GLOBAL PRICING OF FINANCIAL MARKET RISK PERCEPTIONS

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CERTIFICATE OF ORIGINALITY

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ABSTRACT

We examine the pricing of financial market risk perceptions in 46 international stock markets. Using the price of volatile stocks (PVS) as an empirical measure of risk perceptions, we find that risk perceptions can predict future stock returns global markets, with the predictability stronger in developed markets than in emerging markets. Risk perceptions also have predictive power on value, size and investment factor premiums. Further, risk perceptions of volatile stocks have globally negative real effects on the macroeconomic output gap and firm investments. Our findings suggest that investor perceptions of risk are relevant for global market risk premiums and real outcomes, whereas the relation between PVS and return predictability is related to national culture dimension of uncertainty avoidance. Financial market development, economic freedom and corporate governance also influence corporate investments in different levels of risk perceptions.

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1 Introduction

While risk or uncertainty is the cornerstone of the asset pricing theory (e.g., Sharpe (1964), Lintner (1965), Fama and French (1993), Fama and French (2015), Brogaard and Detzel(2015), Bali, Brown and Tang(2017), etc.), it is the risk perceived by investors that affect their asset allocation decisions, which can further affect the equilibrium asset prices (e.g., Gooding (1978), Dowling (1986), Weber and Milliman (1997), Huber, Palan and Zeisberger (2019)). Pflueger, Siriwardane and Sunderam (2020) indicate that investors' risk perceptions are an important determinant of risk premiums. For example, volatile stocks are supposed to be riskier than other stocks, and their discount rates should be higher whenever investors have greater perceptions of risk and lower vice versa. In other words, the risk perceptions affect the realized risk premiums.

Prior studies on risk perceptions are usually limited to survey analysis or laboratory experiments due to a lack of quantitative measurements to capture investors' risk perceptions (Weber and Hsee (1998), Holzmeister et al. (2020)). Those studies do not directly link risk perceptions and risk premiums together. Using the price of volatile stocks (PVS) as a measure of risk perceptions, empirically computed as the value spread between low volatility stocks and high volatility stocks as in Pflueger, Siriwardane and Sunderam (2020), our study assesses the importance of investors' risk perceptions on global stock markets. PVS is proportional to investors' risk perceptions, and it directly shows the role of risk perceptions in the realized risk premiums. In addition, PVS is capable of capturing the influences of small and volatile firms on the economy (Pflueger et al. (2020)), which are of vital importance for economies around the world.[1] We comprehensively study the pricing of risk perceptions over 46 international stock markets from 1990 to 2020, and we investigate the real effects of risk perceptions on firm investments and economic output in the global markets.

[1] See *Word Bank:* https://www.worldbank.org/en/topic/smefinance

Our paper first shows that investor risk perceptions are priced in the international markets in that risk perceptions negatively predict future stock returns and positively predict future cash flows of volatility-sorted portfolio (e.g., long low volatility stocks and short high volatility stocks). Low volatility stocks yield lower stock returns and high volatility stocks have higher stock returns when risk perceptions are high. Moreover, low volatility stocks are less risky and are relatively higher in stock price according to the standard present value logic (Campbell and Shiller (1988), Vuolteenaho (2002)). This finding suggests that risk perceptions are an important component for global risk premiums.

Given the market differences in cultural backgrounds, market maturity, etc. (e.g., Chui et al. (2010), Fama and French (2012), Watanabe et al. (2013), Titman, Wei and Xie (2013), Jacobs (2016), Fama and French (2017), Bartram and Grinblatt (2021), etc.), our cross-sectional tests on pricing of risk perceptions show that cultural differences can impact the pricing of risk perceptions across countries. The countries with high uncertainty avoidance cultural backgrounds have a smaller magnitude of predicting future stock returns using PVS. We find that the risk perception is priced in both developed markets and emerging markets, suggesting investors' risk perceptions are important for risk premiums, not only in the U.S. but also elsewhere in general.

Empirical evidence in U.S. and international markets shows that firms optimally invest more when the expected stock returns are lower based on Q-theory (e.g., cost of capital) (Liu, Whited and Zhang (2009), Li, Livdan and Zhang (2009), Titman, Wei and Xie (2013)). In uncertain times, a firm deters its corporate investments based on the rationale of the real option theory (Bloom, Bond and Reenen (2007), Julio and Yook (2012), Gulen and Ion (2016), Bloom et al. (2018), Xu (2020)). An increase in uncertainty may also lead to increasing in stock volatility and rising in risk premiums (e.g., Pastor and Veronesi (2012; 2013), Brogaard and Detzel (2015)). Nevertheless, our paper has shown the important role of risk perceptions in risk

premiums. The aforementioned combined effects suggest that investors' risk perceptions should have negative real effects on firm investments.

We show that firms in our global sample indeed shrink their investment expenses on average when risk perceptions are high after controlling for economic policy uncertainty and other variables. The shrinkage comes mainly from the high volatility stock price firms which actually face higher costs of capital, except for firms in European developed market. We also find the Q-theory channel of investment becomes more sensitive when risk perceptions are high. In the cross-section analyses, empirical results show that the decline is less pronounced in countries with higher economic freedom, higher financial development and better corporate governance. Meanwhile, the total industrial production also declines at the macroeconomy level as reflected by the output gap.

Our paper focuses on international asset pricing implications of financial market risk perceptions, and we look into whether specific risk factors (value, profitability, size, momentum and investment) premiums are relevant to market risk perceptions in the international markets. Common risk factors are essential components of international stock returns and are, therefore, of vital importance to the international financial market (Hou, Karolyi and Kho (2011), Fama and French (2012; 2017)). Our empirical results continue to show that risk perceptions on value, size and investment factors are relevant to their future factor premiums in the global stock markets. [2] The findings are robust that our additional tests of linking factor value-spread with factor premiums do not show consistent results. Our risk factor-related evidence suggests that even for common risk factor premiums in most of the international markets, risk perceptions still have a significant effect.

To sum up, our paper contributes to the literature on global pricing of risk perceptions. Our research first contributes to the studies in empirical research of investor risk perceptions

[2] Lochstoer and Tetlock (2020) show factor returns can be driven by cash flow and discount rate news.

in global financial markets. Nosić and Weber (2010) find the determinants of investors' risk-taking decisions are likely to be subjective risk perceptions instead of objective historical returns using survey analysis. Huber, Palan and Zeisberger (2019) show that individual-level investor risk perception would be reflected in the market-level stock prices in an experimental setting. Our paper quantitatively measures the investors' risk perceptions in the global financial market, which can capture global market investors' sentiment using accounting and stock data. The quantitative measurement facilitates more general and accurate empirical implications on investors' risk perceptions in the international markets. We further demonstrate the effects of market risk perceptions on real outcomes in the global markets. Currently, the relationship between market risk perceptions and firm-level real outcomes has not been systematically examined yet. Pflueger et al. (2020) emphasize more on macroeconomic outcomes than firm-level outcomes, despite the latter's great importance in financial markets. We add new evidence to this branch of literature with the evidence that the effects of risk perceptions on firm-level investments around the world.

Next, our study contributes to a better understanding of the risk premiums in the international markets. We test the important role of risk perceptions in risk premiums across the international markets. Our empirical results show corporate investments are more sensitive to the Q-theory channel when risk perceptions are high. And we continue to find that value, size and investment factor premiums are relevant to investor risk perceptions. Previous international asset pricing research has demonstrated that risk factors are important components of stock prices in the international stock market. Hou, Karolyi and Kho (2011) find momentum and cash flow-to-price can capture the stock price variations in international stock prices. Fama and French (2012; 2017) further show that size, book-to-market ratio, profitability and investment factors are also important in explaining the patterns in global stock prices. The idea of incorporating risk perceptions on specific risk factors are similar to the practice of Moreira

and Muir (2017), which states buying low volatility stocks produce higher alpha when market is volatile. Our results suggest investor risk perceptions are relevant to factor premiums in the global stock markets and are thus important to the international financial markets.

Lastly, our paper also relates to a large work in international finance seeking to identify whether and how asset prices or realized risk premiums vary across countries. Previous literature shows the performance of some risk factor premiums varies in different markets with market maturity, national culture, etc. Weber and Hsee (1998) find cross-cultural differences in risk perception of financial options using survey data. Chui et al. (2010) introduce the culture dimension measured by Hofstede (2001) to the asset pricing literature. Holzmeister et al. (2020) show risk perception and investment propensity are relatively homogeneous across countries. We find the pricing of investor perceptions is not uniform among different countries as well, contrary to earlier findings based on survey data (Holzmeister et al. (2020)). Specifically, the pricing of risk perceptions is related to the national culture dimension of uncertainty avoidance. In addition, massive asset pricing literature shows the role of market maturity in asset prices. Watanabe et al. (2013) show that the asset growth anomaly is more pronounced in developed markets and those where stocks are more efficiently priced. While Jacobs (2016) finds the mispricing of 11 anomalies is common both in emerging markets and developed markets. Bartram and Grinblatt (2021) show that alphas from mispricing are more pronounced in emerging markets from the perspective of market efficiency. However, in the case of risk perceptions, we do not find much divergence in asset prices between developed and emerging markets.

Overall, our paper contributes to the international asset pricing research on risk perceptions. We also bring new insights to international risk premiums studies and shed lights on research about firm-level real effects. This paper proceeds as follows. Section 2 outlines the data and variables in detail. Section 3 is about the summary statistics. Section 4 shows our main

empirical results. Section 5 presents our cross-sectional results. We conclude our paper in Section 6.

2 Data and variables

2.1 Data sources

In our paper, the U.S. accounting data come from Compustat North America and stock price data are from Center for Research on Securities Prices (CRSP). We use CCM link table provided by WRDS to merge the two data sets. Compustat North America Annual and Quarterly datasets are both used for accounting information. We use CRSP Monthly and Daily for monthly and daily stock returns. The international data besides U.S. listed firms are primarily from Compustat Global. Accounting information is from Compustat Global Annual and Quarterly. Stock information is from Compustat Security Daily dataset. As international data before 1990 are available for only a few countries, our data cover the period of 1990q1 to 2020q4. We obtain country-level macro data from OECD website.

The data cleaning process for international stock data is overall consistent with the procedures in Bessembinder, Chen, Choi and Wei (2021) and Jensen, Kelly and Pederson (2021). All the stock returns and accounting information are in U.S. dollars. We include only the primary issuing stocks of every firm in our analysis. For firms with multiple primary issues, we select the one with the longest listing period. If there still exist multiple primary issues with the same listing period for a firm, we choose the stock that is listed in the same incorporate location as the listing exchange. We follow the procedure in Bessembinder et al. (2021) to backfill Canadian data prior to April 1998.

2.2 Risk perception measurement PVS

The theoretical framework of Pflueger et al. (2020) states that a firm's log expected return in excess of the risk-free rate can be derived as:

$$ln\mathbb{E}_t[R_{it+1}] - r_{ft} = \gamma s_i \mathbb{V}_t(\varepsilon_{t+1}), \quad (1)$$

whereas $\mathbb{V}_t(\varepsilon_{t+1})$ is the perceived risks, s_i captures firm i's riskiness, γ stands for investors' risk aversion. Risky firms' expected returns move more with perceived risk $\mathbb{V}_t(\varepsilon_{t+1})$ than safer firms' from the above model. The perceived risk can be inferred using the cross-section of firms and relate a firm's book-to-market ratio to its expected return.

$$\begin{aligned} PVS_t &= ln\left(\frac{K_{LT+1}}{V_{Lt}-D_{Lt}}\right) - ln\left(\frac{K_{HT+1}}{V_{Ht}-D_{Ht}}\right) \\ &= ln\mathbb{E}_t\left[R_{L,t+1}\right] - ln\mathbb{E}_t\left[R_{H,t+1}\right] \\ &= -\gamma(s_L - s_H)\mathbb{V}_t(\varepsilon_{t+1}) \end{aligned} \tag{2}$$

Where K, V, D stand for a firm's capital, value and dividend, respectively. Letter L and H describe whether the firm is low volatility firms or high volatility ones. Equation (2) indicates that price of volatile stocks (PVS) is proportional to investors' perceived risks and is also related to stock prices. It contains the information about investors' risk aversion, firm's exposure to risk and also the risk perception. This paper seeks to investigate the pricing of risk perceptions in the international financial markets in that risk perceptions are less studied in the literature compared with risks and uncertainties.

In order to construct reliable risk perception measurements for every country, we require each country to have more than 100 stocks in each quarter so as to conduct further analysis. PVS is empirically calculated as the difference between the average book-to-market ratio of the lowest volatility quintile stocks and the highest volatility quintile stocks in every quarter. We first sort stocks into quintiles based on their past 2-month daily stock volatility at the end of every quarter for every country and then form the long-short portfolio, which is long on the lowest volatility quintile stocks and short on the highest volatility quintile. PVS is the book-to-market spread between the long side and the short side for every country at every quarter. The portfolio is quarterly rebalanced. The construction of PVS follows the below equation:

$$PVS_t = \overline{\left(\frac{B}{M}\right)}_{low\ vol,t} - \overline{\left(\frac{B}{M}\right)}_{high\ vol,t} \quad (3)$$

Where the first term stands for the average book-to-market ratio of the lowest volatility quintile and the second term is the average book-to-market ratio of the highest volatility quintile at quarter t. When investors' risk perceptions of financial market are high, they would prefer to buy less volatile stocks. Thus, the prices of low-volatility stocks will be pushed higher compared with high-volatility stocks. PVS will decrease due to the increase in the market value of low volatility stocks. For each country, we can construct PVS following Equation (3) and require at least 100 stocks to establish this risk perception measurement.

Given that a country may have multiple stock exchanges of varying sizes, we only include common stocks on the major stock exchanges to construct the risk perception measurement PVS for every country. We calculate the book-to-market ratio as the book equity divided by the trailing 6-month average of market equity for every stock following Pflueger et al. (2020). Market equity is computed on a monthly basis, which is the end-of-month stock price times shares outstanding. Book equity of a firm first comes from Compustat Quarterly data, and if the quarterly book equity data is not available, we use Compustat Annual book equity. To avoid the disturbance of measurement errors in the Compustat Global datasets to our risk perception measurement, we winsorize the book-to-market value of each country at the top 99.5% and bottom 0.5% levels. Each stock's volatility is computed as the standard deviation of its previous two months' daily ex-dividend returns. In order to have valid volatility, a stock must have at least 20 observations in the previous two months to enter the sample. In our construction of PVS, the accounting information is known with a 4-month lag for each firm. We exclude the firms who either have end-of-month market equity or 6-month trailing average market equity less than $1 million and require firms to have stock returns for the next quarter. We adjust the delisting stock prices as in Shumway (1997).

Apart from country-level risk perception measurement, we also construct PVS to measure regional-level market risk perceptions as international markets are becoming increasingly integrated. We have PVS for the whole global world, for the developed market and the emerging market. The division of developed or emerging is based on the market maturity of each country according to International Monetary Fund (IMF) classification. Further, we specify developed markets according to their geographic locations and have PVS for American developed markets, European developed markets and Asia-Pacific developed markets. The construction is generally the same as in Equation (3). For the higher level PVS construction, we do not sort the stocks again in each area. Instead, we use a stock's volatility ranking in its listing country to determine its position in the five quintiles of broader areas. More specifically, the long-short portfolio of a broader area is taking the long leg of every county's lowest volatility stock quintile and taking the short leg of every country's highest volatility stock quintile within that area. In this way, we construct regional-level volatility-sorted portfolios as in Equation (3).

3 Summary statistics

We have 47 countries with sufficient stock information to construct PVS and conduct further analyses. In addition to country-level analysis, we have regional subsample analyses based on market maturity and geographic locations.

Table 1 reports the summary statistics of our international sample spanning from 1990q1 to 2020q4. For each country, the data starts from the first quarter of each country that has over 100 distinct stocks to the end of 2020. Panel A presents the total number of stocks of all the markets and the average stock number of each group during this period. There are altogether 61,049 stocks that enter our global sample. The developed markets and the emerging markets contribute 44,107 and 16,942 stocks to the whole sample, respectively. If we exclude US stocks from the global sample, the sample size is reduced to 44,999. For the developed

markets, stocks from American stock exchanges consist of the largest part, which is 17,722. Asia-Pacific developed markets have altogether 15,317 stocks and European developed markets have 11,724 stocks. If we exclude Japan listed stocks from the Asia-Pacific developed sample, the remaining stock number for Asia-Pacific developed areas is 11,724. In Panel B, we show the number of stocks in the main stock exchanges of the corresponding countries. United States contributes the largest number of stocks (16,050) to the whole sample, and United Arab Emirates contributes the smallest stock number (104). The time for every country to have at least 100 listed firms varies, and for most of the developed countries, their country enters the sample in the 1990s. United Arab Emirates also has the shortest observation period.

[Insert Table 1 here]

Panel C presents summary statistics of firm-level characteristics for each region. Our global sample has an average annual stock return of 0.147. Stocks in European developed markets have the lowest average stock return spanning the period 1990-2020, while stocks in American developed markets have the highest average annual return. The average book-to-market ratio of our global sample is 1.016. And the lowest average book-to-market ratio is in American developed markets. Asia-Pacific developed markets have the highest average book-to-market ratio.

In Appendix, we show the mean and the median values of every firm's ROE for the future 4 quarters, stock return for the future 4 quarters, book equity, market equity and the book-to-market ratio. ROE is computed following Cohen, Polk and Vuolteenaho (2003), which uses the clean-surplus-based formula. Among the stocks that enter our international sample, stocks listed in United Arab Emirates exchanges have the lowest average ROE of the future one year (0.002), and the stocks listed in Turkey have the highest average future 1-year ROE (6.915). Stocks in Nigeria stock market have the lowest average future 1-year stock return (-0.045) and stocks in Indonesia have the highest average future 1-year stock return (0.25) during

their sample period. The average values of book equity and market equity in each market vary in a wide range. Sri Lanka is the country with the lowest average book equity and the lowest average market equity (43.889 and 64.699 respectively), and the stock market with the highest average book equity and the highest average market equity are Turkey (8516.075) and Netherland stock market (4467.116) respectively. Meanwhile, China has the smallest average book-to-market ratio (0.394), and Romania has the highest average book-to-market ratio (2.168). For every country, the mean values of firms' characteristics are larger than those of the median value, indicating that the sample is positively skewed.

4 Main empirical Results

In this section, we show our main empirical results of pricing and real effects of risk perceptions measured by PVS in the global markets. We begin by showing the PVS in every concerned market. We then examine the pricing, the real effects and risk factor performance that are relevant to PVS in corresponding markets.

4.1 PVS in each market

Figure 1 show the risk perceptions measurement PVS in the global market, developed market and emerging market from 1990 to 2020. In Figure 1, we annotate some major events that are closely related to the rapid changes of risk perceptions in the market. We do not see an unexpected divergence between developed and emerging market risk perceptions in Figure 1.

[Insert Figure 1 here]

In Appendix C and D, we separately show the risk perceptions for the concerned regions and remaining countries. Figure A2 and Figure A3 are the developed market's PVS and the emerging market's PVS. In Figure A4 to Figure A6, we further construct different developed regional PVS according to the geographical locations and display the PVS of each region at each quarter. As stocks in the US stock exchanges consist of over 1/3 of the global stock sample, we also construct PVS for global stock market, developed market and American developed

market after excluding US stocks from the sample. Figure A7 to A8 show the global PVS and developed market PVS without US stocks in the sample. The remaining regional and country-level PVS graphs can be found in the Appendix D and E.

4.2 PVS and return predictability

4.2.1 Time-series predictive analysis

To see whether risk perceptions in each market are priced, we test the ability of risk perceptions to predict the future one-year stock returns and cash flows. The stock returns and returns on equity (ROE) are both equally weighted within each volatility quintile.

We use PVS to examine whether investor risk perceptions contain information about future stock returns and future cash flows for each market. Cohen et al. (2003) decompose firms' book-to-market ratio into stock returns and profitability and PVS is essentially the value spread between low volatility stocks and high volatility stocks. We thus iterate the following time-series regression for each market of interest with two dependent variables:

$$Y_{t\to t+4} = a + b \times PVS_t + \varepsilon_{t+4} \tag{4}$$

The independent variable, PVS, is our risk perception measurement at quarter t. $Y_{t\to t+4}$ is the future annual average return of the long-short portfolio which is long on the bottom volatility quintile stocks and short on the top volatility quintile stocks and is either stock return or ROE. When the dependent variable is stock return, we use Hodrick (1992) to adjust the standard errors, or else we use Newey and West (1987) standard errors with five lags.

Table 2 shows the predictability power of risk perceptions on future 1-year stock returns and ROE. In Panel A, we show the predictability power of global-level and region-level PVS on stock return and ROE. We believe the risk perceptions of broader areas are of vital importance as the global economy has been increasingly integrated. In Column (1), global PVS can positively predict future stock returns, and the coefficient on PVS is 0.119 and statistically significant. Column (2) shows that global PVS does not contain information about future ROE,

and the coefficient on PVS is -0.131 but insignificant. If we exclude US stocks from the sample, in Column (3) we show that the global PVS without U.S. stocks still has a positive and significant coefficient on future portfolio returns. Meanwhile, the magnitude of the coefficient decreases to 0.0892. Global PVS without U.S. stocks still has no significant predictive power of future ROE as suggested in Column (4). We partition our sample into developed market stocks and emerging market stocks according to the market maturity and construct PVS for them respectively. We find that developed market PVS has positive predictive power on future stock returns and fails to significantly predict future ROE. In Column (5), the coefficient of developed market PVS on predicting future 1-year stock return is 0.135 with a significant level of 99%, and in Column (6) the coefficient of developed market PVS on future 1-year ROE is -0.109 but not significant. Again, if we use the developed market PVS without US stocks, PVS still has positive predictive power on future 1-year stock return with a significant coefficient of 0.0928 as in Column (7). Still, it does not contain information about future ROE. For emerging market, the coefficients of emerging market PVS are insignificant on both future stock return and ROE as shown in Column (9) and (10).

[Insert Table 2 here]

In Panel B, we further divide developed regions into European developed market, Asia-Pacific developed market and American developed market according to the geographic locations. The coefficient of European PVS on future stock return is positive but insignificant in Column (1), indicating that European developed market PVS has no predictive power on future stock return. Similarly, the coefficient of European developed market PVS on future ROE is -0.156 and insignificant. In Column (3) and (4), Asia-Pacific developed market PVS has a significant and positive coefficient on future stock return and has insignificant predictive power on future ROE. If we exclude Japanese stocks from the Asia-Pacific developed market as suggested in Column (5) and (6), the predictive power of PVS on stock return still persist,

while the magnitude increases from 0.0809 to 0.142. In Column (7) and (8), PVS of American developed market significantly predict future stock return and has no predictive power over future ROE. If we exclude US stocks from the American developed market stocks, the PVS is formed by using Canadian stocks, and the predictive power of PVS on future stock return disappears. However, American developed market PVS without US stocks (Canadian PVS) has a negative and significant coefficient on future ROE. We do see some differences in PVS regarding predicting future stock return and firms' profitability that are related to geographical locations.

In Appendix B Table A2, we display the predictive power of country-level PVS on future stock return and ROE to examine whether the country-level risk perception contains relevant information. In total, we construct 47 countries' PVS and Appendix C presents the country-level PVS figures. We do not examine the predictability power of United Arab Emirates PVS as it only has very few quarters with available PVS. Panel A1 shows that the PVS of 13 countries (Chile, China, Germany, Finland, U.K., Hong Kong, Indonesia, Poland, Romania, Singapore, Thailand, USA and Vietnam) can predict the future 1-year stock return with at least 90% confidence level of statistical significance. Meanwhile, in Panel A2, 20 countries' (Bangladesh, Canada, Switzerland, Chile, China, Spain, France, U.K., Greece, Hong Kong, India, Israel, Jordan, Japan, Sri Lanka, Netherlands, Philippine, Sweden, Thailand, Taiwan, Vietnam) PVS can negatively predict the future ROE with at least 90% statistical significance. Among them, the PVS of Chile, China, U.K., Hong Kong, Thailand and Vietnam (altogether 6 countries) can both predict the future 1-year stock return and the future one-year portfolio ROE.

The results indicate that risk perceptions can contain information both about future stock returns and future cash flows of the volatility-sorted portfolio in some countries. When

market risk perceptions are high, PVS is low, the low volatility stock returns' future returns are lower, and those firms can also be more profitable.

4.2.2 Pooled predictive analysis

We now look into the average predictive power of risk perceptions on the future annual returns across global markets. We pool the country-level data together and run panel regression for the whole global sample as follows:

$$Y_{i,t\to t+4} = a + b \times PVS_{i,t} + Country\ FE + \varepsilon_{i,t+4} \quad (5)$$

Where $PVS_{i,t}$ is the risk perception measurement in country i at quarter t. $Y_{i,t\to t+4}$ is the volatility-sorted long-short portfolio's future return of country i in quarter t. The coefficient b captures the average effect of $PVS_{i,t}$ on future volatility-sorted returns in all the countries that enter our analysis. As well, $Y_{i,t\to t+4}$ can be stock return or ROE. We add country fixed effect in the regression model to control for some unobservable omitted country-level variables that may impact the returns. The standard errors are clustered by both quarter and country. We also run similar regressions for regional subsamples.

[Insert Table 3 here]

In Table 3, we show the average predictability of investors' risk perception on future firm returns. By pooling all the country-level data together, we have the panel data for country-quarter PVS. We run a regression of Equation (5) for a total of 3,747 country-quarter data to obtain the average effect of PVS on future one-year stock return and ROE. We see that in Column (1) and Column (2), the coefficient of PVS is significant and positive on future stock return and is significant and negative on future ROE. This result shows that, on average, investor risk perceptions have predictive power on future stock returns and cash flows in the global markets. If we exclude US data from our panel regression, PVS can still significantly predict future return and ROE. We further partition the global sample into emerging market panel data and developed market panel data, and repeat regressions following Equation (5) see

the average effects in the two markets. For both developed market and developed market pooled data, we find that PVS has significant predictive power for both future one-year stock return and ROE on average. If we exclude U.S. data from the developed market sample, the significance still persists, while the magnitude of PVS on future stock return decreases and the magnitude of PVS on future ROE increases. If we relax the control variables and do not include country-fixed effects in our regression, the results are quite similar as shown in Column (11) and (12).

In summary, we show evidence of investor risk perceptions have predictive power on firm future stock returns and fundamentals in the global markets. The above analysis suggests that low volatility stocks have lower stock returns when investors perceive high risks in the market, and vice versa for the high volatility stocks. Our time-series analysis shows developed market risk perceptions have a stronger pricing of risk perceptions than the developed market, and European developed market seems not to price investor risk perceptions. In the pooled data analysis, we find on average risk perceptions are priced in the global markets.

4.3 PVS and real effects

We test whether market risk perceptions have influences on real outcomes in this subsection. In the previous empirical specifications, we find global evidence that risk perceptions are priced in the global stock returns. Here, we explore whether the high cost of capital has real effects on both firm investment and the macroeconomy.

We control for Baker et al. (2016) Economic Policy Uncertainty in some of our empirical specifications, and EPU is obtained from its website. We winsorize all our variables at the top 99.5% and bottom 0.5% in every country to exclude the disturbance of measurement errors in the raw data set.

4.3.1 PVS and firm investment

As we discussed, the change in cost of capital would have the real effects on firm investments according to Q-theory, and uncertainty (which is correlated with risk perceptions) also negatively influence firm investments (Liu, Whited and Zhang (2009), Li, Livdan and Zhang (2009), Titman, Wei and Xie (2013), Gulen and Ion (2016), etc). We continue our empirical research to see whether market risk perceptions would have real effects on firm investment outcomes in global markets. We use capital investment and total investment (the sum of capital investment and R&D expenses) in our regression specifications to capture the firm-level investment following previous research in U.S. and international research (e.g., Titman, Wei and Xie (2004; 2013), Gulen and Ion (2016), Shroff (2017), etc.). Especially, Gulen and Ion (2016) empirically show policy uncertainty would reduce firm investments. As risk perceptions and policy uncertainty are correlated but not identical (Pflueger et al.), we thus include EPU in our empirical specifications to control for its effect. The regression model is following:

$$Y_{i,j,t+1} = a + b \times PVS_{j,t} + c \times EPU_{j,t} + \sum Controls + FE + \varepsilon_{i,j,t+1} \quad (6)$$

Where i, j, t index firm, country and time respectively. The time frequency can be quarterly or annual based on the dependent variable. When dependent variable $Y_{i,j,t+1}$ is capital investments scaled by last period total assets (CAPX/Lagged total assets), and we have both quarterly and annual frequency empirical regressions. When the dependent variable $Y_{i,j,t+1}$, is total investments scaled by last period total assets (Total Investment/ Lagged total assets), the data frequency is annual and total investment is the sum of capital investments and R&D investment. We test whether PVS of country j in time t influences the future investment of firm i listed at country j in time $t + 1$. At the same time, we control for an array of variables that are shown to have impacts on firm-level investments in previous studies. PVS would be averaged within a year for firm-year model, and EPU would be averaged within a quarter or a

year for the corresponding data structure. Regional EPU is first taken if there is a ready index for the policy uncertainty, and if there is no, we take the average country-level EPU of corresponding regions. Other firm-level variables such as Tobin's q, cash flows, and sales growth are included as control variables. To control for potential omitted variables, we have firm and time (either quarter or year) fixed effects in our regression specifications. The standard errors are clustered at firm and time levels.

[Insert Table 4 here]

Table 4 presents the average effect of risk perceptions on firm future investments in global market. Panel A reports the correlation matrix for the concerned variables in our empirical model. As economic policy uncertainty might comove with investors' risk perceptions to increase, they still contain different information as they are not perfectly correlated with each other. From Column (1) to (7) in Panel B, the data is on a quarterly basis and the remaining Column (7) to (8) are in an annual frequency. In Column (1), we see that PVS has a significant and positive coefficient on future one-quarter capital investment using our global firm-quarter sample. The interpretation of the positive coefficient on PVS is when market risk perceptions are high, PVS is low, and firms will decrease their capital investments. We notice that the coefficient on EPU is negative and significant, which is consistent with the findings in Gulen and Ion (2016), showing high policy uncertainty will dampen firm capital investment. The simultaneous significant coefficients on PVS as well as on EPU along with the similar negative effects on firm-level investment further show that risk perceptions and policy uncertainty contain different while correlated information.

In Column (2) to (5), we run subsample regressions for stocks listed in different regions. We find the effect of PVS on developed market firms is smaller in magnitude than that of emerging markets in Column (2) and Column (3), although both are significant. We also find that on average, the effect of market risk perceptions on firms listed in European developed

markets is significant, but this is not the case for American and Asia-Pacific markets as is seen from Column (5) and Column (6). In Column (7), we include an interactive term between PVS and Tobin's Q. And the negative and significant coefficient on this interactive term suggests that the Q-theory channel is more sensitive for corporate investment when risk perceptions are high (e.g., PVS is low).

In the remaining Column (8) and (9), we run regressions of Equation (6) using firm-year data for global sample. The dependent variables for Column (8) and Column (9) are future one-year scaled capital investment and scaled total investment, respectively. The results in Column (8) and (9) show consistent results with the previous firm-quarter data, which is risk perceptions have negative real effects on firm investments.

4.3.2 PVS and output gap

Having examined the influences on real outcome at firm level, we now investigate the impacts of market risk perceptions on macroeconomic output level. Output gap is a production-based macroeconomic variable and is usually defined as the difference between the real GDP and the real potential output. It shows the difference between the real economy production and its potential outcome when it's running at an efficient rate. A negative output gap shows the economy is underworking and a positive one indicates the economy is overworking.

Due to the lack of credible data, we can only try to find alternative measures for output gap in the international setting. The measure of output gap in our paper is widely used in macroeconomics (Clarida, Gali, and Gertler (2000), Fuhrer and Rudebusch (2004), Cooper and Priestley (2009), etc.) and is constructed as follows:

$$y_t = a + b \times t + c \times t^2 + v_t \quad (7)$$

Where y_t is the log of industrial production, t is a time trend, and v_t is an error term, which is the output gap. The output gap related data is downloaded from the OECD website for 27 countries. For regional output gap, we first average (either equal-weight or value-weight)

the industrial production of all the countries within that region and then run the above regression to get the residual as the regional output gap. Then, for further test, we control for several variables in our regression following Pflueger et al. (2020) and assess the impact of financial market risk perceptions on macroeconomic real outcomes:

$$Output\ Gap_{t+1} = a + b \times PVS_t + c \times Real\ Rate_t + d \times Output\ Gap_t + \varepsilon_{t+1} \quad (8)$$

Where PVS_t is the market risk perceptions in quarter *t*, $Output\ Gap_{t+1}$ is the output gap in quarter $t + 1$ and is obtained from Equation (8), $Real\ Rate_t$ is the one-year Treasury bill rate minus the one-year survey expectations of inflation. We also control for the current year's output gap. Again, we iterate the above regression model for each region concerned.

[Insert Table 5 here]

Table 5 presents the results of market risk perceptions and output gap in global markets. Due to the availability of industrial production data, we cannot cover all the countries in one specific region. We only have 27 countries to provide credible macroeconomic data, so we can only use the limited data to represent the regional output. Panel A shows results of PVS on output gap calculated using equal-weighted average industrial production for each country within specified region. We find market risk perceptions have significant impacts on output gap in global market in general, particularly in developed market and American developed market. The positive coefficient of PVS suggests when market risk perceptions are high in a market, PVS is low, and the output gap will decrease in the next quarter. Panel B shows the results using the value-weighted average industrial production regional output gap, and the weight is industrial production of each country in that region. The results are the same for global and developed market, as the coefficients on PVS stay both positive and significant. The statistical significance on American developed market disappears if we value-weighted industrial production in each region, while the coefficient is still positive. Moreover, Europe

and Asia-Pacific developed markets show marginal significant and positive results of PVS on output gap.

In general, we find evidence showing high market risk perceptions decrease macroeconomy outcomes using output gap in this subsection.

4.4 PVS and factor premiums

In this section, we test whether the risk perceptions about certain risk factors contain information about future risk factor premiums. In previous sections, we have shown PVS contains future stock return and cash flow information. As risk factors are important to international stock returns (Hou et al. (2011)), we look into whether risk perceptions are relevant to common factor premiums in international markets.

We include 5 common factors, value, profitability, investment, size and momentum in our analysis. The factor-based characteristics of each stock are constructed in conventional ways. A firm's value measure is B/M ratio and is calculated as dividing its book equity by its market equity at the end of June after the calendar year of book equity as in Fama and French (1992). Profitability is constructed as annual revenues minus costs of goods sold, interest expense, and selling, general, and administrative expenses, all divided by book equity following Fama and French (2015). Investment is the asst growth of this year and last year. Size is the last December market equity of a firm. For a firm with multiple common stocks, we sum up the market equities of all common stocks to get the size of the firm. Momentum is the previous 12-months holding period return of a stock Fama and French (1996).

For every country and every quarter, we sort stocks into different 5 quintiles based on each stock's factor-related characteristic using the big firm breakpoint (firms that are larger than median size in every country). For US stocks, we use the NYSE breakpoint. After identifying the characteristic quintile with a lower volatility, we construct our portfolio by taking the long side of the low-volatility factor quintile and the short side of the high-volatility

one. By doing so, we can get the empirical risk perceptions proxy and for each factor. The corresponding book-to-market spread of the two quintiles is the empirical PVS of the factor. That is:

$$PVS_{t,F} = \left[\overline{\left(\frac{B}{M}\right)}_{t,F1} - \overline{\left(\frac{B}{M}\right)}_{t,F5}\right] \times Sign\left(\bar{\sigma}_t(F1) - \bar{\sigma}_t(F5)\right) \times (-1) \quad (9)$$

F denotes the factor to be examined. $F1$ and $F5$ represent the bottom quintile and the top quintile of the factor-based characteristic sorts respectively. $\bar{\sigma}_t$ is the average volatility of a quintile at quarter t. $Sign$ takes the value of either 1 or -1 depending on the input variable's sign. The intuition for this equation is that, investors consider not only the factor-based characteristic values but also the volatility of stocks as to show their risk perceptions. We form the corresponding long-short portfolio of the same long-short leg as in the factor PVS construction. For every country in every quarter, we sort stocks into different 5 quintiles based on each stock's factor-related characteristic based on the big firm breakpoint (firms that are larger than median size in every country). For U.S. stocks, we use the NYSE breakpoint. The five factors are all constructed in conventional ways as stated in Section 2. Then, we run the below regression for each region:

$$Ret_{t\to t+1,F} = a + b \times PVS_{t,F} + \varepsilon_{t+1} \quad (10)$$

On the left-hand-side, $Ret_{t\to t+1,F}$ is the future one-quarter stock return of the portfolio which corresponds to the factor PVS long-short portfolio. F denotes for the factor to be examined. The independent variable PVS_t is the risk perception for each market at quarter t. For each factor in each country/region, we repeat the above time-series regressions. We use Newey and West (1987) to correct the standard errors. We do not rank all the stocks again when it comes to regional level analyses, and we use the position of each stock as is in its own country's characteristic quintile of every quarter.

Table 6 reports the results of risk perceptions and factor premiums. In Panel A, we find that risk perceptions in all the examined markets predict value premium in the next quarter. In

Panel B, we examine whether profitability factor premium is due to risk perceptions of market. The results show that in the U.S. market, emerging market and American developed market, PVS can positively predict profitability premium with at least 90% statistical significance. While for global market and other markets, there are no significant results of PVS on profitability risk factor returns in the sample period. Panel C reports the results of PVS on next quarter size return, and it suggests that PVS can drive the size factor premiums in almost all the regions except for emerging market. In Panel D, we do not find evidence that supporting the momentum premium is relevant to risk perceptions, with only a marginal significance in U.S. market. Panel E presents the results of PVS on future one quarter investment factor premiums of different markets. We find that risk perceptions can positively predict future investment premiums also in all the markets.

[Insert Table 6 here]

We seek to demonstrate that value spread and factor PVS are not uniform concepts. In Appendix C, we provide the results of value-spread on future factor premiums and the correlation matrix between factor value-spread and PVS. Factor PVS is different from value-spread as it involves volatility adjustment. From Appendix C and Table 6, we can see the predictability of value-spread is generally not as strong as PVS for value and investment factors. The correlation matrix of value-spread and PVS is in Appendix C. We believe factor value-spread and PVS can capture different information in related situations.

Overall, our results show that, common factor premiums are relevant to risk perceptions in the global markets.

5 Cross-sectional empirical results

We have several cross-sectional tests to further find out the country- or market-level characteristics that may influence the pricing of investor risk perceptions. We also seek to validate the Q-theory channel of risk perceptions on firm investment effects.

5.1 PVS predictability of returns and cross-country differences

To systematically explore why and how risk perceptions perform differently in terms of predicting future returns in different markets, we take some country-level characteristics into our investigation. In this section, we examine the impact of country-level characteristics on the predictability of PVS on future returns.

We first consider the impact of market maturity. To conduct the examinations, we run the following panel regression model by including an interaction term:

$$Y_{i,t\to t+4} = a + b \times PVS_{i,t} + c \times PVS_{i,t} \times Dev_i + Country\ FE + \varepsilon_{i,t+4} \quad (11)$$

Here, Dev_i is an indicator variable that takes the value 1 if country i is with developed stock market, and 0 otherwise. We interact $PVS_{i,t}$ with the indicator variable to test whether the market maturity would influence the risk perceptions of investors on future volatility-sorted portfolio's stock return. The dependent variable $Y_{i,t\to t+4}$ can be stock return or ROE.

[Insert Table 7 here]

In Table 7 Panel A, we run the above regression and examine the differences between developed countries' PVS and emerging countries' PVS on predicting the future one-year return of volatility-sorted portfolios. As shown in Column (1) and (2), we do not find significant differences between the predictive power of PVS on future stock return or ROE between the emerging countries and developed countries. After excluding U.S. data from our sample, we still do not find significant differences in the pricing differences. If we do not include country fixed effect in our model, the results are also quite similar as shown in the last two columns.

Investors with different cultural backgrounds may have different reactions when they perceive with the same risk levels, resulting in diverse investment decisions. Inspired by previous research using survey data (Weber and Hsee (1998)), we link PVS stock return predictability with culture dimensions. We make use of Hofstede (2001) cultural index to examine whether cultural differences can impact PVS predictability on asset returns. Hofstede

(2001) cultural index has 5 dimensions on culture: Power Distance Index, Individualism vs. Collectivism, Masculinity vs. Femininity, Uncertainty Avoidance Index and Long-term Orientation vs. Short-term Normative Orientation. We would like to see whether those cultural dimensions would impact the predictive power of risk perception on future returns as follows:

$$Y_{i,t\to t+4} = a + b \times PVS_{i,t} + c \times PVS_{i,t} \times Culture_i + Country\ FE + \varepsilon_{i,t+4} \qquad (12)$$

Where $Culture_i$ is one of the five cultural dimension indexes for country i. We control for country fixed effects for potential country-level omitted variables. The standard errors are also clustered by country and by quarter. $Culture_i$ measures a country's cultural dimension, and it is a constant number for each country. The coefficient c on the interaction term captures the effects of different levels of uncertainty aversion on risk perceptions' predictive power of future one-year return. The dependent variable $Y_{i,t\to t+4}$ is also either stock return or ROE.

In Table 7 Panel B, we find the interaction term's coefficient on the interaction term between country's uncertainty avoidance index and PVS is -0.00124 and marginally significant at 90% level. Other cultural dimensions seem to have no impact on the pricing of investor risk perceptions. The cultural index may not be available for all the countries in our sample, so the panel size is smaller than that of the previous global panel regression.

UAI (Uncertainty Avoidance Index) is the degree to which a country's members feel uncomfortable about future uncertainty or ambiguity, and high UAI suggests that high intolerance of future uncertainty. The significant coefficient on the interactive term shows that the more uncomfortable the people in a society feel about future uncertainty, the smaller the magnitude of PVS coefficient is regarding predicting the future volatility-sorted stock return. Our interpretation is that different countries with different uncertainty tolerance cultural backgrounds have different pricing of risk perceptions. We do not find ROE performance can be explained by cultural differences.

In the untabulated tables, we investigate the impacts of other country-level characteristics. We include the development of financial institutions and financial markets, economic freedom, and country governance. However, we do not find significant or impactful results.

5.2 PVS, volatile stocks and firm investment

The discussion in the previous sections shows the real effects of risk perceptions following Q-theory. Q-theory indicates that firms make fewer optimal investments with high cost of capital. We seek to clarify whether the impact of risk perceptions is most sensitive to the real outcomes of firms with highly volatile stocks. We establish a panel regression as follows:

$$Y_{i,j,t+1} = a + \sum_{n=2}^{5} a_n \times Q_{i,t}^{n} + b \times PVS_{j,t} + \sum_{n=2}^{5} b_n \times Q_{i,t}^{n} \times PVS_{j,t} + c \times EPU_{j,t} + \sum Controls + FE + \varepsilon_{i,j,t+1} \quad (13)$$

Where $Q_{i,t}^{n}$ is an indicator variable that takes 1 if stock i is in volatility group n in quarter t, $n \in \{2,3,4,5\}$. The indicator variables identify the different risk levels of stocks. The interaction term of $PVS_{j,t}$ and $Q_{i,t}^{n}$ captures the differences between stocks in different volatility quintiles and the lowest volatility ($Q_{i,t}^{1}$) quintile. The dependent variable is quarterly capital investments scaled by last period's total assets (CAPX/ Lagged total assets). We include the same array of independent variables as well as firm and quarter fixed effects as in our main regression.

[Insert Table 8 here]

We find consistent results with our conjecture in Table 8. In Column (1) with global sample, the interaction terms between the indicator variables of stock volatility are all significant and positive, which suggests firms with higher volatility stock prices are those who cut their investment. The developed market and emerging market subsamples have similar patterns as the global sample as shown in Column (2) and Column (3). What's interesting is in

the remaining subsamples of developed market stocks. In Column (4) the results in European developed market present that the coefficient on PVS is positive and significant, while the coefficients on the remaining interaction terms are not as significant compared with other regions. The results in Column (4) suggest in Europe, even the low volatile stocks decrease future investment, which somewhat coincides with no significant results of PVS on future volatility-sorted stock returns. Column (5) and Column (6) show the results for American developed market and Asia-Pacific developed market. We find that in these two areas, firms with higher volatility stocks do decrease future investment more in the time of high risk perceptions.

Taken together, we find robustness results supporting market risk perceptions have real effects on firm-level investment. The effects are more pronounced in high volatility firms as they face higher costs of capital when investors perceive high risks in the market, which coincides with the Q-theory channel.

5.3 Cross-sectional tests of PVS and firm investment

In the last subsection, we conduct the cross-sectional test of PVS and firm investments. We examine cross-country differences and firm investments during times of different risk perceptions. Firms may be differently impacted by risk perceptions due to the country-level differences in market development, corporate governance, etc. Following the previous literature, we address whether the real effects of risk perceptions vary among each country due to their market features. Specifically, we test the impact of economic freedom, financial market development, country governance and corporate governance using popular international indicators. We use the following empirical specifications:

$$Y_{i,j,t+1} = a + b \times PVS_{j,t} + c \times PVS_{j,t} + d \times CV_{j,t} \times EPU_{j,t}$$
$$e \times CV_{j,t} + \sum Controls + FE + \varepsilon_{i,j,t+1} \quad (14)$$

The dependent variable is quarterly capital investments of firm i that is listed in country j in quarter t scaled by last period's total assets (CAPX/ Lagged total assets). $CV_{j,t}$ is the country-level variable that shows the market differences in each dimension, and the coefficient on the interaction term of $PVS_{j,t}$ and $CV_{j,t}$ captures the differences of risk perceptions real effect on firm investments among stocks in different market conditions. $CV_{j,t}$ can represent overall score of economic freedom, financial market development, country governance and anti-self-dealing index for each country. We include an array of control variables as in previous specifications. We also include firm and quarter fixed effects in our regression. Except anti-self-dealing index, all the other country-level indicators change with time.

[Insert Table 9 here]

Table 9 presents our results for cross-country differences in country investment changes with different levels of risk perceptions. We can see country-level dimensions can influence how would firms change their investments when perceive different levels of risk perceptions. In Column (1) to (4), we see the coefficients on the interaction terms are all negative and statistically significant. In countries with high economic freedom, high financial development, high rule of law and high anti-self-dealing index, firms tend to decrease less in their future investments in times of high invest risk perceptions.

The results in Table 9 suggest firm investments are less influenced by the perceived risks of investors in countries with better financial development and better corporate governance. Their listing markets may have strong institutions and financial market regulations to protect them, resulting in less impacted firm real investments. Overall, our cross-country test on country-level factors shows firms that are listed in different markets show cross-markets differences in future investment changes with risk perceptions.

6 Conclusion

The accounting-based risk perception measurement, PVS, allows us to quantify the market risk perceptions for global markets with ready and sufficient data. Compared with popular measurements that are based on economic events and investors' sentiments, PVS is advantageous in using stock price and accounting information. Our paper constructs PVS for 46 countries and other regions. We further investigate the pricing and real effects of risk perceptions in international markets. In addition, we examine whether important international risk factor performance is also related to market risk perceptions.

Our results suggest that risk perceptions are priced in a lot of countries. We find risk perceptions contain information about future 1-year stock returns and cash flow information in global markets. Cultural backgrounds influence investment decisions when investors perceive financial markets with different levels of risk, and countries with relatively lower uncertainty aversion cultures have stronger pricing of risk perceptions. In addition, we provide international evidence that the future performance of risk factors is related to the market risk perceptions. We show that value, size and investment factor premiums are relevant to the risk perceptions in the global markets. Consistently, in times of high risk perceptions, firms cut their investment expenses, which comes mostly from the high volatility firms that face high cost of capitals. Meanwhile, the total industrial production also declines in the macroeconomy, as is shown in the negative relation between output gap and PVS. The magnitude of decline in firm-level investments also relates to country economic freedom, financial institution development and governance.

Overall, we extend a new easily-established risk perception measurement to investigate the pricing of financial market risk perceptions in the worldwide markets. Our study brings new insights to the asset pricing studies and real effects research of risk perceptions in the international stock market. We also provide fresh views into international risk factor research.

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Table 1 Summary Statistics

This table provides summary statistics of global stocks of our sample from 1990q1 to 2020q4. We include only the primary issue of a firm and require the stock to be issued in the main stock exchange in a country. To be included in the further analysis, stocks should have daily stock return data of at least 20 days in the previous two months. The stocks should also have stock returns in the next quarter. A country enters the analysis when the listing stock number first exceeds 100 and the beginning date for each market is shown in the table. Market equity is computed on a monthly basis. Book equity first comes from Compustat Quarterly and if the data is void in Quarterly, it will be filled in by the Annual database. Book-to-market ratio is calculated as the book equity divided by the 6 months' trailing average market equity. B/M is winsorized at 99.5% and 0.5% for every country. $ROE_{t,t+4}$ is the future one-year return over equity, and is obtained using clear-surplus model. $Ret_{t,t+4}$ is the future one-year stock return. Panel A and Panel B provide stock number related information by region and by country. In Panel C, we show average and median values of future one-year ROE, future one-year stock return, BE, ME and B/M values by region.

Panel A: By Region

Region	Start Date	Number of Stocks	Average Number	Date of number > 100
Global	199003	61049	20151	199003
Global ex US	199003	44999	15978	199003
Developed	199003	44107	14736	199003
America	199003	17722	4765	199003
Europe	199003	11068	3813	199003
Asia Pacific	199003	15317	6157	199003
Asia Pacific ex JP	199003	11724	4051	199003
Emerging	199206	16942	5854	199206

Panel B: By country

Country	Stock Exchange	No. of Stocks	Average No.	Date of No. > 100	Geographic Region
Australia	ASX All Markets	3002	983	199001	Asia and Pacific
Bangladesh	Dhaka Stock Exchange Ltd	304	237	200904	Asia and Pacific
Belgium	NYSE Euronext Brussels	224	125	200002	Europe
Brazil	BM and F Bovespa SA Bolsa De Valores Mercadorias E Futuros	373	209	200403	America
Canada	Toronto Stock Exchange	1672	592	199001	America
Chile	Santiago Stock Exchange	244	128	199903	America
China	Shanghai Stock Exchange	2201	1694	199802	Asia and Pacific
China	Shenzhen Stock Exchange	1460			Asia and Pacific
Denmark	OMX Nordic Exchange Copenhagen AS	324	154	199703	Europe
Egypt, Arab Rep.	Egyptian Exchange	214	166	200803	Asia and Pacific
Finland	NASDAQ OMX Helsinki Ltd	224	125	200003	Europe
France	NYSE Euronext Paris	1398	528	199002	Europe

Table 1 (continue)

Germany	Deutsche Boerse AG	570	518	199002	Europe
Germany	XETRA	767			Europe
Greece	Athens Exchange SA Cash Market	303	192	200102	Europe
Hong Kong SAR, China	Hong Kong Exchanges and Clearing Ltd	2523	1029	199401	Asia and Pacific
India	BSE Ltd	1735	1507	199803	Asia and Pacific
India	National Stock Exchange of India	2338			Asia and Pacific
Indonesia	Indonesia Stock Exchange	700	322	199702	Asia and Pacific
Israel	Tel Aviv Stock Exchange	542	300	200302	Europe
Italy	Borsa Italiana Electronic Share Market	605	237	199502	Europe
Japan	Tokyo Stock Exchange	3593	2106	199001	Asia and Pacific
Jordan	Amman Stock Exchange	235	179	200701	Asia and Pacific
Korea, Rep.	Korea Exchange Stock Market	941	869	199601	Asia and Pacific
Korea, Rep.	Korea Exchange KOSDAQ	1149			Asia and Pacific
Kuwait	Kuwait Stock Exchange	225	163	200603	Asia and Pacific
Malaysia	Bursa Malaysia	1334	691	199202	Asia and Pacific
Mexico	Bolsa Mexicana De Valores Mexican Stock Exchange	140	109	201201	America
Netherlands	NYSE Euronext Amsterdam	302	137	199602	Europe
New Zealand	New Zealand Exchange Ltd	214	114	200401	Asia and Pacific
Nigeria	Nigerian Stock Exchange	174	136	200802	Africa
Norway	Oslo Bors ASA	487	177	199802	Europe
Pakistan	Karachi Stock Exchange Guarantee Limited	449	267	200201	Asia and Pacific
Philippines	Philippine Stock Exchange Inc	295	187	199802	Asia and Pacific
Poland	Warsaw Stock Exchange	960	419	200302	Europe
Romania	Spot Regulated Market BVB	95	88	201102	Europe
Romania	RASDAQ	65			Europe
Russian Federation	MICEX Stock Exchange	284	181	201001	Europe
Saudi Arabia	Saudi Stock Exchange	203	154	200802	Asia and Pacific
Singapore	Singapore Exchange	1090	498	199404	Asia and Pacific
South Africa	Johannesburg Stock Exchange	581	257	199603	Africa
Spain	Bolsa De Madrid	331	132	199602	Europe
Sri Lanka	Colombo Stock Exchange	294	219	200601	Asia and Pacific
Sweden	NASDAQ OMX Nordic	915	323	199702	Europe

Table 1 (continue)					
Switzerland	Swiss Exchange	387	211	199502	Europe
Taiwan, China	TAIPEI EXCHANGE	1021	1152	199802	Asia and Pacific
Taiwan, China	Taiwan Stock Exchange	1242			Asia and Pacific
Thailand	Stock Exchange of Thailand	884	423	199503	Asia and Pacific
Turkey	Istanbul Stock Exchange	450	296	200202	Europe
United Arab Emirates	Abu Dhabi Securities Exchange	65	99	201901	Asia and Pacific
United Arab Emirates	Dubai Financial Market	39			Asia and Pacific
United Kingdom	London Stock Exchange	4231	1422	199001	Europe
United States	New York Stock Exchange	3449	4174	199001	America
United States	American Stock Exchange	10875			America
United States	The Nasdaq Stock Market	1726			America
Vietnam	HoChiMinh Stock Exchange	346	411	200902	Asia and Pacific
Vietnam	Hanoi Stock Exchange	255			Asia and Pacific

Panel C: Reginal summary statistics

Region	$ROE_{t,t+4}$		$Ret_{t,t+4}$		Book Equity		Market Equity		B/M Ratio	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Global	5.141	0.065	0.147	0.016	966.864	93.035	1658.993	137.900	1.016	0.688
Developed	5.380	0.068	0.144	0.027	1062.792	104.798	1961.110	148.335	0.971	0.692
Europe	1.412	0.066	0.122	0.033	1188.570	91.372	2045.311	138.156	1.008	0.670
America	6.501	0.081	0.159	0.054	1247.356	113.764	2878.191	213.267	0.755	0.564
Asia Pacific	0.521	0.057	0.146	0.005	842.037	107.059	1199.142	122.405	1.115	0.839
Emerging	3.728	0.057	0.155	-0.017	705.813	68.521	836.826	105.040	1.140	0.674

Table 2 Risk perceptions, cash flows and stock returns

We examine whether market risk perception can predict future stock returns and cash flows in different countries/regions using PVS. PVS is constructed as the B/M spread between the lowest volatility quintile stocks and the highest volatility quintiles stocks in a country/region. The dependent variable is either equally weighted future one-year stock return or ROE of a portfolio that is long on the lowest volatility quintile stocks and short on the highest volatility quintile stocks in a country/region at a specific quarter. We use Hodrick (1992) standard errors and Newey-West standard errors with 5 lags for stock return and ROE, respectively. T-statistic are in the parentheses. Panel A shows the predictability of PVS across different global regions. Panel B shows the predictability of PVS across different developed market. ***,**, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Regional PVS predictability

	Global		Global ex US		Developed		Developed ex US		Emerging	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	$Ret_{t,t+4}$	$Roe_{t,t+4}$	$Ret_{t,t+4}$	$Roe_{t,t+4}$	$Ret_{t,t+4}$	$Roe_{t,t+4}$	$Ret_{t,t+4}$	$Roe_{t,t+4}$	$Ret_{t,t+4}$	$Roe_{t,t+4}$
PVS	0.119***	-0.161	0.0892***	-0.129	0.135***	-0.0899	0.0986**	-0.110	0.0288	-0.00750
	(3.53)	(-1.04)	(3.02)	(-0.71)	(3.23)	(-0.61)	(2.48)	(-0.64)	(0.65)	(-0.05)
Constant	-0.0578*	-0.233	-0.0513	-0.341*	-0.0604*	0.0538	-0.0562*	-0.0517	-0.0614*	-0.614***
	(-1.70)	(-1.22)	(-0.09)	(-1.92)	(-1.72)	(0.44)	(-1.94)	(-0.49)	(-1.83)	(-2.87)
R-Squared	0.286	0.00861	0.275	0.00718	0.274	0.00499	0.228	0.0143	0.0132	0.0000170
N	120	120	120	120	120	120	120	120	111	111

Panel B: Developed Regional PVS predictability

	Europe		Asia Pacific		Asia Pacific ex Japan		America		America ex US	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	$Ret_{t,t+4}$	$Roe_{t,t+4}$	$Ret_{t,t+4}$	$Roe_{t,t+4}$	$Ret_{t,t+4}$	$Roe_{t,t+4}$	$Ret_{t,t+4}$	$Roe_{t,t+4}$	$Ret_{t,t+4}$	$Roe_{t,t+4}$
PVS	0.0466	-0.156	0.0809*	0.0631	0.142**	0.0283	0.162***	-0.0525	0.0848	-0.258***
	(1.03)	(-1.37)	(1.70)	(0.62)	(2.23)	(0.28)	(3.36)	(-0.49)	(1.62)	(-4.26)
Constant	-0.0413	-0.112	-0.0575	-0.0566	-0.129**	-0.0353	-0.0716	0.172	-0.188***	0.0766
	(-0.98)	(-1.32)	(-1.62)	(-0.62)	(-2.36)	(-0.32)	(-1.17)	(1.17)	(-2.83)	(1.56)
R-Squared	0.0383	0.0218	0.145	0.00958	0.177	0.00134	0.188	0.00160	0.0511	0.195
N	120	120	120	120	120	120	120	120	120	120

Table 3 Panel regression of risk perception on stock return and cash flow

We pool all the country-level risk perceptions together to examine the average effect of risk perception on future return and ROE across different regions from 1990q1 to 2020q4. We run panel regressions for different regions according to the market maturity. The dependent variable is either equally weighted future one-year stock return or ROE of a portfolio that is long on the lowest volatility quintile stocks and short on the highest volatility quintile stocks in a country/region at a specific quarter. As U.S. stocks consist a large proportion of our global stock sample, we exclude U.S. stocks in some of our tests to avoid the influences from U.S. stocks. We include country fixed effect to control for country-level confounding effects. The standard errors are all two-way clustered at country and quarter level. T-statistics are in the parentheses. ***,**, and * indicate significance at the 1%, 5%, and 10% levels, resepctively.

	Global		Global ex US		Developed	
	(1)	(2)	(3)	(4)	(5)	(6)
	$Ret_{t,t+4}$	$ROE_{t,t+4}$	$Ret_{t,t+4}$	$ROE_{t,t+4}$	$Ret_{t,t+4}$	$ROE_{t,t+4}$
PVS	0.0778***	-0.0950***	0.0745***	-0.0971***	0.0622***	-0.0784**
	(4.41)	(-4.44)	(4.23)	(-4.35)	(3.14)	(-2.73)
Constant	-0.0509***	-0.0847***	-0.0507***	-0.0933***	-0.0398**	-0.0463***
	(-3.74)	(-7.79)	(-3.81)	(-8.99)	(-2.25)	(-3.65)
Country FE	YES	YES	YES	YES	YES	YES
R-Squared	0.0767	0.0665	0.0751	0.0687	0.0671	0.0704
N	3747	3747	3627	3627	2245	2245
	Developed ex US		Emerging		Global	
	(7)	(8)	(9)	(10)	(11)	(12)
	$Ret_{t,t+4}$	$ROE_{t,t+4}$	$Ret_{t,t+4}$	$ROE_{t,t+4}$	$Ret_{t,t+4}$	$ROE_{t,t+4}$
PVS	0.0557***	-0.0810**	0.101***	-0.120***	0.0779***	-0.0948***
	(2.95)	(-2.59)	(3.45)	(-3.93)	(4.31)	(-4.60)
Constant	-0.0390**	-0.0588***	-0.0674***	-0.142***	-0.0509**	-0.0847**
	(-2.24)	(-5.06)	(-9.32)	(-41.72)	(-2.46)	(-2.46)
Country FE	YES	YES	YES	YES	NO	NO
R-Squared	0.0652	0.0771	0.0965	0.0587	0.0304	0.0103
N	2125	2125	1502	1502	3747	3747

Table 4 Risk perceptions and firm-level investment

In this table, we regress firm-level future investment on PVS, Tobin's q, operating cash flows, sales growth, and the policy uncertainty index from Baker et al. (2016) in global markets. The data are on a quarterly basis from 1990q1 to 2020q4 in the first 7 columns and annual in the last column. In Column (1) to (7), the dependent variable is CAPX/Lagged Total Assets in the future 1 quarter. Column (8)'s dependent variable is the future one-year CAPX/Lagged Total Assets using annual financial statement information. In Column (9), the dependent variable is the future one-year Total Investment/ Lagged Total assets using annual data. Total Investment is the sum of capital expenditure and R&D expense. All the independent variables are winsorized at the top and bottom 0.5% level by country. Standard errors are clustered at the quarter and firm levels. T-statistics are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: Correlation matrix

	CAPX/Lagged AT	PVS	EPU	Tobin's Q	Cash Flow/AT
PVS	0.0678				
EPU	0.0304	-0.1489			
Tobin's Q	0.0586	0.093	-0.042		
Cash Flow/AT	0.1221	-0.0052	0.0688	-0.0706	
Sales Growth	0.0822	0.0447	-0.0475	0.0806	-0.0525

Panel B: Regression results

Dependent Variable	Quarterly CAPX/Lagged Total Assets							Annual CAPX/Lagged Total Assets	Total Investment/ Lagged Total Assets
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Global	Developed	Emerging	Europe Developed	America Developed	Asia-Pacific Developed	Global	Global	Global
PVS	0.000692**	0.000998***	0.00193***	0.00179***	0.000359	0.00108	0.00128***	0.00395***	0.00327**
	(2.38)	(3.09)	(3.99)	(4.69)	(0.90)	(1.52)	(3.56)	(2.91)	(2.31)
EPU	-0.00547***	-0.000680	-0.00648***	-0.000724	-0.00306***	0.00643***	-0.00545***	-0.00646*	-0.00139
	(-6.12)	(-0.71)	(-4.09)	(-0.68)	(-3.15)	(3.06)	(-6.10)	(-1.94)	(-0.35)
PVS×Tobin's Q							-0.000401***		
							(-3.41)		
Tobin's Q	0.00365***	0.00375***	0.00362***	0.00483***	0.00194***	0.00819***	0.00380***	0.0114***	0.0199***
	(17.01)	(15.14)	(9.68)	(12.54)	(22.60)	(10.73)	(18.54)	(15.33)	(17.26)
Cash Flow	0.0137***	0.0101***	0.0225***	0.0141***	0.0113***	0.0130***	0.0137***	0.0122	-0.0532***
	(8.50)	(5.48)	(7.03)	(4.49)	(10.56)	(4.25)	(8.48)	(1.07)	(-3.33)

Table 4 (continue)

Sales Growth	0.000918***	0.000831***	0.00279***	0.00193***	0.000822***	0.000689***	0.000916***	0.000321	0.000171
	(5.05)	(4.37)	(6.40)	(2.88)	(8.74)	(2.86)	(5.03)	(0.96)	(0.53)
Constant	0.0549***	0.0250***	0.0778***	0.0366***	0.0245***	0.00686	0.0546***	0.0674***	0.0616***
	(12.48)	(5.44)	(9.63)	(6.68)	(5.35)	(0.65)	(12.42)	(4.19)	(3.28)
Fixed Effect				Firm and Quarter				Firm and Year	
Cluster				Firm and Quarter clustered				Firm and Year clustered	
R-squared	0.579	0.622	0.435	0.587	0.495	0.593	0.564	0.563	0.655
N	991523	732783	258732	136536	412064	184175	991523	176834	176834

Table 5 Risk perceptions and macroeconomic output

We examine whether market risk perception can predict future output gap in different regions using PVS from 1990q1 to 2020q1. PVS is constructed as the B/M spread between the lowest volatility quintile stocks and the highest volatility quintiles stocks in a country/region. The dependent variables in Panel A and B are the equal-weighted or value-weighted country output gap in a region. Output gap is proxied as the deviation of the logarithm of total industrial production from a trend that includes both a linear component and a quadratic component. Value weighted are based on total industrial production. We control the current year's output gap in our empirical specifications. Real rate is the US one-year Treasury bill rate net of one-year survey expectations of inflation (the GDP deflator) from the Survey of Professional Forecasters. The standard errors are Newey-West standard errors with 5 lags. T-statistics are in the parentheses. ***,**, and * indicate significance at the 1%, 5%, and 10% levels.

Panel A: Equal-Weighted within region

	(1)	(2)	(3)	(4)	(5)	(6)
	Global	Developed	Emerging	Europe Developed	America Developed	Asia-Pacific Developed
PVS	0.00411***	0.00357***	0.00823	0.00273	0.00426**	0.00229
	(3.68)	(2.72)	(1.63)	(1.32)	(2.40)	(0.97)
Real Rate	-0.000199	-0.0000586	0.00725	-0.000584	0.00000795	-0.00169
	(-0.27)	(-0.09)	(1.57)	(-0.57)	(0.01)	(-0.91)
Output Gap	0.884***	0.933***	0.705***	0.955***	0.938***	0.872***
	(21.51)	(29.46)	(6.30)	(37.03)	(32.11)	(12.30)
Constant	0.000125	0.0000398	0.00789	-0.0000771	-0.0000586	-0.000408
	(0.08)	(0.03)	(1.34)	(-0.04)	(-0.03)	(-0.17)
SE	Newey-West Standard Error with Lag 5					
R-Squared	0.833	0.895	0.698	0.928	0.943	0.830
N	120	120	86	120	120	120

Panel B: Value-Weighted within region

	(1)	(2)	(3)	(4)	(5)	(6)
	Global	Developed	Emerging	Europe Developed	America Developed	Asia-Pacific Developed
PVS	0.00342***	0.00374***	0.00862	0.00262*	0.00228	0.00222*
	(3.57)	(2.82)	(1.61)	(1.77)	(1.61)	(1.89)
Real Rate	0.0000826	0.0000803	0.00812*	-0.000181	0.000549	0.000990
	(0.13)	(0.14)	(1.68)	(-0.22)	(1.10)	(1.51)
Output Gap	0.946***	0.953***	0.702***	0.952***	0.950***	0.960***
	(32.56)	(34.93)	(6.44)	(39.62)	(32.13)	(39.17)
Constant	0.000209	0.000139	0.00908	0.000139	0.000135	0.000143
	(0.14)	(0.09)	(1.43)	(0.08)	(0.08)	(0.09)
SE	Newey-West Standard Error with Lag 5					
R-Squared	0.908	0.926	0.683	0.922	0.923	0.923
N	120	120	86	120	120	120

Table 6 Risk perceptions and risk factor premiums

We examine whether the 5 risk factor premiums (book-to-market, profitability, size, 12-month momentum and investment) are driven by risk perceptions on each factor. We sort stocks into 5 quintiles according to each factor-based firm-level characteristic in every country and every quarter. PVS is the corresponding risk perceptions. The dependent variable is the future 1-quarter return of the long-short portfolio that long top quintile stocks and short bottom quintile stocks. A more detailed description can be found in Section 4. We construct our analysis in 9 country/regions. The time period covers 1990q1-2020q4 with emerging market to be shorter due to the data availability. The standard errors are Newey-West standard errors with 5 lags. T-statistics are in the parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: PVS and Book-to-Market premium

	(1) Global	(2) US	(3) Global ex US	(4) Developed	(5) Developed ex US	(6) Emerging	(7) Europe Developed	(8) American Developed	(9) Asia-Pacific Developed
PVS	0.0164***	0.0167***	0.0181***	0.0169***	0.0181***	0.0312***	0.0147***	0.0161***	0.0201***
	(4.50)	(2.87)	(4.05)	(4.59)	(4.65)	(5.22)	(3.16)	(2.92)	(4.41)
Constant	-0.000791	0.00786	0.00124	0.00131	0.000245	0.0250**	0.0122	0.0101	-0.00900
	(-0.11)	(0.97)	(0.20)	(0.21)	(0.04)	(2.26)	(1.60)	(1.36)	(-1.35)
	Newey-West Standard Error with Lag 5								
R-Squared	0.144	0.0764	0.185	0.130	0.171	0.125	0.111	0.0754	0.155
N	120	120	120	120	120	111	120	120	120

Panel B: PVS and Profitability premium

	(1) Global	(2) US	(3) Global ex US	(4) Developed	(5) Developed ex US	(6) Emerging	(7) Europe Developed	(8) American Developed	(9) Asia-Pacific Developed
PVS	0.00905	0.0935***	0.0135	0.0316	0.0202	0.0419*	-0.000687	0.0980***	0.00258
	(0.73)	(3.40)	(1.07)	(1.26)	(1.11)	(1.79)	(-0.09)	(4.33)	(0.23)
Constant	0.00373	0.0430***	0.00792	0.0153	0.0106	0.0337**	0.000256	0.0462***	-0.00344
	(0.47)	(3.59)	(0.89)	(1.12)	(0.91)	(2.26)	(0.05)	(4.57)	(-0.47)
	Newey-West Standard Error with Lag 5								
R-Squared	0.00266	0.0621	0.0106	0.0149	0.0128	0.0332	0.0000445	0.0739	0.000284
N	120	120	120	120	120	111	120	120	120

Table 6 (continue)

Panel C: PVS and Size premium

	(1) Global	(2) US	(3) Global ex US	(4) Developed	(5) Developed ex US	(6) Emerging	(7) Europe Developed	(8) American Developed	(9) Asia-Pacific Developed
PVS	0.0600***	0.145***	0.0512***	0.0885***	0.0629***	0.0333	0.0630**	0.129***	0.0505***
	(3.35)	(4.76)	(3.35)	(4.20)	(3.78)	(0.79)	(2.50)	(4.02)	(3.68)
Constant	0.0151	0.0516***	0.0118	0.0286**	0.0184*	-0.0151	0.0287**	0.0466***	0.00705
	(1.30)	(3.91)	(1.11)	(2.50)	(1.89)	(-0.40)	(2.19)	(3.34)	(0.76)
					Newey-West Standard Error with Lag 5				
R-Squared	0.0442	0.114	0.0465	0.0782	0.0636	0.00652	0.0481	0.102	0.0481
N	120	120	120	120	120	111	120	120	120

Panel D: PVS and 12-month momentum premium

	(1) Global	(2) US	(3) Global ex US	(4) Developed	(5) Developed ex US	(6) Emerging	(7) Europe Developed	(8) American Developed	(9) Asia-Pacific Developed
PVS	0.0369	0.116*	0.0171	0.0528	0.0270	0.0294	0.0523	0.108	0.0445**
	(0.94)	(1.75)	(0.68)	(1.09)	(0.87)	(0.65)	(1.13)	(1.66)	(2.13)
Constant	0.0240	0.0556**	0.0101	0.0278	0.0135	0.00551	0.0511***	0.0585**	0.00174
	(1.52)	(2.13)	(1.16)	(1.52)	(1.37)	(0.41)	(2.67)	(2.09)	(0.24)
					Newey-West Standard Error with Lag 5				
R-Squared	0.0350	0.170	0.0110	0.0533	0.0197	0.0164	0.0450	0.167	0.0445
N	120	120	120	120	120	111	120	120	120

Panel E: PVS and Investment premium

	(1) Global	(2) US	(3) Global ex US	(4) Developed	(5) Developed ex US	(6) Emerging	(7) Europe Developed	(8) American Developed	(9) Asia-Pacific Developed
PVS	0.0404*	0.0871***	0.0372**	0.0474*	0.0545**	0.0586**	0.100***	0.0614***	0.0506***
	(1.82)	(3.25)	(2.25)	(1.92)	(2.31)	(2.31)	(4.04)	(2.89)	(2.90)
Constant	-0.00667	-0.000720	-0.00322	-0.00476	0.00263	0.00284	0.0356***	-0.00698	-0.00228
	(-0.85)	(-0.09)	(-0.72)	(-0.55)	(0.36)	(0.26)	(3.46)	(-0.78)	(-0.43)
					Newey-West Standard Error with Lag 5				
R-Squared	0.0530	0.0829	0.0348	0.0518	0.0637	0.0545	0.121	0.0634	0.0466
N	120	120	120	120	120	111	120	120	120

Table 7 Risk perceptions and country-level differences on future returns

We examine what country-level characteristics explain the differences between market risk perception and future returns. In Panel A, we want to see if the mature market has more pronounced performance. The indicator variable, Developed, takes the value one if the country is a developed country and 0 otherwise. We interact Developed with market risk perception measurement PVS, to examine the difference between developed and emerging markets. In Panel B, we examine the pricing of risk perceptions across different countries through cultural dimensions. We interact PVS with Hofstede (2001) 5 cultural indexes to illustrate the impact of culture. Some countries in our sample do not have corresponding cultural dimensions and thus the sample size might be smaller. We include the country fixed effect to control the influence from unobservable country-level omitted variables. All the standard errors are two-way clustered at country and quarter level. T-statistics are in the parentheses. ***,**, and ∗ indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Developed markets and emerging markets

	Global With US		Global Without US		Global With US	
	(1)	(2)	(3)	(4)	(5)	(6)
	$\mathrm{Ret}_{t,t+4}$	$\mathrm{ROE}_{t,t+4}$	$\mathrm{Ret}_{t,t+4}$	$\mathrm{ROE}_{t,t+4}$	$\mathrm{Ret}_{t,t+4}$	$\mathrm{ROE}_{t,t+4}$
PVS	0.101***	-0.120***	0.101***	-0.120***	-0.120***	0.102***
	(3.48)	(-3.97)	(3.48)	(-3.97)	(-3.93)	(3.41)
PVS×Developed	-0.0393	0.0416	-0.0458	0.0390	0.0416	-0.0395
	(-1.18)	(1.02)	(-1.40)	(0.91)	(1.00)	(-1.20)
Constant	-0.0509***	-0.0847***	-0.0508***	-0.0932***	-0.0847**	-0.0509**
	(-3.76)	(-7.78)	(-3.84)	(-8.97)	(-2.46)	(-2.47)
Country FE	YES	YES	YES	YES	NO	NO
R-Squared	0.0786	0.0670	0.0777	0.0691	0.0322	0.0108
N	3747	3747	3627	3627	3747	3747

Panel B: Cross-country differences through cultural dimension

	Power distance		Individualism		Masculinity		Uncertainty avoidance		Long term orientation	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	$Ret_{t,t+4}$	$ROE_{t,t+4}$	$Ret_{t,t+4}$	$ROE_{t,t+4}$	$Ret_{t,t+4}$	$ROE_{t,t+4}$	$Ret_{t,t+4}$	$ROE_{t,t+4}$	$Ret_{t,t+4}$	$ROE_{t,t+4}$
PVS	0.0443	-0.0895*	0.138***	-0.121**	0.0528	-0.134**	0.164***	-0.103***	0.0665**	-0.108*
	(1.09)	(-1.85)	(2.87)	(-2.09)	(1.67)	(-2.58)	(3.25)	(-1.70)	(2.31)	(-1.82)
PVS×Culture	0.000832	-0.000215	-0.000932	0.000382	0.000751	0.000663	-0.00124*	0.0000354	0.000973	-0.0000425
	(1.02)	(-0.27)	(-1.24)	(0.41)	(1.44)	(0.75)	(-1.92)	(0.04)	(1.38)	(-0.04)
Constant	-0.0443***	-0.0953***	-0.0443***	-0.0953***	-0.0443***	-0.0953***	-0.0443***	-0.0953***	-0.0619***	-0.0896***
	(-3.45)	(-7.77)	(-3.46)	(-7.75)	(-3.43)	(-7.78)	(-3.44)	(-7.78)	(-4.46)	(-10.12)
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
R-Squared	0.109	0.0677	0.111	0.0678	0.109	0.0679	0.113	0.0677	0.123	0.0518
N	3284	3284	3284	3284	3284	3284	3284	3284	1856	1856

Table 8 Risk perceptions, investment and firm volatility

In this table, we examine whether firms with high volatility stock prices are more likely to cut investment. The data are on a quarterly basis from 1990q1 to 2020q1. We do subsample regressions on stocks in different regions according to their listing exchange. The dependent variable in this table is CAPX/Lagged Total Assets in the future quarter. Q2 to Q5 are indicator variables that take value 1 if a stock is in that specific volatility group at a quarter. PVS is the corresponding regional risk perception measurement. We interact PVS with volatility group indicator variables to see the effects of each group of stocks. EPU is the Baker et al. (2016) economic policy uncertainty index. Tobin's Q, cash flow and sales growth are included in the regression to control for potential influences. All the independent variables are winsorized at the top and bottom 0.5% level by country. Standard errors are clustered at the quarter and firm levels. T-statistics are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	Global	Developed	Emerging	Europe Developed	America Developed	Asia-Pacific Developed
PVS	-0.000102	0.000394	0.000215	0.00147***	-0.000266	-0.0000101
	(-0.26)	(0.99)	(0.41)	(3.57)	(-0.87)	(-0.01)
PVS×Q2	0.000499***	0.000357***	0.00109**	-0.000115	0.000407***	0.000437
	(3.34)	(2.79)	(2.51)	(-0.38)	(3.69)	(0.71)
PVS×Q3	0.000957***	0.000780***	0.00170***	0.0000792	0.000817***	0.00150*
	(4.06)	(3.54)	(3.28)	(0.21)	(4.82)	(1.70)
PVS×Q4	0.00146***	0.00109***	0.00332***	0.000918*	0.000975***	0.00247**
	(4.80)	(4.01)	(5.74)	(1.92)	(4.55)	(2.49)
PVS×Q5	0.00120***	0.000850***	0.00329***	0.00126*	0.000768***	0.00136
	(3.52)	(2.83)	(4.20)	(1.85)	(2.94)	(1.17)
Q2	-0.00550***	-0.000645	-0.00662***	-0.000639	-0.00303***	0.00644***
	(-6.14)	(-0.68)	(-4.16)	(-0.60)	(-3.12)	(3.06)
Q3	0.00363***	0.00371***	0.00373***	0.00480***	0.00190***	0.00818***
	(16.88)	(15.00)	(9.84)	(12.52)	(22.66)	(10.69)
Q4	0.0132***	0.00964***	0.0220***	0.0134***	0.0106***	0.0127***
	(8.22)	(5.21)	(6.94)	(4.25)	(9.99)	(4.13)
Q5	0.000906***	0.000822***	0.00273***	0.00190***	0.000796***	0.000683***
	(4.98)	(4.32)	(6.30)	(2.82)	(8.50)	(2.83)
EPU	-0.000134	0.0000643	-0.000820**	0.00000701	0.000411***	-0.000551
	(-0.92)	(0.48)	(-2.18)	(0.02)	(4.17)	(-1.03)
Tobin's Q	-0.000477**	-0.000170	-0.00153***	-0.000636	0.000479***	-0.00120
	(-2.29)	(-0.86)	(-3.17)	(-1.48)	(3.21)	(-1.66)
Cash Flow	-0.00166***	-0.00123***	-0.00324***	-0.00193***	-0.000289	-0.00319***
	(-6.56)	(-5.27)	(-5.72)	(-3.66)	(-1.58)	(-4.12)
Sales Growth	-0.00355***	-0.00291***	-0.00589***	-0.00406***	-0.00208***	-0.00465***
	(-12.35)	(-9.38)	(-9.11)	(-5.52)	(-8.66)	(-4.42)
Constant	0.0561***	0.0257***	0.0804***	0.0374***	0.0246***	0.00858
	(12.70)	(5.57)	(9.88)	(6.85)	(5.40)	(0.81)
FE	Firm and Quarter					
Cluster	Firm and Quarter two-way clustered					
R-squared	0.579	0.623	0.436	0.587	0.496	0.593
N	991523	732783	258732	136536	412064	184175

Table 9 Risk perceptions, country-level differences and firm investment

In this table, we present the cross-sectional tests on whether country-level differences influence the real effects of risk perceptions on firm-level future investment. We take country-level indicator variables, economic freedom, financial development, country governance and corporate governance measurements into our empirical analysis. We interact PVS of every country with the country-level variables respectively and the interaction terms capture the influence of country-level differences on firm investment. Econ_Free stands for Economic Freedom, FD is financial development, Rule is rule of law and Anti_SD is for anti-self-dealing index. PVS is the corresponding regional risk perception measurement. We have control variables and fixed effects in our regressions. All the independent variables are winsorized at the top and bottom 0.5% level by country. Standard errors are clustered at the quarter and firm levels. T-statistics are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)
	Quarterly CAPX/Lagged Total Assets			
PVS	0.00970***	0.00615***	0.00189***	0.00206***
	(5.31)	(5.31)	(4.26)	(3.27)
PVS×Econ_Free	-0.000120***			
	(-4.84)			
Econ_Free	-0.000815***			
	(-8.98)			
PVS×FD		-0.00663***		
		(-4.03)		
FD		-0.0311***		
		(-3.26)		
PVS×Rule			-0.00101***	
			(-3.23)	
Rule			-0.0140***	
			(-6.18)	
PVS×Anti_SD				-0.00229**
				(-2.10)
Anti_SD				-0.0243
				(-1.06)
EPU	-0.00320***	-0.00362***	-0.00429***	-0.00538***
	(-3.65)	(-3.61)	(-4.93)	(-6.04)
Tobin's Q	0.00371***	0.00364***	0.00395***	0.00363***
	(16.55)	(16.05)	(15.75)	(16.95)
Cash Flow/AT	0.0137***	0.0128***	0.0138***	0.0137***
	(8.34)	(7.12)	(8.24)	(8.45)
Sales Growth	0.000909***	0.000901***	0.000918***	0.000912***
	(4.89)	(4.39)	(4.77)	(5.00)
Constant	0.103***	0.0678***	0.0656***	0.0701***
	(16.68)	(7.71)	(15.28)	(4.43)
FE	Country Firm Quarter			
Cluster	Firm and Quarter two way cluster			
R-squared	0.579	0.599	0.578	0.581
N	946498	820033	883723	975472

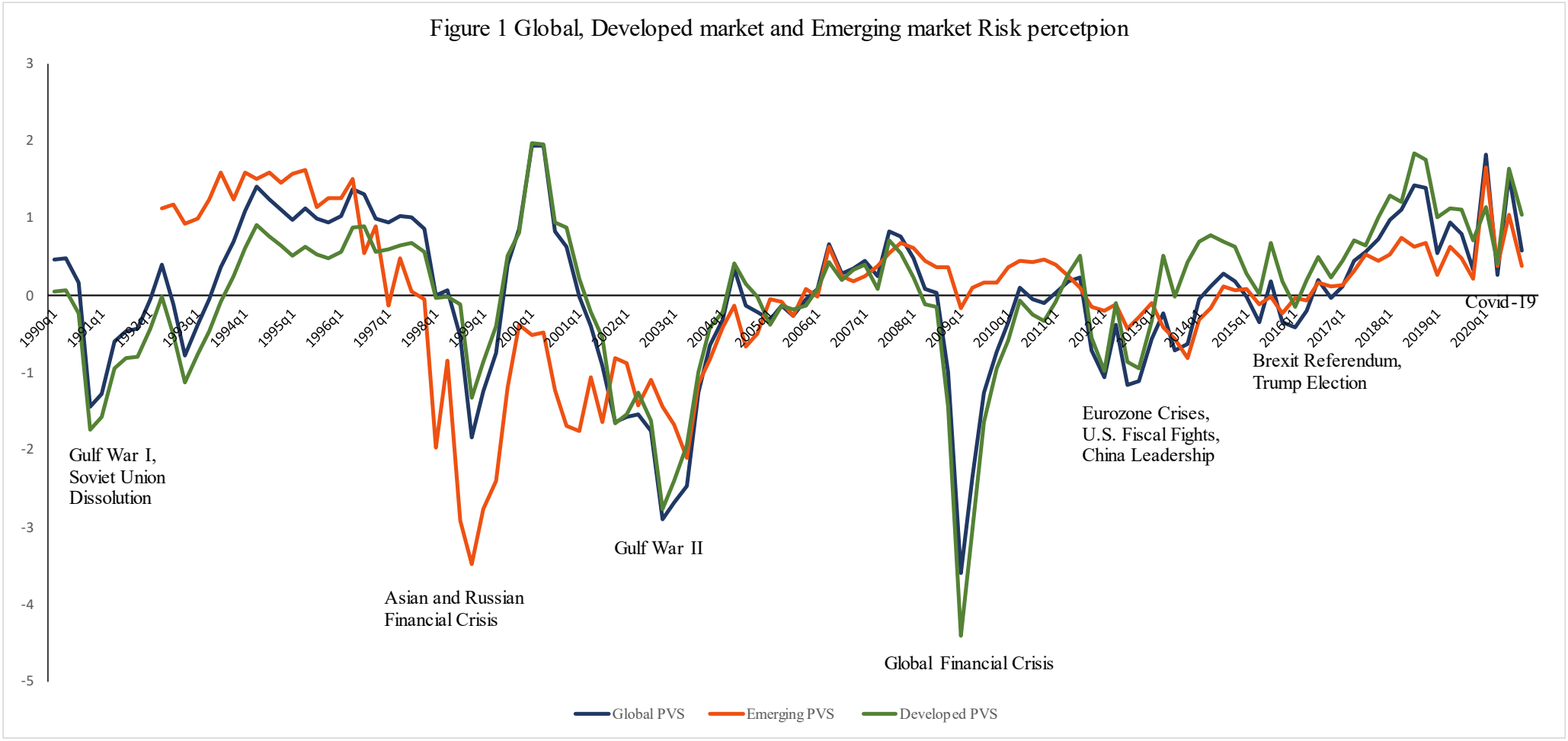


Figure 1 Global, developed and emerging market risk perceptions

Figure 1 shows the risk perception measurement PVS for global market, developed market and emerging market. The data contain quarterly series from 1990 to 2020. Our figure also annotates major events along with investors' risk perception changes in the market.

Appendix A Country-level summary statistics

Table A1 Country-level firm characteristic mean and median values

This table provides summary statistics of global stock sample from 1990q1 to 2020q4. We include only the primary issue of a firm and require the stock to be issued in the main stock exchange in a country. To be included in the further analysis, stocks should have daily stock return data of at least 20 days in the previous two months. The stocks should also have stock returns in the next quarter. A country enters the analysis when the listing stock number first exceeds 100 and the beginning date for each market is shown in the table. Market equity is computed on a monthly basis. Book equity first comes from Compustat Quarterly and if the data is void, it will be filled in by the Annual database. Book-to-market ratio is calculated as the book equity divided by the 6 months' trailing average market equity. B/M is winsorized at 99.5% and 0,5% for every country. $ROE_{t,t+4}$ is the future one-year return over equity, and is obtained using clear-surplus model. $Ret_{t,t+4}$ is the future one-year stock return. We show average and median values of future one-year ROE, future one-year stock return, BE, ME and B/M values by country.

Country	$ROE_{t,t+4}$		$Ret_{t,t+4}$		Book Equity		Market Equity		B/M Ratio	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Australia	1.271	0.014	0.199	-0.032	376.531	18.275	702.071	30.269	0.872	0.612
Bangladesh	0.227	0.079	0.05	-0.054	63.779	21.341	130.916	36.318	0.73	0.572
Belgium	4.109	0.082	0.112	0.08	1462.788	158.997	3000.963	238.283	0.967	0.796
Brazil	1.229	0.025	0.16	-0.01	2432.115	427.338	2910.391	577.874	1.718	0.873
Canada	0.388	0.080	0.188	0.065	1059.138	132.166	1722.312	190.919	0.982	0.706
Chile	1.814	0.077	0.147	0.032	833.738	252.128	1296.866	300.467	1.164	0.814
China	0.378	0.072	0.161	-0.022	585.751	179.831	1374.345	604.477	0.394	0.319
Denmark	0.424	0.060	0.129	0.053	609.902	77.485	1289.398	96.858	0.992	0.822
Egypt, Arab Rep.	0.712	0.024	0.071	-0.066	238.251	45.775	318.717	58.469	1.003	0.846
Finland	0.218	0.080	0.151	0.081	820.785	97.092	1632.154	172.291	0.758	0.603
France	1.407	0.069	0.126	0.041	1648.452	93.25	2636.175	138.24	1.022	0.662
Germany	0.394	0.046	0.1	0.011	1337.708	65.507	2182.978	108.122	1.352	0.609
Greece	0.168	0.014	0.086	-0.035	356.297	59.21	442.516	47.569	1.95	1.192
Hong Kong SAR, China	0.740	0.058	0.189	-0.033	1489.405	145.503	1892.658	136.669	1.531	1
India	0.244	0.033	0.179	-0.045	262.351	26.468	612.047	27.143	1.661	0.848
Indonesia	4.396	0.048	0.25	-0.022	270.982	61.047	661.498	68.652	1.349	0.838
Israel	0.364	0.085	0.152	0.057	297.607	54.126	463.56	71.177	0.982	0.799
Italy	2.461	0.044	0.073	-0.007	1774.58	187.947	2345.826	251.999	0.987	0.73
Japan	0.124	0.061	0.097	0.015	1164.546	233.799	1705.403	264.393	1.073	0.879

Table A1 (continue)

Korea, Rep.	0.248	0.036	0.164	0.001	691.072	87.996	782.404	93.556	1.321	0.98
Kuwait	0.096	0.026	0.01	-0.052	424.992	164.34	668.023	133.741	1.333	1.119
Malaysia	0.276	0.051	0.122	-0.003	230.522	50.569	368.069	42.339	1.378	1.096
Mexico	2.606	0.041	-0.013	-0.049	1721.674	620.688	3521.93	1021.766	0.876	0.653
Netherlands	1.010	0.072	0.097	0.044	2807.906	216.402	4467.116	394.994	0.809	0.581
New Zealand	0.270	0.112	0.117	0.066	330.583	83.071	524.474	130.158	0.79	0.656
Nigeria	0.753	0.000	-0.045	-0.124	201.241	32.34	352.665	27.051	1.553	1.042
Norway	0.601	0.055	0.145	0.03	789.174	112.822	1144.244	138.604	1.292	0.752
Pakistan	1.255	0.078	0.215	0.057	98.469	24.217	169.622	23.522	1.497	0.958
Philippines	1.001	0.046	0.217	0.012	336.373	65.054	645.908	63.434	1.602	0.869
Poland	3.458	0.039	0.127	-0.062	234.844	21.791	330.336	24.725	1.172	0.763
Romania	0.048	0.013	0.092	0.015	267.249	32.337	229.113	18.399	2.168	1.617
Russian Federation	0.519	0.012	0.037	-0.088	3188.649	317.487	2843.842	215.748	1.947	1.13
Saudi Arabia	0.106	0.066	0.088	0.015	1392.086	226.517	2688.22	419.923	0.566	0.517
Singapore	0.319	0.067	0.152	-0.009	517.279	63.808	717.03	62.705	1.298	1.019
South Africa	1.333	0.074	0.127	0.016	740.476	116.385	1501.413	171.551	1.001	0.713
Spain	0.840	0.076	0.118	0.044	2580.226	292.344	4424.271	525.941	0.827	0.583
Sri Lanka	0.377	0.067	0.129	-0.046	43.889	15.168	64.699	15.979	1.087	0.88
Sweden	0.247	0.082	0.153	0.046	726.457	51.889	1382.494	96.994	0.68	0.511
Switzerland	0.228	0.082	0.173	0.084	2075.44	276.521	4258.344	398.678	0.882	0.697
Taiwan, China	0.137	0.073	0.147	0.029	319.75	64.334	551.623	94.553	0.85	0.743
Thailand	0.238	0.107	0.201	0.034	253.984	44.976	487.374	59.248	1.027	0.78
Turkey	6.915	0.001	0.244	0.013	8516.075	60.8	615.784	77.763	1.007	0.795
United Arab Emirates	0.002	0.019	-0.009	-0.027	1725.915	461.233	2207.027	281.105	1.414	1.222
United Kingdom	0.960	0.073	0.124	0.029	788.363	73.525	1466.636	115.612	0.895	0.692
USA	6.636	0.081	0.155	0.052	1274.039	111.044	3042.055	216.945	0.723	0.546
Vietnam	2.942	0.070	0.121	0.022	74.664	16.589	150.585	17.33	1.253	1.007

Appendix B Country-level PVS and future return

Table A2 Cross-country Pricing of PVS

We examine whether market risk perception can predict future stock returns and cash flows in different countries/regions using PVS. PVS is constructed as the B/M spread between the lowest volatility quintile stocks and the highest volatility quintiles stocks in a country/region. The dependent variable is either equally weighted future one-year stock return or ROE of a portfolio that is long on the lowest volatility quintile stocks and short on the highest volatility quintile stocks in a country/region at a specific quarter. The regression is based on a time-series model and we use Hodrick (1992) standard errors for stock return and Newey-West standard errors for ROE with 5 lags. The t statistic is in the parentheses. This table displays the country-level PVS and its predictive power on future stock return and ROE for 46 countries. ARE does not have sufficient data to run a regression. ***,**, and * indicate significance at the 1%, 5%, and 10% levels.

Panel A1: Cross-country PVS predictability on stock return

	(1) ARE	(2) AUS	(3) BEL	(4) BGD	(5) BRA	(6) CAN	(7) CHE	(8) CHL	(9) CHN	(10) DEU
PVS	-	0.108	-0.00224	0.0105	0.0678	0.0848	-0.0576	0.103*	0.317**	0.0839**
	-	(1.54)	(-0.08)	(0.37)	(0.70)	(1.62)	(-0.32)	(1.69)	(2.23)	(2.17)
Constant	-	-0.229***	0.0364	0.00771	-0.0806	-0.188***	-0.187	-0.0331	-0.0617	0.0468
	-	(-2.74)	(0.84)	(0.16)	(-0.90)	(-2.83)	(-0.73)	(-0.53)	(-0.83)	(1.06)
N	-	120	79	38	62	120	99	82	87	119

	(11) DNK	(12) EGY	(13) ESP	(14) FIN	(15) FRA	(16) GBR	(17) GRC	(18) HKG	(19) IDN	(20) IND
PVS	-0.0386	0.0201	0.0389	0.0784**	-0.00245	0.102**	-0.00123	0.259*	0.387***	0.0420
	(-1.00)	(0.37)	(0.41)	(2.35)	(-0.05)	(2.60)	(-0.02)	(1.92)	(4.56)	(0.50)
Constant	0.0153	-0.0175	-0.00792	0.0580	-0.0787	-0.108	0.0248	-0.249	-0.256*	-0.0476
	(0.31)	(-0.24)	(-0.13)	(1.16)	(-1.06)	(-1.62)	(0.36)	(-1.59)	(-1.86)	(-0.65)
N	90	46	95	78	119	120	75	104	91	86

	(21) ISR	(22) ITA	(23) JOR	(24) JPN	(25) KOR	(26) KWT	(27) LKA	(28) MEX	(29) MYS	(30) NGA
PVS	0.0593	0.0348	0.0248	0.0776*	-0.0111	0.0361	-0.0101	-0.00628	0.0311	0.0597
	(1.28)	(0.81)	(0.75)	(1.80)	(-0.25)	(1.11)	(-0.29)	(-0.12)	(0.71)	(0.89)
Constant	0.0149	0.0598*	0.0470	-0.0347	0.113**	0.00109	-0.00845	0.0119	-0.00962	-0.0639
	(0.23)	(1.75)	(1.38)	(-0.84)	(2.51)	(0.02)	(-0.14)	(0.22)	(-0.21)	(-0.89)
N	67	99	52	120	96	54	56	32	111	47

Table A2 (continue)

	(31) NLD	(32) NOR	(33) NZL	(34) PAK	(35) PHL	(36) POL	(37) ROU	(38) RUS	(39) SAU	(40) SGP
PVS	0.0413	0.0682	0.0497	0.0231	0.190	0.0999*	0.0568***	-0.00115	0.00391	0.118**
	(0.88)	(1.22)	(1.41)	(0.42)	(1.52)	(1.85)	(2.95)	(-0.03)	(0.09)	(2.48)
Constant	0.0222	-0.0186	0.0178	-0.0283	-0.251***	-0.155*	0.0292	-0.0618	-0.0126	-0.0650
	(0.44)	(-0.25)	(0.30)	(-0.43)	(-2.80)	(-1.73)	(0.64)	(-1.14)	(-0.18)	(-0.75)
N	95	87	64	72	87	67	35	40	47	101

	(41) SWE	(42) THA	(43) TUR	(44) TWN	(45) USA	(46) VNM	(47) ZAF
PVS	0.0499	0.281*	0.0558	0.00846	0.176***	0.0785**	0.00215
	(0.80)	(1.89)	(1.43)	(0.20)	(3.02)	(2.18)	(0.04)
Constant	0.0765	-0.136	-0.00137	0.0326	-0.0550	0.0137	-0.0958*
	(1.34)	(-1.55)	(-0.02)	(0.79)	(-0.87)	(0.30)	(-1.84)
N	91	98	71	87	120	43	94

Panel A2: Cross-country PVS predictability on ROE

	(1) ARE	(2) AUS	(3) BEL	(4) BGD	(5) BRA	(6) CAN	(7) CHE	(8) CHL	(9) CHN	(10) DEU
PVS	-	0.0915	0.00789	-0.113***	-0.358	-0.258***	-0.0809***	-0.137**	-0.0800***	0.0122
	-	(0.73)	(0.03)	(-3.44)	(-1.32)	(-4.23)	(-2.94)	(-2.32)	(-3.87)	(0.20)
Constant	-	0.129	0.760***	-0.101**	-0.321	0.0766	-0.0423	-0.0605	0.0158	-0.225***
	-	(0.85)	(3.25)	(-2.32)	(-1.19)	(1.53)	(-1.16)	(-0.44)	(0.31)	(-3.86)
N	-	120	79	38	62	115	99	82	87	119

	(11) DNK	(12) EGY	(13) ESP	(14) FIN	(15) FRA	(16) GBR	(17) GRC	(18) HKG	(19) IDN	(20) IND
PVS	0.0435	0.0813	-0.177**	-0.0665	-0.138***	-0.209***	-0.0716**	-0.354**	0.0270	-0.0934***
	(0.25)	(0.81)	(-2.17)	(-1.60)	(-2.77)	(-2.95)	(-2.03)	(-2.36)	(0.33)	(-4.02)
Constant	-0.307**	-0.0364	-0.239*	-0.0912	-0.157**	-0.154**	0.115***	-0.247**	-0.117	0.0174
	(-2.56)	(-0.43)	(-1.94)	(-0.94)	(-2.25)	(-2.40)	(3.52)	(-1.98)	(-1.30)	(0.54)
N	90	46	95	78	119	120	75	104	91	86

Table A2 (continue)

	(21) ISR	(22) ITA	(23) JOR	(24) JPN	(25) KOR	(26) KWT	(27) LKA	(28) MEX	(29) MYS	(30) NGA
PVS	-0.267***	0.123	-0.0359***	-0.0617***	0.161	-0.0321	-0.0683***	0.189	-0.0774	-0.222
	(-3.39)	(1.59)	(-3.85)	(-3.44)	(1.32)	(-0.94)	(-2.99)	(0.68)	(-1.42)	(-1.53)
Constant	-0.275***	0.207	0.0373	-0.108***	-0.0843	0.00198	0.0136	0.252	-0.0448	-0.154
	(-2.88)	(1.02)	(1.64)	(-4.73)	(-1.38)	(0.06)	(0.48)	(1.26)	(-0.95)	(-1.63)
N	67	99	52	120	96	54	56	32	111	47

	(31) NLD	(32) NOR	(33) NZL	(34) PAK	(35) PHL	(36) POL	(37) ROU	(38) RUS	(39) SAU	(40) SGP
PVS	-0.245***	0.0166	-0.0367	-0.289	-0.0958*	-0.138	0.0394*	-0.172	-0.00713	0.0341
	(-3.19)	(0.15)	(-0.58)	(-1.47)	(-1.68)	(-1.53)	(1.71)	(-1.67)	(-0.45)	(0.60)
Constant	-0.208*	-0.0734	-0.122	-0.367*	-0.169	-0.662***	0.0779***	0.0216	0.0238	-0.0811
	(-1.70)	(-0.85)	(-1.63)	(-1.67)	(-1.52)	(-5.08)	(3.00)	(0.14)	(1.15)	(-1.57)
N	95	87	64	72	87	67	35	40	47	101

	(41) SWE	(42) THA	(43) TUR	(44) TWN	(45) USA	(46) VNM	(47) ZAF
PVS	-0.186***	-0.0950***	-0.531	-0.125***	-0.0322	-0.0429***	-0.209
	(-3.66)	(-3.21)	(-1.51)	(-4.94)	(-0.28)	(-3.12)	(-0.97)
Constant	-0.0644	-0.100***	-0.684*	0.0180	0.184	0.0591***	-0.401*
	(-1.07)	(-2.65)	(-1.70)	(0.78)	(1.23)	(3.86)	(-1.81)
N	91	98	71	87	115	43	93

Appendix C Factor value-spread and factor risk premium

Table A3 Factor value-spread and risk factor premiums

We examine whether the 5 risk factor premiums (book-to-market, profitability, size, 12-month momentum and investment) are relevant to value-spread on each factor. We sort stocks into 5 quintiles according to each factor-based firm-level characteristic in every country and every quarter. Value-spread is the book-to-market spread between top and bottom factor quintile. The dependent variable is the future 1-quarter return of the long-short portfolio that long bottom quintile stocks and short top quintile stocks. We construct our analysis in 9 country/regions. The time period covers 1990q1-2020q4 with emerging market to be shorter due to the data availability. The standard errors are Newey-West standard errors with 5 lags. T-statistics are in the parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Value-spread and book-to-market premium

	(1) Global	(2) US	(3) Global ex US	(4) Developed	(5) Developed ex US	(6) Emerging	(7) Europe Developed	(8) American Developed	(9) Asia-Pacific Developed
PVS	0.00640	0.0281	0.0135	0.00996	0.0158	0.0176	0.00195	0.0223	0.00994
	(0.50)	(1.17)	(1.25)	(0.75)	(1.41)	(1.17)	(0.20)	(0.85)	(1.01)
Constant	-0.0170	0.0176	-0.00715	-0.0109	-0.00364	-0.00623	-0.0167	0.0115	-0.0170
	(-0.84)	(0.58)	(-0.46)	(-0.55)	(-0.24)	(-0.20)	(-0.88)	(0.34)	(-1.32)
	Newey-West Standard Error with Lag 5								
N	120	120	120	120	120	111	120	120	120

Panel B: Profitability value-spread and profitability premium

	(1) Global	(2) US	(3) Global ex US	(4) Developed	(5) Developed ex US	(6) Emerging	(7) Europe Developed	(8) American Developed	(9) Asia-Pacific Developed
PVS	0.00807	0.102***	0.0128	0.0316	0.0202	0.00910	0.0273	0.101***	0.00258
	(0.51)	(3.25)	(0.81)	(1.26)	(1.11)	(0.16)	(1.07)	(3.88)	(0.23)
Constant	-0.00303	-0.0471***	-0.00732	-0.0153	-0.0106	-0.000133	-0.0220	-0.0472***	0.00344
	(-0.30)	(-3.39)	(-0.66)	(-1.12)	(-0.91)	(-0.00)	(-1.25)	(-4.00)	(0.47)
	Newey-West Standard Error with Lag 5								
N	120	120	120	120	120	111	120	120	120

Table A3 (continue)

Panel C: Size value-spread and size premium

	(1) Global	(2) US	(3) Global ex US	(4) Developed	(5) Developed ex US	(6) Emerging	(7) Europe Developed	(8) American Developed	(9) Asia-Pacific Developed
PVS	0.0600***	0.145***	0.0512***	0.0885***	0.0629***	0.0333	0.0630**	0.129***	0.0505***
	(3.35)	(4.76)	(3.35)	(4.20)	(3.78)	(0.79)	(2.50)	(4.02)	(3.68)
Constant	-0.0151	-0.0516***	-0.0118	-0.0286**	-0.0184*	0.0151	-0.0287**	-0.0466***	-0.00705
	(-1.30)	(-3.91)	(-1.11)	(-2.50)	(-1.89)	(0.40)	(-2.19)	(-3.34)	(-0.76)
	Newey-West Standard Error with Lag 5								
N	120	120	120	120	120	111	120	120	120

Panel D: Momentum value-spread and 12-month momentum premium

	(1) Global	(2) US	(3) Global ex US	(4) Developed	(5) Developed ex US	(6) Emerging	(7) Europe Developed	(8) American Developed	(9) Asia-Pacific Developed
PVS	0.171**	0.186***	0.150**	0.190***	0.161**	0.171**	0.133**	0.185***	0.104**
	(2.51)	(2.74)	(2.44)	(2.82)	(2.50)	(2.35)	(2.14)	(2.89)	(2.50)
Constant	-0.107***	-0.0970***	-0.0945***	-0.107***	-0.0920***	-0.128***	-0.0963***	-0.106***	-0.0410*
	(-2.94)	(-3.12)	(-2.85)	(-3.19)	(-2.82)	(-3.41)	(-2.98)	(-3.45)	(-1.97)
	Newey-West Standard Error with Lag 5								
N	120	120	120	120	120	111	120	120	120

Panel E: Investment value-spread and investment premium

	(1) Global	(2) US	(3) Global ex US	(4) Developed	(5) Developed ex US	(6) Emerging	(7) Europe Developed	(8) American Developed	(9) Asia-Pacific Developed
PVS	0.0286	0.0852*	0.0416*	0.0493	0.0551**	0.0795	0.0394	0.0737	0.0506***
	(0.79)	(1.90)	(1.93)	(1.18)	(2.04)	(1.60)	(1.06)	(1.59)	(2.90)
Constant	0.0102	0.00132	0.00132	0.00328	-0.00258	-0.0119	-0.00388	0.00101	0.00228
	(0.81)	(0.09)	(0.21)	(0.23)	(-0.32)	(-0.57)	(-0.30)	(0.06)	(0.43)
	Newey-West Standard Error with Lag 5								
N	120	120	120	120	120	111	120	120	120

Table A4 Correlation matrix between factor value spread and factor PVS

We show the correlation matrix of 5 risk factor (book-to-market, profitability, size, 12-month momentum and investment) value-spread and PVS in 9 markets respectively. In each matrix, the first row represents the PVS of each risk factor and the firs column stands for the value-spread of each risk factor.

U.S.

	Value	Prof	Size	Mom	Inv
Value	**0.485**	0.850	0.865	0.679	0.393
Prof	-0.487	**-0.938**	-0.811	-0.575	-0.462
Size	-0.339	-0.774	**-1.000**	-0.557	-0.213
Mom	-0.457	-0.614	-0.688	**-0.814**	-0.290
Inv	-0.154	-0.613	-0.424	-0.527	**-0.665**

Emerging

	Value	Prof	Size	Mom	Inv
Value	**0.853**	0.802	0.917	0.522	0.340
Prof	-0.747	**-0.842**	-0.813	-0.526	-0.266
Size	-0.773	-0.723	**-1.000**	-0.548	-0.187
Mom	-0.621	-0.657	-0.736	**-0.684**	-0.127
Inv	-0.529	-0.598	-0.245	-0.029	**-0.606**

Europe

	Value	Prof	Size	Mom	Inv
Value	**0.381**	0.423	0.693	0.523	0.427
Prof	-0.476	**-0.450**	-0.243	-0.528	-0.560
Size	-0.052	-0.349	**-1.000**	-0.345	-0.246
Mom	-0.196	-0.275	-0.477	**-0.717**	-0.253
Inv	-0.185	-0.308	-0.485	-0.073	**-0.430**

Global

	Value	Prof	Size	Mom	Inv
Value	**0.390**	0.892	0.873	0.416	0.105
Prof	-0.443	**-0.916**	-0.808	-0.454	-0.188
Size	-0.267	-0.729	**-1.000**	-0.305	0.071
Mom	-0.395	-0.581	-0.608	**-0.545**	-0.222
Inv	-0.138	-0.658	-0.522	-0.206	**-0.083**

Developed

	Value	Prof	Size	Mom	Inv
Value	**0.262**	0.940	0.785	0.411	0.150
Prof	-0.296	**-1.000**	-0.782	-0.465	-0.223
Size	-0.066	-0.782	**-1.000**	-0.294	0.128
Mom	-0.242	-0.577	-0.553	**-0.513**	-0.185
Inv	-0.049	-0.681	-0.459	-0.215	**-0.140**

America

	Value	Prof	Size	Mom	Inv
Value	**0.554**	0.852	0.880	0.679	0.267
Prof	-0.594	**-0.948**	-0.831	-0.611	-0.296
Size	-0.434	-0.793	**-1.000**	-0.576	-0.092
Mom	-0.463	-0.626	-0.706	**-0.796**	-0.209
Inv	-0.297	-0.640	-0.494	-0.584	**-0.400**

Global ex U.S.

	Value	Prof	Size	Mom	Inv
Value	**0.204**	0.892	0.881	0.392	0.553
Prof	-0.210	**-0.930**	-0.879	-0.449	-0.551
Size	-0.119	-0.800	**-1.000**	-0.308	-0.530
Mom	-0.239	-0.654	-0.646	**-0.469**	-0.266
Inv	-0.055	-0.712	-0.665	-0.108	**-0.698**

Developed ex U.S.

	Value	Prof	Size	Mom	Inv
Value	**-0.048**	0.881	0.778	0.358	0.394
Prof	-0.077	**-1.000**	-0.825	-0.423	-0.400
Size	0.107	-0.825	**-1.000**	-0.263	-0.233
Mom	-0.049	-0.626	-0.559	**-0.389**	-0.318
Inv	0.073	-0.713	-0.596	-0.073	**-0.507**

Asia-Pacific

	Value	Prof	Size	Mom	Inv
Value	**-0.002**	0.946	0.839	0.396	0.858
Prof	-0.083	**-1.000**	-0.911	-0.414	-0.797
Size	-0.093	-0.911	**-1.000**	-0.275	-0.677
Mom	-0.158	-0.687	-0.640	**-0.352**	-0.373
Inv	0.146	-0.797	-0.677	-0.225	**-1.000**

Appendix D Regional-level PVS figures

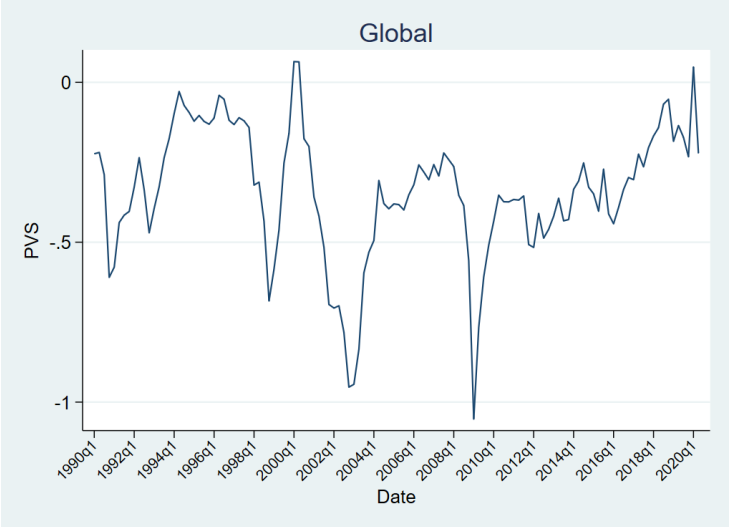


Figure A1 Global risk perceptions

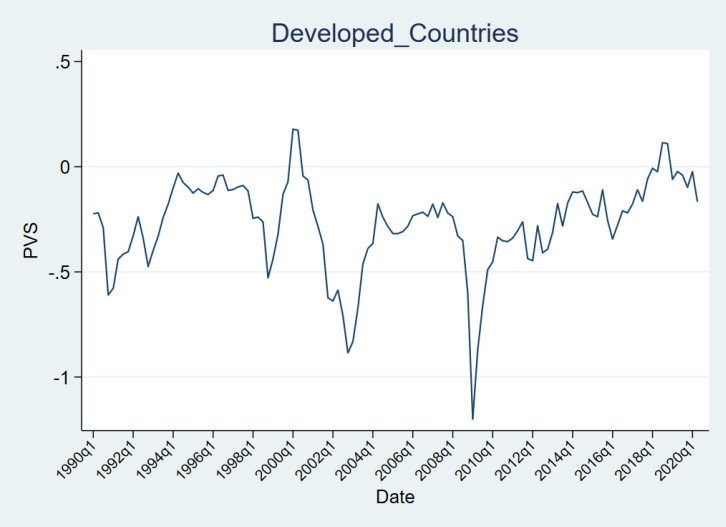


Figure A2 Developed countries risk perceptions

Figure A3 Emerging countries risk perceptions

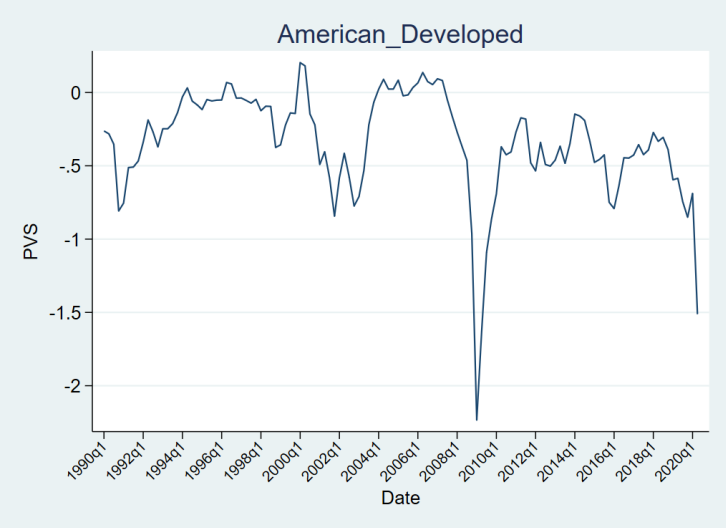


Figure A4 American developed countries risk perceptions

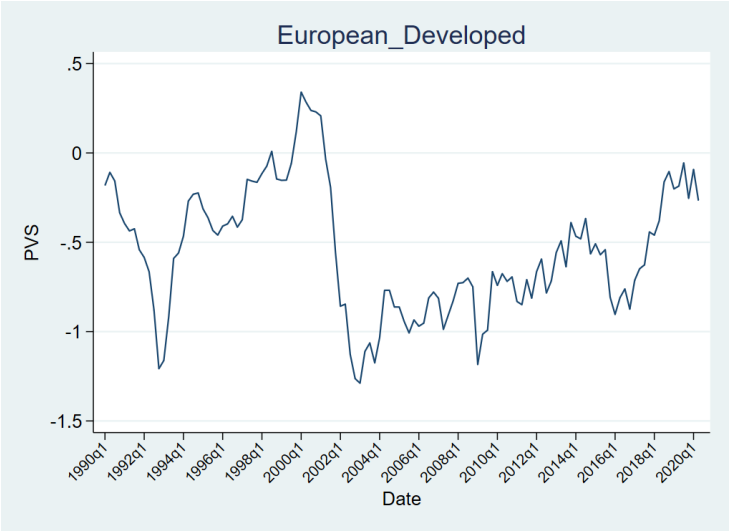


Figure A5 European developed countries risk perceptions

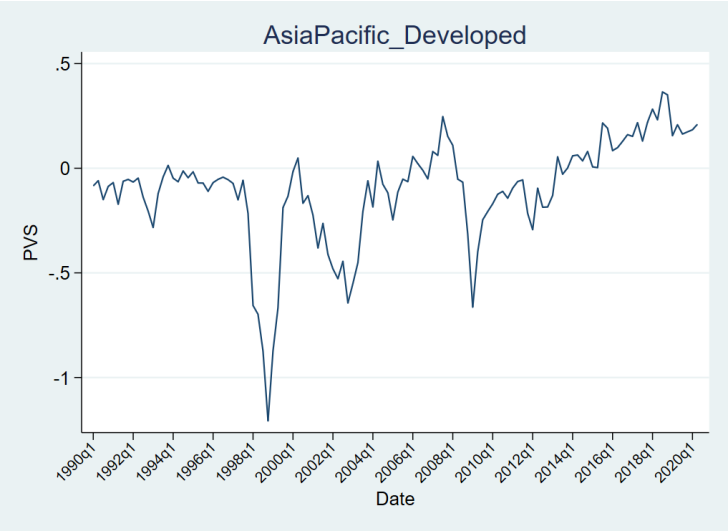


Figure A6 Asia-Pacific developed countries risk perceptions

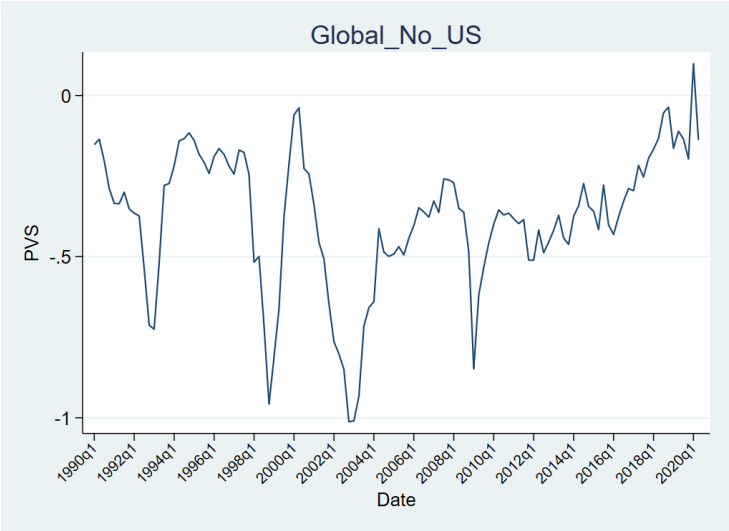


Figure A7 Global ex U.S. risk perceptions

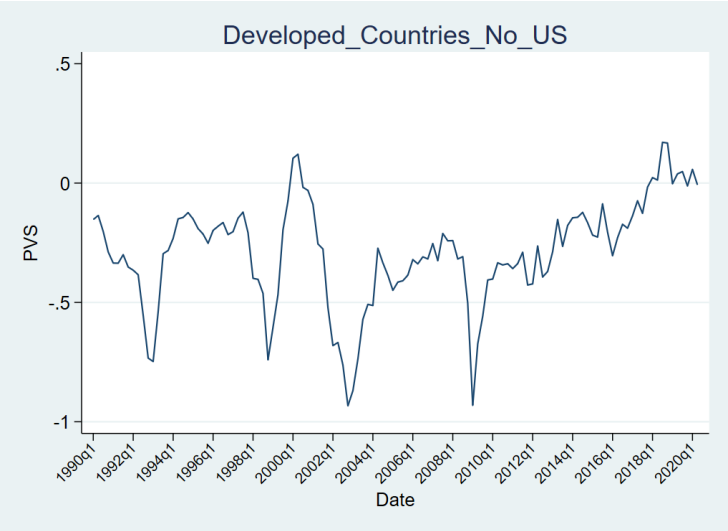
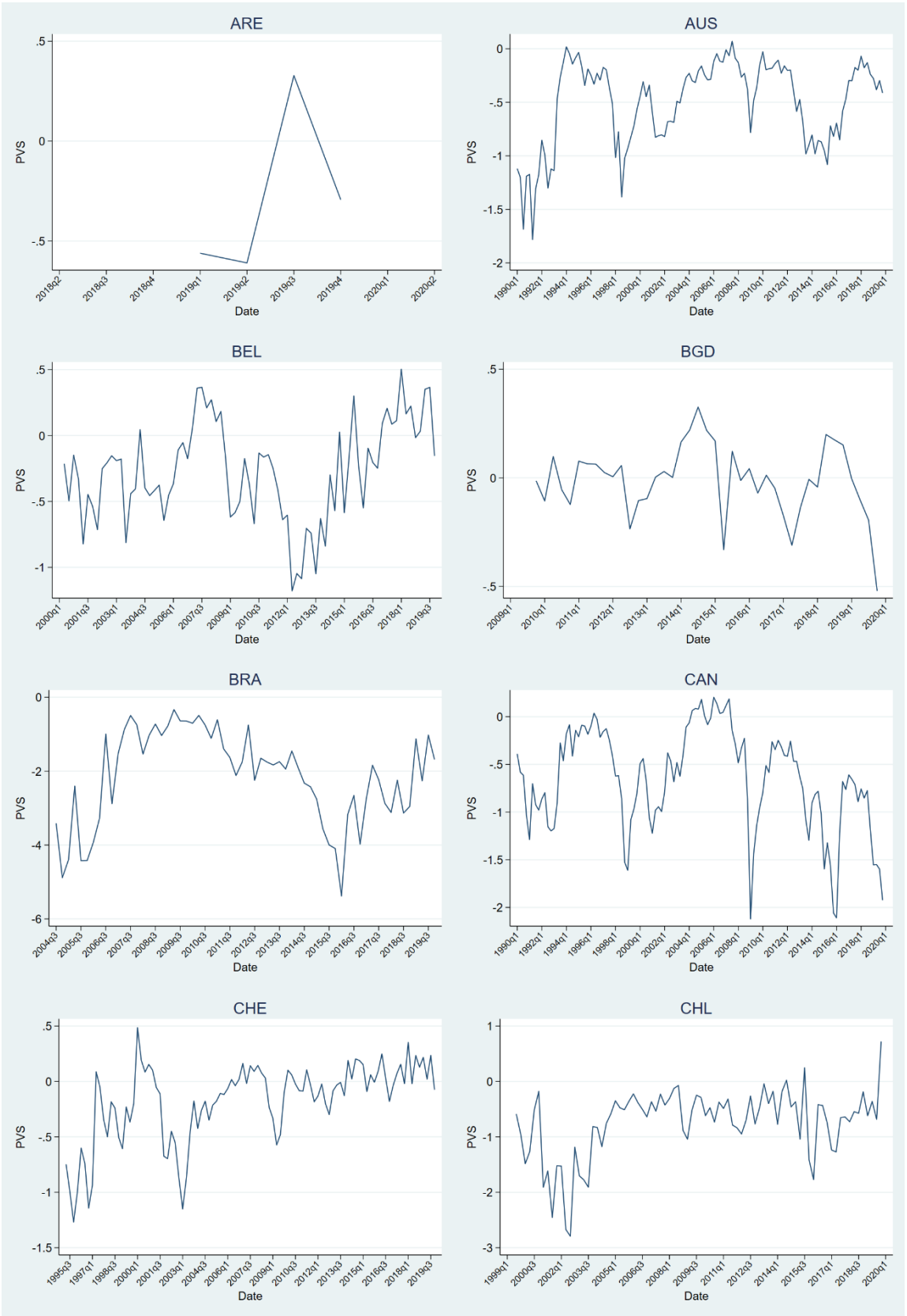


Figure A8 Developed countries ex U.S. risk perceptions

Appendix E Country-level PVS figures

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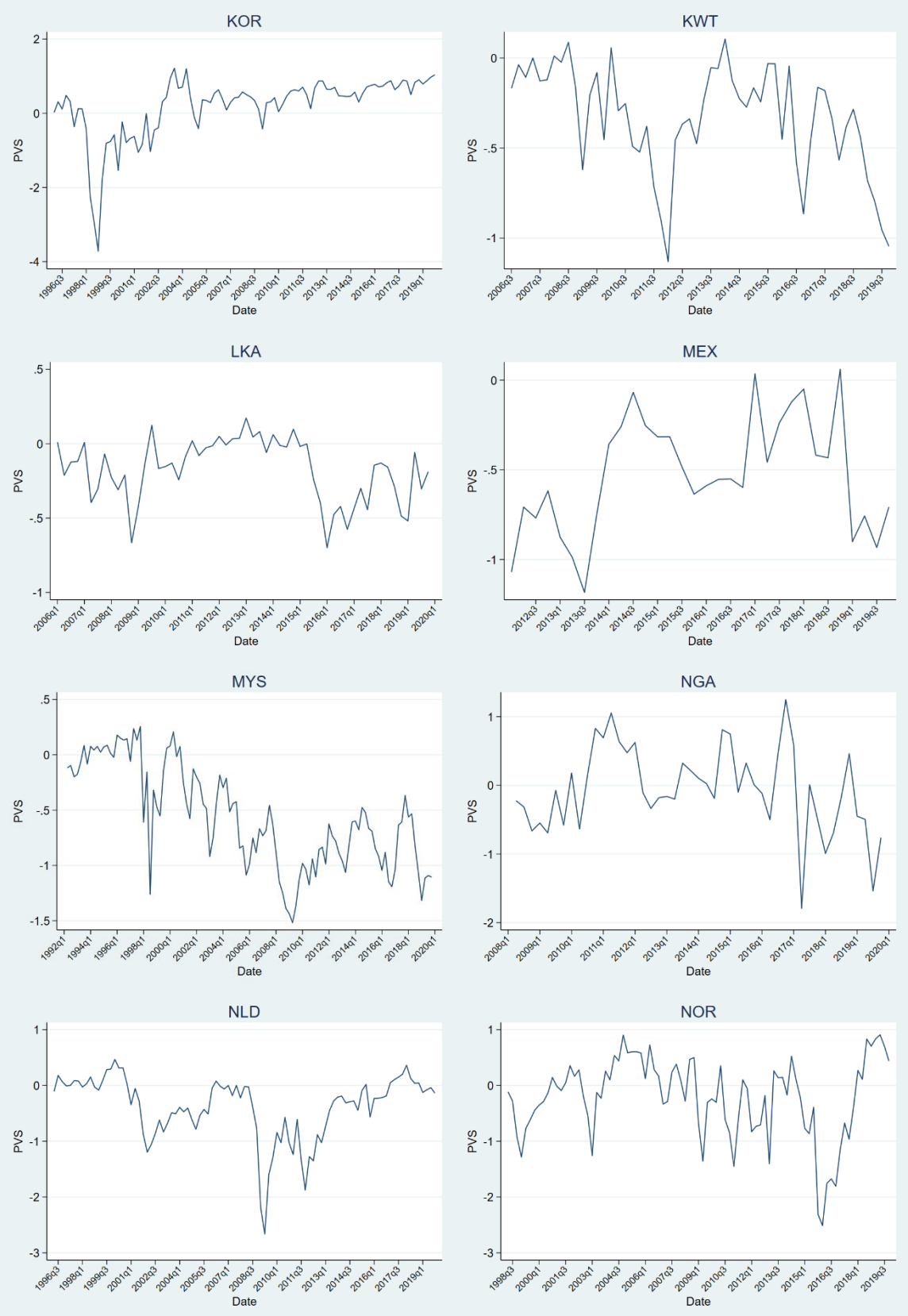
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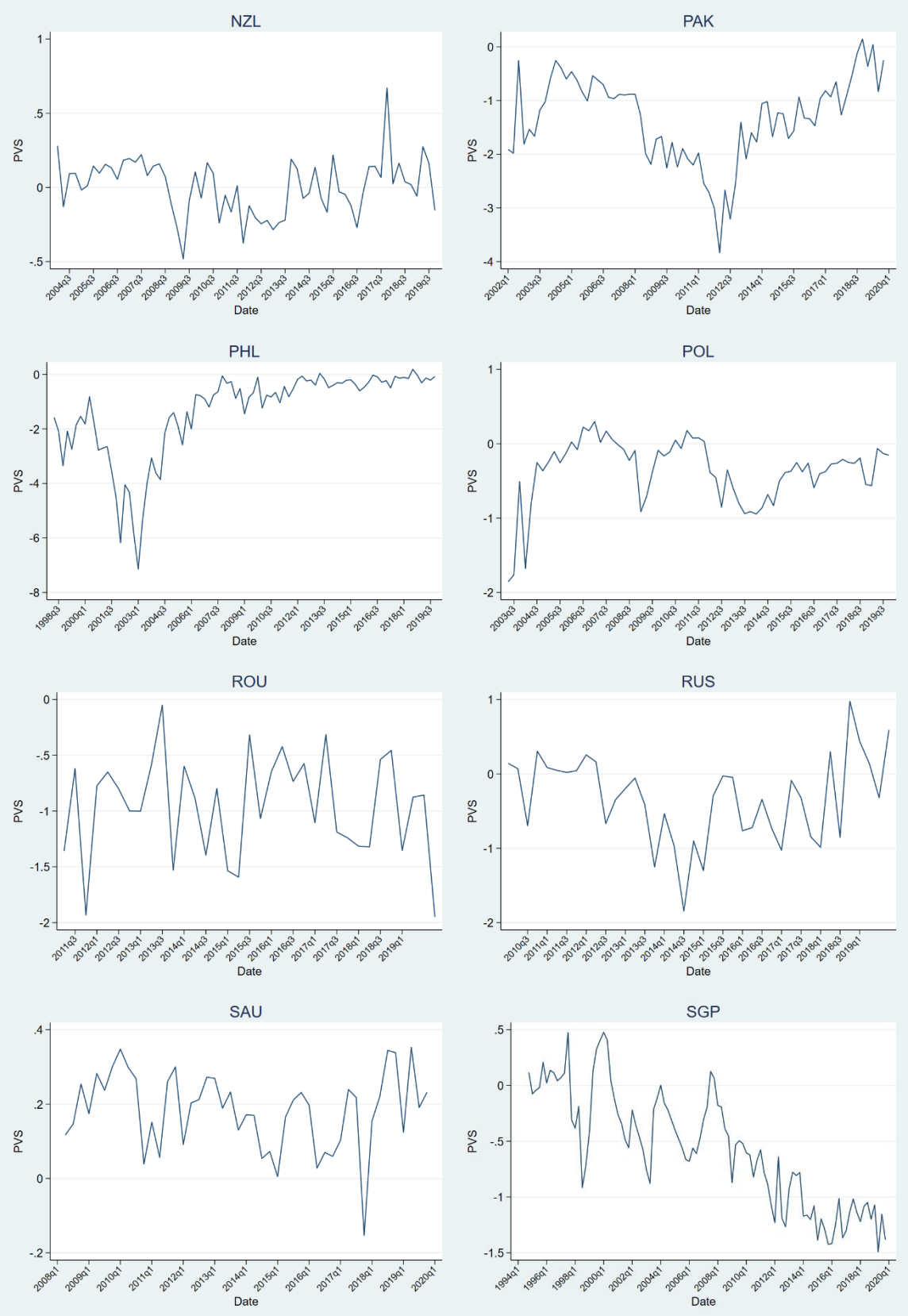
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