Article

Asset Returns and Economic Uncertainty: A Cross-Country Analysis

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ABSTRACT

This paper examines the effects of economic uncertainty (idiosyncratic vis-à-vis common uncertainty) on equity, bond and housing returns across both developed and developing countries. Building on International/Intertemporal Capital Asset Pricing Model (ICAPM), we find that economic uncertainty exerts negative effects on equity, bond and housing returns. When we decompose economic uncertainty into two parts: idiosyncratic and common economic uncertainty, we find that 'idiosyncratic uncertainty' affects equity, bond and housing returns more negative and pronounced than 'common' uncertainty, where investors do not demonstrate differences in responses to the different dimensions of uncertainty. Moreover, there are weak lagged effects of economic uncertainty on asset returns. Additionally, we find negative uncertainty premium for equity more persistently in bullish rather than bearish market conditions. Our results are also robust for low frequency data and inclusion of covid period in the analysis. Our findings have implications for policy makers in both developed and emerging markets regarding clear communication of economic policies.

KEYWORDS

Asset Returns, Economic Uncertainty, Cross-Country Analysis

JEL Code: G11, G12

INTRODUCTION

This paper investigates the effects of economic uncertainty on asset returns (i.e. equity, government bond and housing returns) across both developed and developing countries. The prior literature contains evidence that economic uncertainty generally exerts negative effects on asset returns. The seminal work of Bloom (2009) contends that economic uncertainty is essentially a cause of business cycle fluctuations that reduces investment and consumption and has negative implications on real economic activity (Bernanke, 1983; Bloom, 2009; Gulen & Ion, 2016). Furthermore, elevated economic uncertainty contributed to the deep economic recession and slow recovery during 2008 and afterwards (International Monetary Fund, 2012). However, recent literature (Ozturk & Sheng, 2018) suggests that there are different dimensions of economic uncertainty – idiosyncratic and common uncertainty – which may induce investors to display differential responses with respect to uncertainty.

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While the extant literature provides a number of proxies which represent economic uncertainty,[1] our economic uncertainty measure by Ozturk and Sheng (2018) ('OS' hereafter) is less explored in the asset pricing literature. The OS measure is based on the perceived uncertainty of market participants, thus free of economic model misspecification. Within this measurement of economic uncertainty, total uncertainty is decomposed into idiosyncratic and common components. This measure of uncertainty constitutes uncertainty from both aggregated variability of macroeconomic shocks (i.e. common uncertainty), and economic agents' disagreements (i.e. idiosyncratic uncertainty). Therefore, the OS measure allows us to examine the differential effects of idiosyncratic and common uncertainty on asset returns.

In the literature, one stream of studies investigates the nexus between economic policy uncertainty (hereafter EPU) and financial markets (Kang & Ratti, 2013; Pástor & Veronesi, 2013; Brogaard & Detzel, 2015; Ko & Lee, 2015; Baker, et al., 2016; Li & Peng, 2017; Phan, et al., 2018; Chen, et al., 2017; Gong, et al., 2020). The findings of these studies suggest that EPU has a negative effect on stock returns. Another stream of studies shows both theoretically and empirically that time variation in the conditional volatility of macroeconomic shocks is linked to real economic activity and asset returns (Bloom, 2009; Allen, et al., 2012; Jurado, et al., 2015). Based on this theoretical underpinning, Bali, et al. (2017) explore the relationship between economic uncertainty and a cross section of stock returns. They document that stocks co-vary positively with economic uncertainty and underperforms (in particular, 6% less returns) the stocks that co-vary negatively with economic uncertainty. Bali, et al. (2014) report that macroeconomic uncertainty is priced in the cross section of hedge fund returns but such premiums are absent for mutual fund returns. Moreover, Bali, et al. (2021) find that economic uncertainty is priced in the cross section returns of both investment and non-investment grade corporate bonds (specifically, 0.40% and 0.80% monthly, respectively). Ozoguz (2008), Anderson, et al. (2009), Bekaert, et al. (2009), Bansal, et al. (2014); Bali and Zhou (2016) also studied the uncertainty–return relationship and find that uncertainty and volatility play an important role in asset returns and related risk premia. While most of these previous studies in this area are US based and concentrated on equity returns only, they suggest that there are equity risk premia for economic uncertainty in the US. Motivated by this, in this study we examine whether economic uncertainty carries a risk premium across three asset classes, namely equity, government bond and housing across the countries in the world. The role of economic uncertainty across the asset classes and across the developed and developing countries remains largely unexplored. In this paper, we fill these gaps in the literature.

In a multi-period setting, Merton (1973) indicates that the stochastic nature of future consumption and investment opportunities motivates investors to exhibit non-constant investment behaviour to maximize their utility function. As a result, any country-level or macroeconomic variable that is correlated to future consumption and investment sets is priced in an intertemporal asset price setting. When an asset class has a positive economic uncertainty beta, investors prefer that asset for hedging purposes. Thus, due to hedging demand, investors generally pay more for assets with positive economic uncertainty and accept low returns subsequently. So, we revisit this for a risk averse

[1] (i) implied volatility of stock returns (Bloom, 2009); (ii) newspaper coverage-based measures of economic policy uncertainty known as EPU (Baker, et al., 2016), (iii) professional forecasters' dispersion-based measures of uncertainty; (iv) unforecastable component of a large number of macro variables (Jurado, et al., 2015) which is known as JLN measure. Among the popular measures of economic uncertainty, the implied or realized volatility of stock markets such as VIX (volatility index), is related to uncertainty in Wall Street, which may not reflect uncertainty in the main street. Whereas, news-based uncertainty is dependent on media coverage and media hype, and disagreement-based uncertainty is only a part of total aggregate economic uncertainty. JLN measure lacks addressing heterogenous agent models and private information. There is already abundant literature on the EPU effect. Our adopted measure covers both errors of aggregate shocks and heterogeneity among the agents, thus more comprehensive than other measures.

investor, whether there is negative (positive) economic uncertainty premium for risky (riskless) asset classes, consistent with hedging demand for the intertemporal Capital Asset Pricing Model (CAPM) of Merton (1973). In our analysis, we presume that risky asset classes such as equity and housing would go under the high uncertainty beta asset class while the risk-free asset classes such as government bonds would go under a low uncertainty beta asset class[2]. This is consistent with Bali, et al. (2017) that investors usually reduce stock holdings during the high uncertainty and recession period.

We have a number of key findings in our paper. First, economic uncertainty exerts a negative impact on the asset returns, in particular on stock returns. Second, it is idiosyncratic uncertainty rather than common uncertainty affects asset returns more negatively and persistently across the countries. Third, negative effects for equity is more prevalent in bullish market instead of in bearish markets.

Our paper contributes to the existing literature in several ways. First, unlike prior studies, our paper extends the literature covering both developed and developing countries, and three asset classes consisting of both risky and risk-free assets, to investigate the effect of economic uncertainty on asset returns. Thus, our cross-country analysis offers wide-ranging insights on asset returns and the economic uncertainty relationship in the literature. Second, this paper uses economic uncertainty measures developed by Ozturk and Sheng (2018)[3], which is a more comprehensive measure of uncertainty and to the best of our knowledge this measure is novel with respect to explaining asset risk premia. More importantly, our proxy of uncertainty satisfies the 'endogeneity' criteria because this measure is devoid of any asset returns data. Doan, et al. (2018) devise a portfolio-based uncertainty measure that captures both financial and macroeconomic uncertainty. Our uncertainty proxy OS measure is linked to only aggregate macroeconomic uncertainty. Third, academics, policymakers, fund managers and other stakeholders remain concerned about the potential channels of economic uncertainty affecting an economy. One particular channel of interest is the asset pricing channel. We address this in the present paper. Our study is different to Bali, et al. (2017) who study the effects of Jurado, et al. (2015) (JLN measure hereafter) on equity returns, whereas we use the OS measure as the proxy of uncertainty. Also, they studied the US context only, while we study data for developed and developing countries. Anderson, et al. (2009) use disagreements of professional forecasters as the measure of uncertainty. Our study is different to both studies and is more comprehensive because we use a survey-based uncertainty measure which consists of both conditional volatility of errors (i.e. common uncertainty) and disagreements of professional forecasters (i.e. idiosyncratic uncertainty). In our paper, we posit that investors react differently to different dimensions of uncertainty.

The remainder of the paper is structured as follows. Section 2 provides a brief review of the relevant literature on economic uncertainty and asset returns, and how we develop our testable hypotheses. Section 3 describes the empirical methodology for model specification and data, and explains the OS uncertainty measure. The empirical results are analyzed in Section 4 including a robustness test and the results of additional analysis. Finally, the study is concluded in Section 5.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Finance theory suggests that stock markets price the state or macroeconomic variable that is related to the investors' future consumption and investment opportunity set (Merton, 1973; Campbell, 1992;

[2] This is due to the fact that equity and housing prices become worse during recessions when economic uncertainty goes high. In contrast, during high uncertainty periods, government bonds do well because investors prefer to move to safe assets such as government bonds.
[3] This OS measure is separate from the widely used proxy of macroeconomic uncertainty of Jurado, et al. (2015) for two reasons (Ozturk & Sheng, 2018). First, the OS measure focus is survey-based and focusses on market participants' perceived uncertainty. Second, unlike Jurado, et al. (2015)'s common uncertainty of hundreds of economic series, the OS measure considers both common and disagreement-based idiosyncratic uncertainty.

Campbell, 1996), and hence such variables should affect the expected stock returns. Ross (1976) documents that risk-averse investors should be compensated for systematic risk. Recent literature suggests that there are risk premia for economic uncertainty in the cross-section of asset returns (Bali, et al., 2017; Bali, et al., 2020). Such empirical findings should also hold for well-diversified aggregate market portfolios. For example, economic uncertainty is priced in the hedge fund returns but not priced in the mutual fund portfolios (Bali, et al., 2014). Again, if equity co-moves with the economic uncertainty, then investors are interested to pay higher prices for equity when they expect a rise in economic uncertainty and accept lower returns on an intertemporal basis with a higher uncertainty beta (Bali, et al., 2017). Consequently, returns of risky assets such as equity will depend on the extent of investors' exposure to macroeconomic fundamentals, which in turn depends on how much investors are willing to pursue opportunities from changing economic conditions (Bali, et al., 2017).

To date, a handful of studies examined economic uncertainty and equity returns. For example, Ozoguz (2008) empirically investigates the effect of investors' dynamic belief and Bayesian uncertainty on equity returns. He finds a negative relationship between uncertainty and asset valuation. Using the US data, Bali, et al. (2017) reveal negative economic uncertainty premium in the cross-section of stock returns. They find that stocks in the lowest uncertainty beta decile carry a 6% additional risk-adjusted return on an annual basis relative to the stocks in the highest uncertainty beta decile. Analogous to Bali, et al. (2017), Brogaard and Detzel (2015), Arouri, et al. (2016) and Christou, et al. (2017) report that EPU exerts a negative impact on the stock market returns within a multi-country setting. In contrast, Li & Peng (2017) documents a positive EPU premium for Chinese stock market, which suggests Chinese investors are risk-seeking. In order to be able to explain the negative and positive EPU premium, Nartea, et al. (2020) conditioned negative EPU premium by investor sentiment. Periods of low (high) investor sentiment is usually coincides with the periods of high (low) uncertainty, and accordingly a pessimistic (optimistic) mood is also revealed by the investors. According to Nartea, et al. (2020), negative EPU premium is stronger (weaker) during the periods of low (high) investor sentiment, to the extent that the negative EPU premium is driven by (i) intemporal hedging demand, and (ii) limited participation of pessimistic and uncertainty-averse investors. In another study, whether foreign EPU shocks have meaningful explanatory power in cross section of asset returns, Lee, et al. (2021) find that Chinese EPU shocks have negative EPU premium for US bonds, but not for US equity returns. Other studies such as those conducted by Ko and Lee (2015) and Dakhlaoui and Aloui (2016) suggest that the uncertainty-stock return relationship is time varying.

Bali, et al. (2017) explain negative uncertainty premium in a number of ways. First, they suggest that negative uncertainty premium is driven by intertemporal hedging demand. Second, when economic uncertainty enters into the utility function of the investors, stocks with low (high) uncertainty beta would require higher (lower) returns. Third, uncertainty-averse/pessimistic investors may limit/cease their participation in stocks markets when there is high economic uncertainty. Consequently, stocks are owned by optimistic investors with low uncertainty aversion, thus they require low premium and low returns for high uncertainty beta stocks. Against these theoretical propositions, some studies argue that economic uncertainty is not a valid risk factor/state variable in ICAPM context (Maio & Sata-Clara, 2012; Boons, 2016; Xyngis, 2017). Using JLN measure, Xyngis (2017) find that economic uncertainty is not priced in the portfolio returns, which contradicts Bali, et al, (2017).

A large volume of literature indicates that current as well as forward-looking factors can explain bond risk premia (for example, forward spread (Fama and Bliss, 1987), yield spread (Campbell & Shiller, 1991), linear combination of forward rates or Cochrane-Piazessi factor (Cochrane & Piazzesi, 2005), and macroeconomic factors (Ilmanen, 1995; Ludvigson & Ng, 2009), jump risks (Wright & Zhou, 2009), among others). In the case of bonds, if any factor that is spanned in interest rates, then it is priced in the bond returns[4]. According to "spanning hypotheses", if the bond market is efficient, the current yield curve reflects all the necessary relevant information immediately and, as a result, the current rate is enough for predicting the future interest rate. However, recent findings suggest that macroeconomic risk factors may be un-spanned in the yield curve (see Joslin, et al., 2014). Macro-economic factors are emphasized in the current literature for predicting bond yields that may contain additional predictive information for the yield curve, apart from the established factors such as the CP factor (Cochrane & Piazzesi, 2005; Ludvigson, et al., 2015). Empirical findings on bond risk premia are generally consistent with the theoretical prediction. Leippold and Matthys (2015) document that economic policy uncertainty predicts bond risk premia, while Bali, et al. (2020) find that economic uncertainty has a risk premia for corporate bonds. Using Baker, et al. (2016)'s EPU index, Jiang and Tong (2016) show that monetary policy uncertainty is significant in explaining bond risk premia. Wright (2011) also finds that inflation uncertainty is an important component of bond risk premia for an international dataset.

Analogous to bonds, the interest rate or discount rate channel plays a key role for housing returns. For instance, on the 'supply-side', banks may add an extra premium to the mortgage rate during the time of higher uncertainty. On the 'demand-side', since housing investment is irreversible in nature, higher economic uncertainty may reduce house purchases (Bulan, 2005; Guthrie, 2010). Real option theory (see, Bernanke, 1983; Abel, et al., 1996; Bloom, 2009) suggests that there is an option value waiting for new information for an irreversible investment during the period of heightened uncertainty. When economic agents are uncertain about the future with respect to income, employment, or interest rates, they don't go for a house purchase, rather they save more (also known as precautionary savings) to insulate them in difficult times. Many recent studies have highlighted EPU in housing market returns. Antonakakis, et al. (2015) find negative correlations between housing market returns and EPU. Ajmi, et al. (2014) exhibit a two–way transmission channel between conditional volatility of the US real estate investment trust (REIT) and EPU.

Based on the above discussion, our first hypothesis predicts a negative uncertainty premium for equity and housing returns, indicating a negative relationship of economic uncertainty with equity and housing returns. This is because of both equity and housing are risky asset classes, and hence require risk premium against economic uncertainty. In line with this, as a risky asset class, corporate bond also requires risk premium against economic uncertainty. Thus, a negative relationship is expected between corporate bond and economic uncertainty. However, gathering consistent data on corporate bond across the countries would be difficult. For this reason, we use the data for government bond returns. For government bonds, we posit that there is a positive effect of economic uncertainty on bond returns because of 'flight to safety' behaviour. When there is heightened uncertainty, investors resort to safe-haven asset class. Our first hypothesis is presented as follows:

H01: (i) There is a negative relationship between economic uncertainty and equity returns and housing returns. (ii) There is a positive relationship between economic uncertainty and bond returns.

Again, our second hypothesis is built on the effects of different dimensions of uncertainty on asset returns (i.e. common and idiosyncratic uncertainty). Our common uncertainty measure is in line with JLN measure, which is given by Jurado, et al. (2015). Bali, et al. (2017) and Bali, et al. (2020) used the JLN measure of economic uncertainty. The JLN measure is based on common variation of unforecastable component of large number of macroeconomic variables. Both Bali, et al. (2017)

[4] Interest rates also affect other asset prices and perform as a key channel of transmission of uncertainty. For example, Phan, et al. (2018) find that EPU affects stock returns via the discount rate channel.

and Bali, et al. (2020) find that there is negative economic uncertainty premium for equity and bond returns respectively. Connolly, et al. (2018) document a negative relationship between JLN measure and slope of distant treasury forward-interest rates. Analogous to the effect of common uncertainty, idiosyncratic uncertainty carries a negative uncertainty premium on asset returns. In a classical study, Miller (1977) shows that divergence in opinion increases with risk, which induces both risk-averse and risk-neutral investors to require risk premiums for risky securities. Miller (1977) hypothesizes that pessimistic investors are constrained to hold zero shares and optimistic investors push the price of stocks higher. This results in lower returns. With short sale constraints, Doukas, et al. (2006) find that divergence of opinion is positively related to the stock returns which is opposite to the 'Miller Hypotheses'. Dzieliński, et al. (2018) demonstrate that differences in opinion and investors' attention is positively related to asymmetry in the volatility of returns. They use dispersion in analyst forecasts as a common proxy for differences in opinion and find that both differences in opinion and investors' attention is complementary (see Hong & Stein (2007) for a review of disagreement and stock returns). Similarly, Bali, et al. (2019) examine whether the economic disagreement has any significant impact on the cross section of individual stocks. They find a 7.2% disagreement premium per annum, indicating risk averse investors require a disagreement premium to hold stocks. Anderson, et al. (2009) measure disagreement in an aggregate sense, rather than disagreement about individual stocks or portfolios (such as based on analyst forecasts) and find that assets with higher (lower) correlation with uncertainty carry significant (insignificant) premiums.

In consideration of the above discussion, we suggest that there is negative economic uncertainty premium for common and idiosyncratic uncertainty on asset returns. Our second hypothesis is presented as follows:

H02: (i) There is negative relationship between common uncertainty and equity, and housing returns, while a positive relationship between common uncertainty and government bond returns. (ii) There is negative relationship between idiosyncratic uncertainty and equity, and housing returns, while a positive relationship between idiosyncratic uncertainty and government bond returns.

METHODOLOGY AND DATA

MODEL SPECIFICATION

Given the rise in international participation of foreign investors in the local stock markets and the cross-border listings of stocks during the 1970s, Solnik (1974) and Adler and Dumas (1983) developed International CAPM based on perfect market integration where they consider the world as a single market. In their model, investors hold world market portfolios and national risk-free assets. In line with Solnik (1974), we start with a global asset-pricing model for our analysis. This is also motivated by the fact that our data includes both developed and developing countries, thus a domestic CAPM may not serve our purpose. On the contrary, even a traditional international CAPM-based model may not suffice our purpose considering the stylized facts of recent world business cycle co-movement. It is presumed that there is a global business cycle that converged within developed and developing countries but decoupled (emerging markets are insulated from developed markets' shocks) across them (Kose, et al., 2012). According to Kose, et al. (2012), local factors are more important for emerging markets' cycles and these countries fail to achieve risk sharing and depend more on domestic savings. While developed countries suffer less from local factors but could share risks internationally. Thus, there may be heterogeneity in the effects of both global and local factors for both developed and developing countries. Considering these and the nature of our data, additionally, we augment our international CAPM model with country-specific uncertainty measures, i.e., total measure of economic uncertainty (EUNCT).

In our empirical model, global portfolio return is used as the proxy for global information, while domestic economic uncertainty is used as the proxy for local information. This approach reduces the possibility of any economic misspecification and biased estimation. We estimate OLS regression on time series monthly data for each country and each asset class separately. Again, in an international capital asset pricing model, foreign exchange rate fluctuation risk is considered a major concern. To accommodate this concern, we consider our asset returns denominated in US dollars. The effect of economic uncertainty on asset returns is executed using the following baseline model[5].

$$r_{i,t} = \alpha_{i,0} + \alpha_{i,1} r_{g,t} + \alpha_{i,2}\, DEUNCT_{i,t} + \varepsilon_{it} \quad (1)$$

where r_i is the aggregate asset return for country *i*, $DEUNCT_{i,t}$ is the first difference of the total economic uncertainty index (EUNCT) for country *i*, r_g is the return on the global market portfolio, ε_i is the random error term, $\alpha_{i,1}$ measures the degree of integration of the domestic equity market *i* with international equity markets, $\alpha_{i,2}$ measures the uncertainty effect, and t is the time subscript. The above Equation (1) can be viewed as the global market model augmented by EUNCT where the integration parameter $\alpha_{i,1}$ helps to evaluate the potential benefits of international portfolio diversification for risk-averse investors (Solnik, 1974).

Equation (1) assumes that the two different dimensions of economic uncertainty, common (EUNCC) and idiosyncratic (EUNCI), have an identical effect on domestic market returns. Ozturk and Sheng (2018) note that common uncertainty is the average conditional forecast error volatility of eight (8) macroeconomic series, while idiosyncratic uncertainty represents the extent of disagreement among professional forecasters regarding those eight (8) variables. Thus, to examine whether the effect of common uncertainty on asset returns differs from that of idiosyncratic uncertainty, we use the following model:

$$r_{i,t} = \beta_{i,0} + \beta_{i,1} r_{g,t} + \beta_{i,2}\, DEUNCI_{i,t} + \beta_{i,3}\, DEUNCC_{i,t} + \varepsilon_{it} \quad (2)$$

where $DEUNCI$ is the first difference of idiosyncratic uncertainty (EUNCI), $DEUNCC$ is the first difference of common uncertainty (EUNCC) and ε_i is the random error term. For each country, we test the hypothesis that idiosyncratic and common uncertainties have distinguishable effects on asset returns ($\beta_{i,2} = \beta_{i,3}$). Equation (1) and Equation (2) do not include any business cycle variables (e.g. term spread, default spread) that are typically used in the literature as predictors of asset returns because all uncertainty measures show strong countercyclical movements (Ozturk & Sheng, 2018). We also do not control any other country level macroeconomic variables because our adopted uncertainty measure contains uncertainty of eight macroeconomic variables.

When we run the above Equation (1) and Equation (2) on time series data for each country and for each asset class, we generate aggregate effects of economic uncertainty (coefficients of DEUNCT, DEUNCI and DEUNCC) for each asset class for each country. To be able to explain the percentage change in asset returns with respect to one standard deviation change in economic uncertainty, we use the concept of pooled standard deviation of the uncertainty measures of the sample countries for each asset class. The idea is that the pooled standard deviation of the uncertainty measure of

[5] The unit-root test results suggest that stock returns are stationary while the economic uncertainty indices have a unit root. Consequently, the first difference of the economic uncertainty series is employed for empirical analysis.

the sample countries for each asset class is multiplied with the median uncertainty effect of each asset class of the cross-section of countries. Consequently, the percent change in asset returns with respect to a one standard deviation change in the uncertainty measure for an asset class is obtained. More specifically, the following formula is used:

> Percentage (% change in asset returns with respect to one S.D. change in uncertainty measure =median effect of economic uncertainty on each asset class of cross section of countries X pooled standard deviation of uncertainty measure of sample countries.

The formula for the pooled standard deviation is:

$$SD_{pooled} = \sqrt{\frac{(n1-1)SDn1+(n2-1)SDn2+\cdots+(nk-1)SDnk}{(n1+n2+\cdots+Nk)-K}}$$

where, SD is the standard deviation; n1, n2, …, nk represent the sample size of the individual sample of economic uncertainty of each country; and K is the number of total samples of economic uncertainty.

DATA

Our equity asset category includes twenty-six (26) countries (15 developed and 11 developing countries), while the government bond asset category covers nineteen (19) countries (14 developed and 5 developing countries), and the housing returns from fifteen (15) countries. A time series-based regression for a cross section of countries for these three asset classes is conducted for the period 1989-2014, 2008-2014 and 1990-2014, respectively. Our sample countries are selected based on the FTSE (2023) classification of countries. Our baseline regression models are based on monthly data for equity returns and government bonds, while quarterly data is used for housing returns. We used equity data for twenty-six (26) countries over the period 1989-2014. For each country, aggregate stock returns are calculated as the first differences of log total return indices, obtained from Datastream. The Morgan Stanley Capital International (MSCI) World Index is used as a proxy for the global market portfolio and the first difference of log MSCI provides the global market return, obtained from Datastream. We proxy economic uncertainty indices using the uncertainty index provided by Ozturk and Sheng (2018), obtained from the Sheng website which is available in monthly frequency. When we use the OS measure for quarterly data, such as for housing returns, we take the quarterly average of uncertainty data. This quarterly average of uncertainty data is also used in our robustness test, where we see whether our results hold for low frequency data. Our government bond data covers monthly data for nineteen (19) countries over the period 2008-2014. For each country, aggregate bond returns are calculated as the first difference of log benchmark government bond indices, obtained from Datastream. Global developed country sovereign bond indices from S&P are used as a proxy for the global market portfolio and the first difference of log developed market sovereign bond indices provides the global market return. Again, our real estate data covers quarterly data for fifteen (15) countries over the period 1990-2014. For each country, aggregate housing returns are calculated as the first difference of log real house price indices, obtained from Mack and Martínez-García (2011). The Global housing market index from Mack and Martínez-García (2011) is used as a proxy for the global market portfolio and the first difference of log global housing market index provides the global market return. All return series are denominated in US dollars. Two important issues on the data may affect our results. First, at the time of analysis, OS measure was available from 1989-2014. However, recently OS measure is made available from 1989-2017. We could have extended our analysis with the additional data of uncertainty; however, we believe that this would not give us additional information against inclusion of marginal data points. This motivates us not to include this additional data points in our analysis. Secondly, we had to limit our data sample for bond within 2008-2014. This is because of data unavailability for global bond portfolio index before the period of 2008. This may have impacted our results due to small number of observations. However, importantly, we cover great recession periods of 2008, and this had brought important implications in our results. Descriptive statistics are presented in Table 1, and unit root test results are not presented to preserve space but are available on request.

ECONOMIC UNCERTAINTY MEASURE

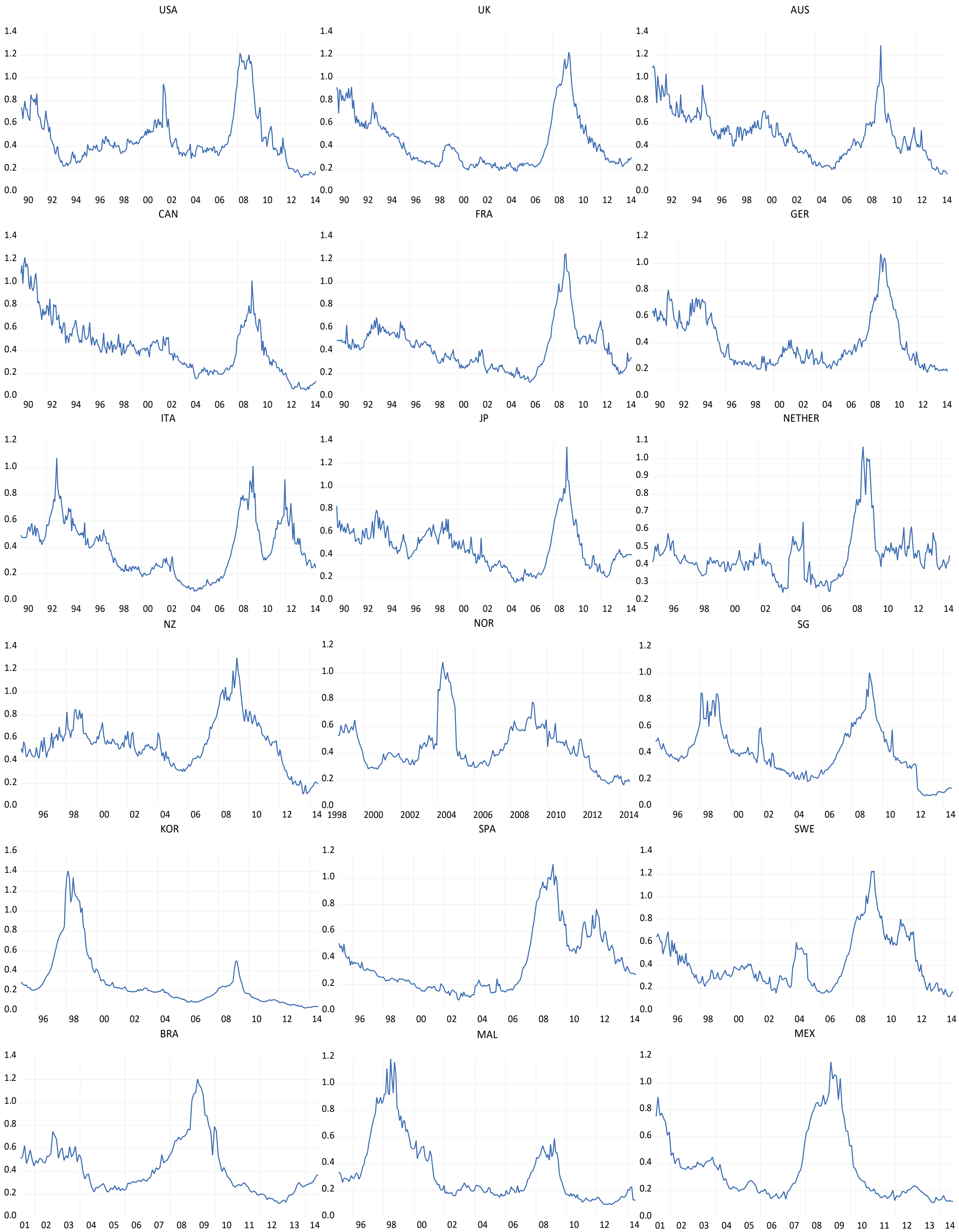
Ozturk and Sheng (2018) estimate EUNCT using professional forecasters' forecasts for eight (8) variables: GDP, consumption, investment, industrial production, inflation, unemployment rate and short-term and long-term interest rates. It is directly linked to the ability to forecast macroeconomic fundamentals rather than implied or realised volatility of stock markets. First, they estimate variable-specific uncertainty for each variable. Then, they estimate EUNCT for each country as the weighted average of standardised components of variable-specific uncertainty. Unlike other subjective uncertainty measures, EUNCT is made of two components: EUNCI and EUNCC. EUNCC is based on perceived variability of future aggregate macroeconomic shocks and EUNCI is based on disagreement among professional forecasters. By construction, both EUNCC and EUNCI are bounded between 0 and 1, while their sum (total uncertainty) ranges from 0 to 2. The EUNCI follows the macroeconomic literature that emphasizes the role of predictable, transparent policies to reduce uncertainty, while the EUNCC is in line with Jurado, et al. (2015). Moreover, being based on a survey of professional forecasters, the uncertainty measure by Ozturk and Sheng (2018) is not prone to model specifications. Appendix 1 presents the decomposition of EUNCT into EUNCI and EUNCC briefly. Figure 1 depicts EUNCT for the sample countries.

EMPIRICAL RESULTS AND DISCUSSION

In Table 1 we present descriptive statistics (only the mean and standard deviation) for each variable (i.e. equity returns, bond returns and housing returns) to have an idea on the properties of the data across the sample countries. Table 1 shows that standard deviations of the stock returns are high compared to the standard deviations of bond returns, while bond returns exhibit higher standard deviations than the housing returns.

ECONOMIC UNCERTAINTY AND STOCK MARKET RETURNS

In Table 2, we present the regression results on the relationship between equity returns and economic uncertainty for monthly data in Equation (1) and Equation (2). Our sample starting period of some developed and developing countries differs due to data availability. Although monthly data start from 1989, most countries' starting year is 1995. Heteroscedasticity and autocorrelation consistent standard errors are used to compute t-statistics of the model parameters. In Equation (1) Table 2, the coefficients of DEUNCT are significant for eight (8) countries out of twenty six (26) countries including USA, Spain, South Korea, Norway, Netherlands, Poland, China and Indonesia (i.e. 5 developed and 3 developing countries), while five (5) coefficients are negative (South Korea, Norway, Netherlands, Poland and Indonesia) (as per our expectation), and three (3) coefficients are positive (USA, Spain and China). During the period of high economic uncertainty, capital should flow to the safe-haven or developed countries from the developing countries. Interestingly, this is evidenced in our result, such


USA
UK
AUS
1.4 1.2 1.0 0.8 0.6 0.4 0.2 0.0
90 92 94 96 98 00 02 04 06 08 10 12 14
92 94 96 98 00 02 04 06 08 10 12 14
CAN
FRA
GER
ITA
JP
NETHER
1.1 1.0 0.9 0.8 0.7 0.6 0.5 0.4 0.3 0.2
96 98 00 02 04 06 08 10 12 14
NZ
NOR
SG
1998 2000 2002 2004 2006 2008 2010 2012 2014
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1.6
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01 02 03 04 05 06 07 08 09 10 11 12 13 14

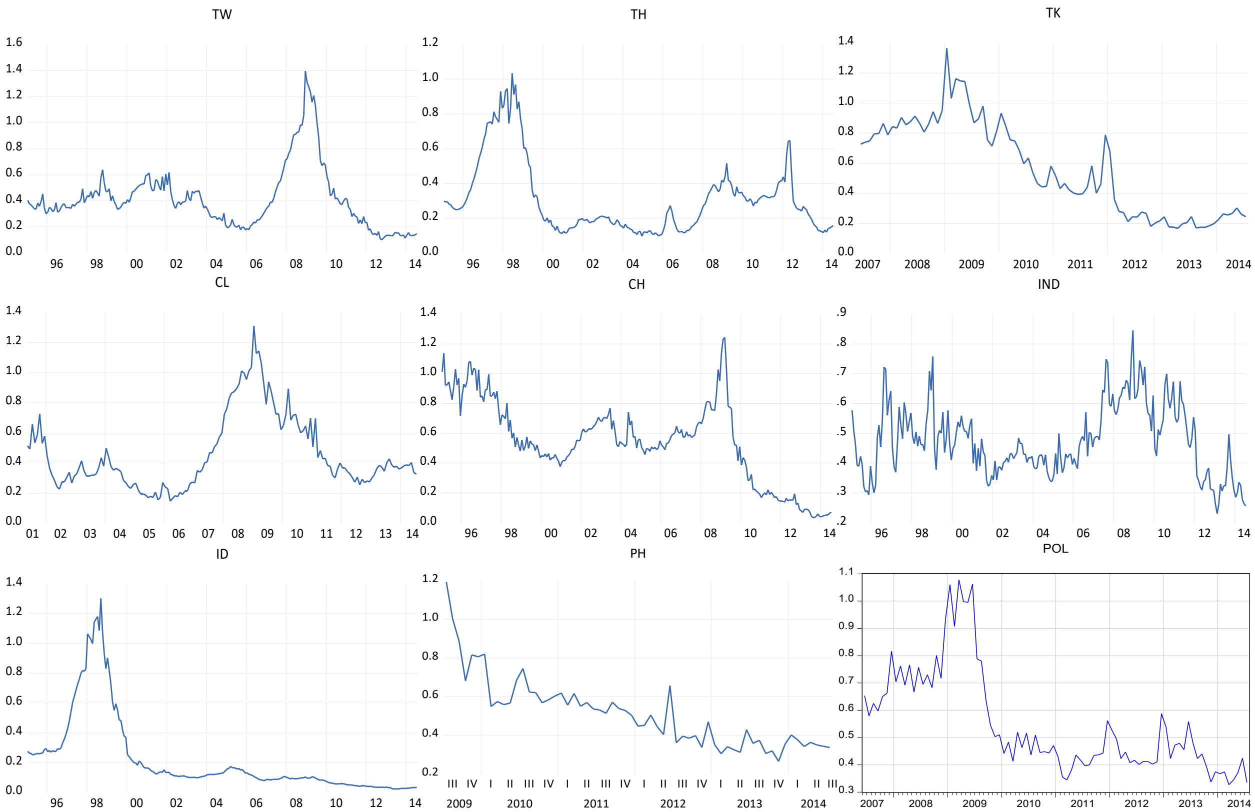

Figure 1. OS Measures (EUNCT)

Note: Presents the total economic uncertainty measures for sample countries. USA=United States, UK=United Kingdom, AUS=Australia, CAN=Canada, FRA=France, GER= Germany, ITA= Italy, JP=Japan, NETHER=Netherlands, NZ= New Zealand, NOR=Norway, SG= Singapore, KOR=South Korea, SPA= Spain, SWE=Sweden, BRA= Brazil, MAL= Malaysia, MEX=Mexico, TW= Taiwan, TH= Thailand, TK= Türkiye, CL= Chile, CH= China, IND= India, ID= Indonesia, PH= The Philippines, POL=Poland

as for the equity market of USA. Our positive equity premium for USA contradicts the results of Bali, et al. (2017). The lack of significant coefficients may be due to economic uncertainty already incorporated in the asset returns[6]. The effect size of the coefficients ranges between -1.11 (Indonesia) and 0.13 (Spain), whereas the median effect is -0.017. This suggests that 1 standard deviation increase in total economic uncertainty reduces aggregate equity returns by 0.00834 or 0.834 percent (the cross-sectional median effect -0.017 is multiplied by the pooled standard deviation of EUNCT of sample countries is 0.47). Given that the positive effect of DEUNCT on equity returns is not predominant across the countries, the significantly negative effect of economic uncertainty on equity returns in three (3) developed (South Korea, Norway and Netherlands) and two (2) developing (Poland and Indonesia) countries is consistent with Ozoguz (2008), Anderson, et al. (2009), Bali, et al. (2014) and Bali, et al. (2017). Taking these results together, the hypothesis ($Ho_1(i)$) of a negative relationship between economic uncertainty and equity returns is partially accepted for five (5) countries. Further, the coefficients of $r_{g,t}$ in Equation (1) are significantly positive in all countries and large at around 1 or slightly more than 1, indicating international diversification and integration of the global equity markets. Integration of equity markets in developed countries is consistent with the theoretical

[6] If strong form of efficiency exists, Efficient Market Hypothesis (EMH) says that asset market is unpredictable and all the available information is already included in the prices public of private. Thus, economic forecasts by professional forecasters are included the asset prices. However, unforecastable component of macroeconomic forecasts (common uncertainty) and disagreements among the economic agents (idiosyncratic uncertainty) should not be captured in the asset returns. Considering it as a new information, both types of uncertainty should be significant. The lack of significance may be due to irrationality of the market (e.g. weak information diffusion, sentiment-based trading, underreaction to the news etc.).

prediction of international CAPM. Although emerging and developing markets are often considered segmented from the developed equity markets, however our findings suggest that equity markets of emerging and developing countries are also integrated with the global equity markets.

Table 1. Descriptive Statistics of Asset Returns

Panel A. Developed Markets

	Equity Returns		Bond Returns		Housing Returns	
Countries	**Mean**	**Std. dev.**	**Mean**	**Std. dev.**	**Mean**	**Std. dev.**
USA	*0.008*	*0.044*	*0.004*	*0.024*	*0.002*	*0.013*
UK	*0.007*	*0.049*	*0.003*	*0.029*	*0.006*	*0.024*
Sweden	*0.010*	*0.074*	*0.004*	*0.034*	*0.011*	*0.014*
Spain	*0.009*	*0.068*	*0.006*	*0.051*	*0.004*	*0.020*
South Korea	*0.006*	*0.109*			*-0.002*	*0.018*
Singapore	*0.006*	*0.070*				
Norway	*0.008*	*0.082*	*0.004*	*0.035*	*0.011*	*0.019*
New Zealand	*0.008*	*0.058*	*0.008*	*0.045*	*0.010*	*0.022*
Netherlands	*0.006*	*0.063*	*0.006*	*0.036*	*0.006*	*0.017*
Japan	*0.000*	*0.061*	*0.004*	*0.028*	*-0.006*	*0.009*
Italy	*0.004*	*0.071*	*0.006*	*0.049*	*0.000*	*0.018*
Germany	*0.007*	*0.062*	*0.005*	*0.035*	*-0.001*	*0.007*
France	*0.007*	*0.059*	*0.005*	*0.036*	*0.006*	*0.016*
Canada	*0.008*	*0.055*	*0.004*	*0.023*	*0.006*	*0.018*
Australia	*0.010*	*0.061*	*0.008*	*0.036*	*0.009*	*0.018*
Switzerland			*0.008*	*0.029*	*0.006*	*0.006*
Poland	*-0.003*	*0.103*	*0.004*	*0.050*		

Panel B. Developing Markets

	Equity Returns		Bond Returns		Housing Returns	
Countries	**Mean**	**Std. dev.**	**Mean**	**Std. dev.**	**Mean**	**Std. dev.**
Brazil	*0.012*	*0.098*				
Malaysia	*0.005*	*0.082*				
Mexico	*0.011*	*0.065*	*0.007*	*0.033*		
Taiwan	*0.004*	*0.080*				
Thailand	*0.003*	*0.106*				
Türkiye	*0.002*	*0.114*				
Chile	*0.009*	*0.061*				
China	*0.009*	*0.100*	*0.006*	*0.015*		
Indonesia	*0.004*	*0.121*				
The Philippines	*0.017*	*0.052*				
Czech Republic			*0.006*	*0.044*		
India			*-0.001*	*0.037*		
World index	*0.006*	*0.045*	*0.003*	*0.019*	*0.001*	*0.008*

Again, in Table 2 Equation (2), the decomposition of DEUNCT into DEUNCI and DEUNCC show that DEUNCI exerts a more pronounced effect on stock markets than does DEUNCC. The coefficients of DEUNCI are significant for seven (7) out of twenty six (26) countries including USA, Spain, Norway, Netherlands, New Zealand, Poland, and Indonesia (i.e., 5 developed and 2 developing countries), for which four (4) coefficients were negative (Norway, Netherlands, Poland and Indonesia) as per our expectation, and three (3) coefficients were positive (USA, Spain and New Zealand). The magnitude of DEUNCI ranges between -1.27 (Indonesia) and 0.14 (Spain) with a median effect of -0.0147. DEUNCI, as measured by disagreement among professional forecasters, exerts negative effects on stock market returns in four (4) countries (i.e. 2 developed and 2 developing countries), which is consistent with the findings of related studies such as Carlin, et al. (2014), and Andrei, et al. (2014, 2019). On the other hand, the coefficients of DEUNCC are significant for two (2) developed countries namely, South Korea and New Zealand, where both coefficients were negative (as per our expectation). The magnitude of DEUNCC ranges between -1.17 (South Korea) and 0.37 (China) with a median effect of -0.073. Along with these findings, the hypothesis (Ho2) of negative effects of DEUNCC and DEUNCI is partially accepted. In addition, Wald statistics in table 2 show that investors demonstrate differential responses to different dimensions of uncertainty only for four (4) countries namely, as South Korea, Norway, New Zealand and Indonesia, suggesting that evidence supporting differences in responses to different dimensions of uncertainty are weak and thus, investors in stock markets usually do not respond differently to different dimensions of uncertainty.

ECONOMIC UNCERTAINTY AND BOND MARKET RETURNS

In Table 3 we explain the regression results on the relationship between bond returns and economic uncertainty for monthly data in Equation (1) and Equation (2). The monthly data starts from 2008 for all countries except Mexico which starts from 2010. Equation 1 in Table 3 presents the effect of DEUNCT on aggregate government bond returns. The coefficients of DEUNCT are significant in five (5) countries (UK, France, Canada, Australia, China) out of nineteen (19) countries. Out of these significant coefficients, only one is positive (China) while all others are negative. The result for China confirms our expectation. The positive coefficient for China suggests that investors have high confidence on Chinese government during turbulent economic condition, which also reflects Chinese economy's continuous growth and resilience. Li and Peng (2017) find that Chinese investors are risk-seekers and desire positive equity premium. The effect size of the coefficients ranges between -0.1095 (Australia) and 0.15 (Mexico) with the median effect -0.0027. This suggests that 1 standard deviation increase in economic uncertainty reduces bond returns by 0.0014 or 0.14 percent (median effect -0.0027 multiplied by the pooled standard deviation of EUNCT for sample countries 0.51). However, the negative effect of DEUNCT on bond returns is not predominant across the countries. Considering these results, the hypothesis Ho1(ii) of a positive relationship between economic uncertainty and bond returns is rejected. Again, the coefficients of $r_{g,t}$ in Equation (1) are significantly positive in all the countries except one country (India). The coefficients are large and around 1, particularly for the developed markets which is consistent with international diversification and bond market integration. However, the relatively low coefficient for global bond returns in emerging markets implies a low integration between developed and developing bond markets which is expected.

In Table 3, Equation (2) shows that the effect of DEUNCI is as good as the effect of DEUNCC on bond markets. The coefficients of DEUNCI are significant in three (3) countries (France, Canada, Australia), albeit all negative, while the coefficients of DEUNCC are significant in three (3) countries as well (Germany, Canada, China) with positive coefficients for Germany and China (confirms our expectation), but negative for Canada. The magnitude of DEUNCI ranges between -0.11 (Australia) and

Table 2. Effects of Economic Uncertainty on Aggregate Stock Market Returns
Panel A. Developed Markets

	Sample Start Period	Equation (1) Intercept	r_{gt}	$DEUNCT_t$	R^2	Equation (2) Intercept	r_{gt}	$DEUNCI_t$	$DEUNCC_t$	R^2	Wald Statistics	N
USA	1989M12	0.003***	0.89***	0.05**	0.83	0.003***	0.89***	0.05**	-0.007	0.83	0.72	296
UK	1989M12	0.0020	0.96***	-0.005	0.77	0.001	0.96***	0.0008	-0.06	0.77	0.40	296
Sweden	1995M3	0.001	1.37***	0.03	0.71	0.001	1.37***	0.05	-0.09	0.71	1.01	233
Spain	1995M3	0.001	1.20***	0.13**	0.62	0.001	1.21***	0.14**	0.05	0.63	0.33	233
South Korea	1995M2	-0.003	1.47***	-0.36**	0.40	-0.004	1.45***	-0.23	-1.17***	0.41	4.70**	234
Singapore	1995M3	-0.001	1.10***	-0.10	0.51	-0.001	1.10***	-0.10	-0.13	0.51	0.01	234
Norway	1998M8	0.001	1.41***	-0.08***	0.67	0.002	1.42***	-0.14***	0.16	0.68	3.35*	192
New Zealand	1995M2	0.002	0.92***	0.05	0.50	0.001	0.92***	0.07*	-0.28*	0.51	4.29**	234
Netherlands	1995M3	-0.001	1.24***	-0.08***	0.80	-0.001	1.24***	-0.09***	-0.05	0.80	0.13	233
Japan	1989M12	-0.005*	0.92***	-0.002	0.45	-0.005*	0.92***	0.008	-0.15	0.45	1.03	296
Italy	1989M12	-0.002	1.12***	-0.007	0.50	-0.002	1.12***	-0.004	-0.05	0.50	0.08	296
Germany	1989M12	-0.000	1.14***	-0.01	0.68	-0.000	1.14***	-0.01	-0.005	0.68	0.004	296
France	1989M12	0.001	1.13***	0.03	0.73	0.001	1.13***	0.02	0.12	0.73	0.67	296
Canada	1989M12	0.002	0.99***	-0.007	0.64	0.002	0.99***	-0.007	0.0005	0.64	0.002	296
Australia	1991M1	0.002	1.11***	-0.01	0.64	0.001	1.11***	-0.012	-0.22	0.64	1.20	283
Poland	2007M7	-0.008**	1.62***	-0.15**	0.76	-0.008**	1.62***	-0.15**	-0.15	0.76	0.001	85

Panel B. Developing Markets

	Sample Start Period	Equation (1) Intercept	r_{gt}	$DEUNCT_t$	R^2	Equation (2) Intercept	r_{gt}	$DEUNCI_t$	$DEUNCC_t$	R^2	Wald Statistics	N
Brazil	2001M6	0.004	1.58***	-0.05	0.57	0.004	1.58***	-0.06	0.08	0.57	0.23	158
Malaysia	1995M2	0.0003	0.74***	0.05	0.16	0.000	0.74***	0.09	-0.30	0.17	1.17	234
Mexico	2001M6	0.005*	1.13***	-0.03	0.68	0.005**	1.13***	-0.06	0.14	0.69	1.42	158
Taiwan	1995M2	-0.003	1.04**	0.002	0.34	-0.003	1.04***	0.016	-0.10	0.34	0.25	234
Thailand	1995M2	-0.005	1.27***	-0.24	0.30	-0.004	1.27***	-0.32	0.17	0.31	1.005	234

Table 2. Continued
Panel B. Developing Markets

	Sample Start Period	Equation (1) Intercept	r_{gt}	$DEUNCT_t$	R^2	Equation (2) Intercept	r_{gt}	$DEUNCI_t$	$DEUNCC_t$	R^2	Wald Statistics	N
Türkiye	*2007M2*	*-0.002*	*1.43******	*-0.04*	*0.47*	*-0.006*	*1.43******	*-0.02*	*-0.84*	*0.48*	*1.50*	*85*
Chile	*2001M6*	*0.004*	*0.87******	*-0.05*	*0.45*	*0.004*	*0.87******	*-0.05*	*-0.07*	*0.008*	*0.008*	*158*
China	*1995M2*	*0.003*	*0.94******	*0.11**	*0.17*	*0.004*	*0.95******	*0.09*	*0.37*	*0.17*	*0.22*	*234*
Indonesia	*1995M2*	*-0.005*	*1.35******	*-1.11******	*0.36*	*-0.004*	*1.31******	*-1.27******	*-0.13*	*0.38*	*3.68*****	*234*
The Philippines	*2009M8*	*0.008*	*0.7345******	*-0.05*	*0.36*	*0.008*	*0.73******	*-0.04*	*-0.09*	*0.36*	*0.34*	*60*

Note: This table presents the OLS regression results for the following Eq.:

$$r_{i,t} = \alpha_{i,0} + \alpha_{i,1} r_{g,t} + \alpha_{i,2}\, DEUNCT_{i,t} + \varepsilon_{it} \quad (1)$$

$$r_{i,t} = \beta_{i,0} + \beta_{i,1} r_{g,t} + \beta_{i,2}\, DEUNCI_{i,t} + \beta_{i,3}\, DEUNCC_{i,t} + \varepsilon_{it} \quad (2)$$

Presents monthly results. Heteroscedasticity and autocorrelation consistent standard errors are used to compute t-statistics of the model parameters. *The dependent variable* is aggregate stock market return ($r_{i,t}$). R_g is the return on global market portfolio, $DEUNCT$ is change in total economic uncertainty, $DEUNCI$ change in idiosyncratic uncertainty, and $DEUNCC$ is change in common uncertainty. *The last column presents the Wald test statistic for the hypothesis, which states that* idiosyncratic and common uncertainties have distinguishable effects on stock returns*:* $\beta_{i,2} = \beta_{i,3}$.* significance at .10 level ** significance at .05 level *** significance at .01 level.

0.07 (Japan) with a median effect of -0.002. This suggests that the idiosyncratic uncertainty, as measured by disagreement among professional forecasters, exerts negative effects on government bond market returns. The magnitude of DEUNCC ranges between -0.27 (Japan) and 0.76 (Mexico) with the median effect of -0.017, indicating the negative effects of common uncertainty on government bond market returns. Taking these findings into account, the hypothesis H02 of negative effects of DEUNCC and DEUNCI is partially accepted. While Wald statistics in Table 3 show that investors demonstrate differential response to different dimensions of uncertainty for four (4) countries namely Japan, Germany, Switzerland and China , suggesting that evidence supporting differences in responses to different dimensions of uncertainty are weak, thus investors in bond markets do not respond differently with respect to different dimensions of uncertainty. This finding is analogous to that of equity market results.

ECONOMIC UNCERTAINTY AND HOUSING MARKET RETURNS

In Table 4 we demonstrate the regression results on the relationship between housing market returns and economic uncertainty for quarterly data in Equation (1) and Equation (2). Table 4 Equation 1 shows the effect of DEUNCT on the aggregate housing market returns. The coefficients of DEUNCT are statistically significant in four (4) countries (Spain, Italy, Australia, Switzerland) out of fifteen (15) developed countries while the sign is positive for two (2) countries (Spain, Italy) and, as expected, negative for two (2) countries (Australia, Switzerland). During economic uncertain period, buyers of housing allocate funds in the real estate sector for Spain and Italy. This also indicates lack of investment opportunities in the financial markets during turmoil. The effect size of the coefficients ranges between -0.06 (UK) and 0.05 (Italy) with the median effect -0.006. The median effect size indicates that 1 standard deviation increase in total economic uncertainty reduces housing market returns by 0.0027 or 0.27 percentage points (median effect -0.006 multiplied by pooled standard

Table 3. Effects of Economic Uncertainty on Aggregate Bond Market Returns
Panel A. Developed Markets

	Sample Start Period	Equation (1) Intercept	r_{gt}	$DEUNCT_t$	R^2	Equation (2) Intercept	r_{gt}	$DEUNCI_t$	$DEUNCC_t$	R^2	Wald Statistics	N
USA	2008M1	0.002	0.63***	0.03	0.30	0.002	0.62***	0.04	-0.02	0.30	0.23	79
UK	2008M1	0.000	0.82***	-0.10*	0.32	0.000	0.82***	-0.11	-0.01	0.33	0.12	79
Sweden	2008M1	0.000	1.26***	-0.002	0.51	0.000	1.26***	0.002	-0.04	0.51	0.18	79
Spain	2008M1	0.001	1.61***	0.01	0.38	0.000	1.61***	0.01	-0.01	0.38	0.01	79
Norway	2008M1	0.000	0.96***	-0.02	0.29	0.000	0.95***	-0.01	-0.04	0.29	0.03	79
New Zealand	2008M1	0.003	1.40***	0.004	0.36	0.004	1.41***	-0.001	0.11	0.36	0.08	79
Netherlands	2008M1	0.001	1.41***	-0.007	0.60	0.001	1.40***	-0.002	-0.04	0.60	0.09	79
Japan	2008M1	0.001	0.88***	0.03	0.35	0.000	0.87***	0.07	-0.27	0.40	3.83**	79
Italy	2008M1	0.001	1.42***	-0.06	0.34	0.001	1.42***	-0.06	-0.06	0.34	0.00	79
Germany	2008M1	0.000	1.44***	-0.03	0.65	0.001	1.46***	-0.06	0.24**	0.66	6.34***	79
France	2008M1	0.000	1.44***	-0.07*	0.59	0.001	1.44***	-0.09**	0.05	0.60	1.54	79
Canada	2008M1	0.001	0.61***	-0.08**	0.29	0.001	0.60***	-0.08**	-0.15*	0.29	0.38	79
Australia	2008M1	0.004	1.01***	-0.10*	0.35	0.004	1.00***	-0.11*	0.04	0.35	0.39	79
Switzerland	2008M1	0.005**	0.81***	0.007	0.30	0.006***	0.81***	-0.005	0.20	0.32	3.69**	79
Poland	2008M1	0.000	0.98***	-0.08	0.16	0.990	0.99***	-0.09	-0.07	0.16	0.02	79

Panel B. Developing Markets

	Sample Start Period	Equation (1) Intercept	r_{gt}	$DEUNCT_t$	R^2	Equation (2) Intercept	r_{gt}	$DEUNCI_t$	$DEUNCC_t$	R^2	Wald Statistics	N
Mexico	2010M7	0.005	1.03***	0.15	0.24	0.006	1.01***	0.06	0.76	0.27	2.30	49
China	2008M1	0.005***	0.13*	0.02***	0.037	0.007***	0.11*	-0.0008	0.29***	0.10	9.57*	79
Czech Republic	2008M1	0.002	1.05***	0.01	0.21	0.003	1.06***	0.01	0.03	0.21	0.01	79
India	2008M1	-0.002	0.43	-0.0002	0.05	-0.003	0.44	0.009	-0.24	0.06	0.39	79

Note: This table presents the OLS regression results for the following Eq.:

$$r_{i,t} = \alpha_{i,0} + \alpha_{i,1} r_{g,t} + \alpha_{i,2}\ DEUNCT_{i,t} + \varepsilon_{it} \quad (1)$$

$$r_{i,t} = \beta_{i,0} + \beta_{i,1} r_{g,t} + \beta_{i,2}\ DEUNCI_{i,t} + \beta_{i,3}\ DEUNCC_{i,t} + \varepsilon_{it} \quad (2)$$

Presents monthly results. Heteroscedasticity and autocorrelation consistent standard errors are used to compute t-statistics of the model parameters. *The dependent variable* is 10-year benchmark Datastream bond index return ($r_{i,t}$). R_g is the return on developed markets sovereign bond index from standard and poor, DEUNCT is change in total economic uncertainty, $DEUNCI$ change in idiosyncratic uncertainty, and $DEUNCC$ is change in common uncertainty. *The last column presents the Wald test statistic for the hypothesis, which states that* idiosyncratic and common uncertainties have distinguishable effects on bond returns: $\beta_{i,2} = \beta_{i,3}$. N is the number of observations. * significance at .10 level ** significance at .05 level *** significance at .01 level.

deviation of EUNCT for the sample countries which is 0.46). The result indicates that increases in economic uncertainty have a negative effect on the housing market returns implying that an increase in uncertainty related to employment, interest rates, economic outlook, real activity and inflation have negative effects on the housing markets. This supports the notion that economic agents reduce consumption of housing as durable goods when there is a rise in the economic uncertainty. However, the negative effect of DEUNCT is not prevalent nor persistent across the countries. These results signify that the hypothesis (H01(i)) of a negative relationship between economic uncertainty and housing market returns is partially accepted. Further, the coefficient of $r_{g,t}$ in Equation (1) is significant for most of the countries and positive for all countries except Switzerland. The significant coefficients are large at around 1 and consistent with the notion that global housing markets are integrated. Further, the coefficients also reveal that housing is considered an important vehicle for international investment and diversification and transmitter of economic shocks. The correlation with the global housing market is consistent with Hirata, et al. (2012).

In Table 4 Equation (2), the results reveal that DEUNCI exerts a more pronounced impact on the housing market than that of DEUNCC. Specifically, the coefficients of DEUNCI are significant in six (6) countries (US, UK, South Korea, France, Canada and Australia) with negative coefficients (confirms our expectation) except the US. On the contrary, the coefficients of DEUNCC are significant in three (3) countries (Spain, Italy and Switzerland) with a negative coefficient for Switzerland (confirms our expectation) and a positive for others. The magnitude of DEUNCI ranges between -0.12 (UK) and 0.03 (USA) with a median effect of -0.007. The magnitude of DEUNCC ranges between -0.07 (Switzerland) and 0.13 (Canada) with median effect of 0.014. Therefore, the hypothesis H02 of negative effects of DEUNCI and DEUNCC is partially accepted. In addition, investors demonstrate differential responses to different dimensions of uncertainty for 7 countries such as the UK, Sweden, Spain, Italy, France, Canada, Switzerland (see Wald statistics in Table 4), suggesting that evidence supporting differences in responses to different dimensions of uncertainty are weak and, therefore, investors in the housing market do not respond differently with respect to different dimensions of uncertainty. Overall, our findings for housing are consistent with Strobel, et al. (2020) and Hirata, et al. (2012) for negative effects of uncertainty shocks, and Antonakakis, et al. (2015) for the negative effect of economic policy uncertainty on housing returns.

ROBUSTNESS TEST

We conduct the robustness test for our key findings using low frequency monthly data to test whether our results are consistent with quarterly frequency data. Since macroeconomic data are published quarterly and not available on a monthly basis and our uncertainty proxy is mainly based on macroeconomic variables, we attempt to see whether our results hold for the quarterly dataset as well. Given that we had already used quarterly data for housing returns, so our robustness test is conducted for equity returns and bond returns. The un-tabulated results on quarterly data suggest that results of our baseline regression hold for both equity and bond returns.[7] In short, the negative effect of DEUNCT is re-confirmed for both equity and bond, while DEUNCI is more negative than that of DEUNCC. However, these effects are neither prevalent nor persistent across countries for quarterly data. In addition, evidence supporting differences in responses to different dimensions of uncertainty is weak, meaning that investors do not demonstrate differences in responses to the different dimensions of uncertainty. Overall, the findings are consistent with the monthly data for equity and bonds.

[7] For brevity we do not present the quarterly results in the paper, but the results are available on request from the authors.

Table 4. Effects of Economic Uncertainty on Aggregate Housing Market Returns
Panel A. Developed Markets

	Sample Start Period	Equation (1) r_{gt}	Equation (1) $DEUNCT_t$	Equation (1) R^2	Equation (2) r_{gt}	Equation (2) $DEUNCI_t$	Equation (2) $DEUNCC_t$	Equation (2) R^2	Wald Statistics	N
USA	1990Q1	1.33***	0.01	0.66	1.35***	0.03***	-0.02	0.68	2.17	99
UK	1990Q1	1.80***	-0.06	0.4	1.75***	-0.12***	0.04	0.43	7.09***	99
Sweden	1995Q1	0.80***	-0.001	0.23	0.805***	-0.03	0.05	0.27	3.15*	78
Spain	1995Q1	1.82***	0.05**	0.56	1.82***	0.02	0.08***	0.56	3.29*	78
South Korea	1995Q1	0.34	-0.04	0.06	0.39	-0.07*	0.01	0.08	2.11	78
Norway	1998Q3	0.501	0.01	0.05	0.49***	0.02	-0.02	0.06	0.3	64
New Zealand	1995Q1	1.40***	-0.04	0.28	1.40***	-0.04	-0.05	0.29	0.02	78
Netherlands	1995Q1	0.68***	0.02	0.1	0.69***	0.02	0.05	0.11	0.61	78
Japan	1990Q1	0.05	-0.006	0.006	0.06	-0.007	-0.002	0.005	0.03	99
Italy	1990Q1	1.30***	0.054***	0.34	1.32***	0.027	0.09***	0.36	5.01**	99
Germany	1990Q1	-0.13	0.007	0.02	-0.13	0.011	-0.003	0.03	0.36	99
France	1990Q1	1.27***	-0.01	0.43	1.28***	-0.04*	0.02	0.44	2.61*	99
Canada	1990Q1	0.70***	-0.02	0.1	0.75***	-0.08***	0.13	0.2	2.87*	99
Australia	1991Q1	0.94***	-0.05*	0.21	0.94***	-0.060**	-0.05	0.21	0.001	88
Switzerland	1998Q4	-0.25***	-0.02**	0.21	-0.24***	0.01	-0.07***	0.49	56.31***	63

Note: This table presents the OLS regression results for the following Eq.:

$$r_{i,t} = \alpha_{i,0} + \alpha_{i,1} r_{g,t} + \alpha_{i,2}\, DEUNCT_{i,t} + \varepsilon_{it} \quad (1)$$

$$r_{i,t} = \beta_{i,0} + \beta_{i,1} r_{g,t} + \beta_{i,2}\, DEUNCI_{i,t} + \beta_{i,3}\, DEUNCC_{i,t} + \varepsilon_{it} \quad (2)$$

Presents quarterly results. Heteroskedasticity and autocorrelation consistent standard errors are used to compute t-statistics of the model parameters. *The dependent variable* is real housing market index return from Mack and Martinez Garcia (2011), ($r_{i,t}$). R_g is the return on the aggregate real housing price index from Mack and Martinez Garcia (2011), $DEUNCT$ is change in total economic uncertainty, $DEUNCI$ change in idiosyncratic uncertainty, and $DEUNCC$ is change in common uncertainty. *The last column presents the Wald test statistic for the hypothesis, which states that* idiosyncratic and common uncertainties have distinguishable effects on housing returns: $\beta_{i,2} = \beta_{i,3}$. N is the number of observations. * significance at .10 level ** significance at .05 level *** significance at .01 level.

We also examine the robustness of our results from empirical modelling perspectives. For this, we compare and contrast our results with that of Arouri, et al. (2012) (AR hereafter). Our empirical model is similar to that of AR, but AR's model is based on the partial market segmentation hypothesis. Again, perfect market integration is relatively less realistic due to different direct/indirect barriers, which restrict investors' access to the international capital market or holding foreign assets. In line with these, AR document that investors do not hold a world market portfolio and such a portfolio is inefficient. They also find that local risks are not diversifiable internationally due to a lack of partial market segmentation and thus International CAPM should be augmented with the local risks. With perfect integration, their model becomes the traditional International CAPM model. Since our empirical model is similar to the empirical strategy of AR, we are interested to see whether our findings are robust to that of AR. In their paper, AR finds that market integration is time-varying in nature and emerging markets are becoming more integrated due to structural reforms and liberalization. The risk premium for local factors is more important for emerging markets' total risk premium, however, rising integration has reduced the importance of local risk premium within the total premium for emerging economies in recent years. On the contrary, global factors are more relevant to explain total risks for developed markets. Our results are in contrast to AR in two ways. First, unlike AR results, we find that global factors (global portfolio returns, i.e., $r_{g,t}$) are significant and close to 1 or more across developed and developing countries and across the asset classes. Second, local factors (total economic uncertainty, i.e., DEUNCT) are mostly insignificant across both developed and developing countries and across the asset classes. The explanation for our different results could be that developing markets became more integrated with developed markets over the years, thus they have achieved global risk sharing (i.e. diversifying local risks internationally) and access to global investments.

Financial markets across the globe suffered due to covid 19, which is often compared with Global Financial Crisis of 2007, and 1987 stock market crash (Kamal and Wohar, 2023). Consequently, it is important to see whether our benchmark results hold with extended dataset, specifically during covid period of 2020. We make robustness of our results for stocks and bond with monthly data ranging between m9, 2014 to m9,2020[8]. We find that total economic uncertainty and idiosyncratic uncertainty is more negative for stock returns across the countries (more specifically for the developed markets), which is consistent with our earlier results. While for bond returns, we find that economic uncertainty (total and idiosyncratic components) remains more positive across the countries. These results are consistent with our main results.

ADDITIONAL ANALYSIS

CONTEMPORANEOUS AND LAGGED EFFECTS OF UNCERTAINTY

We further explore the likelihood of a slow response of market participants to economic uncertainties. Since the magnitude of uncertainty is not observable but rather is estimated by exploiting the predictive contents of available data, market participants may be unsure about how to respond to economic uncertainty. As such, market participants may demonstrate a sluggish response by resorting to the wait-and-see approach when there is high economic uncertainty (Bernanke, 1983; Bloom, 2009). To address this possibility, we augment both Equation (1) and Equation (2) with a one period lagged value of the corresponding uncertainty variables. In particular, we investigate the lagged effect of economic uncertainty on asset returns along with the contemporaneous effects to observe whether lagged effects and contemporaneous effects are jointly zero (tested by the Wald test). Using the Wald test, we examine whether both contemporaneous and lagged effects are jointly irrelevant or not to the asset returns. The results are reported in Tables 5 to Table 7. We find that the results remain consistent despite using lagged data.

In Table 5 Panel A shows the effects of $DEUNCT_t$ and $DEUNCT_{t-1}$ on equity returns. The results indicate that the contemporaneous effects are negative and significant although we used the lagged

[8] Results are available from the author upon reasonable request.

uncertainty measure. In particular, the effect of $DEUNCT_t$ is significantly negative for South Korea, Norway, Netherlands, Poland and Indonesia while the effect of $DEUNCT_{t-1}$ is significantly negative only for the Netherlands when we used lagged uncertainty for equity. However, as shown by the Wald statistics in Table 5 Column 4, we accept that both the effects of $DEUNCT_t$ and $DEUNCT_{t-1}$ are not jointly irrelevant for five (5) countries including USA, South Korea, Norway, Netherlands and Indonesia, out of twenty-six (26) countries. As a result, the joint effects of $DEUNCT_t$ and $DEUNCT_{t-1}$ on aggregate equity returns are irrelevant for monthly data. This implies the impounding of information on equity prices in most of the cases, such as for twenty-one (21) countries out of twenty-six (26) countries, thus largely supporting the efficient market hypothesis (EMH) of Fama (1970). Again, Table 5 Panel B reveals the effects of $DEUNCI_t$ and $DEUNCI_{t-1}$ and $DEUNCC_t$ and $DEUNCC_{t-1}$ on equity returns. The effects of $DEUNCI_t$ remain negative and significant for Norway, Netherlands, Mexico, Poland and Indonesia, whereas $DEUNCI_{t-1}$ is weakly significant and negative for Netherlands only. Similarly, the effects of $DEUNCC_t$ exhibit a negative significant impact on equity returns for Japan and Türkiye, but the effect of $DEUNCC_{t-1}$ is negative for Sweden. Overall, the lagged effects are relatively weak compared to the contemporaneous effects for equity markets. With respect to the differences in responses to different dimensions of uncertainty, as shown in the Wald statistics in Table 5 Column 9, we find differences in responses to different dimensions of uncertainty on the contemporaneous (lagged) basis for five (two) countries. Thus, we do not observe differences in responses to different dimensions of uncertainty for contemporaneous (lagged) effects of the economic uncertainty measures on equity returns which confirms our earlier findings.

In Table 6 Panel A shows the effects of $DEUNCT_t$ and $DEUNCT_{t-1}$ on bond returns, while the effects of $DEUNCI_t$ and $DEUNCI_{t-1}$ and $DEUNCC_t$ and $DEUNCC_{t-1}$ are shown in Panel B. In Panel A, the results of the lagged effects ($DEUNCT_{t}$-1) are found to be more significant and positive than that of the contemporaneous effects ($DEUNCT_t$) for bond returns on a monthly basis. More specifically, the effects of $DEUNCT_{t-1}$ are positive and significant on bond returns for the USA, China and India. For additional evidence favoring the significance of lagged effects, The Wald statistics as shown in Table 6 Column 4 suggest that the hypothesis of joint effects of $DEUNCT_t$ and $DEUNCT_{t-1}$ are not irrelevant for seven (7) out of nineteen (19) countries. This implies that slow response of bond market investors to the economic uncertainty. In Panel B, $DEUNCI_{t-1}$ appears to have a positive and significant relation to bond returns in the USA, Netherlands and India. Again, some variation is also observed in the effects of $DEUNCC_t$ and $DEUNCC_{t-1}$ for their effects on bond returns. That is, $DEUNCC_t$ is found positive and significant for the UK and Italy while $DEUNCC_{t-1}$ is found positive and significant for Norway. Further, as per the Wald statistics as shown in Table 6 Column 9, we find differences in responses to different dimensions of uncertainty on contemporaneous (lagged) basis for four (four) countries. This suggests that bond market investors do not show different responses to different dimensions of uncertainty on either a contemporaneous basis or a lagged basis which confirms our earlier findings.

Finally, in Table 7 Panel A demonstrates the effects of $DEUNCT_t$ and $DEUNCT_{t-1}$ on housing returns while the effects of $DEUNCI_t$ and $DEUNCI_{t-1}$ and $DEUNCC_t$ and $DEUNCC_{t-1}$ are shown in Panel B. In Panel A, like equity returns, the lagged effects do not matter much for housing returns on a quarterly basis. That is, the effects of uncertainty ($DEUNCT_t$) remain negative and significant for the UK, Australia and Switzerland when we include lagged values. The Wald statistics as shown in Table 7 Column 4 suggest that the hypothesis of joint effects of $DEUNCT_t$ and $DEUNCT_{t-1}$ are not irrelevant for three (3) countries out of fifteen (15) countries. This implies that information incorporates quickly in the housing returns and that the housing market is an efficient market in these three (3) countries. Again, in Panel B, the effects of $DEUNCI_t$ remain negative and significant for the UK, South Korea, France, Canada and Australia. However, like bond returns, the variation is less between $DEUNCC_t$ and $DEUNCC_{t-1}$ for their effects on housing returns. This means $DEUNCC_t$ shows a negative and significant relation for Spain

Table 5. Contemporaneous and Lagged Effects of Economic Uncertainty on Aggregate Stock Market Returns

Panel A. Developed Markets

	Panel A			Panel B				
	DEUNCT$_t$	DEUNCT$_{t-1}$	Wald[a]	DEUNCI$_t$	DEUNCC$_t$	DEUNCI$_{t-1}$	DEUNCC$_{t-1}$	Wald[b]
USA	.05 **	-0.02	2.50 *	.05 **	-0.04	-0.02	0.06	0.7 (-0.36)
UK	-0.001	0.003	0.007	0.01	0.41	0.01	-0.49	0.85 (-1.6)
Sweden	0.04	-0.008	0.49	0.05	0.47	0.02	-.62 **	1.74 (4.51**)
Spain	.12*	0.08	1.82	.14 **	-0.47	0.09	0.55	0.62 (-0.34)
South Korea	-.48 ***	0.45	3.14 **	-0.28	-0.83	.66 **	0.61	0.12 (-0.6)
Singapore	-0.10	0.02	1.03	-0.1	-0.2	0.02	0.11	0.22 (-0.12)
Norway	-.08 **	0.05	3.53 **	-.13 ***	0.15	0.05	0.04	2.91 * (-0.01)
New Zealand	0.04	-0.04	1.19	0.06	-0.4	-0.02	0.12	0.54 (-0.05)
Netherlands	-.09 ***	-.04 *	4.73 ***	-.09 ***	-0.05	-.04 *	-0.02	0.13 (-0.03)
Japan	-0.002	0.01	0.03	0.01	-.65 *	0.01	0.53	2.96 *(-1.74)
Italy	-0.03	-0.08	1.72	-0.02	0.61	-0.07	-0.71	0.68 (-0.64)
Germany	-0.02	-0.02	0.12	-0.02	0.3	-0.01	-0.33	0.93 (-0.97)
France	0.02	-0.009	0.39	0.02	0.61	-0.01	-0.51	1.48 (-1.11)
Canada	-0.01	-0.05	0.84	-0.02	-0.19	-0.05	0.22	0.04 (-0.13)
Australia	-0.01	0.02	0.21	-0.001	-0.63	0.03	0.41	1.49 (-0.83)
Poland	-0.16 **	-0.02	2.56	-.16 **	-0.09	-0.04	-0.05	0.07 (-0.1)

Panel B. Developing Markets

	Panel A			Panel B				
	DEUNCT$_t$	DEUNCT$_{t-1}$	Wald[a]	DEUNCI$_t$	DEUNCC$_t$	DEUNCI$_{t-1}$	DEUNCC$_{t-1}$	Wald[b]
Brazil	-0.04	0.08	0.83	-0.07	-0.78	0.02	1.14 **	1.56 (3.95**)
Malaysia	0.01	-0.27	1.09	0.03	0.36	-0.23	-0.86	0.25 (-0.8)
Mexico	-0.05	-0.04	0.59	-.16 **	0.65	-0.13	-0.47	2.77 * (-0.62)

Table 5. Continued
Panel B. Developing Markets

	Panel A			Panel B				
	DEUNCT$_t$	**DEUNCT$_{t-1}$**	**Wald[a]**	**DEUNCI$_t$**	**DEUNCC$_t$**	**DEUNCI$_{t-1}$**	**DEUNCC$_{t-1}$**	**Wald[b]**
Taiwan	*0.002*	*0.004*	*0.002*	*0.01*	*-0.64*	*0.005*	*0.59*	*1.71 (-1.52)*
Thailand	*-0.32*	*0.17*	*1.23*	*-0.33*	*0.58*	*-0.13*	*-0.51*	*2.44 (-0.79)*
Türkiye	*-0.03*	*0.05*	*0.45*	*0.01*	*-4.59 *****	*0.06*	*3.73 **	*3.91 ** (-2.55)*
Chile	*-0.04*	*0.01*	*0.49*	*-0.03*	*0.95*	*0.03*	*-1.09*	*1.47 (-1.68)*
China	*0.11 **	*0.04*	*1.39*	*0.09*	*0.1*	*0.01*	*0.35*	*0.0008 (-0.53)*
Indonesia	*-1.11 ****	*0.03*	*16.76 ****	*-1.30 ****	*-0.14*	*-0.1*	*-0.09*	*3.52 * (-0.07)*
The Philippines	*-0.06*	*0.01*	*1.53*	*-0.04*	*-0.18*	*0.003*	*-0.04*	*0.31 (-0.03)*

Notes: Presents monthly results. Panel A presents the results for Eq. (1) augmented by lagged total uncertainty: $r_{i,t} = \alpha_{i,0} + \alpha_{i,1} r_{g,t} + \alpha_{i,2}\, DEUNCT_{i,t} + \alpha_{i,3}\, DEUNCT_{i,t-1} + \varepsilon_{it}$. Panel B presents the results for Eq. (2) augmented by lagged idiosyncratic uncertainty and lagged common uncertainty: $r_{i,t} = \beta_{i,0} + \beta_{i,1} r_{g,t} + \beta_{i,2}\, DEUNCI_{i,t} + \beta_{i,3}\, DEUNCC_{i,t} + \beta_{i,4}\, DEUNCI_{i,t-1} + \beta_{i,5}\, DEUNCC_{i,t-1} + \varepsilon_{it}$. *The dependent variable* is aggregate stock market return ($r_{i,t}$). R_g is the return on global market portfolio, $DEUNCT$ is change in total economic uncertainty, $DEUNCI$ change in idiosyncratic uncertainty, and $DEUNCC$ is change in common uncertainty. Wald[a] is Wald test statistic, which tests the irrelevance of both the *contemporaneous and lagged total uncertainty* for stock returns ($\alpha_{i,2} = \alpha_{i,3} = 0$). Wald[b] is Wald test statistic to test for two simultaneous restrictions, $\beta_{i,2} = \beta_{i,3}$ and $\beta_{i,4} = \beta_{i,5}$, where the former (latter) implies identical *contemporaneous* (lagged) effects of idiosyncratic and common uncertainties on stock returns. T-statistics of the model parameters are obtained from *heteroscedasticity and autocorrelation consistent standard errors.*
* significance at .10 level ** significance at .05 level *** significance at .01 level

and Switzerland, whereas DEUNCCt-1 shows as negative and significant for Sweden and Germany. Finally, Wald statistics as shown in Column 9 of Table 7, suggest that we find differences in responses to different dimensions of uncertainty on a contemporaneous (lagged) basis for five (three) countries. This suggests that housing market investors do not show differences in responses to different dimensions of uncertainty either on a contemporaneous basis or a lagged basis which confirms our earlier results.

ECONOMIC UNCERTAINTY EFFECTS ACROSS ECONOMIC STATES

Phan, et al. (2018) find that economic uncertainty and stock returns predictability is asymmetric, that is positive EPU shocks predict stock returns more strongly than the negative EPU shocks. Nartea, et al. (2020) find that negative uncertainty premium varies across different level of investor's sentiment, which in turn varies across different level of uncertainty. In line with prior literature, we posit that premium of economic uncertainty is conditioned on economic states, that is effects of economic uncertainty may vary during bearish and bullish market conditions. During recessions, economic uncertainty may rise and so do its effects on asset returns. Some literature suggests that economic policy uncertainty is persistent (Plakandaras, et al, 2019; Abakah, et al, 2021, Sheng, et al, 2022). Sheng, et al. (2022) suggest that the persistence of policy uncertainty is observed during higher climate risks.

Table 6. Contemporaneous and Lagged Effects of Economic Uncertainty on Aggregate Bond Market Returns

Panel A. Developed Markets

		Panel A				Panel B		
	$DEUNCT_t$	$DEUNCT_{t-1}$	Wald[a]	$DEUNCI_t$	$DEUNCC_t$	$DEUNCI_{t-1}$	$DEUNCC_{t-1}$	Wald[b]
USA	*0.017*	*0.08 **	*1.61*	*0.032*	*-0.19*	*0.09 ****	*0.184*	*0.83 (-0.171)*
UK	*-0.11 ***	*0.038*	*2.289*	*-0.11 **	*1.54 **	*0.05*	*-1.48 ***	*3.00 * (4.37) ****
Sweden	*-0.002*	*-0.046*	*0.408*	*-0.001*	*0.330*	*-0.042*	*-0.377*	*2.102 (-1.93)*
Spain	*0.012*	*0.066*	*0.590*	*0.019*	*0.092*	*0.07*	*-0.081*	*0.01 (-0.07)*
Norway	*-0.016*	*0.016*	*0.069*	*-0.017*	*0.010*	*-0.043*	*0.26 ***	*0.02 (3.85) ***
New Zealand	*-0.021*	*-0.122*	*3.18 ****	*-0.068*	*1.076*	*-0.154*	*-0.917*	*3.63 * (-1.80)*
Netherlands	*-0.007*	*0.037*	*0.993*	*-0.001*	*-0.019*	*0.05**	*-0.049*	*0.023 (-0.67)*
Japan	*0.029*	*-0.050*	*1.40 **	*0.059*	*-0.683*	*-0.030*	*0.430*	*3.29 * (-2.08)*
Italy	*-0.080*	*-0.052*	*1.95*	*-0.06 **	*1.53 ***	*-0.027*	*-1.61 ***	*5.28 ** (4.91) ***
Germany	*-0.029*	*-0.070*	*1.00*	*-0.062*	*0.381*	*-0.102*	*-0.146*	*2.120 (-0.023)*
France	*-0.070*	*-0.064*	*1.92*	*-0.093*	*0.230*	*-0.081 **	*-0.172*	*0.269 (-0.025)*
Canada	*-0.090*	*-0.050*	*4.32 ****	*-0.10 ***	*0.840*	*-0.050*	*-0.994*	*0.825 (-0.91)*
Australia	*-0.10 **	*0.039*	*4.02 ***	*-0.10 **	*-0.500*	*0.030*	*0.512*	*0.265 (-0.47)*
Switzerland	*0.001*	*-0.027*	*0.18*	*-0.019*	*0.333*	*-0.040*	*-0.150*	*2.036 (-0.19)*
Poland	*-0.110*	*-0.074*	*1.53 **	*-0.116*	*-0.113*	*-0.078*	*-0.057*	*0.000 (-0.009)*

Panel B. Developing Markets

		Panel A				Panel B		
	$DEUNCT_t$	$DEUNCT_{t-1}$	Wald[a]	$DEUNCI_t$	$DEUNCC_t$	$DEUNCI_{t-1}$	$DEUNCC_{t-1}$	Wald[b]
Mexico	*0.102*	*-0.18 ****	*1.451*	*-0.067*	*-0.365*	*-0.390*	*1.046*	*0.054 (-1.63)*
China	*0.025*	*0.024 **	*2.25 ***	*0.008*	*0.642*	*0.009*	*-0.371*	*2.618 (-0.88)*
Czech Republic	*0.001*	*-0.110*	*5.83 ****	*-0.006*	*0.037*	*-0.120*	*-0.035*	*0.076 (-0.28)*
India	*0.012*	*0.08 **	*1.999*	*0.044*	*0.480*	*0.12 ****	*-0.87 ***	*0.63 (6.29) ****

Notes: Presents monthly results. Panel A presents the results for Eq. (1) augmented by lagged total uncertainty: $r_{i,t} = \alpha_{i,0} + \alpha_{i,1} r_{g,t} + \alpha_{i,2}\, DEUNCT_{i,t} + \alpha_{i,3}\, DEUNCT_{i,t-1} + \varepsilon_{it}$. Panel B presents the results for Eq. (2) augmented by lagged idiosyncratic uncertainty and lagged common uncertainty: $r_{i,t} = \beta_{i,0} + \beta_{i,1} r_{g,t} + \beta_{i,2}\, DEUNCI_{i,t} + \beta_{i,3}\, DEUNCC_{i,t} + \beta_{i,4}\, DEUNCI_{i,t-1} + \beta_{i,5}\, DEUNCC_{i,t-1} + \varepsilon_{it}$. *The dependent variable* is 10-year benchmark Datastream bond index return ($r_{i,t}$). r_g is the return on developed markets sovereign bond from Standard & Poor's, DEUNCT is change in total economic uncertainty, $DEUNCI$ change in idiosyncratic uncertainty, and $DEUNCC$ is change in common uncertainty. Wald[a] is Wald test statistic, which tests the irrelevance of both the *contemporaneous and lagged total uncertainty* for bond returns ($\alpha_{i,2} = \alpha_{i,3} = 0$). Wald[b] is Wald test statistic to test for two simultaneous restrictions, $\beta_{i,2} = \beta_{i,3}$ and $\beta_{i,4} = \beta_{i,5}$, where the former (latter) implies identical *contemporaneous* (lagged) effects of idiosyncratic and common uncertainties on bond returns. T-statistics of the model parameters are obtained from *heteroscedasticity and autocorrelation consistent standard errors.* * significance at .10 level ** significance at .05 level *** significance at .01 level

Table 7. Contemporaneous and Lagged Effects of Economic Uncertainty on Aggregate Housing Market Returns

Panel A. Developed Market

	Panel A			Panel B				
	DEUNCT$_t$	DEUNCT$_{t-1}$	Wald[a]	DEUNCI$_t$	DEUNCC$_t$	DEUNCI$_{t-1}$	DEUNCC$_{t-1}$	Wald[b]
USA	*0.015*	*0.003*	*1.05*	*0.03 ****	*-0.04*	*0.015 **	*0.02*	*2.29 (-0.05)*
UK	*-0.08 ***	*0.013*	*1.85*	*-0.14 ****	*0.13*	*-0.012*	*-0.1*	*4.12 ** (-0.44)*
Sweden	*-0.007*	*0.017*	*0.8*	*-0.03*	*0.12 ****	*0.016*	*-0.08 **	*8.47 (3.53) **
Spain	*0.02*	*0.057 ****	*6.44 ****	*-0.004*	*-0.12 ***	*0.02*	*0.23 ****	*3.98 **(6.91)****
South Korea	*-0.01*	*-0.07*	*1.36*	*-0.09 ****	*0.08*	*-0.13*	*-0.02*	*3.16 * (-0.8)*
Norway	*0.02*	*-0.03*	*1.19*	*0.02*	*0.05*	*-0.01*	*-0.13*	*0.1 (-2.58)*
New Zealand	*-0.04*	*-0.02*	*1.87*	*-0.05*	*0.02*	*-0.03*	*-0.08*	*0.33 (-0.24)*
Netherlands	*0.02*	*0.02*	*1.83*	*0.01*	*-0.04*	*-0.01*	*0.14 ****	*1.4 (5.35) ***
Japan	*0.002*	*-0.01*	*0.85*	*-0.0004*	*0.003*	*-0.01*	*-0.005*	*0.01 (-0.03)*
Italy	*0.03 ***	*0.047*	*6.86 ***	*0.02*	*0.06*	*0.03 ****	*0.04*	*0.38 (-0.01)*
Germany	*0.009*	*-0.008*	*0.67*	*0.012*	*0.05 **	*0.001*	*-0.07 **	*1.68 (-2.45)*
France	*-0.009*	*-0.015*	*0.51*	*-0.04 **	*-0.02*	*-0.04*	*0.06*	*0.1 (-0.88)*
Canada	*-0.025*	*0.01*	*0.57*	*-0.09 ****	*0.12*	*-0.05*	*0.005*	*2.64 * (-0.2)*
Australia	*-0.05 **	*-0.018*	*2.06*	*-0.06 ***	*-0.052*	*-0.02*	*0.012*	*0.005 (-0.14)*
Switzerland	*-0.02 **	*-0.014*	*2.81 **	*0.01 **	*-0.06 ****	*0.006*	*-0.01*	*24.71 *** (-1.08)*

Notes: Presents quarterly results. Panel A presents the results for Eq. (1) augmented by lagged total uncertainty: $r_{i,t} = \alpha_{i,0} + \alpha_{i,1} r_{g,t} + \alpha_{i,2}\, DEUNCT_{i,t} + \alpha_{i,3}\, DEUNCT_{i,t-1} + \varepsilon_{it}$. Panel B presents the results for Eq. (2) augmented by lagged idiosyncratic uncertainty and lagged common uncertainty: $r_{i,t} = \beta_{i,0} + \beta_{i,1} r_{g,t} + \beta_{i,2}\, DEUNCI_{i,t} + \beta_{i,3}\, DEUNCC_{i,t} + \beta_{i,4}\, DEUNCI_{i,t-1} + \beta_{i,5}\, DEUNCC_{i,t-1} + \varepsilon_{it}$. *The dependent variable* is real housing market index return from Mack Martinez Garcia ($r_{i,t}$). R_g is the return on the aggregate real housing price index from Mack Martinez Garcia, $DEUNCT$ is change in total economic uncertainty, $DEUNCI$ change in idiosyncratic uncertainty, and $DEUNCC$ is change in common uncertainty. Wald[a] is Wald test statistic, which tests the irrelevance of both the *contemporaneous and lagged total uncertainty* for housing returns ($\alpha_{i,2} = \alpha_{i,3} = 0$). Wald[b] is Wald test statistic to test for two simultaneous restrictions, $\beta_{i,2} = \beta_{i,3}$ and $\beta_{i,4} = \beta_{i,5}$, where the former (latter) implies identical *contemporaneous* (lagged) effects of idiosyncratic and common uncertainties on housing returns. T-statistics of the model parameters are obtained from *heteroskedasticity and autocorrelation consistent standard errors.* * significance at .10 level ** significance at .05 level *** significance at .01 level

Thus, during different economic states, economic uncertainty effects may vary as it becomes more persistent and non-mean reverting during extreme economic conditions or economic shocks. For this, we conduct Quantile regression of Koenker and Bassett (1978) for equity, bond and housing returns using Equation 1 and Equation 2 for 10 quantiles (for example, 0.10, 0.20,…..., 0.90). Beginning with the un-tabulated results, we show that global asset returns ($r_{g,t}$) are significant and positive in all economic conditions across assets and across the countries, which is consistent with our earlier baseline results.[9] Next, we find negative economic uncertainty premium (DEUNCT) for stocks more persistently across the countries in bullish market condition than bearish market condition. While, both DEUNCI and DEUNCC have mostly negative effects on stock returns across the countries in both bearish and bullish market conditions. For bonds, there is negative uncertainty premium (DEUNCT) in bullish market for only Canada and Australia. DEUNCC has more pronounced negative effects on bond returns in bullish market than the DEUNCI. However, effects of DEUNCC and DEUNCI for bonds are not persistent across the countries. Finally, there are mixture of positive and negative uncertainty premiums (DEUNCT, DEUNCI, and DEUNCC) for housing returns in both bearish and bullish market conditions.

CONCLUSION

In this paper, we have investigated the effects of economic uncertainty (including common and idiosyncratic uncertainties) on equity, bond and housing returns for both developed and emerging markets using unique data of economic uncertainty within an international asset-pricing framework. We hypothesize that economic uncertainty (including its different dimensions) exerts a negative effect on equity and housing returns and a positive effect on government bond returns across the countries based on intertemporal asset pricing of Merton (1973). Our empirical results document that economic uncertainty has a negative effect on equity and housing returns on the one hand, and a positive effect on bond returns, on the other hand, across the sample countries. However, these negative and positive effects are neither prevalent nor persistent across the countries. The negative (positive) effects of economic uncertainty imply that investors demand a risk premium for holding both risky assets (risk-free assets) during high periods of economic uncertainty. This indicates the allocation of resources to safe-haven assets apart from government bonds. It also signifies the fact that investors hold cash during high uncertain periods by resorting to a wait-and-see approach.

Another key finding of our study is that idiosyncratic economic uncertainty, measured by disagreements among economic agents, has a more pronounced negative effect on equity, housing and bond returns than does common uncertainty. This finding is consistent with the notion that under idiosyncratic uncertainty which reflects policy uncertainty, forward-looking investors require an extra risk premium. This result is consistent with the Ozturk and Sheng (2018) finding that there are different dimensions of economic uncertainty (idiosyncratic and common) where market participants exhibit differences in responses to economic activity. However, we contrast with the results of Ozturk and Sheng (2018) with respect to common uncertainty exerting large and persistent negative effects on the economic activity. In our case, idiosyncratic uncertainty effects are more negative and persistent for asset returns, specifically for stock returns. Our finding that idiosyncratic uncertainty negatively affects equity, housing, and bond returns calls for mitigation of asymmetric information among different groups of participants in asset markets through the introduction of more transparent and predictable economic policies. This can be done by communicating central banks' policy to the economic agents properly. Additionally, investors and market participants do not demonstrate differences in responses to different dimensions of economic uncertainty. This indicates that financial market participants do not distinguish between different dimensions of uncertainty which confirms uniform responses to uncertainty by economic agents. Finally, our additional analysis confirms that contemporaneous and lagged effects of economic uncertainty remain consistent with baseline findings despite using lagged data, albeit the lagged effect is relatively weak except for bond returns.

[9] For brevity we do not present the quantile regression results in the paper, but the results are available on request from the authors.

We also confirm market participants do not show differences in responses to different dimensions of economic uncertainty on a contemporaneous (lagged) basis for all asset returns in the additional analysis.

Our findings are important for policymakers in both developed and emerging markets because by maintaining aggregate macroeconomic stability, it is possible to reduce the effects of economic uncertainty on financial and housing markets and to ensure proper allocation of resources. However, our key policy prescription is that by forming transparent, well-anchored, and well-communicated policies, it is possible to reduce policy related uncertainty effects on the asset market and the economy.[10] Again, the coefficients of global portfolio are mostly significant for different asset classes. This relates to international diversification and integration of the global markets (equity, bond and housing) as suggested in the international Capital Asset Pricing Model (CAPM). In particular, emerging markets should undertake macroeconomic policy measures for improving integration between developed and developing countries, so that developing countries can get access to the international capital market and achieve risk sharing internationally. It is important to note that policy responses cannot handle unforecastable components of aggregate volatility (common uncertainty).

Despite the comprehensiveness of our study, results in three asset types in developed and emerging markets, and contributions to knowledge therein, our study is not free from some limitations. One limitation is that our economic uncertainty measure is based on consensus forecasts, which is argued to be inefficient due to overestimation of the old public information and underestimation of the new private information (Crowe, 2010). In addition to that, large heterogeneity in the individual level forecasts may raise the idiosyncratic component of our uncertainty measure. These limitations in our adopted uncertainty measure may have also caused large number of insignificant results for asset returns. Such insignificant results may also be due to the fact that retail investors may not have access to the contents and reports of professional forecasters due to higher costs, and retail investors constitute large portion of the market. Ozturk and Sheng (2018) presented that JLN measure has large persistently negative effect on economic activity, while EPU and VXO show overshooting effect on the economic activities. Comparing to the EPU and VXO, OS measure show larger persistence on economic activity in the findings of Ozturk and Sheng (2018). Despite of the limitations of the OS measure, we believe our exercise has important implications for the investors. In particular, Ozturk and Sheng (2018) included S&P500 in their VAR based analysis, which indicates uncertainty effect for only US markets. Thus, our international focus on multi asset class is more comprehensive approach to reveal the uncertainty effects on asset markets. The study is also constrained by data availability which leads to different data periods for different asset types, and even a different starting year for the sample of countries within the same asset type. Another limitation is the large variation in emerging market sample countries between equity and bond market returns along with there being no sample countries in the housing market returns. Future studies should consider and incorporate more countries from both markets for robust analysis as well as to offer a comparative perspective between developed and emerging countries. Given that the housing market is relatively weak in emerging markets, future studies need to capture this important sector of the economy. This can provide further insights on the effects of economic uncertainties in the emerging markets' housing sector and whether the effects are similar to that found in developed markets. In empirical specifications, future studies can include term and default premiums to check the robustness of our results. In asset pricing literature, these two variables are widely used, thus the use of these variables could bring additional insights into the results. Finally, a growing number

[10] We refer to COVID-19 in this regard which is a true economy-wide exogenous shock that hits the global stock market recently, and governments across the world come up with different policies and packages to reduce the impact of the pandemic on the market.

of studies is dealing with climate risks and asset returns facilitated by recently developed climate risks measures (for example, Bua, et al, 2022). The implications of the climate risks in the financial markets landscape are rising due to firm performances, and house values are directly being impacted by the climate physicals risk (floods, droughts, sea level rise) and transition risks (policy and regulatory risks). Considering this, our study can be extended with the measures of climate risks as a proxy of uncertainty.

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APPENDIX

Capital Asset Pricing Model decomposes stock volatility into market volatility and firm specific risks. Motivated by this, Ozturk and Sheng (2018) decomposed total uncertainty measure into common and idiosyncratic uncertainty in the following manner. First, they defined consensus forecast error e_t as the weighted average of individual forecast error e_{it} as follows:

$$e_t = \sum_{i=1}^{n} w_{it}\, e_{it} \tag{1}$$

Where w_{it} is the weight of individual forecast error in consensus forecast error. In line with CAPM, they defined the relationship between individual forecast errors and consensus forecast error as follows:

$$e_{it} = \beta_i e_t + \varepsilon_{it} \tag{2}$$

Where β_i measures individual forecast's tendency to respond to common shocks, as proxied by consensus forecast error e_t. While ε_{it} is orthogonal to e_t by construction. Equations 1 and 2 together impose the restriction of $\sum_{i=1}^{N} W_{it}\beta_i = 1$ .From the Equation 2, Ozturk and Sheng (2018) derived a variance decomposition where covariance term is zero as follows:

$$Var\ e_{it} = \beta_i{}^2 Var\ (e_t) + Var\ (e_{it}) \tag{3}$$

In the above equation, $Var\ (e_t)$ captures the common volatility and $Var\ (e_{it})$ is the idiosyncratic volatility. To avoid the problem of estimating individual specific betas for the above equation, Ozturk and Sheng (2018) assumed,

$$e_{it} = e_t + u_{it} \tag{4}$$

and plugging it in equation 2, and they find:

$$u_{it} = (\beta_i - 1)e_t + \varepsilon_{it}) \tag{5}$$

However, in equation 4, e_t and u_{it} are not orthogonal, thus they added covariance term in equation 4, and taking variance in both sides, they find as below:

$$\begin{aligned} Var\ e_{it} &= Var\ (e_t) + Var\ (u_{it}) + 2\ cov\ (e_t, u_{it}) \\ &= Var\ (e_t) + Var\ (u_{it}) + 2(\beta_i - 1)\ Var(e_t) \end{aligned} \tag{6}$$

Despite, the variance of an individual forecast error contains the covariance term, the weighted average of variances across forecasters is devoid of the covariance term and individual betas. The covariance terms aggregates out in equation 6 due to the restriction $\sum_{i=1}^{N} W_{it}\beta_i = 1$. Thus, in aggregate, they get below:

$$\sum_{i=1}^{N} w_{it}\, Var\ (e_{it}) = var\ (e_t) + \sum_{i=1}^{N} w_{it}\, Var\ (u_{it}) \tag{7}$$

In the above equation, total uncertainty of forecaster is divided into common $var\ (e_t)$ and idiosyncratic uncertainty $\sum_{i=1}^{N} w_{it}\, Var\ (u_{it})$.

Then, denoting common uncertainty as ${\sigma^2}_{cjt}$ and idiosyncratic uncertainty as D_t, Ozturk and Sheng (2018) estimated variable specific, and country specific uncertainty as follows:

$$U_{cjt} = {\sigma^2}_{cjt} + D_t \quad (8)$$

$$U_{ct} = \sum_{i=1}^{J} U_{cjt} \quad (9)$$

Where, U is uncertainty, c is country, j is the variable, and t is the time. They measured ${\sigma^2}_{cjt}$ through stochastic volatility model and D_t using interquartile ranges of the forecasts of the professional forecasts.