Uncertainty and the Risk-Return Tradeoff*

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Abstract

The Merton's (1973) Intertemporal Capital Asset Pricing Model (ICAPM) implies that the conditional risk should contain the unspanned Knightian uncertainty component which may be very important when interest rate is not sufficient to describe the investment state, but the conventional risk–return tradeoff tests only consider the spanned risk component and end up with inclusive findings. Borrowing a machine-learning based index of economic policy uncertainty (EPU) from Baker, Bloom and Davis (2016) who design this index to capture the Knightian uncertainty in macroeconomic, monetary, political, fiscal, national security, sovereign credit, international trade, and currency areas, we detect a significant EPU–return tradeoff relation. Further empirical analyses suggest that more than 60% of this EPU–return tradeoff should be attributed to the Knightian uncertainty while less than 10% of it can be attributed to the spanned risk. More interestingly, we find that expected stock return is significantly positively related to conditional risk as suggested by Merton when this EPU index is employed as the proxy of the conditional risk, and this tradeoff is mainly attributed to the component of Knightian uncertainty–return tradeoff rather than the component of spanned risk–return tradeoff. Using this EPU index, we find that the risk–return tradeoff exists in corporate bond markets. Overall, our analyses suggest that the Knightian uncertainty unspanned by capital market risks plays a very important role in detecting a positive risk–return tradeoff relationship.

JEL classification: G12 G13

KeyWords: ICAPM, Conditional risk, Unspanned risk, Tradeoff, Knightian Uncertainty, Policy Uncertainty

1 Introduction

A main tenet of modern finance is that investors demand compensation for investing in assets whose payoffs are uncertain. The most challenging job in testing this positive risk-payoff relationship is to properly measure the unobservable uncertainty. The traditional view is that the tradeoff is inherently estimable by estimating the means and variances of equity returns, as in Merton (1973, 1980). As such, extant studies test this relationship using market portfolio return as the proxy of uncertainty but the findings are unfortunately inclusive.[1] According to Merton (1973), the risk-return tradeoff can be approximated by variance-return relationship if and only if return variance is a sufficient stochastic of conditional risks, or equivalently, if and only if interest rate is a sufficient statistic of the state.[2] This sufficiency cannot be meet both theoretically and empirically. According to Knight (1921) and Keynes (1937), uncertainties beyond capital market are substantial and can significantly change investment state. The literature defines the uncertainty that is measurable by investment portfolio return volatility as risk, and the uncertainty which is not spanned by investment portfolio returns as Knightian uncertainty. In this study, we call the later Knightian uncertainty and unspanned risks interchangeably. Knightian uncertainty matters because it can have large consequences on financial markets via changes in regulation, taxes, geo-political security, international treaties (trade). Empirically, there is a large body of literature suggests that many unspanned economic "uncertainties" can systematically impact stock prices. For example, there are enormous studies show that political election, monetary policy, regulations, exchange rate, and others significantly impact stock prices.[3] Moreover, the Merton (1973) model suggests that such uncertainty should be included in the conditional risk estimate if it matters in the generating process of stock prices. Unlike the spanned risk (return variance), however, the Knightian uncertainty is inherently hard to measure.

In this study, we test this risk-return relationship using a novel approximation of the conditional risks which contains both conventional spanned risks and unspanned Knightian uncertainty. We first

[1] For example, Baillie and DeGennaro (1990), French, Schwert and Stambaugh (1987), and Campbell and Hentschel (1992) do find a positive albeit mostly insignificant relation between the conditional variance and the conditional expected return while Ghysels, Santa-Clara and Valkanov (2005) find a significantly positive relation. In the meantime, Campbell (1987) and Nelson (1991) find a significantly negative relation. Glosten, Jaganathan and Runkle (1993), Harvey (2001), and Turner, Startz and Nelson (1989) find both a positive and a negative relation depending on the method used.

[2] Merton (1973) shows that this variance-return relationship (ICAPM) holds if an implicit state variable (the interest rate) can present sufficiently the investment "state".

[3] The major findings are summarized in the literature review section.

verify the importance of Knightian uncertainty in the generating process of stock prices by introducing an additional state variable to the model and ending up with a two-risk-factor model, out of which the first approximates the conventional spanned risks and the second represents the Knightian uncertainty. The rationale in our two-factor model is similar to that in Maio and Santa-Clara (2012), who extend the single-factor ICAPM model to a multi-factor model by introducing an explicit state variable to capture the "state" in capital market beyond interest rates to justify the Fama-French 3-factor and other multi-factor models. In our two-factor model, however, which risk contributes more to the risk-return relationship seems an empirical question. We use the "Economic Policy Uncertainty" (EPU henceforth) Index proposed by Baker, Bloom and Davis (BBD, 2016) as the proxy for the unspanned Knightian uncertainty. This index is appropriate because it is novelly constructed by extracting "policy uncertainty" in capital market, political, monetary, fiscal, national security, taxing, international trade, currency, government spending, healthcare and other areas from 10 leading newspapers in the United States using text analysis approach.[4]

Specifically, we test the risk-return tradeoff relationship using the comprehensive new risk proxies by Baker, Bloom and Davis, and compare our test with the conventional tests which focus only on the spanned risk proxies, including the variance, skewness and kurtosis of market portfolio returns, the range and GARCH volatility of market portfolio returns. We test whether each individual proxy is a sufficient stochastic of investment risk and focus on the EPU index since it is constructed to capture both spanned and unspanned risks from the most areas beyond stock markets. Consistent with previous studies, monthly stock return is negatively related to the variance of past-month daily returns over the period from 1900 to 2016 while the corresponding Newey-West statistic is as small as -0.10. Monthly stock returns are also negatively (and insignificantly) related to the skewness or the range volatility of past-month daily returns. Monthly stock returns are positively related to the GARCH variance but this relationship becomes negative after controlling macroeconomic variables. Monthly market returns is positively related to the kurtosis of daily returns in past month while this relationship is pretty insignificant. The Economic Policy Uncertainty (EPU) index, however, is significantly positively related to market returns and this relationship remains after controlling conventional macroeconomic variables. We further find that the positive EPU-return tradeoff remains

[4] Although we do not report, we also test the tradeoff using other uncertainty indexes proposed in the literature including the "Macroeconomic Uncertainty " by Jurado, Ludvigson and Ng (2015) and the "Disaster Index" (NVIX) by Manela and Moreira (2017).

when the expected returns are approximated by cumulative market returns over subsequent 3 to 12 months.

In short, we detect a significant EPU-return tradeoff relation. We are very interested in whether this tradeoff is mainly driven by the Knightian uncertainty component in the EPU index. In addition to the Knightian uncertainty, the literature, however, suggests three alternative explanations for the existence of this tradeoff, including spanned risks, the dynamics of investor's risk aversion and macroeconomic investment opportunity state. Since all the four explanations are not mutually exclusive, we identify the dominant one by linearly decomposing the EPU index into four components: the component explained by conventional risk proxies, the component by investor's time-varying risk aversion, the component by macroeconomic state variables, and a residual part as a proxy of the unobserved Knightian uncertainty. To be solid, we employ all most conventional spanned risk proxies, including the conventional variance, range variance, GARCH variance, skewness and kurtosis of the market portfolio returns, and find that all of these proxies together have less than 8% power to explain the EPU-return tradeoff. The investor's time-varying risk aversion, approximated by the standardized Sharpe ratio of CRSP value-weighted stock market portfolio, has around 2% explanatory power of the EPU-return tradeoff.[5] The market investment opportunity state variables, including the dividend yield of the S&P 500 index, inflation rate, default spread, and stock market portfolio return, altogether have around 28% explanatory power. In other words, the total explanatory power of the three alternative sources contained in the EPU-return tradeoff is less than 40%, and more than 60% of the tradeoff should be attributed to the Knightian uncertainty contained in the EPU index. In sum, our analyses suggest that unspanned Knightian uncertainty in monetary policy, fiscal policy, regulation, national security, currency, taxes and other areas have significant impacts on the generating process of stock returns and cannot be ignored in testing the risk-return relationship.

To better understand how the EPU index effectively capture the unspanned Knightian uncertainty and whether the captured uncertainty in this index are the main underlying drivers of positive risk-return tradeoff, we decompose the EPU index into two orthogonal components, that is, the spanned risks by market return moments and the unspanned uncertainty, by regressing this index

[5] We also use alternative proxies proposed in literature, including the Consumer Confidence Index provided by the University of Michigan, the Baker-Wurgler Investor Sentiment Index, and a risk aversion index by Bekaert, Engstrom and Xu (2017). These indexes have shorter sample periods and all empirical results are more supportive to the Knightian uncertainty explanation.

on conventional spanned risk proxies. The fitted EPU index captures the uncertainty contained in conventional risk proxies and the EPU residual contains unspanned Knightian uncertainty beyond conventional risk proxy. The fitted EPU index (spanned risk) out of all linear regression models fails to describe the positive risk-return tradeoff relationship but the unspanned uncertainty part strongly supports this relationship.

In addition to investigating the risk-return relationship in stock markets, we also test whether the Knightian uncertainty matters in corporate bond markets. We use the long-term corporate bond issue index defined by Goyal and Welch (2008) as the approximation of corporate bond markets.[6] Consistent with the findings in stock market, we do not find a significant spanned risk-return tradeoff but detect a significant EPU-return tradeoff in corporate bond market. The three alternative explanations of spanned risk, time-varying risk aversion and macroeconomic state variables together explain around 35% of the bond market EPU-return tradeoff, implying that around two thirds of the tradeoff should be attributed to the Knightian uncertainty.

Since the EPU index is constructed by extracting uncertainty texts from 12 categories,including economic policy, monetary policy, fiscal policy, taxes, government spending, healthcare, national security, government entitled programs, regulations, trade, and sovereign credit and currency. we further test the EPU-return relationship using categorical EPU indexes, We find that the EPU-return tradeoff exists in 11 categories and significantly exists in 9 categories, and that Knightian uncertainty contributes 60% to 96% of the categorical EPU-return tradeoffs. We also examine the risk-return relationship for 18 international markets using similar Economic Policy Uncertainty index constructed for each market based on local leading English newspaper(s). The results are mixed and suggest the complication in building an effective unspanned index for other markets.

The main contribution of this study is to show the importance of Knightian uncertainty unspanned by capital market risks on stock market and the risk-return relationship in particular. The paper by Joslin, Priebsch and Singelton (2014) show that unspanned macro risks play an important role in pricing US treasury securities. Our study shows that unspanned risks are also very influential in the

[6] This index spans from January 1926 to December 2016 and is collected from Goyal's website at http://www.hec.unil.ch/agoyal/. We thank Amit Goyal for making this data available online. We also approximate bond markets by the Bloomberg LUACTRUU index, a comprehensive index for the corporate bond markets in the United States. One disadvantage of this index is the length of its sample period, which spans from February 1973 to December 2016. The findings remain with this index.

pricing process of corporate bonds and stocks. There are enormous studies show that unspanned risks from political, monetary, fiscal, national security, taxing and currency systematically impact stock prices. We further show that incorporating these uncertainties is critical for both corporate bond and stock investors to estimate their investment risks.

The paper which is most close to our study is Anderson, Ghysels and Guergens (2009) who test whether uncertainty beyond stock return variance is priced in stock prices. They use a similar framework but assume that investors are averse to model misspecification caused by Knightian uncertainty. We assume that investors acknowledge the pricing power of Knightian uncertainty. They use the disagreement of analysts forecasts as a measure of uncertainty or deviations from the benchmark. We are interested in the economic sources of the deviations. Hence, we have to find proxies for political economic uncertainty that go beyond those measured by market variances and covariances. We use the EPU index of Baker, Bloom and Davis, and show that EPU does have an impact on asset prices. Our study is also related to Brogaard and Detzel (2015) who test whether current EPU can predict subsequent stock returns. In addition to that we provide a simple model to justify their test, we use a longer version of the EPU. They use only one from 1985-2014. It is hard to measure political uncertainty within a short time span. We use the EPU that starts from 1926. This reasonably long sample allows us to not only have more power in the tests but also to correctly identify political uncertainty variations. We further decompose EPU into spanned and unspanned parts and focus on the Knightian effect. We also extend these analyses to corporate bond markets.

The remainder of this paper is organized as follows. Section 2 describes the motivation and methodologies. Section 3 reports the main empirical results. Section 4 concludes the paper.

2 Knightian Uncertainty and ICAPM

2.1 Economic Policy Uncertainty and Knightian Uncertainty

Knight (1921, Chapter 7) proposes that the difference between risk and uncertainty is that the priori distribution of risky event's outcome is known while the priori distribution of uncertain event's outcome is not and has to be estimated. In finance area, the priori distribution of stock returns is assumed to be known and approximated by its historical distribution in practice. For example, French, Schwert and Stambaugh (1987), and Pastor, Sinha and Swaminathan (2008) use the variance of market portfolio returns; French, Schwert and Stambaugh (1987), Glosten, Jagannathan and Runkle (1993), Lundblad (2007), Bali (2008) and Nyberg (2012) use GARCH approach to derived the volatility from historical market returns; Amaya, Christofersen, Jacobs and Vasquez (2015) use the skewness and kurtosis of historical market returns. Alizadeh, Brandt and Deebold (2002) propose the volatility of historical stock price change gap within a month as an alternative measure of risk. Ghysels, Santa-Clara and Valkanov (2005) propose the mixed data sampling (MIDAS) approach to estimate expected variance. Bekaert and Hoerova (2014), and Manela and Moreira (2017) use the implied volatility of the S&P 500 option prices (VIX) as an approximation of conditional expected risk. Christensen and Prabhala (1998), and Guo and Whiltelaw (2006) span this data sample period by combining the implied volatility of the S&P 100 index option prices from November 1983 to May 1995.

However, it is hard to predict the occurring and results of many macroeconomic and political events, such as trade dispute, presidential election and war in particulary. It is even harder to compute the priori distribution of these event's impact on stock prices while they do significantly affect stock prices.[7] Enormous studies show that many macroeconomic and political events beyond capital market significantly impact capital market while their impacts are not captured by the estimated return volatilities. Studies by Santa-Clara and Valkanov (2003), Boutchkova, Doshi, Durnev and Molchanov (2012), Julio and Yook (2012), Belo, Gala and Li (2013), and Kelly, Pastor and Veronesi (2016) suggest that political events are priced in stock prices; Baxter and King (1993), Flannery and Protopapadakis (2002), Belo and Yu (2013), and Pastor and Veronesi (2012, 2013, 2017) argue that stock prices are related to fiscal policy and government spending; Patelis (1997), Thorbecke (1997), Rigobon and Sack (2003), Bjornland and Leitemo (2009) show that U.S. monetary policy has significant impact on stock prices; Blanchard (1981), Flannery and James (1984), Campbell and Shiller (1988), Boyd, Levine and Smith (2001), Flannery and Protopapadakis (2002) show that interest rate and inflation rate matter in stock market; Jorion (1991), Roll (1992), Dumas and Solink (1995), Ammer and Mei (1996), Griffin and Stulz (2001) propose that exchange rate and international trade significantly impact stock prices; Baker and Wurgler (2006), Telock (2007), Brogaard and Detzel (2015), Baker, Bloom and Davis (2016), Manela and Moreira (2017) show that media and

[7] Knight (1921, Chapter 8) points out that the unknown priori distribution may be approximated using subjective distribution. See also LeRoy and Singell, 1987.

investor sentiment are significant factors of stock prices. Furthermore, many studies also show that risks in macroeconomy such as U.S. government tax policy (e.g. Reigganum, 1983; Givoly and Ovadia, 1983; McGranttan and Prescott, 2003; Sikes, 2014), economic regulations (e.g., McGranttan and Prescott, 2003; Cumming, Johan and Li, 2011), macroeconomic output and business cycle (e.g., Blanchard, 1981; Schwert, 1989; Levine and Zervos, 1998; McQueen and Roley, 1993; McGranttan and Prescott, 2003; Jurado, Ludvigson and Ng, 2015; Bali, Brown and Tang, 2017), consumer consumption shock (Wachter, 2013), and stock market integration and globalization (Forbes and Rigobon, 2002) all have significant impact on stock prices.

In this study, we take the view that all these events outside capital market are uncertain events and our objective is to measure their impacts on capital market at the aggregate level. To focus on the Knightian uncertainty impact, in empirical analysis we further purge the spanned risk part from the aggregated uncertainty. It is complicate to build such a comprehensive proxy for these uncertain events. Fortunately, Baker, Bloom and Davis (2016) propose an Economic Policy Uncertainty index using text analysis approach to extract uncertainty out of six (between 1926 and 1984) or ten (from 1985 to 2016) leading newspapers in USA. One important feature of this index is that it is constructed on the counts of uncertainty events without any assumption of the priori distribution of the events. Moreover, Baker, Bloom and Davis (2016) show that this index can effectively capture the uncertainty in economy, regulation, government expense, international diplomacy and politics. We think that this index is a reasonable proxy of Knightian uncertainty in capital markets and ask whether combining risk and uncertainty can provide better estimation of conditional expected risk from the perspective of Merton's (1973) risk-return relationship.[8]

[8] Jurado, Ludvigson and Ng (2015) construct an uncertainty index derived out of 132 macroeconomic indicators from January 1961 to December 2011 using a parametric stochastic volatility forecasting model. The 132 macro series covers a broad category of macroeconomic activity, including real output and income, employment and hours, real retail, manufacturing and trade sales, consumer spending, housing starts, inventories and inventory sales ratios, orders and unfilled orders, compensation and labor costs, capacity utilization measures, price indexes, bond and stock market indexes, and foreign exchange measures. Jurado, Ludvigson and Ng further show that this index can capture uncertainty beyond stock market and is significantly related to the economic policy uncertainty index of Baker, Bloom and Davis (2016). Bali, Brown and Tang (2017) show that this index is priced in cross-sectional returns. Manela and Moreira (2017) propose a proxy of conditional expected variance by regressing the option implied volatility (VIX) on the contemporaneous word frequency of front-page coverage of the *WallStreetJournal* over the sample period from 1889 to 2016.

2.2 Knightian Uncertainty and ICAPM

In this section, we propose a theoretical model to show that Kinghtian uncertainty is priced in stock prices but not reflected in stock return volatility by introducing an explicit state variable of macroeconomic uncertainty to the Merton's (1973) ICAPM model. Although Merton's (1973, equation 13) model allows the generating process of stock returns is a function of a multi-dimension state variable, it is well known that the illustrative ICAPM model does not explicitly identify the state variable in the covariance matrix of market and individual returns. Some papers introduce an explicit state variable in Merton's model. For example, Anderson, Ghysels and Juergens (2009) introduce a state variable proxy into the Merton's model and derive a two-factor model. In this model, the explicit state variable does not directly but indirectly impact stock prices through model ambiguity. Maio and Santa-Clara (2012) extend the Meteron's single-factor ICAPM model to multi-factor models by introducing an undefined state variable. As pointed by Merton, and Maio and Santa-Clara, any state variable which is included in Merton's model should be able to predict market portfolio returns.

Following Merton (1973), we assume there are K investors, N risky assets and one risk-free asset. In addition to the implicit state variable component (the interest rate), a proxy of the spanned capital market risk, we explicitly introduce a second state variable component as a proxy of the Knight uncertainty capital market. Specifically, the explicit state variable of the Knight uncertainty is given by:

$$dx = a(x)dt + b(x)dB_t. \tag{1}$$

where B_t is a standard Wiener process, a and b are functions of the current state.[9] The generating process of prices of risky stock i under the state variable can be defined as:

$$dP_{i,t}/P_{i,t} = \mu_{i,t}(x)dt + \sigma_{i,t}(x)dB_{i,t} \tag{2}$$

where $P_{i,t}$ denotes the price of stock i in month t, and $\mu_{i,t}$ and $\sigma_{i,t}$ denote the mean and volatility of the returns of stock i. The $N+1^{th}$ security is a risk-free asset with an instantaneous rate of return r_f.

[9]Since the priori distribution of Knightian uncertainty, by definition, is unknown, the known distribution here can be thought as subjective distribution (Knight, 1921, Chapter 8; Leroy and Singell, 1987). The spirit is also similar to the distribution assumption of model uncertainty (as a proxy of Knightian uncertainty) in Anderson, Ghysels and Juergens (2009).

The dynamics of the k^{th} investor's wealth are given by:

$$dW_t = \sum_{i=1}^{N} \omega_{i,t}(\mu_{i,t} - r_{f,t})W_t dt + (r_{f,t}W_t - c_t)d_t + \sum_{i=1}^{N} \omega_{i,t} W_t \sigma_{i,t} dB_{i,t}, \tag{3}$$

where $\omega_{i,t}$ denotes the portfolio weight for stock i in month t, and c_t is the consumption. The k^{th} investor lifetime utility function is given by:

$$E_0\left[\int_0^{\infty} U(c(s),s)ds\right], \tag{4}$$

subject to the intertemporal budget constraint in Equation (3). The investor's dynamic optimization becomes:

$$\begin{aligned} 0 \;&=\; \max_{\omega,c}\Bigg[U(c,t) + J_t + J_w\Big[(\sum_{i=1}^{N}(\mu_{i,t} - r_{f,t})W_t - c_t\Big] + J_x a_x \\ &\quad + (1/2)J_{ww}\sum_{i=1}^{N}\omega_i \sum_{j=1}^{N}\omega_j \sigma_{i,j} W_t^2 + J_{xw} b_x \sum_{i=1}^{N}\omega_i \sigma_i \theta_{x,i} W_t + (1/2) b_{xx} J_{xx}\Bigg], \end{aligned} \tag{5}$$

where $\theta_{x,i}$ denotes the instantaneous correlation between dB_t and $dB_{i,t}$. The first order conditions (FOC) are:

$$0 = U_c(c,t) - J_w(W,x,t) \tag{6}$$

and for $i = 1,2,...,n$:

$$0 = J_w(\mu_i - r_f) + J_{ww}\sum_{j=1}^{N}\omega_j W_t \sigma_{ij} + J_{xw} b_x \sigma_i \theta_{ki}, \tag{7}$$

Let ν_{ij} be the elements of the inverse of the instantaneous covariance matrix of returns, $\Omega, P = -J_w/J_{ww}$, and $Q = -J_{xw}/J_{ww}$, the explicit demand function of Equation(7) becomes:

$$\omega_i W_t = P\sum_{j=1}^{N}\nu_{ij}(\mu_j - r_f) + Q b_x \sum_{j=1}^{N}\sigma_j \theta_{jx} \nu_{ij} \tag{8}$$

It can be shown that the aggregate demand for stock i becomes:

$$D_i = P\sum_{j=1}^{N}\nu_{ij}\mu_j - r_f. \tag{9}$$

The market demand becomes:

$$dM = \sum_{i=1}^{N+1} D_i dP_i/P_i + \sum_{i=1}^{K} (W_i - ci)dt = \sum_{i=1}^{K} dW_i \tag{10}$$

Replace ω_i by D_i/M and assume that there exists a stock whose return is perfectly related to the Knightian uncertainty (we denoted its standard deviation as σ_x), then Equation (8) can be simplified as:

$$\mu_i - r_f = (M/P) \sum_{j=1}^{N} \omega_j \sigma_{ij} + (Qb_x/P\sigma_x)\sigma_{ix}. \tag{11}$$

The market portfolio return process can be simplified as:

$$\mu_M - r_f = (M/P)\sigma_M^2 + (Qb_x/P\sigma_x)\sigma_{Mx}. \tag{12}$$

Equation (12) says that the expected returns of market portfolio is a linear function of market portfolio (spanned) risk and macroeconomic volatility unspanned by market portfolio returns. Following Cochrance (2005, Chapter 9), we approximate Equation (12) in discrete time as:

$$E_t(R_{M,t+1} - R_{f,t+1}) = \gamma_M \sigma_M^2 + \gamma_K \sigma_{Mx}. \tag{13}$$

Empirically, we test the following tradeoff relationship:

$$E_t[R_{M,t+1}] = \alpha + \beta_M * Risk_t + \beta_K * Uncertainty_t, \tag{14}$$

where β_M is the relative risk aversion of the representative agent to spanned risks and β_K is the risk aversion to unspanned Knightian uncertainty.

The literature suggests that spanned risks can be approximated by stock return volatility or higher moments. Following the convention, we approximate spanned risks using singleton or various sets of market return volatility, range volatility, GARCH volatility, skewness, and kurtosis. To partition the unspanned risks and spanned risks captured in the EPU index, we decompose it using the following linear regression:

$$EPU_t = \kappa + \beta * Risk(R_t) + \varepsilon_t, \tag{15}$$

where $Risk(R_t)$ can be either a singleton or a vector of spanned risk proxies. According to our argument, the fitted EPU index from the equation captures conventional spanned risks and ε_t captures unspanned uncertainty.

3 Empirical Analysis

In this section, we first describe the data used in empirical analyses. Then we test whether risk−return and uncertainty−return relationships empirically exist with conventional risk proxies of (i.e., stock return volatilities) and the EPU index as a proxy of Knightian uncertainty. As we will show soon that a significant EPU−return tradeoff exists in capital market but a significant risk−return tradeoff does not. We conduct further analyses to test whether the EPU−return tradeoff should be attributed to Knightian uncertainty by excluding all alternative explanations for the EPU−return relation. We then turn to test the efficacy of the Knightian uncertainty−return tradeoff.

3.1 Data

The data used for our analysis span from January 1926 to December 2016, and are from various sources. We use the value-weighted index portfolio from the Center for Research in Security Prices (CRSP) as a proxy of the U.S. stock market. We use the long-term corporate bond issues, which spans from January 1926 to December 2016, defined by Goyal and Welch (2008) as a proxy of the U.S. corporate bond market.[10] Our main proxy of unspanned uncertainty is the so-called "Economic Policy Uncertainty" (EPU) constructed by Baker, Bloom and Davis (2016), a text analysis based measure of policy uncertainty news out of six (between 1926 and 1984) to ten (from 1985 to 2016) leading newspapers in USA. Uncertainty is measured by the change in the scaled counts of news articles containing terms of economic and policy uncertainty, such as uncertainty, uncertain, economic or economy, regulation, deficit, legislation, Congress, White House, Federal Reserve, the Fed, regulations, regulatory, deficits, congressional, legislative, and legislature.[11] To make the magnitude of the index are comparable to stock returns and variance, in our analysis we take log of

[10]We use the Bloomberg LUACTRUU index as an alternative proxy of the U.S. corporate bond market. This index is constructed based on all US corporate bond issues but spans from January 1973 to December 2016.

[11]Please refer to Baker, Bloom and Davis (2016) for details of the index construction

this index and then scaled by 100.[12] We also simply scale the index by 1000 and the results are almost unchanged.[13]

In addition, we follow the literature and construct the spanned Knightian risk proxies using market portfolio returns. Specifically, we construct conventional volatility and range volatility of market portfolio returns based on daily returns within the most recent month, and GARCH volatility using monthly market portfolio returns throughout the whole sample period. We also compute the skewness and kurtosis of daily market returns within each month and use them as alternative proxies of spanned conditional risk. The macroeconomic variables, including the dividend yield of the S&P 500 index, the inflation rate based on Consumer Price Index (all urban consumers), and the default spread defined as the yield spread between Moody's rated BAA and AAA corporate bonds, as well as the risk-free rate defined as the Treasury-bill rate are from Amit Goyal's website.

Figure 1 plots the time series of all risk and uncertainty proxies over the entire sample period and suggests that each proxy evolves differently from others. The market portfolio return variance, the conventional conditional risk spanned risk proxy, jumps during the great recession period in 1930s, the WWII period, the oil crisis period in 1980s, and the recent housing crisis period. The Economic Policy Uncertainty Index, which contains both spanned and unspanned risks by construction, jumps during the 1930s but does not during other times. Table 1 reports the summary statistics of the market portfolio returns and each uncertainty index over the sample period and the pairwise correlations of these variables. Over the whole sample period from January 1926 to December 2016, Panel A in Table 1 shows that the market portfolio delivers an average monthly return around 1% with a standard deviation of 5%. The market portfolio return is significantly negatively autocorrelated, evidence of an AR(1) process. The mean, median and standard deviation of each conventional risk proxy, including market volatility (%), range volatility (%), GARCH volatility (%), skewness and kurtosis are reported

[12]Pastor and Veronesi (2013) also scale this index for their analysis of political risk premia.

[13] We also use the "News Implied Volatility" index (NVIX) by Manela and Moreira (2017) as an alternative proxy of unspanned uncertainty. The main disadvantage of this proxy is that it only covers the first page of *WallStreetJournal* and may not be able to effectively measure unspanned risks. Following Manela and Moreira, we use the quare term of this index and scale it by 10000. Another proxy of unspanned uncertainty used in this study is the "Macroeconomic Uncertainty" index proposed by Jurado, Ludvigson and Ng (2015), which is derived out of 132 macroeconomic indicators from January 1961 to December 2011 using a parametric stochastic volatility forecasting model. Following Jurado, Ludvigson and Ng (2015), we focus the one-month index. This index, however, mainly covers uncertainty in macroeconomic area but is not designed to measure shocks beyond the economy and capital markets. The (unreported) empirical results suggest that these two proxies underperform the EPU index in capturing Knightian uncertainty.

from the 2^{nd} to 6^{th} rows.[14] Column 5 suggests that most of these series (except the skewness) are AR(1) processes and the GARCH volatility series is highly autocorrelated with an AR(1) coefficient of -0.98. The summary statistics of the EPU index, are in the 7^{th} row and suggest that it is a AR(1) process. Panel B in Table 1 shows that conventional risk measures of market return volatilities, including the conventional volatility, range volatility and GARCH volatility, are highly correlated with each other. The correlation between conventional volatility and range volatility is as high as 0.95. The conventional risk proxies are significantly related to the EPU index. However, the small magnitudes of these correlations suggest that the unspanned risk proxies may capture risks beyond uncertainty in capital market.

3.2 Does EPU–Return Tradeoff Exist?

In this section, we test whether the spanned risk-return tradeoff and EPU-return tradeoff exist empirically. According to Merton's (1973) ICAPM model, we expect to detect significant positive tradeoffs if the proxies of spanned risk are effective. We first conduct simple regressions of risk-return tradeoff test for each singleton spanned risk proxy and the EPU index and conduct further tests controlling the main macroeconomic predictors used in the literature. The empirical test results are illustrated in Table 2 and do not suggest any spanned risk-return tradeoff but suggest a significant EPU-return tradeoff. Consistent with previous studies, the tradeoff relationship in Panel A (simple regressions) is slightly negative and statistically insignificant when conditional risk is approximated by the conventional volatility or range volatility of market portfolio returns.[15] The tradeoff relationship becomes positive but insignificant when conditional risk is approximated by GARCH volatility or kurtosis of the market portfolio returns.[16] However, the EPU-return relationship is positive (0.33) and statistically significant (t=2.15). The results are consistent with Baker, Bloom and Davis (2016) that the EPU index can effectively measure risks broadly spanned from capital markets to areas of macroeconomy, monetary policy, fiscal policy, national security, international

[14]This table shows a significant difference in magnitude across risk measures. To fix this in our tradeoff analyses, we scale each risk variable by its standard deviation over the whole sample period.

[15]For example, Harvey (2001), Brandt and Kang (2004), Adrian and Rossenberg (2008), Lettau and Ludvigson (2010), among others.

[16]Bali (2008) and Nyberg (2012) show that GARCH-M volatility does a better job than conventional GARCH volatility in the tradeoff test.

trade, sovereign credit and so on. Panel B in Table 2 (multiple regressions) shows that the findings in Panel A remain after controlling other return predictors. In fact, the EPU-return relationship is more positive (0.70) and significant (t=3.19) after controlling additional return predictors.

3.3 Knightian Uncertainty and the EPU–Return Tradeoff

In this section, we investigate whether the positive EPU-return relationship documented in last section can be attributed to the Knightian uncertainty contained in the EPU index. The extant studies on risk-return relationship provide four potential explanations, which may not be mutually exclusive. First, the conventional risk-return tradeoff studies suggest that the existence of EPU-return tradeoff may be due to that EPU can be spanned by conventional risk proxies. Recent studies (e.g. Campbell and Cochrane, 1999; Mezly, Santos and Veronesi, 2004; Wachter, 2006; Guiso, Sapienza and Zingales, 2018) suggest that the existence of EPU-return may be because EPU can capture investor's time-varying risk-aversion. Moreover, the conventional risk-return tradeoff tests also implies that EPU may be an effective proxy of macroeconomic investment opportunities. Regardless, the EPU index by construction is designed to capture uncertainties of monetary policy, political events, international relationship and others beyond capital markets, which we refer to as Knightian uncertainty in the sense of unspanned by investment return moments. Because the four explanations are not mutually exclusive, we examine the relative importance of each one in explaining the variation of the EPU index. The most important explanation should have the largest explanatory power for the variation of the EPU index.

We first test whether the EPU index is a sufficient proxy of spanned risks by regressing EPU on the conventional risk proxies, including market return variance, range variance, GARCH variance, skewness and kurtosis. The empirical results are in Table 3 and do not support the spanning relationship between EPU and the conventional risk proxies. Table 3 provides two interesting observations. First, the EPU index is positively and significantly related to each conventional spanned risk proxy except the market return kurtosis, evidence that it does effectively capture conventional spanned risks. Columns 1 to 4 show that the coefficients of these individual conventional risk proxies from simple regressions are around 0.15 and statistically significant at 1% level. The significant positive relationship between the EPU index and the market return volatility or skewness remains in the multiple regression (column 6) while such regression may suffer from collinearity because the conventional spanned risk proxies are significantly highly correlated to each other as shown in Table 1. Second, the EPU index also captures uncertainties unspanned by conventional risk measures. The R^2s of all regressions in Table 3 span from 0.04% (column 5) to 4.42% (column 1). The low R^2s suggest that more than 95% of the variation of the EPU index cannot be explained by conventional spanned risk measures, and consistent with Baker, Bloom and Davis (2016) that the EPU index is designed to capture all risks and uncertainties.

Second, we test whether the EPU index is spanned by time-varying risk aversion by controlling a time-varying risk-aversion variable in previous spanning tests. Existing studies propose several approaches to proxy investor's time-varying risk aversion. Campbell and Cochrane (1999) argue that time-varying risk aversion is implied in the process of Sharpe ratio maximization. Following this argument, we use the squared Sharpe ratio of the daily returns of the CRSP value-weighted index portfolio within each month as a proxy of time-varying risk aversion. The squared Sharpe ratio ensures non-negative results and captures the non-linear relationship between risk-aversion and investment states. Based on the framework of Bad Environment-Good Environment, Bekaert, Engstrom and Xu (2017) construct a proxy of time-varying risk-aversion using macroeconomic fundamentals, asset prices and option prices. Moreover, Baker and Wurgler (2006) propose an investor sentiment index to approximate the dynamics of aggregated risk preference. In this study, we use the squared Sharpe ratio of market returns as our main proxy because the sample periods of other two proxies are relatively short.[17] The results are in Table 4. First, the coefficient of the squared Sharpe ratio is between -0.19 and -0.15 and statistically significant at 1% level, suggesting that the EPU index is significantly related to the time-varying risk aversion. Second, the R-squared is still small, between 3% and 10%, suggesting that the majority part of the variation of the EPU index cannot be explained by the variations of the conventional risk proxies and investor's risk-aversion dynamics.

Lastly, we test whether the EPU index can be spanned by macroeconomic investment opportunities by further controlling the main macroeconomic state variables,which are the dividend yield of the

[17]The Baker-Wurgler index starts from 1965.7 and the Bekaert-Engstrom-Xu index starts from 1985.6. The daily CRSP index starts from 1927.7. The results based on the other two proxies are stronger than that based on the squared Sharpe ratio of the CRSP index returns to support the Knightian uncertainty explanation.

S&P 500 index, inflation rate, default spread, and stock market portfolio returns, proposed by Ghysels, Santa-Clara and Valkanov (2005). The results are in Table 5. The coefficients of the macroeconomic state variables except the stock market return are significant. The R-squareds increase to between 35% and 37%. Both suggest that the EPU is related to macroeconomic states. However, the R-squareds also suggest that the majority (more than 60%) of the variation of the EPU cannot be explained by conventional risk proxies, risk-aversion dynamics and macroeconomic states. Following the argument in Section 2, we argue that the EPU-return relationship should be driven by the Knightian uncertainty out of capital markets.

3.4 Knightian Uncertainty–Return Tradeoff

In last section, we show that the significant EPU-return relationship should be attributed to the Knightian uncertainty which is not spanned by risk proxies. In this section, we investigate how important it is to incorporate unspanned risks (uncertainty) into the conditional risk in detecting the risk-return relationship. We re-conduct the conditional risk-return tradeoff tests after including both spanned and unspanned risk measures. We use the unexpected EPU index (residuals from the decompositions in Table 3 or Equation 15) as the proxy of unspanned uncertainties and two types of proxies of spanned risks, that is, the conventional conditional risk measures based on market portfolio returns and the fitted EPU index. By construction, we can perceive the relative importance of spanned and unspanned risks in the conditional risk-return relationship. The empirical results are reported in Table 6. In Panel A, we include the unspanned proxy (unexpected EPU Index) and various sets of the conventional spanned risk proxies in the risk-return tradeoff tests. The most impressive observation from Panel A is that the coefficients on all uncertainty proxies (models) are positive and statistically significant at 1% level. The coefficients on market return volatilities are positive but only two out of four cases are marginally significant (10%level). The coefficients on GARCH volatility are positive but small and insignificant. The coefficients on market return skewness or kurtosis are negative. In Panel B, we conduct conditional risk-return tests using the fitted EPU indexes from Table 3 as spanned risk proxies. Similar to Panel A, the coefficients on the unspanned risk proxies are around 0.70 and statistically significant at 1% level across all models. The coefficients on all spanned risk proxies are insignificant while some of them are positive.

To sum up, Table 6 suggests that unspanned uncertainty is the dominant component of investor's total risk, and that the inconclusive findings on risk-return tradeoff relationship in previous studies may be caused by the failure of incorporating unspanned risk into the conditional risk estimation.

3.5 Uncertainty–Return Tradeoff: Long Horizon

In previous sections, we find significant risk-return tradeoff relationship after incorporating unspanned risks into conditional risk. In this section, we test how robust the findings are. We first test whether whether the tradeoff relationship exists at long horizon, that is, we test risk-return relationship between conditional risk and cumulative excess returns over future three to 12 months.

$$\Pi_{i=1}^{k}[1+(R_{M,t+1}-R_{f,t+1})]-1=\alpha+\beta^{T}\text{Risk}_{t}+\delta^{T}*Control_{t}+\varepsilon_{t+1}, \tag{16}$$

where $\Pi_{i=1}^{k}[1+(R_{M,t+1}-R_{f,t+1})]-1$ is the cumulative excess market return over months $t+1$ to $t+k$, $Risk_t$ denotes the vector of spanned and unspanned risk measures in month t, and $Control_t$ is the vector of controlled macroeconomic variables in month t, including short-term interest rate, default spread, the dividend yield on the S&P 500 index, and one-month lagged market portfolio return.

Same to Panel A Table 6, we use various versions of unexpected EPU index from Table 3 as proxies of unspanned risks and the corresponding conventional spanned risk measures in our tests.[18] The empirical results of risk-return tradeoff tests between spanned and unspanned risks and cumulative excessive market portfolio returns over future three, six and 12 months are reported in Panels A, B and C in Table 7, respectively. Table 7 illustrates two interesting findings. First, the coefficient of unspanned risk proxies are positive and statistically significant at 1%level in all specifications and all panels. This coefficient is around 2 for tradeoff tests of risk and three-month cumulative returns, around 3.6 for tests with six-month cumulative returns, and around 6.3 for tests with 12-month cumulative returns. These are significant evidence that risk-return tradeoff exists in long-horizon. Second, the coefficients on spanned risk proxies, including range and GARCH volatilities, skewness, and kurtosis of market portfolio returns, are either negative or positive but insignificant across all panels (horizons). The coefficient of the conventional market-return volatility

[18]In an untabulated table, we find that the results are unchanged when we use the fitted EPU indexes as proxies of spanned risks.

is positive and insignificant. In the tradeoff test of risk and 6-month returns, however, this coefficient becomes positive and significant when all spanned risk measures are included. This inconsistency arises because of the collinearity issue in the specification as we already see in Table 1 that the correlation between the conventional and range volatility of market returns is as high as 0.95, and the correlation between the conventional and GARCH volatilities is 0.5 and significant. To sum up, Table 7 suggests that risk-return tradeoff relation exists in long horizons and ignorance of unspanned risks in the conditional risk estimation may fail to detect such a relationship.

3.6 Knightian Uncertainty and Corporate Bond Markets

3.6.1 Does EPU-Return Exist in Bond Market?

In this section, we test whether the risk-return tradeoff and EPU-return tradeoff exist in corporate bond markets. According to Section 2, we expect to detect a significant positive EPU-return tradeoff. We use the average returns of the long-term corporate bonds issued by U.S. firms as the main approximation of corporate bond market.[19] The sample spans from January 1926 to December 2016. Since the daily returns are not available, we use GACRH variance as a proxy of Knightian risks in bond markets. We conduct both simple regressions of return-risk tradeoff test for the GARCH variance and the EPU index and regressions of risk-return tradeoff tests controlling the main macroeconomic predictors used in the literature. The empirical test results are illustrated in Table 8. The first three columns are the results of simple regressions and the second three columns are results of multiple regressions. Neither case, however, suggests a significant risk-return tradeoff but both cases suggest a significant EPU-return tradeoff in bond market. Similar to studies on risk-return tradeoff equity markets (e.g. Bali, 2008; Nyberg, 2012), the coefficient of the GARCH variance is positive but insignificant in both simple and multiple regressions. However, the EPU-return relationship is positive and very significant. The coefficient of the EPU index is 0.29 (t=4.43) in the simple regression and 0.26 (t=3.17) in the multiple regression. The coefficients of the EPU index are unchanged when the GARCH variance is added in the regressions (Columns 3 and 6).

[19]The data is from Amit Goyal's website. We also use the LUACTRUU index from Bloomberg as the base approximation of corporate bond markets because it is a comprehensive index for U.S. corporate bond issues. The data spans from January 1973 to December 2016, which is about half of the length of our main sample.The results based on this index are quantitatively similar.

3.6.2 EPU–Return Tradeoff and Knightian Uncertainty

Given the significant EPU-return tradeoff, we investigate whether this tradeoff is a proxy of Knightian uncertainty-return tradeoff by excluding the three alternative explanations suggested in Section 3.3. We conduct similar regressions, that is regressing the EPU index on the bond market GARCH variance, the squared Sharpe ratio, the four macroeconomic variables, or various combinations of these variables. The results are in Table 9. The first column reports the results of whether the EPU-return relationship can be explained by return variance of bond market portfolio. The coefficient of the GARCH variance is 0.31 (t=5.21) and the R-squared is only 9.45%, suggesting that the spanned risks in bond market cannot explain the EPU-return relationship. The second column reports the results of whether the EPU-return relationship can be explained by the dynamics of investor's risk-aversion proxied by the squared Sharpe ratio of stock market returns. The low R-squared (2.99%) does not support this explanation. The third column reports the results whether the EPU-return tradeoff can be explained by macroeconomic state variables. The coefficients of the dividend yield on the S&P 500 index, the inflation rate and the default spread are statistically significant and the R-squared is 34.61%, implying that macroeconomic state may explain a significant part of the EPU-return tradeoff and that the majority of this tradeoff (around two thirds) remained unexplained. Columns 4 and 5 report the results of whether the EPU-return tradeoff can be explained by both spanned risk and risk aversion as well as macroeconomic state. The R-squared becomes 35.21% when all proxy variables are considered, suggesting that the majority of the EPU-return tradeoff cannot be explained by these three explanations. In short,the results in Table 9 are again consistent with Baker, Bloom and Davis (2016) that the EPU index can effectively measure risks broadly spanned from capital markets to areas of macroeconomy, monetary policy, fiscal policy, national security, international trade, sovereign credit and so on.

3.7 Further Analysis

3.7.1 Categorical Knightian Uncertainty

In this section, we conduct several analyses to further understand the sources of Knightian uncertainty. As we discussed in previous section, the EPU index is designed to capture uncertainty outside capital market which significantly affects stock prices but cannot be spanned by conventional risk factors, risk aversion dynamics or macroeconomic investment opportunity states. In addition to the comprehensive uncertainty index, Baker, Bloom and Davis also use the same approach to generate uncertainty index for each unspanned category, including uncertainties from (1) economic policy, (2) monetary policy, (3) fiscal policy, (4) taxes, (5) government spending, (6) healthcare, (7) national security, (8) government entitled programs, (9) general regulations, (10) financial regulations, (11) trading policy, and (12) sovereign debt and currency. These categorical indexes individually capture Knightian uncertainty in each category and allow us to explore the relative importance of the categorical Knightian uncertainty in investor's total uncertainty. Following the analysis in previous section, we first test whether the EPU-return tradeoff exists in each category. We then investigate whether such tradeoff can be attributed to Knightian uncertainty by testing whether market volatility, dynamic risk aversion and macroeconomic investment state can explain the variation of each categorical EPU index. Finally, we test whether categorical Knightian uncertainty-return tradeoff exists using a derived Knightian uncertainty proxy in the tradeoff test.

The empirical results of the categorical EPU-return tradeoff tests are in Table 10. Panel A reports the results of regressions of expected market return (approximated by next-month return) on each categorical EPU index and conventional macroeconomic variables. The results suggests that the EPU-return tradeoff is significantly supported by the categorical EPU index using uncertainty events in areas of economic policy, fiscal policy, taxes, healthcare policy, nation security and government entitled program, respectively. Panel B further controls the volatility of market portfolio returns and suggests that the insignificant positive tradeoff in Panel A in areas of monetary policy, government spending, and regulations is driven by the negative tradeoff of market volatility-return. The tradeoff in these areas becomes significant after the market return variance is controlled in tests. One interesting observation is the negative but insignificant tradeoff in the financial regulation area, which implies that the categorical EPU index in this area may be a proxy of spanned conventional risks (as we will show further evidence in next analysis). In total, Table 10 suggests that the EPU-return tradeoff exists in 11 out of 12 categories and significantly exists in 6 (or 9) areas.

After documented the evidence of EPU-return tradeoff in many categories, we test whether such tradeoff exists mainly because these categorical EPU indexes effectively capture Knightian uncertainty in these areas. The results are reported in Table 11 and suggest that the EPU-return tradeoff in each category, except the financial regulation area, cannot be attributed to market return variance, time-varying risk aversion, or the macroeconomic investment state. The R-squared in most regressions of categorical EPU indexes on market volatility, risk aversion and macroeconomic variable is lower than 20% except in the regression for the financial regulation category (39.43%) and for the macroeconomic policy category (30.53%). In other words, Table 11 suggests that the categorical EPU-return tradeoff should be attributed the Knightian uncertainty contained in each categorical EPU index.

In the next, we test whether there exists a Knightian uncertainty-return tradeoff in each category. We construct a Knightian uncertainty index in each category using the residual from the regression of categorical EPU index on market return volatility. We further control the conventional macroeconomic variables and market return volatility in the tradeoff tests. The results are in Table 12 and show that the Knightian uncertainty-return tradeoff exists in 11 categories and significantly exists in 9 categories. Comparing with the Panel B of Table 10, the coefficient of the Knightian uncertainty proxy and the R-squared in each regression are almost unchanged while the magnitude of coefficient of the market return volatility becomes less negative. This is further evidence that the EPU-return tradeoff in these areas is mainly driven by Knightian uncertainty.

We further test whether the unspanned categorical Knightian uncertainty supports long-horizon uncertainty-return tradeoff relations by regressing cumulative excess market returns over future three, six or 12 months on each unspanned categorical Knightian uncertainty proxy defined in Table 12, market return volatility (spanned risk proxy) and other control variables. The results are respectively reported in Panels A, B and C in Table 13. The tradeoff relationship between unspanned uncertainty and cumulative 3-month excess returns (Panel A) is stronger than the one-month return-risk tradeoff (Table 12). Specifically, all types of unspanned categorical Knightian uncertainty, except unspanned Knightian regulatory uncertainty or unspanned Knightian uncertainty in financial regulations, support a significant risk-3-month-return tradeoff relationship. Panels B and C in Table 13 show that the long-horizon tradeoffs between unspanned categorical Knightian uncertainty and returns become weaker. Only six out of 12 unspanned categorical uncertainty indexes are positive and significantly related to future six-month cumulative returns and five of them are positively and significantly related to future 12-month cumulative returns.

3.7.2 International Evidence

In this section, we test whether the Knightian EPU-return tradeoff exists in international markets. We borrow the international EPU indexes constructed by Baker, Bloom and Davis (2016) as the unspanned Knightian uncertainty proxy for the corresponding markets. These indexes are constructed using the same text analysis on local English-based newspapers. Specifically, Baker, Bloom and Davis construct an EPU index for each of 19 markets covering the major markets in Asia, Europe, North and South America. We use 18 of them because the sample period for the EPU index of Mexico only spans from 1996 to 2016. In each market, we use the major stock market index of a market as the proxy of market portfolio. The tradeoff test is specified as:

$$E_t[R_{i,t+1}] = \alpha_i + \gamma EPU_{i,t} + \delta R_{i,t} + \varepsilon_{i,t+1}, \tag{17}$$

where $R_{i,t}$ is the market portfolio return of market i in month t. The results are reported in Table 14. The tradeoff coefficients are positive for G7 markets, which is consistent with the findings by Pastor, Sinha and Swamninathan (2008). However, Table 14 shows that the significant tradeoff relationship between EPU index and market portfolio returns only exists in four markets, including Korea, Netherlands, Spain and U.K. However, it may be too risky to make inference from Table 14 that no uncertainty-return tradeoff exists in other markets for several reasons. The first reason is the short sample period. Table 14 shows that the number of total observations is fewer than 200 for four markets, and fewer than 300 for 11 markets. Second, the EPU index based on counting uncertainty news in local market may not be a sufficient statistic for markets which are highly integrated with other markets (for example the individual markets in Eurozone). Third, large noise may be introduced during the EPU index construction process, which based on local newspapers issued in English, for markets which official languages are not English, such as China or Russia. Finally, current indexes for many markets are constructed on too few leading news papers. [20]

[20]For example, the EPU index for China is constructed based on South China Morning Post circulated only in Hong Kong; the EPU index for Russia is constructed only using Kommersant.

4 Conclusions

The positive risk-return tradeoff is the most important and fundamental concept in finance while this relationship is hard to be detected because it is challenging to find appropriate proxies of conditional risk and expected return. Following Merton (1973) and by introducing a explicit state variable, we briefly show that the conditional risk should contain both spanned risks and unspanned Knightian uncertainty. Borrowing the Economic Policy Uncertainty index from Baker, Bloom and Davis (2016), which is expected to capture unspanned risks from security, political, economic and other areas by construction, we empirically show that incorporating unspanned Knightian uncertainty into conditional risk estimation successfully detects a risk-return tradeoff at both short and long horizons, and this tradeoff is robust. Further analyses show that unspanned risks themselves are able to detect a risk-return tradeoff and unspanned uncertainty estimation is complicate and not straightforward. Moreover, our findings on the tradeoff between portfolio returns and unspanned Knightian uncertainty also remain in corporate bond markets.

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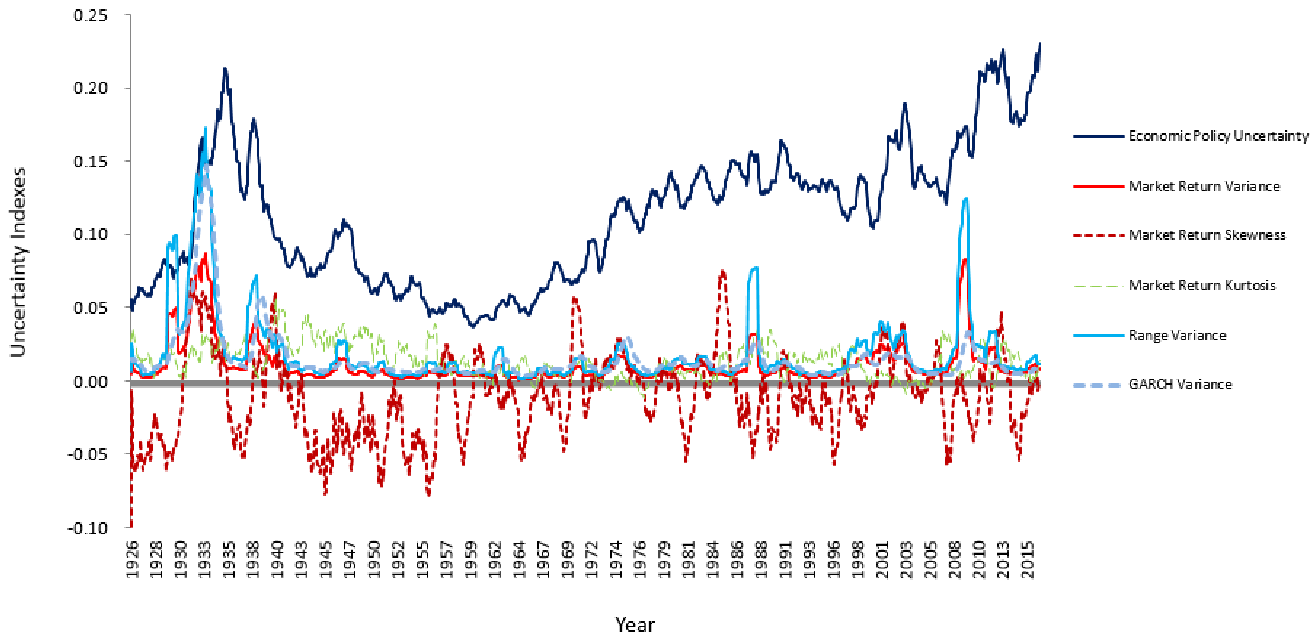
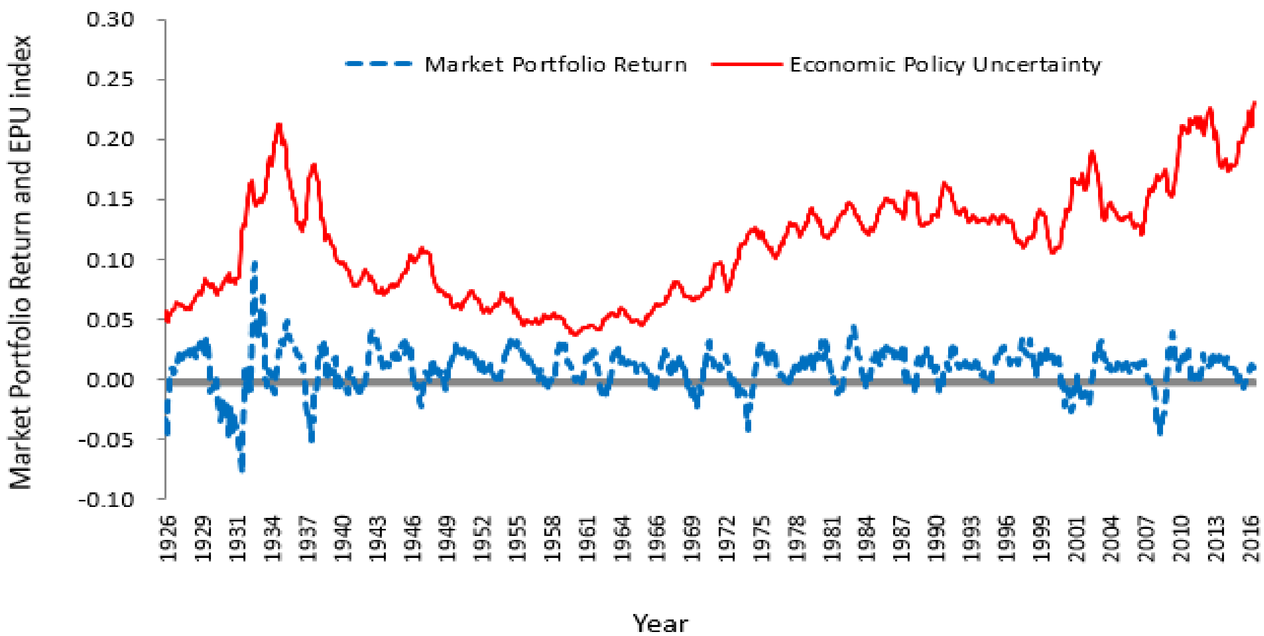
Fig. 1. Time Series of Spanned Risks and the EPU Index



This figure plots the time series of 12-month moving averages of all spanned and unspanned risk proxies, including the variance, range-volatility, GARCH-volatility, skewness and kurtosis of the CRSP value-weighted index returns, and the Bloom-Baker-Davis Economic Policy Uncertainty (EPU) Index. The sample period is 1926:01–2016:12.

Fig. 2. Time Series of the EPU Index and Market Portfolio Returns



This figure plots the time series of 12-month moving averages of the EPU index by Bloom, Baker and Davis, and the CRSP value-weighted index returns. The sample period is 1926:01–2016:12.

Table 1 Summary Statistics

This table reports summary statistics of all risk proxies used in this study. Market portfolio is approximated by the value-weighted CRSP index portfolio (VWRETD). Monthly market portfolio return volatility, skewness and kurtosis are computed based on daily returns. Range volatility is defined in Alizadeh, Brandt and Diebold (2002), and GARCH volatility is derived from the GARCH (2,1) process of monthly VWRETD. EPU is the Economic Policy Uncertainty Index and from Baker, Bloom and Davis. Panel A reports mean, median, standard deviation, and the results of AR(1) process test for each series (the AR(1) coefficient and the associated Durbin-Waston statistic). Panel B reports the correlation matrix of all risk proxies. The corresponding p-value is in parenthesis and the sample period is from January 1926 to December 2016. *** and * denote statistical significance at the 1% and 10% level, respectively. The sample period is from January 1926 to December 2016.

Panel A: Summary Statistics

	Sample period	Mean	Median	Std. Dev.	Coef of AR(1)	DW-stat of AR(1)
Market Return	1926-2016	0.92	1.26	5.36	-0.11***	1.78
Market Volatility	1926-2016	0.01	0.01	0.02	-0.61***	0.77
Range Volatility	1926-2016	0.19	0.08	0.44	-0.45***	1.10
GARCH Volatility	1926-2016	0.29	0.18	0.40	-0.98***	0.03
Market Skewness	1926-2016	-0.11	-0.09	0.70	-0.12***	1.76
Market Kurtosis	1926-2016	0.67	0.28	1.65	-0.01	1.98
EPU Index	1900-2016	4.70	4.78	0.45	-0.85***	0.31

Panel B: Correlations between Risk Proxies

	MKT Vol	Range	GARCH	MKT Skew	MKT Kurto	EPU
Market Return	-0.25***	-0.25***	0.03	0.12*	-0.04	-0.03
(p-value)	(0.00)	(0.00)	(0.37)	(0.06)	(0.19)	(0.33)
Market Vol.		0.95***	0.50***	0.10	0.11***	0.21***
(p-value)		(0.00)	(0.00)	(0.95)	(0.03)	(0.00)
Range Vol.			0.46***	0.08***	0.210***	0.17***
(p-value)			(0.00)	(0.01)	(0.00)	(0.00)
GARCH Vol.				0.16***	0.04	0.15***
(p-value)				(0.00)	(0.18)	(0.00)
Market Skew					-0.22***	0.14
(p-value)					(0.00)	(0.27)
Market Kurto						-0.21
(p-value)						(0.50)

Table 2 Uncertainty–Return Tradeoff Analysis

This table reports the empirical results of risk-return tradeoff test using various spanned and unspanned uncertainty proxies, including the volatility, range volatility, GATCH volatility, skewness, and kurtosis of market portfolio, the Economic Policy Uncertainty (EPU) Index by Baker, Bloom and Davis. The risk-return tradeoff test is specified as: $R_{M,t+1} - R_{f,t+1} = \alpha + \beta * \text{RiskProxy}_t + \delta^T * Control_t + \varepsilon_{t+1}$, where $(R_{M,t+1} - R_{f,t+1})$ is the CRSP VWRETD portfolio return in excess of the three-month T-bill rate in month $t+1$, $RiskProxy_t$ is the risk proxy in month t, and $Control_t$ is the vector of controlled macroeconomic variables in month t, including short-term interest rate, default spread, the dividend yield on the S&P 500 index and one-month lagged market portfolio return. Panel A reports the the coefficient of each market risk proxy based on simple tradeoff regressions (without control variables, and the sample is spanned back to 1900 using data from Schwert's website) and Panel B reports the the coefficient of each market risk proxy based on multiple regressions over the sample period from January 1926 to December 2016. The Newey-West $t-$statistics with 3 lags are in parenthesis. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Panel A: Simple Regressions for Individual Risk Proxies

	Dependent variable: next-month excess market returns					
Uncertainty Proxy	1	2	3	4	5	6
Market Volatility	-0.03					
	(-0.09)					
Range Volatility		-0.14				
		(-0.38)				
GARCH Variance			0.12			
			(0.40)			
Market Skewness				-0.05		
				(-0.30)		
Market Kurtosis					0.12	
					(0.61)	
EPU						0.33**
						(2.15)
Intercept (%)	0.61***	0.66***	0.49**	0.58***	0.55***	-0.09
	(3.35)	(3.90)	(2.16)	(3.51)	(3.62)	(-0.27)
N	1,400	1,400	1,400	1,400	1,400	1,400
R^2 (%)	0.02	0.15	0.04	0.03	0.03	0.37

Panel B: Multiple Regressions for Individual Risk Proxies						
	Dependent variable: next-month excess market returns					
Uncertainty Proxy	1	2	3	4	5	6
Market Volatility	-0.08					
	(-0.18)					
Range Volatility		-0.23				
		(-0.53)				
GARCH Volatility			-0.30			
			(-0.80)			
Market Skewness				-0.21		
				(-1.11)		
Market Kurtosis					0.07	
					(0.32)	
EPU						0.70***
						(3.19)
S&P Dividend yield	0.28**	0.28**	0.29**	0.27**	0.28**	0.51***
	(2.03)	(2.04)	(2.09)	(2.02)	(1.99)	(3.23)
Inflation rate	-0.42	-0.44	-0.44	-0.43	-0.42	-0.54
	(-1.29)	(-1.32)	(-1.34)	(-1.31)	(-1.27)	(-1.61)
Default spread	0.09	0.18	0.33	0.10	0.04	-0.60
	(0.19)	(0.36)	(0.48)	(0.20)	(0.07)	(-1.02)
Market return	0.10	0.10	0.11**	0.11**	0.11**	0.10*
	(1.63)	(1.53)	(1.98)	(2.07)	(1.96)	(1.87)
Intercept (%)	-0.46	-0.48	-0.58	-0.52	-0.47	-2.05**
	(-0.53)	(-0.55)	(-0.62)	(-0.61)	(-0.54)	(-2.11)
N	1,091	1,091	1,091	1,091	1,091	1,091
R^2 (%)	2.35	2.47	2.48	2.47	2.35	3.42

Table 3 Does Volatility Span the EPU?

This table reports the empirical results of whether the EPU-return tradeoff in Table 2 is spanned by conventional spanned risk measures of the volatility, range volatility, GATCH volatility, skewness, and kurtosis of stock market portfolio returns by regressing the EPU index on each conventional risk proxy as: $EPU_t = \kappa + \beta * Vol_t + \varepsilon_t$. The R-squared represents the spanning power of return volatilities. This table reports the coefficient of each volatility proxy in the equation and the associated R-squared from the regression. The Newey-West t-statistics with 3 lags are in parenthesis. The whole sample period is from January 1926 to December 2016. *** and ** denote statistical significance at the 1% and 5% levels, respectively.

Volatility Proxy	1	2	3	4	5	6
Market Variance	0.21***					0.53***
	(3.58)					(2.92)
Range Variance		0.17***				-0.38**
		(2.81)				(-2.16)
GARCH Variance			0.15***			0.04
			(3.41)			(0.78)
Market Skewness				0.14***		0.11***
				(4.34)		(3.21)
Market Kurtosis					-0.02	0.02
					(-0.65)	(0.64)
Intercept	0.02***	0.02***	0.02***	0.02***	0.02***	0.02***
	(34.29)	(35.34)	(30.18)	(38.58)	(37.78)	(30.34)
N	1,091	1,091	1,091	1,091	1,091	1,091
R^2 (%)	4.42	2.76	2.36	1.97	0.04	7.15

Table 4 Does Time–Varying Risk Aversion Span the EPU?

This table reports the empirical results of whether the EPU-return relation is spanned by the dynamics of market risk aversion by regressing the EPU index on the aversion proxy as: $EPU_t = \kappa + \beta * Vol_t + \theta * Aversion_t + \varepsilon_t$. The time-varying risk aversion is approximated by the monthly Sharpe ratio of daily returns on the CRSP value-weighted index. This table reports the coefficient of each market uncertainty proxy in the equation and the associated R-squared from the regression. The Newey-West *t*-statistics with 3 lags are in parenthesis. The sample period is from July 1926 to December 2016. *** and ** denote statistical significance at the 1% and 5% levels, respectively.

	Dependent variable: Economic Policy Uncertainty Index					
	1	2	3	4	5	6
Market Variance	0.19***					0.49***
	(3.35)					(2.81)
Range Variance		0.15**				-0.35**
		(2.60)				(-2.06)
GARCH Variance			0.14***			0.03
			(3.19)			(0.69)
Market Skewness				0.15***		0.13***
				(4.77)		(3.56)
Market Kurtosis					-0.03	0.02
					(-0.95)	(0.44)
Squared S.R.	-0.15***	-1.57***	-0.16***	-0.19***	-0.18***	-0.16***
	(-7.15)	(-7.36)	(-7.37)	(-7.95)	(-7.78)	(-7.22)
Intercept (%)	0.02***	0.02***	0.02***	0.02***	0.02***	0.02***
	(33.87)	(34.93)	(30.09)	(37.15)	(37.15)	(30.09)
N	1,086	1,086	1,086	1,086	1,086	1,086
R^2 (%)	6.62	5.19	4.97	5.38	3.08	9.54

Table 5 Do State Variables Span the EPU?

This table reports the empirical results of whether the EPU-return relation is spanned by macroeconomic investment state variables by regressing the EPU index on these variables as: $EPU_t = \kappa + \beta * Vol_t + \theta * Aversion_t + \delta * State_t + \varepsilon_t$. This table reports the coefficient of each market uncertainty proxy in the equation and the associated R-squared from the regression. The Newey-West t-statistics with 3 lags are in parenthesis. The whole sample period is from July 1927 to December 2016. *** and ** denote statistical significance at the 1% and 5% levels, respectively.

	Dependent variable: Economic Policy Uncertainty Index					
	1	2	3	4	5	6
Market Variance	0.003					0.17
	(0.07)					(1.19)
Range Variance		-0.01				-0.14
		(-0.19)				(-0.95)
GARCH Variance			-0.16***			-0.18***
			(-2.90)			(-2.93)
Market Skewness				0.05*		0.06**
				(1.78)		(1.99)
Market Kurtosis					0.02	0.05
					(0.76)	(1.54)
Squared S.R.	-0.09***	-0.09***	-0.09***	-0.09***	-0.08***	-0.09***
	(-4.67)	(-4.68)	(-5.04)	(-4.91)	(-4.56)	(-5.18)
S&P Dividend Yield	-0.31***	-0.31***	-0.31***	-0.31***	-0.31***	-0.31***
	(-12.10)	(-12.10)	(-12.13)	(-12.01)	(-11.86)	(-11.97)
Inflation rate	0.16**	0.16***	0.14**	0.16***	0.16***	0.15***
	(2.62)	(2.64)	(2.55)	(2.72)	(2.64)	(2.70)
Default spread	0.88***	0.89***	1.04***	0.86***	0.88***	1.00***
	(11.47)	(11.99)	(11.65)	(12.91)	(12.42)	(10.94)
Market return	0.01	0.01	0.01	0.01	0.01	0.01
	(1.29)	(1.20)	(1.47)	(1.03)	(1.23)	(1.61)
Intercept (%)	0.02***	0.02***	0.02***	0.02***	0.02***	0.02**
	(19.44)	(19.45)	(19.36)	(19.28)	(19.51)	(19.37)
N	1,086	1,086	1,086	1,086	1,086	1,086
R^2 (%)	35.12	35.12	36.41	35.33	35.16	37.02

Table 6 Knightian Uncertainty–Return Tradeoff

This table reports the empirical results of the Knightian uncertainty-return tradeoff test using various unspanned uncertainty proxies. The unspanned Knightian uncertainty is approximated by the unexpected EPU in Table 3. The Knightian uncertainty-return tradeoff test is specified as: $R_{M,t+1} - R_{f,t+1} = \alpha + \beta * Uncertainty_t + \delta^T * Control_t + \varepsilon_{t+1}$, where $(R_{M,t+1} - R_{f,t+1})$ is the CRSP VWRETD portfolio return in excess of the three-month T-bill rate in month $t+1$, $Uncertainty_t$ denotes either spanned Knightian risk or unspanned Knightian uncertainty in month t, and $Control_t$ is the vector of controlled spanned risk proxies and macroeconomic variables, including short-term interest rate, default spread, the dividend yield on the S&P 500 index and one-month lagged market portfolio return. Panels A and B test the relationship between next-month market return and unspanned Knightian uncertainty (approximated by unexpected EPU from Table 3) after controlling for the conventional Knightian risk proxies (Panel A) or the expected EPU (Panel B). The Newey-West t-statistics with 3 lags are in parenthesis. This table reports the coefficients in the tradeoff test equation. The Newey-West t-statistics with 3 lags are reported in the parenthesis. The sample period is from January 1926 to December 2016. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Panel A: Knightian Uncertainty ($UnexpectedEPUIndex$) + Return Moments

	Dependent variable: next-month excess market returns							
	1	2	3	4	5	6	7	8
Knightian Uncertainty	0.66***	0.71***	0.66***	0.70***	0.71***	0.69***	0.69***	0.67***
($UnexpectedEPU$)	(2.97)	(3.17)	(3.03)	(3.19)	(3.23)	(3.15)	(3.21)	(3.13)
Market Volatility	1.80*	0.06	1.59*	0.06				
	(1.84)	(0.15)	(1.70)	(0.15)				
Range Volatility	-0.13	-0.15			-0.14			
	(-0.62)	(-0.71)			(-0.75)			
GARCH Volatility	0.20	0.001				0.04		
	(0.90)	(0.00)				(0.17)		
Market Skewness	-1.79**		-1.55*				-0.11	
	(-2.29)		(-1.89)				(-0.26)	
Market Kurtosis	-0.12		-0.12					-0.09
	(-0.31)		(-0.30)					(-0.23)
S&P Dividend Yield	0.50***	0.49***	0.52***	0.50***	0.50***	0.50***	0.50***	0.50***
	(3.15)	(3.11)	(3.27)	(3.22)	(3.23)	(3.09)	(3.23)	(3.28)
Inflation rate	-0.52	-0.57*	-0.50	-0.56	-0.56*	-0.55	-0.56*	-0.56*
	(-1.44)	(-1.66)	(-1.41)	(-1.61)	(-1.66)	(-1.61)	(-1.64)	(-1.64)
Default spread	-0.42	-0.47	-0.49	-0.54	-0.53	-0.59	-0.45	-0.39
	(-0.63)	(-0.89)	(-0.72)	(-1.00)	(-0.92)	(-1.00)	(-0.82)	(-0.52)
Market return	0.11*	0.11*	0.10	0.10	0.11**	0.10*	0.09	0.10*
	(1.64)	(1.67)	(1.54)	(1.55)	(1.98)	(1.87)	(1.46)	(1.88)
Intercept (%)	-0.87	-0.70	-0.78	-0.64	-0.63	-0.57	-0.64	-0.72**
	(-0.95)	(-0.83)	(-0.85)	(-0.75)	(-0.74)	(-0.66)	(-0.74)	(-0.79)
N	1,091	1,091	1,091	1,091	1,091	1,091	1,091	1,091
R^2 (%)	3.32	3.25	3.54	3.44	3.54	3.48	3.60	3.43

Panel B: Knightian Uncertainty ($UnexpectedEPUIndex$) + $ExpectedEPU$								
	Dependent variable: next-month excess market returns							
	1	2	3	4	5	6	7	8
Knightian Uncertainty	0.70***	0.69***	0.67**	0.71***	0.69***	0.70***	0.70***	0.69***
($UnexpectedEPU$)	(3.19)	(3.21)	(3.13)	(3.23)	(3.15)	(3.17)	(3.20)	(3.16)
$E_t[EPU\|_{MKTVOL}]$	0.30							
	(0.14)							
$E_t[EPU\|_{RangeVOL}]$		-0.68						
		(-0.26)						
$E_t[EPU\|_{GARCHVOL}]$			-0.57					
			(-0.23)					
$E_t[EPU\|_{MKTSkew}]$				-0.97				
				(-0.75)				
$E_t[EPU\|_{MKTKurto}]$					-1.90			
					(-0.18)			
$E_t[EPU\|_{allVOLs}]$						1.44		
						(0.92)		
$E_t[EPU\|_{MKTmoments}]$							-0.21	
							(-0.13)	
$E_t[EPU\|_{all}]$								0.83
								(0.61)
S&P Dividend yield	0.50***	0.50***	0.50***	0.50***	0.50***	0.52***	0.49***	0.51***
	(3.22)	(3.23)	(3.28)	(3.23)	(3.09)	(3.24)	(3.17)	(3.20)
Inflation rate	-0.56	-0.56*	-0.56*	-0.56*	-0.55	-0.51	-0.58*	-0.54
	(-1.61)	(-1.64)	(-1.64)	(-1.66)	(-1.61)	(-1.49)	(-1.67)	(-1.57)
Default spread	-0.54	-0.45	-0.39	-0.53	-0.59	-0.76	-0.43	-0.63
	(-1.00)	(-0.82)	(-0.52)	(-0.92)	(-1.00)	(-1.46)	(-0.80)	(-1.20)
Market return	0.10	0.09	0.10*	0.11**	0.10*	0.11*	0.10*	0.10*
	(1.55)	(1.46)	(1.88)	(1.98)	(1.87)	(1.84)	(1.67)	(1.82)
Intercept (%)	-1.25	0.77	0.004	1.47	3.52	-3.52	-0.24	-2.31
	(-0.27)	(0.14)	(0.09)	(0.51)	(0.15)	(-1.02)	(-0.07)	(-0.76)
N	1,091	1,091	1,091	1,091	1,091	1,091	1,091	1,091
R^2 (%)	3.44	3.55	3.48	3.60	3.43	3.49	3.54	3.42

Table 7 Knightian Uncertainty–Return Tradeoff: Long Horizon

This table reports the empirical results of the long-run uncertainty-return tradeoff test using various proxies of unspanned Knightian uncertainty. The unspanned risks are approximated by the unexpected EPU in Table 3. The Knightian uncertainty-return tradeoff test is specified as: $\Pi_{i=1}^{k}[1+(R_{M,t+1}-R_{f,t+1})]-1 = \alpha+\beta*\text{Uncertainty}_t+\delta^T*Control_t+\varepsilon_{t+1}$, where $\Pi_{i=1}^{k}[1+(R_{M,t+1}-R_{f,t+1})]-1$ is the cumulative excess market return over months $t+1$ to $t+k$, $Uncertainty_t$ denotes the unspanned Knightian uncertainty in month t, and $Control_t$ is the vector of controlled spanned risk proxies and macroeconomic variables, including short-term interest rate, default spread, the dividend yield on the S&P 500 index and one-month lagged market portfolio return. Unspanned Knightian uncertainties are approximated by the unexpected EPU index from EPU decomposition. Panel A tests the relationship between next-three-month excess market return and unspanned uncertainty after controlling for the conventional risk proxies based on market return. Panels B and C test the relationship between unspanned uncertainty and next-six-month (Panel B) or next-twelve-month (Panel C) cumulative market return. This table reports the coefficients in the tradeoff test equation. The Newey-West $t-$statistics with 3 lags are reported in the parenthesis. The sample period is from January 1926 to December 2016. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Panel A: cumulative excess market returns over next three months

	1	2	3	4	5	6	7	8
Knightian Uncertainty	1.93***	1.92***	1.98***	1.96***	1.96***	1.91***	1.99***	1.95***
(*Unexpected EPU*)	(2.77)	(3.09)	(3.05)	(3.08)	(3.08)	(3.09)	(3.10)	(3.04)
Market Vol.	1.00	0.52	0.07	0.13				
	(0.46)	(0.25)	(0.09)	(0.15)				
Range Vol	-0.24	-0.40			0.10			
	(-0.56)	(-0.22)			(0.13)			
GARCH Vol	0.47	-0.26				-0.14		
	(0.97)	(-0.28)				(-0.14)		
Market Skewness	-0.94		-0.23				-0.28	
	(-0.54)		(-0.55)				(-0.74)	
Market Kurtosis	-0.28		0.36					0.42
	(-0.30)		(0.72)					(0.89)
S&P Dividend yield	1.30***	1.35***	1.30***	1.36***	1.37***	1.36***	1.35***	1.33***
	(3.29)	(3.19)	(3.05)	(3.17)	(3.17)	(3.18)	(3.14)	(3.05)
Inflation rate	-1.69*	-1.65*	-1.68*	-1.62*	-1.60*	-1.61*	-1.62	-1.61
	(-1.78)	(-1.74)	(-1.76)	(-1.72)	(-1.66)	(-1.64)	(-1.63)	(-1.60)
Default spread	-0.50	-0.65	-0.82	-1.02	-1.09	-0.75	-1.06	-1.19
	(-0.27)	(-0.40)	(-0.64)	(-0.79)	(-0.85)	(-0.45)	(-0.74)	(-0.80)
Market return	-0.03	-0.04	-0.03	-0.04	-0.04	-0.03	-0.02	-0.03
	(-0.30)	(-0.40)	(-0.33)	(-0.46)	(-0.85)	(-0.33)	(-0.21)	(0.80)
Intercept (%)	–2.12	-1.93	-1.89	-1.73	-1.67	-1.89	-1.65	-1.55
	(-1.11)	(-0.95)	(-0.96)	(-0.86)	(-0.84)	(-0.93)	(-0.85)	(-0.77)
N	1,088	1,088	1,088	1,088	1,088	1,088	1,088	1,091
R^2 (%)	5.67	5.27	5.61	5.20	5.18	5.24	5.43	5.35

Panel B: cumulative excess market returns over next six months								
	1	2	3	4	5	6	7	8
Knightian Uncertainty	3.65***	3.64***	3.60***	3.57***	3.57***	3.63***	3.61***	3.55***
(*Unexpected EPU*)	(3.47)	(3.45)	(3.50)	(3.48)	(3.49)	(3.45)	(3.52)	(3.46)
Market Vol.	3.39**	2.76*	0.44	0.50				
	(2.10)	(1.70)	(0.55)	(0.61)				
Range Vol	-3.33**	-2.60*			0.23			
	(-2.19)	(-1.75)			(0.29)			
GARCH Vol	0.89	0.919				1.11		
	(0.49)	(0.51)				(0.62)		
Market Skewness	-0.34		-0.35				-0.34	
	(-0.67)		(-0.69)				(-0.73)	
Market Kurtosis	0.63		0.28					0.40
	(1.30)		(0.59)					(0.92)
S&P Dividend yield	2.41***	2.48***	2.38***	2.45***	2.45***	2.48***	2.42***	2.42***
	(4.39)	(4.45)	(4.36)	(4.41)	(4.39)	(4.38)	(4.39)	(4.34)
Inflation rate	-2.29	-2.23	-2.38	-2.31	-2.31	-2.24	-2.33	-2.31
	(-1.49)	(-1.45)	(-1.52)	(1.48)	(1.49)	(1.49)	(1.50)	(1.47)
Default spread	-3.49	-3.73	-2.69	-2.97	-2.92	-3.77	-2.90	-3.11
	(-1.23)	(-1.29)	(-1.11)	(1.20)	(1.19)	(1.29)	(1.21)	(1.47)
Market return	-0.02	-0.04	-0.001	-0.02	-0.03	-0.01	0.01	-0.01
	(-0.12)	(-0.29)	(-0.01)	(-0.16)	(-0.2)	(-0.11)	(0.08)	(-0.26)
Intercept (%)	-1.08	-8.04	-10.62	-0.86	-0.76	-0.66	-0.68	-0.50
	(-0.48)	(-0.35)	(0.46)	(0.37)	(0.32)	(0.29)	(0.30)	(0.05)
N	1,085	1,085	1,085	1,085	1,085	1,085	1,085	1,085
R^2 (%)	8.01	7.53	7.75	7.35	7.38	7.41	7.67	7.44

Panel C: cumulative excess market returns over next 12 months								
	1	2	3	4	5	6	7	8
Knightian Uncertainty	6.21***	6.20***	6.35***	6.33***	6.32***	6.20***	6.37***	6.31***
(*Unexpected EPU*)	(3.33)	(3.34)	(3.47)	(3.48)	(3.48)	(3.36)	(3.47)	(3.46)
Market Vol.	4.57*	3.87	0.75	0.86				
	(1.86)	(1.54)	(0.64)	(0.73)				
Range Vol	-3.94 **	-3.11			0.52			
	(-2.04)	(-1.53)			(0.52)			
GARCH Vol	-0.70	-0.62				-0.12		
	(-0.31)	(-0.27)				(-0.05)		
Market Skewness	0.15		0.15				0.18	
	(0.18)		(0.17)				(0.23)	
Market Kurtosis	0.80		0.36					0.41
	(1.14)		(0.51)					(0.63)
S&P Dividend yield	5.15***	5.22***	5.15***	5.22***	5.23***	5.21***	5.22***	5.20***
	(4.77)	(4.8)	(4.79)	(4.79)	(4.77)	(4.72)	(4.78)	(4.76)
Inflation rate	-3.71	-3.66	-3.73	-3.66	-3.64	-3.67	-3.64	-3.63
	(-1.25)	(-1.23)	(-1.25)	(-1.22)	(-1.21)	(-1.23)	(-1.21)	(-1.20)
Default spread	-3.80	-3.99	-4.59	-4.84	-4.84	-4.00	-4.97	-5.14
	(-0.92)	(-0.96)	(-1.34)	(-1.39)	(-1.40)	(-0.97)	(-1.46)	(-1.48)
Market return	0.06	0.05	0.05	0.03	0.03	0.06	0.07	0.06
	(0.39)	(0.31)	(0.31)	(0.21)	(0.19)	(0.41)	(0.47)	(0.40)
Intercept (%)	-4.95	-4.79	-4.21	-4.13	-3.95	-4.56	-3.54	-3.46
	(-1.09)	(-1.05)	(-0.92)	(-0.90)	(-0.86)	(-1.00)	(-0.78)	(-0.76)
N	1079	1079	1079	1091	1079	1079	1091	1079
R^2 (%)	14.18	14.00	14.04	13.89	13.90	13.98	13.96	13.92

Table 8 Uncertainty–Return Tradeoff in Corporate Bond Markets

This table reports the empirical results of uncertainty-return tradeoff test using the GARCH volatility of bond market portfolio and the Economic Policy Uncertainty (EPU) Index by Baker, Bloom and Davis. The tradeoff test is specified as: $R_{B,t+1} - R_{f,t+1} = \alpha + \beta * \text{Uncertainty}_t + \delta^T * Control_t + \varepsilon_{t+1}$, where $(R_{B,t+1} - R_{f,t+1})$ is the bond market portfolio return in excess of the three-month T-bill rate in month $t+1$, $Uncertainty_t$ is the risk proxy, including both the GARCH variance of bond returns and the EPU index, in month t, and $Control_t$ is the vector of controlled macroeconomic variables in month t, including short-term interest rate, default spread, the dividend yield on the S&P 500 index and one-month lagged market portfolio return. The Newey-West $t-$statistics with 3 lags are in parenthesis. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

	Dependent variable: next-month excess bond market returns					
	1	2	3	4	5	6
Bond Variance	0.12		0.03	0.05		0.04
	(0.92)		(0.24)	(0.42)		(0.33)
EPU		0.29***	0.28***		0.26***	0.26***
		(4.43)	(3.91)		(3.17)	(3.13)
S&P Dividend yield				-0.04	0.03	0.04
				(-0.90)	(0.76)	(0.87)
Inflation rate				0.23*	0.04	-0.27**
				(1.88)	(0.26)	(-1.98)
Default spread				-0.23*	-0.26*	0.01
				(-1.69)	(-1.71)	(0.07)
Market return				0.12***	0.11**	0.11**
				(2.84)	(2.60)	(2.62)
Intercept (%)	0.14*	-0.39***	-0.39***	0.10	-0.48**	-0.49**
	(1.67)	(-3.01)	(-3.02)	(0.51)	(-2.18)	(-2.15)
N	1,091	1,091	1,091	1,091	1,091	1,091
R^2 (%)	0.29	1.73	1.75	2.84	3.73	3.78

Table 9 Knightian Uncertainty and the EPU–Return Tradeoff in Bond Market

This table reports the empirical results of whether the EPU-return tradeoff in corporate bond market in Table 8 is spanned by bond return moments, time-varying risk aversion or macroeconomic investment state variables specified as: $EPU_t = \kappa + \beta * Vol_t + \theta * Aversion_t + \delta^T * State_t + \varepsilon_t$. This table reports the coefficient of each market uncertainty proxy in the equation and the associated R-squared from the regression. The Newey-West t-statistics with 3 lags are in parenthesis. The whole sample period is from July 1927 to December 2016. *** and ** denote statistical significance at the 1% and 5% levels, respectively.

	Dependent variable: Economic Policy Uncertainty Index				
	1	2	3	4	5
GARCH Variance	0.31***			0.30***	0.05
	(5.21)			(5.12)	(1.06)
Squared S.R.		-0.17***		-0.15***	-0.08***
		(-7.82)		(-7.24)	(-4.38)
S&P Dividend Yield			-0.31***		-0.30***
			(-12.29)		(-11.63)
Inflation rate			0.90**		0.84***
			(12.52)		(10.15)
Default spread			0.18***		0.14**
			(3.00)		(2.39)
Market return			0.01		0.01
			(0.58)		(0.53)
Intercept (%)	0.02***	0.02***	0.02***	0.02***	0.02***
	(29.56)	(37.76)	(19.24)	(29.32)	(19.49)
N	1,091	1,086	1,091	1,086	1,086
R^2 (%)	9.45	2.99	34.61	11.72	35.21

Table 10 Categorical Uncertainty–Return Tradeoff Analysis

This table reports the empirical results of multiple uncertainty-return tradeoff test using categorical EPU indexes (Panel A) with market return volatility (Panel B). Baker, Bloom and Davis generate 12 categorical EPU indexes, and in this table we examine the significance of each one separately. The 12 categories include: (1) economic policy, (2) monetary policy, (3) fiscal policy, (4) taxes, (5) government spending, (6) health care, (7) national security, (8) entitlement, (9) regulation, (10) financial regulation, (11) trade policy and (12) sovereign debt and currency.

Panel A: single categorical EPU index

	Dependent variable: next-month excess market returns											
Category	1	2	3	4	5	6	7	8	9	10	11	12
Economic Policy	0.51**											
	(2.11)											
Monetary Policy		0.32										
		(1.35)										
Fiscal Policy			0.52**									
			(2.34)									
Taxes				0.53***								
				(2.58)								
Gov. Spending					0.34							
					(1.27)							
Healthcare						0.60***						
						(2.94)						
National Security							0.40*					
							(1.87)					
Entitled Programs								0.44**				
								(1.99)				
Regulations									0.24			
									(0.93)			
Finance Regulation										-0.35		
										(-0.80)		
Trade Policy											0.12	
											(0.96)	
Debt&currency												0.21
												(0.90)
S&P Dividend yield	0.41	0.53*	0.49*	0.56**	0.48*	0.76***	0.52*	0.70**	0.60**	0.64**	0.57*	0.63**
	(1.39)	(1.87)	(1.80)	(2.03)	(1.67)	(2.69)	(1.93)	(2.53)	(2.18)	(2.30)	(1.93	(2.34)
Inflation rate	-0.36	-0.41	-0.36	-0.36	-0.40	-0.28	-0.46	-0.36	-0.39	-0.52	-0.41	-0.39
	(-0.52)	(-0.59)	(-0.52)	(-0.52)	(-0.57)	(-0.40)	(-0.65)	(-0.53)	(-0.56)	(-0.78)	(-0.58)	(-0.55)
Default spread	-0.92	-0.65	-0.94	-1.02	-0.66	-0.94	-0.69	-0.77	-0.78	-0.14	-0.47	-0.54
	(-0.88)	(-0.64)	(-0.89)	(-0.96)	(-0.65)	(-0.93)	(-0.66)	(-0.77)	(-0.80)	(-0.14)	(-0.44)	(-0.54)
Market return	0.09	0.08	0.08	0.08	0.08	0.07	0.08	0.07	0.07	0.06	0.07	0.07
	(1.28)	(1.25)	(1.16)	(1.14)	(1.16)	(1.07)	(1.17)	(1.10)	(1.15)	(1.03)	(1.10)	(1.10)
Intercept (%)	-0.59	-0.43	-0.37	-0.46	-0.14	-0.92	-0.29	-0.75	-0.40	-0.33	-0.27	-0.37
	(-0.59)	(-0.44)	(-0.38)	(-0.46)	(-0.14)	(-0.90)	(-0.29)	(-0.75)	(-0.38)	(-0.34)	(-0.26)	(-0.38)
N	383	383	383	383	383	383	383	383	383	383	383	383
R^2 (%)	2.76	2.21	2.91	2.98	2.24	3.44	2.49	2.69	1.99	2.16	1.80	1.96

Panel B: single categorical EPU index+ market volatility

	Dependent variable: next-month excess market returns											
	1	2	3	4	5	6	7	8	9	10	11	12
Econ Policy	0.73***											
	(3.00)											
Money Policy		0.55**										
		(2.31)										
Fisc Policy			0.60***									
			(2.67)									
Taxes				0.59***								
				(2.79)								
Gov.Spending					0.43*							
					(1.70)							
Healthcare						0.61***						
						(3.09)						
Security							0.46**					
							(2.16)					
Entitled								0.47**				
								(2.25)				
Regulations									0.41*			
									(1.77)			
Fin Regul.										-0.13		
										(-0.30)		
Trade Policy											0.19	
											(1.32)	
Debt&currency												0.30
												(1.33)
Market VOL	-0.98***	-0.97***	-0.84***	-0.82***	-0.83***	-0.76	-0.82***	-0.79**	-0.87***	-0.70**	-0.78**	-0.81***
	(-3.32)	(-3.40)	(-2.79)	(-2.69)	(-2.76)	(-0.99)	(-2.72)	(-2.63)	(-2.95)	(-2.61)	(-2.56)	(-2.74)
S&P Div yield	0.13	0.27	0.30	0.38	0.27	0.60**	0.34	0.55*	0.41	0.49*	0.38	0.47*
	(0.42)	(0.93)	(1.09)	(1.37)	(0.94)	(2.09)	(1.22)	(1.92)	(1.48)	(1.76)	(1.26)	(1.70)
Inflation rate	-0.87	-0.93	-0.82	-0.81	-0.85	-0.70	-0.92	-0.80	-0.84	-0.86	-0.83	-0.82
	(-1.33)	(-1.39)	(-1.24)	(-1.23)	(-1.29)	(-1.08)	(-1.38)	(-1.22)	(-1.20)	(-1.31)	(-1.25)	(-1.24)
Default spread	0.17	0.53	0.08	-0.03	0.38	0.03	0.32	0.21	0.19	0.47	0.58	0.51
	(0.17)	(0.56)	(0.08)	(-0.03)	(0.39)	(0.03)	(0.33)	(0.22)	(0.20)	(0.47)	(0.57)	(0.55)
Market return	0.01	0.01	0.01	0.004	0.01	0.002	0.01	0.002	0.001	0.01	0.01	-0.00
	(0.17)	(0.56)	(0.08)	(-0.03)	(0.39)	(0.03)	(0.33)	(0.22)	(0.20)	(0.47)	(0.57)	(-0.55)
Intercept (%)	-0.88	-0.72	-0.50	-0.58	-0.22	-1.02	-0.40	-0.88	-0.65	-0.31	-0.40	-0.54
	(-0.88)	(-0.73)	(-0.50)	(-0.58)	(-0.23)	(-0.99)	(-0.40)	(-0.88)	(-0.64)	(-0.32)	(-0.40)	(-0.57)
N	383	383	383	383	383	383	383	383	383	383	383	383
R^2 (%)	5.21	4.56	4.85	4.8	4.1	5.04	4.31	4.4	3.97	3.34	3.44	3.74

Table 11 Knightian Uncertainty and the Categorical EPU–Return Tradeoff

This table reports the empirical results of whether each categorical EPU Index is spanned by market return volatility, risk aversion dynamics and macroeconomic state variables by regressing each categorical EPU index on these variables as: $\text{CatEPU}_{i,t} = \alpha_i + \beta_i * \text{MKTVOL}_t + \theta_i * \text{Aversion}_t + \delta_i^T * \text{State}_t + \varepsilon_{i,t}$. The expected categorical EPU represents risks spanned by volatility, risk aversion dynamics or macroeconomic state, and the unexpected part ($\varepsilon_{i,t}$) captures unspanned Knightian uncertainty from the corresponding category. This table reports the coefficients in the equation for each categorical EPU index. The Newey-West $t-$statistics with 3 lags are in parenthesis. The whole sample period is from January 1985 to December 2016. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively. The stock market portfolio is approximated by the value-weighted CRSP portfolio.

Categorical EPU	Intercept	Volatility	Aversion	Dividend	Inflation	Default	Market ret	R^2 (%)
Economic Policy	0.01***	0.30***	0.09**	0.46***	0.02	0.31*	-0.01	30.53
	(3.54)	(4.22)	(2.41)	(4.98)	(0.10)	(1.82)	(-1.23)	
Monetary Policy	0.01***	0.39***	0.07	0.35***	0.13	-0.27	-0.01	18.46
	(3.03)	(4.22)	(1.47)	(3.27)	(0.73)	(-1.46)	(-0.92)	
Fiscal Policy	0.00*	0.14*	0.09*	0.26***	-0.08	0.52***	-0.01	17.21
	(1.65)	(1.88)	(1.94)	(2.88)	(-0.36)	(2.78)	-0.93)	
Taxes	0.01**	0.09	0.09*	0.13	-0.10	0.71***	-0.01	5.97
	(2.32)	(1.49)	(1.93)	(1.46)	(-0.44)	(3.79)	(-0.87)	
Gov. Spending	-0.00	0.17	0.08*	0.44***	-0.03	0.03	-0.01	16.45
	(-0.49)	(1.53)	(1.95)	(4.90)	(-0.12)	(0.13)	(-1.18)	
Healthcare	0.01***	0.00	0.02	-0.22**	-0.28	0.59**	-0.00	7.32
	(5.03)	(0.02)	(0.57)	(-2.38)	(-1.35)	(-2.59)	(-0.30)	
Security	0.00	0.14***	0.03	0.28**	0.13	0.12	-0.01	8.23
	(1.00)	(2.89)	(0.86)	(2.34)	(0.63)	(0.53)	(-0.55)	
Entitled Program	0.01***	0.06	0.08*	-0.18**	-0.14	0.37*	-0.00	4.94
	(5.48)	(0.76)	(1.71)	(-2.18)	(-0.64)	(-1.75)	(-0.34)	
All Regulations	0.01***	0.28***	0.07**	0.14	-0.07	0.47***	-0.00	19.77
	(4.35)	(3.90)	(2.01)	(1.51)	(-0.41)	(2.65)	(-0.20)	
Fin Regulation	-0.00**	0.40***	0.03	0.13*	0.00	0.77***	-0.00	39.43
	(-2.05)	(5.94)	(0.93)	(1.65)	(0.01)	(4.86)	(-0.25)	
Trade Policy	0.01***	0.13***	0.05	0.49***	-0.19	(-1.05)***	-0.00	16.48
	(3.60)	(3.71)	(1.11)	(4.41)	(-1.25)	(-3.98)	(-0.51)	
Sovereign	0.01***	0.20*	0.05	-0.01	-0.15	-0.43*	0.01	3.75
	(2.88)	(1.93)	(0.67)	(-0.11)	(-1.08)	(-1.70)	(0.98)	

Table 12 Categorical Knightian Uncertainty–Return Tradeoff Test

This table reports the empirical results of the categorical Knightian uncertainty-return tradeoff test. Baker, Bloom and Davis generate one EPU index for each of 12 categories: (1) economic policy, (2) monetary policy, (3) fiscal policy, (4) taxes, (5) government spending, (6) health care, (7) national security, (8) entitlement, (9) regulation, (10) financial regulation, (11) trade policy and (12) sovereign debt and currency. Each index is decomposed into an expected part (Knightian risk) and an unexpected part (Knightian uncertainty) by regressing the index on market portfolio volatility as: $\text{CatEPU}_{i,t} = \alpha_i + \beta_i * \text{MKTVOL}_t + \varepsilon_{i,t}$. The expected categorical EPU represents the spanned Knightian risks and the unexpected part ($\varepsilon_{i,t}$) captures unspanned Knightian uncertainty. The categorical Knightian uncertainty-return tradeoff test is specified as: $R_{M,t+1} - R_{f,t+1} = \alpha_i + \beta_i * \text{CatUncertainty}_{i,t} + \delta^T * Control_t + \varepsilon_{t+1}$, where $(R_{M,t+1} - R_{f,t+1})$ is the CRSP VWRETD portfolio return in excess of the three-month T-bill rate in month $t+1$, $CatUncertainty_{i,t}$ is the categorical unspanned Knightian uncertainty based on the i^{th} categorical EPU in month t from the decomposition equation, and $Control_t$ is the vector of controlled macroeconomic variables in month t, including short-term interest rate, default spread, the dividend yield on the S&P 500 index and one-month lagged market portfolio return. This table reports the coefficient of each market uncertainty proxy in the equation. The Newey-West t-statistics with 3 lags are in parenthesis. The whole sample period is from January 1985 to December 2016 (384 months). ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Categorical Knightian Uncertainty	Dependent variable: next-month excess market returns											
Economic	0.73*** (3.00)											
Monetary		0.55** (2.31)										
Fiscal			0.60*** (2.67)									
Taxes				0.59*** (2.79)								
Gov.Spending					0.43* (1.70)							
Healthcare						0.61*** (3.09)						
Security							0.464** (2.16)					
Entitled								0.47** (2.25)				
Regulation									0.41* (1.77)			
Fin.Regulation										-0.13 (-0.30)		
Trade											0.19 (1.32)	
Sovereign												0.30 (1.33)
Market Volatility	-0.72** (-2.41)	-0.78*** (-2.77)	-0.69** (-2.30)	-0.67** (-2.22)	-0.75** (-2.50)	-0.67** (-2.13)	-0.75** (-2.51)	-0.72** (-2.35)	-0.72** (-2.30)	-0.77** (-2.35)	-0.79** (-2.59)	-0.78*** (-2.64)
S&P Dividend yield	0.13 (0.42)	0.27 (0.93)	0.30 (1.09)	0.38 (1.37)	0.27 (0.94)	0.60** (2.09)	0.34 (1.22)	0.55* (1.92)	0.41 (1.48)	0.49* (1.76)	0.38 (1.26)	0.47* (1.70)
Inflation rate	-0.87 (-1.33)	-0.93 (-1.39)	-0.82 (-1.24)	-0.81 (-1.23)	-0.85 (-1.29)	-0.70 (-1.08)	-0.92 (-1.38)	-0.80 (-1.22)	-0.84 (-1.28)	-0.86 (-1.31)	-0.82 (-1.25)	-0.82 (-1.24)
Default spread	0.17 (0.17)	0.53 (0.56)	0.08 (0.08)	-0.03 (-0.03)	0.38 (0.39)	0.03 (0.03)	0.32 (0.33)	0.21 (0.22)	0.19 (0.20)	0.47 (0.47)	0.58 (0.57)	-0.51 (-0.55)
Market return	0.01 (0.13)	0.01 (0.14)	0.01 (0.08)	0.01 (0.08)	0.01 (0.1)	0.002 (0.03)	0.01 (0.11)	0.002 (0.03)	0.001 (0.02)	0.01 (0.47)	0.01 (0.07)	-0.00 (-0.55)
Intercept (%)	0.73 (0.66)	0.07 (0.07)	0.39 (0.37)	0.30 (0.29)	0.20 (0.19)	-0.29 (-0.30)	0.11 (0.10)	-0.30 (-0.31)	0.06 (0.06)	-0.39 (-0.38)	-0.23 (-0.24)	-0.38 (-0.40)
N	384	384	384	384	384	384	384	384	384	384	384	384
R^2 (%)	5.21	4.56	4.85	4.80	4.1	5.04	4.31	4.40	3.97	3.34	3.44	3.74

Table 13 Categorical Knightian Uncertainty–Return Tradeoff: Long Horizon

This table reports the empirical results of categorical Knightian uncertainty-return tradeoff test over long horizons. Each categorical Knightian uncertainty is defined as the residual from the regression of the categorical EPU on market return volatility. Baker, Bloom and Davis generate EPU index in 12 categories, we generate 12 categorical Knightian uncertainty indexes for (1) economic policy, (2) monetary policy, (3) fiscal policy, (4) taxes, (5) government spending, (6) health care, (7) national security, (8) entitlement, (9) regulation, (10) financial regulation, (11) trade policy and (12) sovereign debt and currency.

Category Knightian Uncertainty	Panel A: tradeoff test over next three month											
Market Vol.	-0.82	-0.99	-0.74	-0.66	-0.92	-0.69	-0.90	-0.77	-0.82	-0.80	-0.90	-1.06
	(-1.05)	(-1.34)	(-0.97)	(-0.84)	(-1.29)	(-0.82)	(-1.09)	(-1.00)	(-0.95)	(-0.93)	(-1.09)	(-1.38)
Economic	1.94***											
	(3.35)											
Monetary		1.29**										
		(2.26)										
Fiscal			1.88***									
			(3.64)									
Taxes				1.86***								
				(3.67)								
Gov. Spending					1.70***							
					(3.32)							
Healthcare						1.73***						
						(3.73)						
Security							1.11**					
							(2.36)					
Entitled								1.95***				
								(4.04)				
Regulation									1.40**			
									(2.91)			
Fin Regulation										0.85		
										(1.13)		
Trade											-0.05	
											(-0.15)	
Sovereign												1.47***
												(3.38)
S&P Dividend yield	0.63	1.09	1.03	1.27*	0.77	1.93**	1.24	1.87**	1.33*	1.44*	1.58*	1.55**
	(0.75)	(1.30)	(1.33)	(1.64)	(0.97)	(2.44)	(1.59)	(2.38)	(1.68)	(1.81)	(1.93)	(2.00)
Inflation rate	-0.86	-0.99	-0.69	-0.66	-0.77	-0.40	-0.97	-0.54	-0.77	-0.84	-0.83	-0.60
	(-0.50)	(-0.56)	(-0.41)	(-0.39)	(-0.45)	(-0.23)	(-0.54)	(-0.33)	(-0.44)	(-0.48)	(-0.45)	(-0.34)
Default spread	-0.06	0.86	-0.45	-0.79	0.49	-0.51	0.37	-0.18	-0.15	-0.15	0.44	1.15
	(-0.02)	(0.31)	(-0.16)	(-0.28)	(0.18)	(-0.19)	(0.13)	(-0.07)	(-0.05)	(-0.06)	(0.15)	(0.43)
Market return	-0.06	-0.06	-0.07	-0.07	-0.06	-0.07	-0.06	-0.08	-0.08	-0.07	-0.07	-0.09
	(-0.54)	(-0.54)	(-0.61)	(-0.62)	(-0.55)	(-0.70)	(-0.57)	(-0.74)	(-0.71)	(-0.63)	(-0.63)	(-0.89)
Intercept (%)	1.20	-0.67	0.59	0.33	0.34	-1.51	-0.58	-1.64	-0.34	-0.59	-1.47	-2.06
	(0.41)	(-0.24)	(0.21)	(0.12)	(0.12)	(-0.59)	(-0.21)	(-0.64)	(-0.13)	(-0.23)	(-0.57)	(-0.81)
N	381	381	381	381	381	381	381	381	381	381	381	383
R^2 (%)	7.54	5.50	8.03	8.00	7.20	7.72	5.11	9.10	5.77	4.01	3.33	6.64

(Categorical Knightian Uncertainty–Return Tradeoff: Long Horizon (cont'd))

Categorical Knightian Uncertainty	Panel B: tradeoff test over next six month											
Market Vol.	-0.31	-0.48	-0.16	-0.06	-0.41	-0.11	-0.40	-0.21	-0.33	-0.30	-0.28	-0.58
	(-0.36)	(-0.54)	(-0.19)	(-0.07)	(-0.51)	(-0.12)	(-0.42)	(-0.26)	(-0.34)	(-0.31)	(-0.29)	(-0.69)
Economic	2.07**											
	(2.11)											
Monetary		1.07										
		(1.19)										
Fiscal			2.59***									
			(3.07)									
Taxes				2.55***								
				(3.02)								
Gov. Spending					2.48***							
					(3.21)							
Healthcare						2.29**						
						(2.92)						
Security							1.33					
							(1.51)					
Entitled								2.51***				
								(3.45)				
Regulations									1.15			
									(1.29)			
Fin Regulation										0.79		
										(0.67)		
Trade											-0.64	
											(-0.92)	
Sovereign												1.73**
												(2.14)
S&P Dividend yield	2.77	3.37**	3.03*	3.37**	2.62*	4.26***	3.38**	4.16**	3.57**	3.65**	4.08**	3.75**
	(1.61)	(1.98)	(1.93)	(2.16)	(1.65)	(2.71)	(2.12)	(2.68)	(2.28)	(2.32)	(2.47)	(2.46)
Inflation rate	-4.00	-4.11	-3.77	-3.73	-3.87	-3.39	-4.14	-3.58	-3.92	-3.98	-4.08	-3.71
	(-1.37)	(-1.37)	(-1.30)	(-1.29)	(-1.34)	(-1.18)	(-1.37)	(-1.27)	(-1.32)	(-1.34)	(-1.34)	(-1.26)
Default spread	-0.35	0.54	-1.06	-1.53	0.23	-1.09	0.09	-0.63	-0.29	-0.36	-0.45	1.01
	(-0.07)	(0.10)	(-0.20)	(-0.29)	(0.04)	(-0.22)	(0.02)	(-0.13)	(-0.06)	(-0.07)	(-0.08)	(0.20)
Market return	-0.10	-0.10	-0.11	-0.11	-0.10	-0.12	-0.10	-0.12	-0.12	-0.11	-0.11	-0.14
	(-0.76)	(-0.79)	(-0.82)	(-0.83)	(-0.75)	(-0.91)	(-0.80)	(-0.92)	(-0.90)	(-0.85)	(-0.87)	(-1.09)
Intercept (%)	-0.16	-2.32	-0.18	-0.56	-0.37	-3.07	-1.92	-3.24	-2.06	-2.17	-3.08	-3.68
	(-0.03)	(-0.48)	(-0.04)	(-0.11)	(-0.08)	(-0.68)	(-0.39)	(-0.72)	(-0.45)	(-0.47)	(-0.68)	(-0.82)
N	378	378	378	378	378	378	378	378	378	378	378	378
R^2 (%)	9.62	8.02	11.62	11.55	11.30	11.04	8.55	11.96	8.09	7.57	7.55	9.52

Categorical Knightian Uncertainty	Panel C: tradeoff test over next 12 months											
Market Vol.	0.21	0.04	0.37	0.48	0.08	0.50	0.09	0.38	0.18	0.26	0.25	-0.25
	(0.21)	(0.04)	(0.37)	(0.48)	(0.07)	(0.51)	(0.09)	(0.39)	(0.17)	(0.25)	(0.22)	(-0.25)
Economic	2.59											
	(1.28)											
Monetary		0.38										
		(0.19)										
Fiscal			3.01**									
			(2.00)									
Taxes				2.90*								
				(1.91)								
Gov. Spending					3.03**							
					(2.32)							
Healthcare						3.22**						
						(2.33)						
Security							1.803					
							(0.82)					
Entitled								3.75***				
								(3.08)				
Regulations									1.57			
									(1.25)			
Fin. Regulations										1.39		
										(1.13)		
Trade											-0.93	
											(-0.71)	
Sovereign												3.06***
												(3.13)
S&P Dividend yield	5.86**	6.93**	6.26**	6.66**	5.70**	7.79***	6.57**	7.72***	6.82**	6.89**	7.53***	7.06***
	(1.81)	(2.15)	(2.22)	(2.41)	(2.05)	(2.80)	(2.23)	(2.88)	(2.50)	(2.53)	(2.66)	(2.69)
Inflation rate	-7.53*	-7.49*	-7.25*	-7.21*	-7.36*	-6.66*	-7.70*	-6.93*	-7.38*	-7.47*	-7.59*	-6.99*
	(-1.92)	(-1.89)	(-1.87)	(-1.85)	(-1.90)	(-1.77)	(-1.91)	(-1.86)	(-1.85)	(-1.87)	(-1.87)	(-1.81)
Default spread	-0.25	0.69	-1.02	-1.52	0.50	-1.35	0.33	-0.85	-0.15	–0.50	-0.39	1.95
	(-0.04)	(0.10)	(-0.15)	(-0.22)	(0.07)	(-0.20)	(0.05)	(-0.13)	(-0.02)	(–0.07)	(-0.05)	(0.29)
Lagged market return	–0.07	-0.09	-0.08	-0.09	-0.07	-0.10	-0.08	-0.11	-0.10	-0.09	-0.09	-0.14
	(-0.36)	(-0.45)	(-0.41)	(-0.42)	(-0.36)	(-0.49)	(-0.4)	(-0.49)	(-0.49)	(-0.44)	(-0.46)	(-0.72)
Intercept (%)	-2.08	-5.38	-2.36	-2.86	-2.43	-0.06	-4.18	-6.00	-4.35	-4.20	-5.77	-6.86
	(-0.23)	(-0.65)	(-0.29)	(-0.35)	(-0.31)	(-0.74)	(-0.49)	(-0.78)	(-0.56)	(-0.55)	(-0.75)	(-0.91)
N	372	372	372	372	372	372	372	372	372	372	372	372
R^2 (%)	14.82	13.11	15.91	15.74	15.99	16.69	14.20	18.13	13.80	13.50	13.34	16.51

Table 14 EPU–Return Tradeoff in International Markets

This table reports the empirical results of whether EPU-return tradeoff exists in international markets. Baker, Bloom and Davis generate an individual EPU index for each market of Australia, Chile, China, Europe, France, Germany, India, Ireland, Italy, Japan, Korea, Netherlands, Russia, Singapore, Spain, Sweden and United Kingdom. We test the uncertainty-return tradeoff using the home market EPU index and the following regression: $R_{i,t+1} - R_{f,t+1} = \alpha_i + \beta_i * EPU_{i,t} + \delta_i * R_{i,t} + \varepsilon_{i,t+1}$, where $(R_{i,t+1} - R_{f,t+1})$ is the market return of country i in excess of the three-month T-bill rate in month $t+1$, $EPU_{i,t}$ is the EPU index in country i in month t, and $R_{i,t}$ is the one-month lagged market portfolio return of country i. This table reports the coefficients in the equation for each country. The Newey-West $t-$statistics with 3 lags are in parenthesis. The whole sample period is from January 1985 to December 2016. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable: next-month excess market returns					
Market	Home EPU	Market return	Intercept (%)	N	R^2 (%)
Australia	-0.19	0.05	1.10**	294	0.60
	(-0.71)	(0.60)	(2.58)		
Brazil	-0.19	0.41	3.50***	319	18.47
	(-0.41)	(4.12)	(2.72)		
Canada	0.06	0.136**	0.49	391	1.83
	(0.31)	(2.36)	(1.11)		
Chile	-0.07	0.08	1.02	295	0.75
	(-0.30)	(1.26)	(1.47)		
China	-0.41	0.06	1.58**	271	0.74
	(-1.20)	(0.94)	(2.10)		
France	0.21	0.06	0.34	360	0.47
	(0.86)	(0.86)	(0.57)		
Germany	0.52*	0.04	-0.18	295	0.81
	(1.75)	(0.67)	(-0.25)		
India	-0.08	0.06	1.72*	175	0.37
	(-0.18)	(0.72)	(1.68)		
Ireland	-0.14	0.19***	1.06*	389	3.55
	(-0.53)	(3.36)	(1.70)		
Italy	0.34	0.05	-0.66	235	0.46
	(0.87)	(0.71)	(-0.52)		
Japan	-0.04	0.05	0.38	367	0.27
	(-0.16)	(0.80)	(0.42)		
Korea	0.97**	0.08	-1.03	329	2.07
	(2.26)	(1.44)	(-1.15)		
Netherlands	0.79**	0.10	-0.77	173	1.96
	(2.03)	(0.92)	(-0.92)		
Russia	0.35	0.12*	-0.07	279	1.69
	(1.08)	(1.78)	(-0.09)		
Singapore	-0.05	0.21*	0.80	175	4.29
	(-0.21)	(1.84)	(1.31)		
Spain	0.72**	0.06	-0.87	199	1.78
	(2.04)	(0.86)	(-1.04)		
Sweden	0.51	0.12**	-0.13	367	2.03
	(1.41)	(2.26)	(-0.79)		
UK	0.42***	-0.01	0.13	247	1.10
	(2.67)	(-0.14)	(0.36)		