



## MEASURING ECONOMIC UNCERTAINTY AND ITS EFFECT ON THE HONG KONG ECONOMY

### *Key points:*

- *Hong Kong's economic outlook has been subject to heightened uncertainty in recent years amid a series of geopolitical and economic shocks. As economic uncertainty may affect not only economic activities but also financial conditions, there is a need for Hong Kong to track economic uncertainty closely, particularly given the sizable financial sector in the economy. As such, this paper follows the literature to compile a news-based economic uncertainty index for Hong Kong.*
- *We find that the constructed index is intuitive and can indicate heightened uncertainty amid major economic and political events, particularly from the external environment. It also has stronger predictive power of real GDP growth than another proxy of uncertainty based on stock market volatility. In analyzing the effect on the broader economy, we find that higher economic uncertainty has the expected effect of dampening private spending, hiring and consequently real GDP growth, and the transmission process also featured a tightening of financial conditions.*
- *Reflecting Hong Kong's small open economy nature, our analysis also indicates that there were notable spillovers of uncertainty from major trading partners to Hong Kong. Altogether, our results imply that, for a small open economy like Hong Kong, uncertainty could constitute another channel of international spillovers from the external environment, in addition to its effect through the trade and financial*

*channels. Therefore, our economic uncertainty index would be useful to our macro-financial surveillance of Hong Kong.*

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## I. INTRODUCTION

Heightened uncertainty was believed to be a reason contributing to the weakness in global economic growth in recent years. In particular, a series of geopolitical and economic shocks, such as the European sovereign debt crisis and the Brexit referendum, were perceived to have raised economic uncertainties with repercussions on private domestic demand in many economies. As such, there is a recognized need to track economic uncertainty for the purpose of macro-financial surveillance.

For an economy with a sizable financial sector like Hong Kong, the case for tracking economic uncertainty can be even stronger, as recent studies found that economic uncertainty can also affect financial conditions and hence the real economy (see Gilchrist et al. (2014) and Caldara et al. (2016)). As such, we compile an economic uncertainty index for Hong Kong using Baker et al. (2016)'s method to count the number of related news articles. We find that the resulting index is intuitive and can signal high uncertainty during major economic and political events. We also find that the index has stronger predictive power of real GDP growth relative to another proxy of uncertainty based on realized stock market volatility.

To investigate the impact of economic uncertainty on Hong Kong's macro-financial conditions, we estimate a vector-autoregressive (VAR) model and conduct an impulse response analysis of measures of economic activities and financial conditions to an innovation in the economic uncertainty index. In line with theories and empirical findings for other economies, we find that higher economic uncertainty would dampen private consumption, investment, vacancy posting and consequently real GDP, with the transmission process also featuring a tightening of financial conditions.

To identify the driver of Hong Kong's economic uncertainties, we conduct an analysis of spillovers of uncertainty from major trading partners to Hong Kong. We find that a notable portion of Hong Kong's economic uncertainties stem from its major partners, with uncertainties from Europe and the U.S. playing the leading roles. Given the macro-financial effects of economic uncertainty, our paper carries a policy implication that,

for a small open economy like Hong Kong, there is a need to track uncertainty closely as it also constitutes another channel of international spillovers from the external environment, in addition to the trade and financial channels.

The rest of the paper is organized as follows. Section II describes the methodology that we use to compile the economic uncertainty index for Hong Kong, followed by an assessment of its performance in predicting real GDP growth. Section III estimates a VAR model to assess the macro-financial impact of economic uncertainty on the Hong Kong economy. Section IV conducts an inward spillover analysis of economic uncertainty. The final section concludes.

## II. MEASURING UNCERTAINTY

To compile the economic uncertainty index for Hong Kong, we follow Baker et al. (2016) in counting the frequency of news articles that contain terms relating to uncertainty, given that such approach has been applied by many studies (e.g. Moore (2017), Arbatli et al. (2017)). We use the Wisers Information Portal, which is a digital archive of Chinese news media in Hong Kong, to search for relevant Chinese words in the following ten major local Chinese newspapers: *Wen Wei Po*, *Sing Pao*, *Ming Pao*, *Oriental Daily*, *Hong Kong Economic Journal*, *Sing Tao Daily*, *Hong Kong Economic Times*, *Apple Daily*, *Hong Kong Commercial Daily*, and *Tai Kung Pao*.

Our set of relevant Chinese words (with translation into English) is summarized in Table 1, classified into four categories: (1) “*Domestic (or variant)*”; (2) “*Economy (or variant)*”; (3) “*Uncertainty (or variant)*”; and, (4) at least one of the following terms: “*Policy (or variant)*”, “*Public*”, “*Expenditure (or variant)*”, “*Investment*”, “*Budget*”, “*Fiscal*”, “*SAR Government*”, “*Politics*”, “*Chief Executive*”, “*Interest*”, “*Reform*”, “*Optimize*”, “*Deficit*”, “*Tax*”, “*Regulation (or variant)*”, “*Hong Kong Monetary Authority*”, “*Reserves*”, or “*Linked Exchange Rate System*” (Table 1). Criteria (1) and (2) define a base group of articles that cover the

Hong Kong economy. Criterion (3) contains the key words on uncertainty, while criterion (4) captures the key words on major local policy issues.<sup>1</sup>

To control for the change in the volume of news article across newspaper and time, we scale the number of articles meeting criteria (1) – (4) *in each month* by those that meet only criteria (1) and (2) (i.e. the base group of articles that are related to the Hong Kong economy only) *for the same month*.<sup>2</sup> We then standardize the scaled series to unit standard deviation, followed by an averaging of the resulting monthly series across the ten newspapers. We then normalize the index to have a mean of 100 for the period of April 1998 to December 2009, followed by a seasonal adjustment of the index.

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<sup>1</sup> In this regard, while studies for other economies would name the constructed index as “economic policy uncertainty index”, on the basis that criterion (4) would capture policy uncertainty, we prefer to name our index as “economic uncertainty index”. This is because Hong Kong adopts a currency board system which is very robust and rarely constituted a source of uncertainty in the past. Hong Kong’s taxation system is also very simple and transparent, while the regulatory framework is also widely recognized to be strong. While dropping criterion (4) in the news search criteria would not materially affect the pattern of our economic uncertainty index as well as the results of our subsequent analysis, we prefer to retain such criterion on the basis that it can help ensure the relevancy of the news to Hong Kong.

<sup>2</sup> The compilation of our index differs from Baker et al. (2016) in the choice of the base of normalization. While Baker et al. (2016) normalize counts by the total number of all kind of articles (including sports, lifestyle etc), we normalize counts by the total number of articles on the economy only, as we believe that changing volume of unrelated articles (e.g. sports, lifestyle) due to social taste or editorial preference may introduce irrelevant fluctuation in the uncertainty index.

**Table 1. Relevant Chinese terms (with translations to English) for compiling the economic uncertainty index**

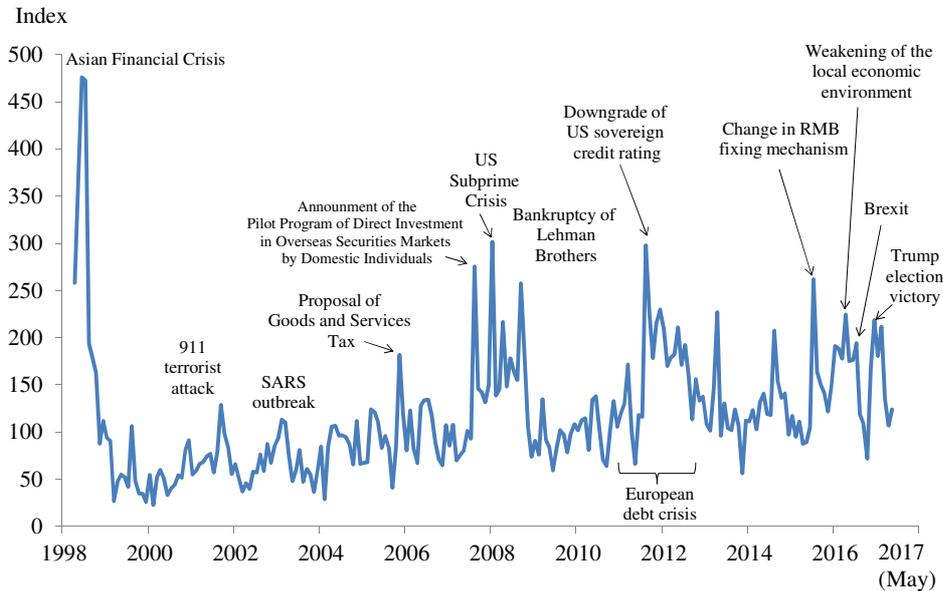
<b>Criteria</b>	<b>English</b>	<b>Chinese</b>
(1) Region	Domestic/Hong Kong	本地/本港/香港
(2) Economic	Economic/Economy/Financial	經濟/金融
(3) Uncertainty	Uncertainty/Uncertain/Unclear/ Unstable/Volatile/Unpredictable	不確定/不明確/不明朗/ 未明/不穩/波動/ 難料/難以預料/難以預測/ 難以預計/難以估計
(4) Policy terms	Policy/measures Public Expenditure/spending Investment Budget Fiscal SAR government  Politics Chief Executive Interest Reform Optimize/refine Deficit Tax Regulation/rules Hong Kong Monetary Authority Reserves The Linked Exchange Rate System	政策/措施/施政 公共 支出/開支 投資 預算 財政 當局/政府/ 特別行政區/特區 政治 行政長官/特首 利率/利息/息口 改革 優化 赤字 稅 規管/規例/規則 金融管理局/金管局 儲備 聯繫匯率

Source: Authors' definition

Chart 1 plots our economic uncertainty index, with key economic or political events being marked in the chart to help interpret the index. As shown in the chart, the fluctuation of our uncertainty index is broadly consistent with economic intuition and highly correlated with the timing of external shocks, showing large spikes during major global events such as the Asian Financial Crisis in 1997-98, the 9/11 terrorist attack in 2001, the US subprime crisis in 2007, the bankruptcy of Lehman Brothers in 2008, the downgrading of US sovereign credit rating in 2011 and the deepening of the European sovereign debt crisis in the same year. Our index also appeared to respond to some local events, such as the outbreak of SARS in 2003 and discussions about the implementation of goods and

services tax in 2006, and the weakening of the local economic environment in early 2016.

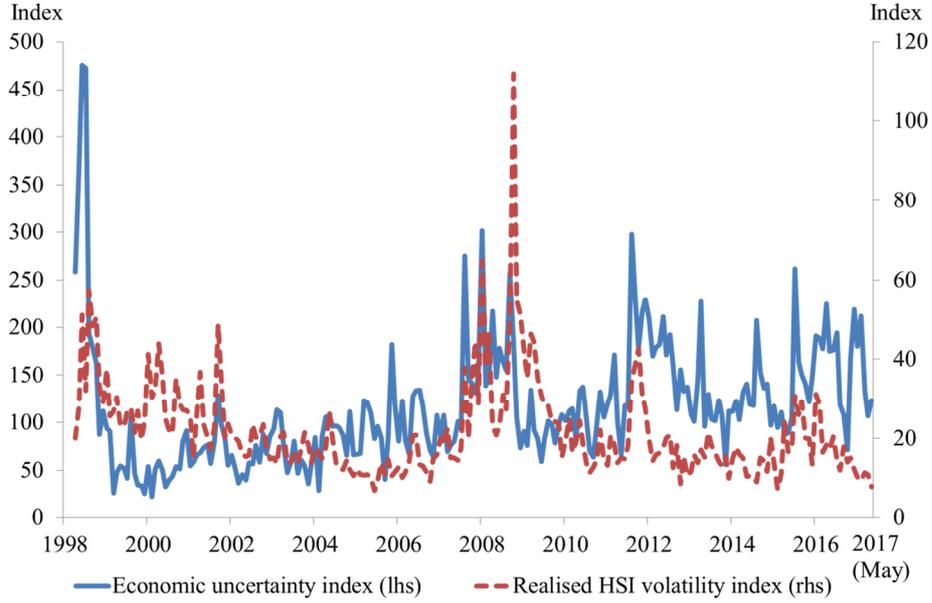
**Chart 1. Economic uncertainty index for Hong Kong**



Source: Authors' estimates

To shed more light on the properties of our economic uncertainty index, we compare it with the stock market volatility, which is another proxy of uncertainty used in the literature. In this regard, this paper chooses not to measure economic uncertainty by stock market volatility, as such volatility can be influenced by factors such as risk aversions in addition to uncertainty (see Baker et al. (2013)). With that said, given that uncertainty can affect risk premium and hence asset pricing (see Kostka and van Roye (2017)), major fluctuations in the economic uncertainty index should be reflected in higher stock market volatility. As shown in Chart 2, despite occasional divergences (say, during the European debt crisis), our economic uncertainty index largely spiked at around the same time as the realized volatility of the Hang Seng Index, especially during the Asian Financial Crisis, the Global Financial Crisis, downgrading of US sovereign credit rating and the European sovereign debt crisis. The correlation between these two indices is 0.25.

**Chart 2. Economic uncertainty index and realized HSI volatility index**



Sources: CEIC and authors' estimates

As a further test, we compare the forecasting power of our economic uncertainty index on real GDP growth against that of the stock market volatility, using the following forecasting model<sup>3</sup>:

$$\Delta_h Y_{t+h} = \alpha + \sum_{i=1}^h \beta_i \Delta Y_{t-i} + \gamma_1 Uncert_t + \omega_t$$

Where  $\Delta_h Y_{t+h} = \frac{400}{h+1} \ln \left( \frac{Y_{t+h}}{Y_{t-1}} \right)$  is the annualized quarterly growth of real GDP at  $h$  quarters ahead, and  $Uncert_t$  is either our economic uncertainty index (*EU*) or the realized Hang Seng Index Volatility (*HSI vol.*), converted into quarterly frequency by averaging the monthly series. We estimate the model using ordinary least squares and we use the full sample period starting from 1998Q2 for our estimation. Table 2 shows the coefficient estimates of the forecasting model, with the t-statistics reported in brackets. A statistically significant coefficient suggests that the variable can help predict real GDP growth.

<sup>3</sup> Caldara et al. (2016) use the same forecasting model to assess the predictive power of different uncertainty indices.

As shown in columns 1-2, our economic uncertainty index (*EU*) is highly significant at the one-quarter ahead ( $h=1$ ) horizon, while the Hang Seng Index volatility (*HSI vol.*) is not. Similar findings also hold at the two-quarter ahead ( $h=2$ ) horizon, as shown in columns 5-6 of Table 2. As such, our economic uncertainty index compares favourably against the Hang Seng Index volatility in predicting real GDP growth.

To check for robustness, we add the weighted-sum financial condition index (*FCI<sup>WS</sup>*) to the forecasting model as a control variable (see Chan et al. (2016)). The weight of the component variables in the financial condition index is determined by its impact on real GDP growth, and Chan et al. (2016) show that this index can help predict real GDP growth.<sup>4</sup> Controlling for such index in the forecasting model therefore allows us to examine the marginal information content of our economic uncertainty index. Columns 3-4 of Table 2 again show that our economic uncertainty index is highly significant at the one-quarter ahead ( $h=1$ ) horizon, while the Hang Seng Index volatility is not. Columns 7-8 also report similar findings at the two-quarter ahead horizon.

Altogether, our analysis indicates that our economic uncertainty index is intuitive and has relatively good forecasting power of real GDP growth than other commonly-used proxy of uncertainty.

**Table 2. Coefficient estimates of the forecasting model**

	1-quarter ahead ( $h = 1$ )				2-quarter ahead ( $h = 2$ )			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>EU</i>	-0.03*** [-3.41]		-0.02*** [-2.83]		-0.03*** [-3.08]		-0.03** [-1.91]	
<i>HSI vol.</i>		0.02 [0.63]		0.02 [0.45]		0.04 [1.13]		0.04 [1.01]
<i>FCI<sup>WS</sup></i>			2.35*** [4.33]	2.72*** [4.57]			1.73*** [3.87]	2.12*** [5.21]
Adj. $R^2$	0.27	0.09	0.48	0.39	0.27	0.06	0.41	0.30

Source: Authors' estimates

Note: The t-statistics reported in brackets are based on the heteroskedasticity- and autocorrelation-consistent asymptotic covariance matrix computed according to Newey and West (1987) with the automatic lag selection method of Newey and West (1994): \*  $p < .10$ ; \*\*  $p < .05$ ; and \*\*\*  $p < .01$ .

<sup>4</sup> Our uncertainty index will still perform better than the Hang Seng Index volatility if we use the financial condition index estimated using the principal component approach.

### III. MACRO-FINANCIAL EFFECT OF UNCERTAINTY

To analyze the effect of economic uncertainty on Hong Kong's macro-financial conditions, we estimate a VAR model with the following endogenous variables: (1) real GDP growth ( $y$ ); (2) real private consumption growth ( $pce$ ); (3) real private investment growth ( $inv$ ); (4) growth in posting of private sector vacancy, ( $vag$ ); (5) financial condition index ( $FCI_{ws}$ ); and (6) economic uncertainty index ( $EU$ ). To control for the influence from the external environment, we include world GDP growth (as measured by the growth in the trade-weighted real GDP of Hong Kong's major trading partners) as an exogenous variable in the VAR. All growth rates are measured on a year-on-year basis<sup>5</sup>.

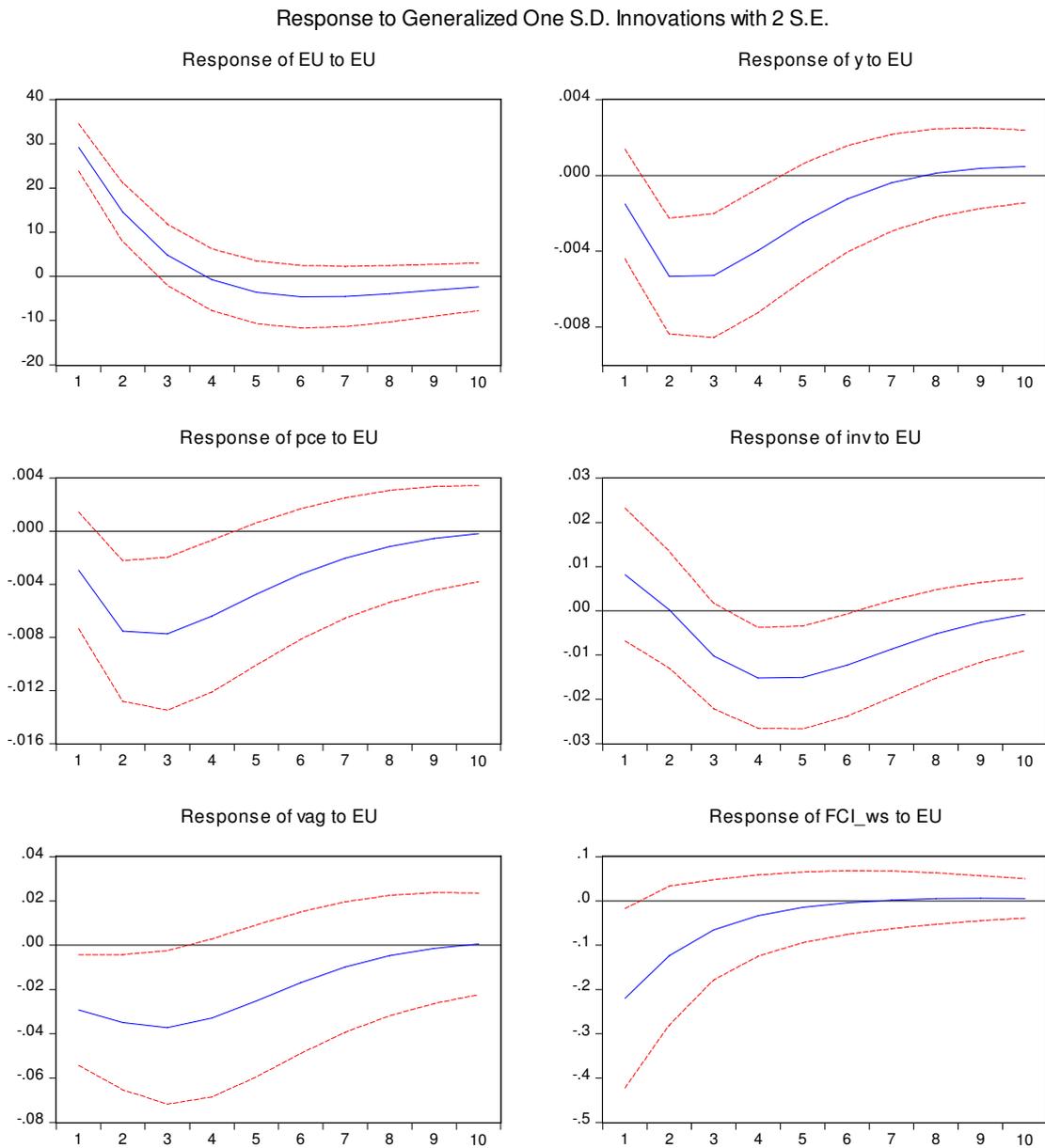
Regarding the choice of the endogenous variables, we include real private consumption, private investment and private vacancy in the VAR, in accordance with the theory that economic uncertainty can delay these activities due to the real option value of "wait and see" generated by the presence of adjustment costs or irreversibility (Carroll (1997), Dixit and Pindyck (1994), Guglielminetti (2016)). We also include the financial condition index in the VAR, in light of the findings that uncertainty can raise risk premium (see Kostka and van Roye (2017)) and affect the economy through the financial channel (Caldara et. al. (2016)). Altogether, these variables enable us to identify the ways through which uncertainty can affect real GDP growth.

We estimate the VAR model using quarterly data from 1998Q3 – 2016Q4. We set the lag length of the VAR model to one, as our sample size limits the degree of freedom in our estimation. To avoid any dependence on the ordering of variables in the VAR model, we conduct our impulse response analysis using the generalized impulse response function (see Pesaran and Shin (1998)). Chart 3 shows the impulse responses of different endogenous variables to an innovation in the economic uncertainty index. In general, all responses have the expected signs in line with theories and empirical evidences from other economies. In particular, higher economic uncertainty would dampen private consumption, private investment and private vacancy posting, and the transmission process also features a tightening of financial conditions. As such, real GDP growth would be adversely affected.

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<sup>5</sup> Data on the real GDP, real private consumption, real private investment and private vacancy are sourced from the Census and Statistics Department. Data on the world GDP are estimated by the authors.

**Chart 3. Generalized impulse responses to one standard deviation innovation in the economic uncertainty index**



Source: Authors' estimates.

Note: The error band is estimated using Monte Carlo simulation.

#### IV. SPILLOVER OF UNCERTAINTY

As a small open economy, the economic uncertainty facing Hong Kong would inevitably stem in part from the external environment. A recent study by Klößner and Sekkel (2014) also suggests that uncertainty could spill across economies and constitute another channel of international spillovers. To identify the major driver of Hong Kong's economic uncertainty, we follow Klößner and Sekkel (2014) to conduct a spillover analysis of uncertainty, focusing on the spillover to Hong Kong due to its small open economy nature.

As in Klößner and Sekkel (2014), we use the methodology of Diebold and Yilmaz (2009) and estimate a VAR model,  $Y_t = \Phi_1 Y_{t-1} + \dots + \Phi_p Y_{t-p} + \epsilon_t$ , where  $\epsilon_t$  is an i.i.d. shock, and  $\Phi_1, \dots, \Phi_p$  are the coefficient matrix of the lag terms, and  $Y_t$  is a vector economic uncertainty indices of Hong Kong and its major trading partners. With stationarity, the VAR has a moving average representation of  $Y_t = \epsilon_t + A_1 \epsilon_{t-1} + A_2 \epsilon_{t-2} + \dots$ . Let  $\Sigma_\epsilon$  be the covariance matrix of  $\epsilon$ , the forecast error covariance matrix is given by  $\Sigma_{\epsilon,h} = \sum_{h=0}^{h-1} A_h \Sigma_\epsilon A_h'$ . Using the lower-triangular Cholesky factor  $L$  of the  $\Sigma_\epsilon$  matrix (i.e.  $LL' = \Sigma_\epsilon$ ),  $\sum_{h=0}^{h-1} (A_h L)_{ij}^2$  can be considered as the contribution of shocks to variable  $j$  to variables  $i$ 's forecast error variance, which is the key measure in our analysis.

Based on the economic size of Hong Kong's major trading partners, we order the uncertainty index of the U.S. or Europe either first or second in the VAR, followed by either the uncertainty index of Mainland China or Japan. In any case, Hong Kong's uncertainty index was ordered last, with its lag terms being restricted to zero in other economies' equations, such that Hong Kong's uncertainty would not spill over to other economies. Following Klößner and Sekkel (2014), we report the spillover estimates across all permutations of the system, so as to make our conclusion less susceptible to the ordering of variables.

The uncertainty indices for the advanced economies are measured using Baker et al. (2016)'s methodology and are downloaded from Policyuncertainty.com. Nevertheless, for Mainland China, we use the realised Shanghai Stock Exchange Composite Volatility instead of the economic policy

uncertainty index provided by that website. This is because the latter is based only on one non-local English newspaper<sup>6</sup>, which may capture journalists' perceptions of the uncertainty in the global environment rather than that in Mainland China. In accordance with the indication of most information criteria, we set the lag length of the VAR model to four with 12-month-ahead forecasts, and we estimate the model over a sample period between April 1998 and December 2016.

Table 3 show the estimated spillovers of uncertainties from the “source” economy in each column to the “recipient” economy in each row. As shown in the last column in the table, about 40% of Hong Kong’s economic uncertainties stem from its major partners, with uncertainties from Europe and the U.S. playing the leading roles, possibly reflecting the series of economic and political events that these economies experienced in recent years.<sup>7</sup>

**Table 3. Spillovers of uncertainty among major trading partners**

	<b>EU</b>	<b>US</b>	<b>CN</b>	<b>JP</b>	<b>HK</b>	<b>From others</b>
<b>Europe (EU)</b>	73.2	22.7	0.4	3.8	0.0	26.8
<b>United States (US)</b>	15.1	81.6	0.8	2.5	0.0	18.4
<b>Mainland China (CN)</b>	3.7	2.3	92.6	1.5	0.0	7.5
<b>Japan (JP)</b>	13.0	19.6	3.4	64.1	0.0	36.0
<b>Hong Kong (HK)</b>	16.0	12.4	5.8	6.5	59.4	40.7
<b>Contribution to others</b>	47.7	56.9	10.4	14.3	0.0	
<b>Net</b>	20.9	38.6	2.9	-21.7	-40.7	

Source: Authors' estimates

Note: EU and the U.S. would either be ordered first or second in the VAR, while CN and JP would either be ordered third or fourth. The columns show the fraction of the forecast-error variance that the “source” economy exports to other economies, based on the average of the spillover estimates across four permutations of the ordering. Similarly, the rows indicate the fraction of the forecast-error variance that the “recipient” economy imports from other economies.

<sup>6</sup> Mainland China’s economic uncertainty index is based on search results from the South China Morning Post only.

<sup>7</sup> We have also tried using the economic policy uncertainty index of Mainland China for the estimation and the results are similar. However, the influence of Mainland China on itself is unreasonably low (less than 50%) compared with other advanced economies, suggesting the index might have captured journalists' perceptions of the uncertainty in the global environment.

Given the macro-financial effects of economic uncertainty, our findings therefore suggest that the external environment, in addition to trade and financial channels, would also pose spillover to Hong Kong through influencing economic uncertainty. Therefore, for macro-financial surveillance purpose, it is important to track the economic uncertainty facing the economy closely.

## **V. CONCLUDING REMARKS**

Hong Kong's economic outlook has been subject to heightened uncertainty in recent years amid a series of economic and political events. To facilitate our macro-financial surveillance, we use the method of Baker et al. (2016) to compile a news-based economic uncertainty index for Hong Kong. We find that such index is intuitive with shocks from the external environment being much larger and more frequent than domestic ones. The index also has stronger predictive power of real GDP growth than another proxy of uncertainty based on stock market volatility. In analyzing the effect on the broader economy, we find that higher economic uncertainty would dampen economic activities and tighten financial conditions, in line with theories and empirical evidences in other economies. We also identify a notable spillover of uncertainty from major trading partners to Hong Kong. Altogether, our paper suggests that, for a small open economy like Hong Kong, there is a need to track uncertainty closely as it also constitutes another channel of international spillovers from the external environment, in addition to its effect through the trade and financial channels.

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