\boldsymbol{Low\ Sci_i \times Colonization_i \times Mercury_t}$		**-6.074**
		(-2.16)
$Mercury_t$	-4.433	-4.425
	(-2.26)	(-2.36)
$Ret_{i,t-1}$	0.065	0.065
	(6.33)	(6.27)
$Ret_{i,t-2}$	-0.018	-0.018
	(-2.01)	(-2.00)
$Ret_{i,t-3}$	-0.013	-0.013
	(-1.77)	(-1.78)
$Ret_{i,t-4}$	0.001	0.001
	(0.17)	(0.17)
$Ret_{i,t-5}$	-0.021	-0.021
	(-3.28)	(-3.24)
$VOL_{i,t-1}$	0.060	0.060
	(5.16)	(5.19)
$VOL_{i,t-2}$	0.012	0.012
	(0.74)	(0.75)
$VOL_{i,t-3}$	0.029	0.029
	(2.74)	(2.78)
$VOL_{i,t-4}$	0.005	0.005
	(0.59)	(0.58)
$VOL_{i,t-5}$	-0.014	-0.014
	(-1.41)	(-1.40)
$Colonization_i \times Mercury_t$		-0.040
		(-0.01)
$Colonization_i \times Low\ Sci_i$		1.467
		(2.04)
Weekday Fixed	Yes	Yes
Year-Quarter Fixed	Yes	Yes
Country Fixed	Yes	Yes
Clustering	Country & Date	Country & Date
Obs	197,994	197,994
$Adj\ R^2$	0.019	0.019

Table 12: Superstition and Mercury effect

This table summarizes the cross-country variations in the Mercury effect across different levels of superstition beliefs $High\ Superstition_i$ is a binary variable that is equal to one (zero) if a country's superstition belief is in the bottom (top) 1/3 of all the sample countries. In the parentheses below coefficient estimates are robust t-statistics based on standard errors adjusted for heteroskedasticity and country-level and date-level clustering.

Dep. Variable=	$Ret_{i,t}$	
Variable	(1)	(2)
$\boldsymbol{High\ Superstition_i \times Mercury_t}$	**-3.206**	-2.277
	(-1.73)	(-2.36)
$\boldsymbol{High\ Superstition_i \times Colonization_i \times Mercury_t}$		**-5.907**
		(-3.95)
$Mercury_t$	-3.893	-3.354
	(-2.55)	(-1.97)
$Ret_{i,t-1}$	0.075	0.075
	(4.22)	(4.20)
$Ret_{i,t-2}$	-0.012	-0.012
	(-1.23)	(-1.23)
$Ret_{i,t-3}$	-0.019	-0.019
	(-1.96)	(-1.96)
$Ret_{i,t-4}$	0.004	0.004
	(0.30)	(0.29)
$Ret_{i,t-5}$	-0.015	-0.015
	(-1.82)	(-1.82)
$VOL_{i,t-1}$	0.072	0.072
	(3.88)	(3.88)
$VOL_{i,t-2}$	-0.015	-0.015
	(-0.44)	(-0.44)
$VOL_{i,t-3}$	0.046	0.046
	(2.79)	(2.79)
$VOL_{i,t-4}$	0.007	0.007
	(0.52)	(0.52)
$VOL_{i,t-5}$	-0.015	-0.015
	(-1.57)	(-1.57)
$Colonization_i \times Mercury_t$		-3.649
		(-4.03)
$Colonization_i \times High\ Superstition_i$		4.453
		(2.82)
Weekday Fixed	Yes	Yes
Year-Quarter Fixed	Yes	Yes
Country Fixed	Yes	Yes
Clustering	Country & Date	Country & Date
Obs	90,374	90,374
$Adj\ R^2$	0.024	0.024

Table 13: Mercury Retrograde and Trading volume

This table examines the change in the market turnover in the Mercury retrograde days. We use a detrending methodology that calculate the turnover trend as a rolling average of the past 20 trading days of log turnover. In all columns, we include country fixed effect, year-quarter fixed effect, and weekday effect. In the parentheses below coefficient estimates are robust t-statistics based on standard errors adjusted for heteroskedasticity and country-level and date-level clustering.

Dep. Variable=	$Turn_{i,t}$			
Variable	(1)	(2)	(3) $Mercury_t = 1$	(4) $Mercury_t = 0$
$\boldsymbol{Mercury_t}$	-0.012	-0.008		
	(-2.32)	(-1.99)		
$Turn_{i,t-1}$		0.295	0.286	0.291
		(21.58)	(16.33)	(19.75)
$Turn_{i,t-2}$		0.102	0.101	0.099
		(11.76)	(6.36)	(11.64)
$Turn_{i,t-3}$		0.057	0.050	0.057
		(16.07)	(7.07)	(14.27)
$Turn_{i,t-4}$		0.027	0.030	0.025
		(4.89)	(3.63)	(4.20)
$Turn_{i,t-5}$		0.035	0.043	0.033
		(4.48)	(3.87)	(4.04)
$Ret_{i,t-1}$		1.011	0.942	1.059
		(5.12)	(3.57)	(5.23)
$Ret_{i,t-2}$		0.002	-0.167	0.101
		(0.01)	(-0.95)	(0.84)
$Ret_{i,t-3}$		0.119	0.043	0.181
		(1.46)	(0.22)	(2.09)
$Ret_{i,t-4}$		0.009	-0.337	0.126
		(0.10)	(-1.70)	(1.24)
$Ret_{i,t-5}$		-0.026	0.126	-0.044
		(-0.34)	(0.62)	(-0.51)
$VOL_{i,t-1}$		2.894	2.949	2.838
		(11.43)	(8.36)	(10.63)
$VOL_{i,t-2}$		-0.637	-0.496	-0.700
		(-5.24)	(-2.21)	(-5.54)
$VOL_{i,t-3}$		-0.995	-1.189	-0.943
		(-5.48)	(-4.79)	(-4.63)
$VOL_{i,t-4}$		-0.949	-1.044	-0.924
		(-7.29)	(-3.65)	(-7.11)
$VOL_{i,t-5}$		-0.980	-0.659	-1.026
		(-6.34)	(-1.82)	(-6.57)
$Sum\ of\ Ret_{i,t-5,t-1}[Joint]$			0.607	1.423
[*p-value*]			[0.320]	[0.000]
Weekday Fixed	Yes	Yes	Yes	Yes
Year-Quarter Fixed	Yes	Yes	Yes	Yes
Country Fixed	Yes	Yes	Yes	Yes
Clustering	Country & Date	Country & Date	Country & Date	Country & Date
Obs	356,962	355,053	71,129	283,924
$Adj\ R^2$	0.031	0.191	0.220	0.189

Table 14: Mercury Retrograde and Price of risk

In this table, we examine the change in the market price of risk in the Mercury Retrograde days. We consider a conditional version of Merton's (1980) CAPM, which the coefficient on the expected market variance, λ, reflects the expected reward per unit of risk in a country. To measure expected market variance, we use the daily implied variance ($IV_{i,t}$) and $\widehat{VAR_{i,t}}$. $IV_{i,t}$ is the square of daily VIX of the local market index which captures expected market risk over the next 30 days, and $\widehat{VAR_{i,t}}$ is the predicted market return variance by regressing daily realized variance on the average of daily realized variance over past one month. The dependent variable is the expected excess return. We use $\widehat{ret_{i,t}}$ to proxy for expected excess returns by regression market excess returns ($ret_{i,t}$) on several variables related to the local market risk premium. In all columns, we include country fixed effect, year-quarter fixed effect, and weekday effect. In the parentheses below coefficient estimates are robust t-statistics based on standard errors adjusted for heteroskedasticity and country-level and date-level clustering.

Dep. Variable=	$\widehat{ret_{i,t}}$			
Variable	(1)	(2)	(3)	(4)
$\boldsymbol{Mercury_t \times \widehat{VAR_{i,t}}}$			**0.506**	
			(1.81)	
$\boldsymbol{Mercury_t \times IV_{i,t}}$				**0.222**
				(1.81)
$\boldsymbol{Mercury_t}$	**0.407**	**0.498**	-0.593	-0.061
	(1.88)	**(2.90)**	(-1.41)	(-0.38)
$Dep_{i,t-1}$			0.487	0.190
			(5.11)	(2.54)
$Dep_{i,t-2}$			0.119	0.151
			(4.08)	(4.24)
$Dep_{i,t-3}$			0.038	0.236
			(0.57)	(3.71)
$Dep_{i,t-4}$			-0.029	-0.101
			(-0.83)	(-1.84)
$Dep_{i,t-5}$			0.053	0.105
			(1.18)	(2.77)
$\widehat{VAR_{i,t}}$	2.520		0.671	
	(4.06)		(3.59)	
$IV_{i,t}$		0.441		0.160
		(16.28)		(4.87)
Weekday Fixed	Yes	Yes	Yes	Yes
Year-Quarter Fixed	Yes	Yes	Yes	Yes
Country Fixed	Yes	Yes	Yes	Yes
Clustering	Country & Date	Country & Date	Country & Date	Country & Date
Obs	183,101	64,603	182,906	64,568
$Adj\ R^2$	0.213	0.144	0.499	0.302

Table 15: Mercury Retrograde and Risk

In this table, we examine the change in market volatility in the Mercury Retrograde days. In Columns (1)-(2), we use the implied volatility ($VIX_{i,t}$) as the dependent variable. In Columns (3)-(4), we use the daily absolute return ($VOL_{i,t}$) as the dependent variable. In Columns (5)-(6), we use the return covariance ($COV_{i,t}$) as the dependent variable, where $COV_{i,t}$ is the product of the daily market index return and the daily global index return divided by the absolute daily global index return. In all columns, we include country fixed effect, year-quarter fixed effect, and weekday effect. In the parentheses below coefficient estimates are robust t-statistics based on standard errors adjusted for heteroskedasticity and country-level and date-level clustering.

Dep. Variable=	$VIX_{i,t}$		$VOL_{i,t}$		$COV_{i,t}$	
Variable	(1)	(2)	(3)	(4)	(5)	(6)
$\boldsymbol{Mercury_t}$	**0.059**	**0.044**	**1.595**	**0.280**	**1.462**	**0.648**
	(0.54)	**(1.31)**	**(1.65)**	**(0.33)**	**(1.26)**	**(0.58)**
$Ret_{i,t-1}$		-0.001		-0.042		-0.014
		(-3.74)		(-3.48)		(-0.98)
$Ret_{i,t-2}$		-0.000		-0.034		-0.028
		(-1.58)		(-4.84)		(-3.28)
$Ret_{i,t-3}$		-0.000		-0.025		-0.021
		(-0.16)		(-3.83)		(-2.34)
$Ret_{i,t-4}$		-0.000		-0.019		-0.025
		(-1.21)		(-4.02)		(-3.38)
$Ret_{i,t-5}$		0.000		-0.009		-0.013
		(1.74)		(-1.81)		(-2.15)
$Dep_{i,t-1}$		0.836		0.159		0.055
		(27.56)		(8.03)		(4.53)
$Dep_{i,t-2}$		0.044		0.120		0.053
		(1.26)		(15.92)		(7.03)
$Dep_{i,t-3}$		0.044		0.108		0.052
		(1.03)		(12.71)		(5.92)
$Dep_{i,t-4}$		0.004		0.077		0.038
		(0.16)		(13.03)		(7.15)
$Dep_{i,t-5}$		0.030		0.085		0.040
		(1.51)		(17.07)		(7.51)
Weekday Fixed	Yes	Yes	Yes	Yes	Yes	Yes
Year-Quarter Fixed	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed	Yes	Yes	Yes	Yes	Yes	Yes
Clustering	Country & Date	Country & Date	Country & Date	Country & Date	Country & Date	Country & Date
Obs	64,610	64,334	426,154	425,914	426,154	425,914
$Adj\ R^2$	0.726	0.974	0.117	0.222	0.045	0.060

Table 16: Mercury Retrograde and Mood

In Column (1), we work with a regression using the weekly Google sentiment index as the dependent variables. In Column (2), we work with a regression using the daily Google search volume for the topic "Depression-Mood" as the dependent variables. In the parentheses below coefficient estimates are robust t-statistics based on standard errors adjusted for heteroskedasticity.

Dep. Variable=	$Google\ sentiment\ index_{i,t}$	$Depression - Mood_{i,t}$
Variable	(1)	(2)
$\boldsymbol{Mercury_t}$	**0.006**	**0.001**
	(0.69)	**(0.31)**
Dep_{t-1}	-0.393	0.136
	(-26.92)	(11.82)
Dep_{t-2}	-0.211	0.107
	(-16.97)	(13.07)
Dep_{t-3}	-0.132	0.100
	(-9.51)	(13.47)
Dep_{t-4}	-0.071	0.094
	(-5.33)	(13.06)
Dep_{t-5}		0.100
		(12.63)
Weekly Fixed	Yes	No
Weekday Fixed	No	Yes
Year-Quarter Fixed	Yes	Yes
Country Fixed	Yes	Yes
Clustering	Country & Week	Country & Date
Obs	20,634	277,195
$Adj\ R^2$	0.141	0.315

Table IA1

This table reports the results of the regressions in Table 2 for each of the 48 countries. We run the following regression for each of 48 countries:

$$Ret_t = \alpha + \beta_1 \times Mercury_t + Controls_t + FE + e_t$$

where, $Mercury_t$ a time dummy variable takes the value of one if day t falls on the event window of Mercury Retrograde, and zero otherwise. The event window of Mercury Retrograde is from the beginning of the Mercury Retrograde day to the beginning of the Mercury Prograde (direct motion) day $[Retrograde_t, Prograde_t]$. CONTROLS is a set of control variables defined in Table 2. FE are weekday and year-quarter fixed effects. We report the corresponding coefficients and robust t statistics of the regression for each of 48 countries. DEV and EMG denote developed and emerging markets, respectively. In summary, there are 46 out 48 countries have the negative coefficients on $Mercury_t$. Among these 46 countries, 21 (17) countries have the coefficients on $Mercury_t$ are negative and significant at the 10% (5%) level.

Country/Region	Market	Coefficient	T-statistics
Australia	DEV	-3.411	-1.33
Austria	DEV	-2.476	-0.99
Belgium	DEV	-2.984	-1.26
Canada	DEV	-3.710	-1.71
Denmark	DEV	-5.663	-2.12
Finland	DEV	-10.641	-2.17
France	DEV	-1.137	-0.40
Germany	DEV	-6.176	-2.45
Hong Kong	DEV	-13.378	-3.13
Ireland	DEV	-4.417	-1.53
Israel	DEV	0.258	0.07
Italy	DEV	-10.205	-3.19
Japan	DEV	-4.878	-1.77
Netherlands	DEV	-5.076	-1.93
New Zealand	DEV	-3.316	-1.37
Norway	DEV	-5.709	-1.54
Portugal	DEV	-3.851	-1.20
Singapore	DEV	-3.246	-1.06
Spain	DEV	-9.327	-2.62
Sweden	DEV	-7.502	-2.10
Switzerland	DEV	-6.097	-2.69
United Kingdom	DEV	-6.659	-1.35
United States	DEV	-0.616	-0.23
Argentina	EM	-11.413	-2.13
Brazil	EM	-11.064	-2.19
Chile	EM	-6.985	-2.69
China	EM	-6.430	-1.12
Colombia	EM	-1.953	-0.66
Czech Rep	EM	-4.384	-1.07
Egypt	EM	-8.726	-1.59
Greece	EM	-11.164	-2.05
Hungary	EM	-7.292	-1.61
India	EM	-5.721	-1.29
Indonesia	EM	-1.291	-0.25
Korea, South	EM	-10.646	-2.17

Table IA1 (continued)

Malaysia	EM	-8.891	-2.43
Mexico	EM	-7.803	-2.19
Pakistan	EM	-3.814	-0.78
Peru	EM	-7.573	-2.42
Philippines	EM	-6.304	-1.69
Poland	EM	-6.816	-1.35
Russia	EM	-18.116	-2.28
Slovenia	EM	-3.767	-1.15
South Africa	EM	-3.295	-1.13
Taiwan	EM	-6.659	-1.35
Thailand	EM	0.011	0.00
Turkey	EM	-2.014	-0.31
Venezuela	EM	-0.824	-0.10

Appendix IA2

In Column (1), we perform the analysis controlling other factors. Specifically, we drop the January and control for the global temperature effect, sunspot effect, moon effect, other planet retrograde effects, major global financial crisis effect, and fixed effects for the day of the month and the last day of the month (end of month). The crisis periods: the 1987 U.S. stock market crash (October 19, 1987), the Gulf War (January 17, 1991 to February 17, 1991), the Mexican Peso crisis (December 20, 1994 to January 31, 1995), the Asian financial crisis (July 2, 1997 to December 3, 1997), the Russian crisis (August 11, 1998 to January 15, 1999), and GFC (September 2008 to September 2009). In Column (2), we calculate market returns against the U.S. dollars. In Column (3), we use market indexes from WRDS indexes database (January 1986 to Mar 2019 with 39 countries). In Column (4), we control for the country-year-quarter (C-Y-Q) fixed effect. In Column (5), we use weighted least squares (WLS) using ex ante variance instead of ordinary least squares (OLS). In the parentheses below coefficient estimates are robust t-statistics based on standard errors adjusted for heteroskedasticity and country-level and date-level clustering.

Dep. Variable=	$Ret_{i,t}$				
Variable	(1)	(2)	(3)	(4)	(5)
$\boldsymbol{Mercury_t}$	**-5.903**	**-5.665**	**-6.488**	**-5.495**	**-2.538**
	(-2.91)	**(-2.57)**	**(-2.76)**	**(-2.94)**	**(-2.23)**
$Crisis_t$	-24.126				
	(-1.44)				
$Moon_t$	-1.930				
	(-1.11)				
$El\ Niño_t$	3.756				
	(3.73)				
$Sunspot_t$	-0.049				
	(-0.79)				
$Venus_t$	8.909				
	(2.27)				
$Mars_t$	-2.350				
	(-0.76)				
$Jupiter_t$	-6.280				
	(-2.05)				
$Saturn_t$	-0.287				
	(-0.12)				
$Uranus_t$	0.967				
	(0.34)				
$Neptune_t$	-2.021				
	(-0.59)				
$Pluto_t$	-0.483				
	(-0.17)				
Controls	Yes	Yes	Yes	Yes	Yes
Weekday Fixed	Yes	Yes	Yes	Yes	Yes
Year-Quarter	Yes	Yes	Yes	No	Yes
Country Fixed	Yes	Yes	Yes	No	Yes
C-Y-Q Fixed	No	No	No	Yes	Yes
End of month	Yes	No	No	No	No
Day of month	Yes	No	No	No	No
Clustering	Country & Date	Country & Date	Country & Date	Country & Date	Country & Date
Obs	339,847	424,953	233,094	425,914	425,912
$Adj\ R^2$	0.023	0.015	0.017	0.024	0.024
Regression	OLS	OLS	OLS	OLS	WLS

Appendix IA3

This table examines the Mercury effect using different Mercury Retrograde windows and return frequencies. In Column (1), we use the one week before the Mercury Retrograde day to the beginning of the Mercury Prograde day $[Retrograde_{t-7}, Prograde_t]$ as the Mercury Retrograde event window. In Column (2), we use the beginning of the Mercury Retrograde day to one week after the Mercury Prograde day $[Retrograde_t, Prograde_{t+7}]$ as the Mercury retrograde event window. We work with weekly return in Column (3) and monthly return in Column (4). If a week (month) has more than 50% days are Mercury Retrograde days, then we set this week (month) as the Mercury Retrograde week (month) ($Mercury_t = 1$). In Column (5), we re-run the monthly return regression by using the ratio of Mercury Retrograde days to total days in a month as the main interest variable ($Mercury\ Days_t = \frac{Number\ of\ Mercury\ Retrograde\ days}{Total\ days\ in\ a\ month}$). For weekly regression, we control for four lags of weekly returns and volatility. For monthly regression, we control for one lag of monthly returns and volatility. In the parentheses below coefficient estimates are robust t-statistics based on standard errors adjusted for heteroskedasticity and country-level and time-level clustering.

Dep. Variable=	$Ret_{i,t}$				
Variable	(1)	(2)	(3)	(4)	(5)
$\boldsymbol{Mercury_t}$	**-3.874**	**-4.476**	**-22.961**	**-67.323**	
	(-2.41)	**(-2.80)**	**(-2.55)**	**(-1.92)**	
$\boldsymbol{Mercury\ Days_t}$					**-115.514**
					(-2.34)
Controls	Yes	Yes	Yes	Yes	Yes
Weekly Fixed	Yes	Yes	Yes	No	No
Year-Quarter Fixed	Yes	Yes	Yes	Yes	Yes
Country Fixed	Yes	Yes	Yes	Yes	Yes
Clustering	Country & Date	Country & Date	Country & Week	Country & Month	Country & Month
Obs	425,914	425,914	88,722	20,404	20,404
$Adj\ R^2$	0.024	0.024	0.064	0.161	0.161

Appendix IA4

In Column (1), we perform the analysis for the periods between 1973 and 1995. In Column (2), we perform the analysis for the periods between 1996 and 2019. In Column (3), we perform the analysis for the developed countries. In Column (4), we perform the analysis for the emerging countries. In the parentheses below coefficient estimates are robust t-statistics based on standard errors adjusted for heteroskedasticity and country-level and date-level clustering.

Dep. Variable=	$Ret_{i,t}$			
Variable	(1)	(2)	(3)	(4)
$\boldsymbol{Mercury_t}$	**-5.351**	**-4.988**	**-4.816**	**-5.757**
	(-2.49)	**(-2.07)**	**(-2.59)**	**(-2.96)**
Controls	Yes	Yes	Yes	Yes
Weekday Fixed	Yes	Yes	Yes	Yes
Year-Quarter Fixed	Yes	Yes	Yes	Yes
Country Fixed	Yes	Yes	Yes	Yes
Clustering	Country & Date	Country & Date	Country & Date	Country & Date
Obs	139,309	286,605	245,083	180,831
$Adj\ R^2$	0.030	0.022	0.020	0.027

Appendix IA5

This table examines the placebo tests for the Mercury effect. Return windows are as indicated in Column headers. For example, $(t+7, t+30)$ is from the 7th day of Mercury Prograde to the 30th day of Mercury Prograde. In Column (3)-(4), we randomly assign pseudo–Mercury Retrograde days with the mean of 73 calendar days annually. Repeating this 1,000 times, we then build the distribution of coefficients and their t-statistics, that result purely from random Mercury Retrograde windows. We report 5th percentiles in Column (3) and 10th percentiles in Column (4). In the parentheses below coefficient estimates are robust t-statistics based on standard errors adjusted for heteroskedasticity and country-level and date-level clustering.

Dep. Variable=	$Ret_{i,t-30,t-7}$	$Ret_{i,t+7,t+30}$	$Ret_{i,5th\ percentile}$	$Ret_{i,10th\ percentile}$
Variable	(1)	(2)	(3)	(4)
$\boldsymbol{Mercury_t}$	**1.873**	**-1.317**	**-2.760**	**-2.124**
	(1.20)	**(-0.76)**	**(-1.59)**	**(-1.24)**
Controls	Yes	Yes	Yes	Yes
Weekday Fixed	Yes	Yes	Yes	Yes
Year-Quarter Fixed	Yes	Yes	Yes	Yes
Country Fixed	Yes	Yes	Yes	Yes
Clustering	Country & Date	Country & Date	Country & Date	Country & Date
Obs	425,914	425,914	425,914	425,914
$Adj\ R^2$	0.023	0.023	0.021	0.020

Appendix IA6

In this table, we calculate Westfall and Young's (1993) step-down adjusted p-values, which control the family-wise error rate and allows for dependence among p-values by bootstrap re-sampling. 1,000 bootstrap replications are run for each of the eight multiple hypotheses (eight retrograde motions), and each bootstrap replication includes the same control variables as in Column (2) of Table 2.

Dep. Variable=	$Ret_{i,t}$
Variable	(1)
$\boldsymbol{Mercury_t}$	**0.024**
$Venus_t$	0.784
$Mars_t$	0.367
$Jupiter_t$	0.446
$Saturn_t$	0.999
$Uranus_t$	0.784
$Neptune_t$	0.446
$Pluto_t$	0.999

Appendix IA7

This table reports the top ten related Google Trend search topics to the topic "Ancient Greece," "Mythology," and "Hermes." The topic in each column is in the order from the top one to the top ten.

Ancient Greece	Mythology	Hermes
(1)	(2)	(3)
Ancient history – Topic	Greek mythology – Literary genre	Deity – Topic
Greece – Country in the Balkans	Norse mythology – Topic	God – Supreme being
Greek language – Human language	Deity – Topic	Greek mythology – Literary genre
Greeks – Ethnic group	Myth – Literary genre	Hermès – Fashion company
Greek mythology – Literary genre	God – Supreme being	Hermes Group – Company
Ancient Greek – Human language	Greek language – Human language	Mythology – Topic
Mythology – Topic	Greeks – Ethnic group	Greeks – Ethnic group
History – Filed of study	Greece – Country in the Balkans	Greek language – Human language
Myth – Literary genre	Goddess – Topic	Apollo – Deity
Ancient Rome - Topic	Ancient Greece – Topic	Greece – Country in the Balkans

Appendix IA8

This table summarizes the cross-country variations in the Mercury effect across different levels of science. $Low\ Sci_i$ is a binary variable that is equal to one (zero) if a country's scientific indicator is in the bottom (top) 1/3 of all the sample countries. $High\ Com_i$ is a binary variable that is equal to one (zero) if a country's *Combine* score over the sample period is in the top (bottom) 1/3 of all the sample countries. To construct the *Combine* score, we assign countries to twenty groups based on each Google search topic and conduct the three sorting independently to create 60 groups. Group 20 (1) contains the stocks with the highest (lowest) *Ancient Greece*, highest (lowest) *Mythology*, or highest (lowest) *Hermes* variables. We then add the group numbers of each country to a *Combine* score between 3 and 60. In the parentheses below coefficient estimates are robust t-statistics based on standard errors adjusted for heteroskedasticity and country-level and date-level clustering.

Dep. Variable=	$Ret_{i,t}$
Variable	(1)
$\boldsymbol{Low\ Sci_i \times High\ Com_i \times Mercury_t}$	**-5.830**
	(-2.29)
$Mercury_t$	-6.399
	(-2.28)
Controls	Yes
Weekday Fixed	Yes
Year-Quarter Fixed	Yes
Country Fixed	Yes
Clustering	Country & Date
Obs	105,275
$Adj\ R^2$	0.017

Appendix IA9

This table examines the change in the market turnover (trading volume) in the Mercury retrograde days. We use a detrending methodology based on Campbell, Grossman, and Wang (1993) that calculate the turnover trend as a rolling average of the past 20 trading days of log turnover. In all columns, we include country fixed effect, year-quarter fixed effect, and weekday effect. In the parentheses below coefficient estimates are robust t-statistics based on standard errors adjusted for heteroskedasticity and country-level and date-level clustering.

Dep. Variable=	$Volm_{i,t}$	
Variable	(1)	(2)
$\boldsymbol{Mercury_t}$	**-0.011**	**-0.007**
	(-2.08)	**(-1.78)**
$Volm_{i,t-1}$		0.290
		(14.29)
$Volm_{i,t-2}$		0.101
		(11.82)
$Volm_{i,t-3}$		0.053
		(11.76)
$Volm_{i,t-4}$		0.029
		(5.75)
$Volm_{i,t-5}$		0.024
		(4.63)
$Ret_{i,t-1}$		1.231
		(5.92)
$Ret_{i,t-2}$		0.159
		(1.24)
$Ret_{i,t-3}$		0.228
		(2.41)
$Ret_{i,t-4}$		0.095
		(1.02)
$Ret_{i,t-5}$		0.068
		(0.70)
$VOL_{i,t-1}$		2.997
		(13.57)
$VOL_{i,t-2}$		-0.596
		(-5.35)
$VOL_{i,t-3}$		-0.900
		(-5.20)
$VOL_{i,t-4}$		-1.009
		(-7.18)
$VOL_{i,t-5}$		-0.791
		(-6.75)
Weekday Fixed	Yes	Yes
Year-Quarter Fixed	Yes	Yes
Country Fixed	Yes	Yes
Clustering	Country & Date	Country & Date
Obs	354,584	352,760
$Adj\ R^2$	0.024	0.175

Appendix IA10

This table examines the market rection to news. The main control variable is the average of last five days aggregate news sentiment ($ESS_{t-1,t-5}$). In the parentheses below coefficient estimates are robust t-statistics based on standard errors adjusted for heteroskedasticity and country-level and date-level clustering.

Dep. Variable=	$Ret_{i,t}$	
Variable	(1) $Mercury_t = 1$	(2) $Mercury_t = 0$
$\boldsymbol{ESS_{t-1,t-5}}$	20.534	-4.133
	(2.11)	(-0.55)
Controls	Yes	Yes
Weekday Fixed	Yes	Yes
Year-Quarter Fixed	Yes	Yes
Country Fixed	Yes	Yes
Clustering	Country & Date	Country & Date
Obs	22,988	93,014
$Adj\ R^2$	0.062	0.015