A Further Investigation into Economic Uncertainty and Derivatives Usage by Japanese Firms

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１．Introduction

The EPU (Economic Policy Uncertainty) indexes in Japan created by Arbatli et al. (2022) not only include the overall index but also include uncertainty indices for monetary policy, fiscal policy, trade policy and exchange rate policy, which distinguishes the Japan indexes from other countries. Among the Japan EPU indexes, we expect that firms' demand for interest rate derivatives for hedging purposes is related to monetary policy uncertainty. On the other hand, the usage of currency derivatives that apply hedge accounting is related to trade and exchange rate policy.

Like Yan and Yasuda (2022), this paper aims to empirically investigate the effects of monetary policy, trade policy, and exchange rate policy uncertainty on Japanese firms' demand for interest rate derivatives and currency derivatives for hedging purposes, respectively.

Figure 1. Volatility Index and monetary policy, trade policy, exchange rate policy EPU indexes in Japan since 2013
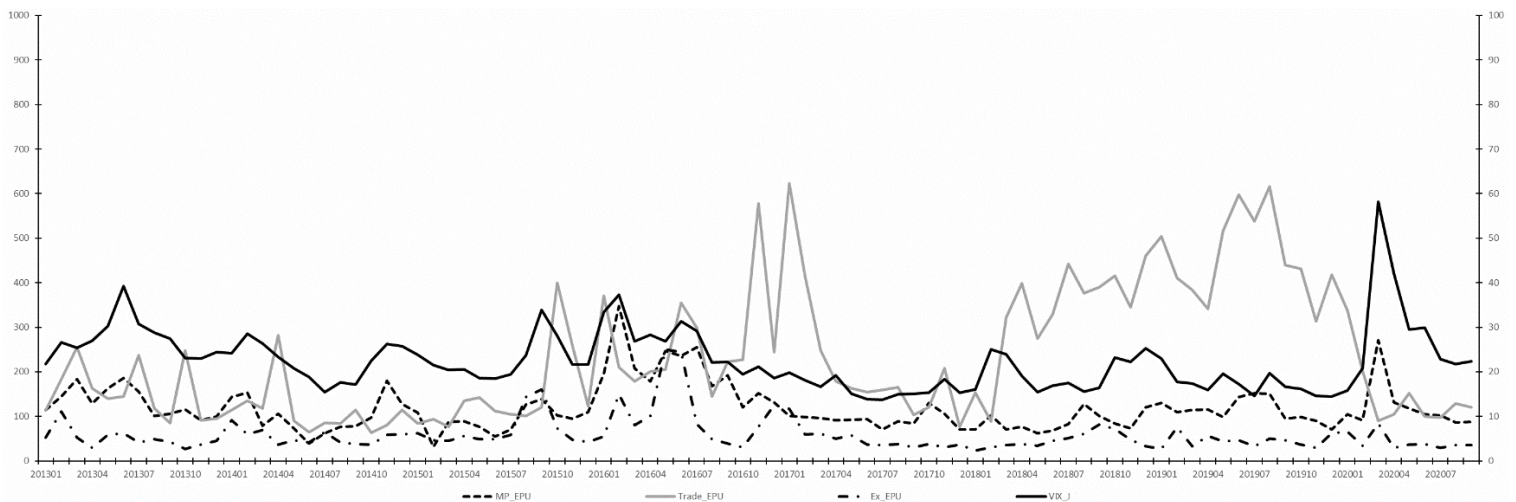

Figure 1 represents Volatility Index (VIX) and monetary policy, trade policy, exchange rate policy EPU indexes(MP_EPU、Trade_EPU、Ex_EPU, respectively)in Japan since 2013**.** While VIX (VIX_J) shows relatively similar movement with MP_EPU, Ex_EPU shows modest movement. By contrast, we note the trade policy uncertainty (Trade_EU) is substantially different from the other EPU indexes.

２．Empirical Analysis

2.1．Data and Methodology

Like Yan and Yasuda (2022), we gather data on Japanese listed firms in the 1st and 2nd sections and exclude all the data on financial or regulated firms. We collect data on derivatives holdings from the same databases as Yan and Yasuda (2022).

Based on the panel data set, we estimate the logit model for the demand of derivatives usage and the OLS model for the determinant of derivative amounts as follows:

$$Hedge\_dum_{i,t} = \alpha_1 + \alpha_2 Uncertainty_{i,t-1} + \alpha \cdot X_{i,t-1} + \varepsilon_{i,t} \qquad (1)$$

$$Derivative\_at_{i,t} = \beta_1 + \beta_2 Uncertainty_{i,t-1} + \beta \cdot X_{i,t-1} + \varepsilon_{i,t} \qquad (2)$$

Regarding the dependent variable of equation (1), in the case of using monetary policy uncertainty (MP_EPU) as the $Uncertainty_{i,t-1}$, we use a dummy variable that takes one if interest rate derivatives that apply hedge accounting are used and zero otherwise (IR_Hedge_dum). In the case of using trade policy uncertainty (Trade_EPU), or exchange rate policy uncertainty (Ex_EPU) as the $Uncertainty_{i,t-1}$, we use a dummy variable that takes one if currency derivatives that apply hedge accounting are used and zero otherwise (CR_Hedge_dum). Same as equation (1), when using MP_EPU as the $Uncertainty_{i,t-1}$, we use the contract amount of interest rate derivative transactions with hedge accounting (IR_Derivative_at) in the left-hand side of equation (2). In the case of Trade_EPU or Ex_EPU, we use the contract amount of currency derivatives with hedge accounting (CR_Derivative_at) in the left-hand side of equation (2).

Regarding the EPU indexes, like the overall index (EPU_J) in the preceding issue, we calculate the natural logarithm of the 12-month moving average of each monthly EPU index (MP_EPU_J_12m, Trade_EPU_J_12m, Ex_EPU_J_12m). Additionally, considering that there is a potential delay of the influence of policy, we also corporate the natural logarithm of the 6-month moving average of each monthly EPU index (MP_EPU_J_6m, Trade_EPU_J_6m, Ex_EPU_J_6m) and the natural logarithm of the 3-month moving average of each monthly EPU index (MP_EPU_J_3m, Trade_EPU_J_3m, Ex_EPU_J_3m). Further, the starting point of the calculation is the end of each company's fiscal year. Regardless of the estimation period of EPU indexes, VIX_J is the natural logarithm of the 12-month moving average of the monthly implied volatility of the stock market consistently. We use the same control variables with the preceding issue.

２.２. **Empirical Results**

Table 1 describes the results on the relationship between the derivative usage and the EPU indexes by category. Panel A shows the results on the relationship between the interest rate derivative usage and the monetary policy EPU indexes (MP_EPU). In general, the coefficients on EPU indexes are inconsistent. For example, Row 2 shows that the coefficient of MP_EPU is negative and statistically significant, while Row 3 shows that the coefficient of MP_EPU is positive and statistically significant. However, Row 4 shows that the coefficient of MP_EPU lost its statistical significance after adding VIX to the estimation. Panel B and C show the results on the relationship between the currency derivative usage and the trade policy EPU indexes (Trade_EPU) and exchange rate policy EPU indexes (Ex_EPU), respectively. The results show that the coefficients of EPU indexes are statistically insignificant. Our results don't show a clear relationship between the demand for interest rate derivatives or currency derivatives and monetary policy, trade policy, or exchange rate policy uncertainty. Based on the above, our results imply that the uncertainty reflected in the EPU indexes does not influence the usage of derivatives. Alternatively, it is not determined by the time-series fluctuation of EPU indexes.

Table 1

	(1)	Marginal effect of (1)	(2)	Marginal effect of (2)	(3)	Marginal effect of (3)	(4)	Marginal effect of (4)	(5)	Marginal effect of (5)	(6)	Marginal effect of (6)
						Panel A						
Dependent Variables	IR_Hedge_dum											
Independent Variables	MP_EPU_J_3m				MP_EPU_J_6m				MP_EPU_J_12m			
Uncertainty	0.037	0.006	-0.197	-0.035	0.283	0.050	-0.147	-0.026	0.157	0.028	-0.366	-0.064
	[0.55]		[-2.63]***		[2.50]**		[-1.08]		[1.49]		[-2.76]***	
VIX_J			1.167	0.205			1.059	0.187			1.276	0.224
			[6.60]***				[5.66]***				[6.51]***	
Constant	-3.286		-5.837		-4.462		-5.730		-3.866		-5.347	
	[-5.86]***		[-8.56]***		[-6.25]***		[-7.63]***		[-5.62]***		[-7.36]***	
Control_variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector_dum	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	10632	10632	10632	10632	10632	10632	10632	10632	10632	10632	10632	10632
Pseudo_R2	0.172		0.175		0.172		0.174		0.172		0.175	
						Panel B						
Dependent Variables	CR_Hedge_dum											
Independent Variables	Trade_EPU_J_3m				Trade_EPU_J_6m				Trade_EPU_J_12m			
Uncertainty	0.012	0.002	0.019	0.004	-0.013	-0.003	-0.007	-0.001	-0.022	-0.004	-0.010	-0.002
	[0.21]		[0.35]		[-0.23]		[-0.12]		[-0.36]		[-0.15]	
VIX_J			0.171	0.033			0.156	0.030			0.152	0.029
			[0.86]				[0.79]				[0.74]	
Constant	-2.377		-2.946		-2.246		-2.763		-2.199		-2.734	
	[-3.71]***		[-3.19]***		[-3.49]***		[-3.00]***		[-3.34]***		[-2.80]***	
Control_variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector_dum	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	6127	6127	6127	6127	6127	6127	6127	6127	6127	6127	6127	6127
Pseudo_R2	0.107		0.108		0.107		0.107		0.107		0.107	
						Panel C						
Dependent Variables	CR_Hedge_dum										限界効果	
Independent Variables	Ex_EPU_J_3m				Ex_EPU_J_6m				Ex_EPU_J_12m			
Uncertainty	-0.007	-0.001	-0.140	-0.027	-0.047	-0.009	-0.163	-0.031	-0.086	-0.017	-0.147	-0.028
	[-0.08]		[-1.09]		[-0.46]		[-1.25]		[-1.03]		[-1.57]	
VIX_J			0.413	0.080			0.356	0.069			0.316	0.061
			[1.36]				[1.41]				[1.44]	
Constant	-2.289		-3.032		-2.126		-2.765		-1.965		-2.697	
	[-3.45]***		[-3.53]***		[-3.02]***		[-3.31]***		[-2.95]***		[-3.21]***	
Control_variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector_dum	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	6127	6127	6127	6127	6127	6127	6127	6127	6127	6127	6127	6127
Pseudo_R2	0.107		0.108		0.107		0.108		0.108		0.108	

Table 2 summarizes the results on the relationship between the extent of derivatives usage and the EPU indexes by category. Panel A shows the results on the relationship between the interest rate derivative usage that apply hedge accounting and the monetary policy EPU indexes (MP_EPU). Panel A shows that the coefficients on MP_EPU are positive in all cases and statistically significant in most cases, indicating that the use of interest rate derivatives measured by contract value increases when the uncertainty measured by monetary policy EPU indexes increases. Compared to the inconsistent results in Table 1, the results in Table 2 imply that firms increase the contract amount of interest rate derivatives when monetary policy uncertainty rises.

Table 2

	Panel A					
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variables	IR_Derivative_at					
Independent Variables	MP_EPU_J_3m		MP_EPU_J_6m		MP_EPU_J_12m	
Uncertainty	0.482	0.060	1.477	0.868	0.781	-0.179
	[2.49]**	[0.27]	[4.33]***	[2.06]**	[2.56]**	[-0.46]
VIX_J		2.180		1.602		2.409
		[4.07]***		[2.78]***		[4.01]***
Constant	-2.444	-7.231	-7.202	-9.283	-3.944	-6.797
	[-1.79]*	[-4.01]***	[-3.76]***	[-4.61]***	[-2.20]**	[-3.54]***
Control_variables	Yes	Yes	Yes	Yes	Yes	Yes
Sector_dum	Yes	Yes	Yes	Yes	Yes	Yes
N	3569	3569	3569	3569	3569	3569
Adj. R-Square	0.281	0.285	0.284	0.286	0.281	0.285
	Panel B					
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variables	CR_Derivative_at					
Independent Variables	Trade_EPU_J_3m		Trade_EPU_J_6m		Trade_EPU_J_12m	
Uncertainty	0.075	0.043	0.110	0.084	0.156	0.099
	[0.30]	[0.17]	[0.43]	[0.33]	[0.56]	[0.34]
VIX_J		-0.804		-0.792		-0.749
		[-0.84]		[-0.83]		[-0.78]
Constant	2.080	4.671	1.875	4.400	1.607	4.181
	[0.91]	[1.15]	[0.83]	[1.12]	[0.68]	[1.00]
Control_variables	Yes	Yes	Yes	Yes	Yes	Yes
Sector_dum	Yes	Yes	Yes	Yes	Yes	Yes
N	2052	2052	2052	2052	2052	2052
Adj. R-Square	0.180	0.180	0.180	0.180	0.180	0.180
	Panel C					
	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variables	CR_Derivative_at					
Independent Variables	Ex_EPU_J_3m		Ex_EPU_J_6m		Ex_EPU_J_12m	
Uncertainty	0.144	1.036	0.107	0.625	0.078	0.304
	[0.37]	[1.91]*	[0.22]	[1.07]	[0.20]	[0.73]
VIX_J		-2.730		-1.585		-1.154
		[-2.08]**		[-1.45]		[-1.16]
Constant	1.931	6.639	2.077	4.813	2.180	4.741
	[0.82]	[1.89]*	[0.75]	[1.39]	[0.88]	[1.36]
Control_variables	Yes	Yes	Yes	Yes	Yes	Yes
Sector_dum	Yes	Yes	Yes	Yes	Yes	Yes
N	2052	2052	2052	2052	2052	2052
Adj. R-Square	0.180	0.181	0.180	0.181	0.180	0.180

Panel B shows the results on the relationship between the currency derivative usage and the trade policy EPU indexes (Trade_EPU). The results show that the coefficients of EPU indexes are not statistically significant. Panel C shows the results on the relationship between the currency derivative usage and the exchange rate policy EPU indexes (Ex_EPU). Column 2 shows that the coefficient on the 3-month exchange rate EPU index is positive and significant at the 10% level, while the other columns show no statistically significant results. The result indicates that Japanese firms use derivatives to hedge exchange rate risk.

３．**Final Remarks**

We empirically investigated how different categories of economic uncertainty affect Japanese firms' demand for derivative transactions for hedging purposes. In general, we could not find clear and consistent results for EPU. However, as discussed in section 2, where we look in more detail, we confirmed that the demand for derivative usage tends to increase when EPU increases in some cases. These results are different from Yan and Yasuda (2022).

From those mentioned above, we empirically investigated how economic uncertainty affects Japanese firms' demand for derivative transactions for hedging purposes in the preceding issue and this issue. Firms' demand for derivatives usage is mainly due to the increase in the uncertainty of the stock market (VIX). On the other hand, we note that the extent of derivatives usage tends to increase when monetary policy uncertainty or exchange rate uncertainty increase. Regarding the relationship between the usage of derivatives with EPU, other studies show a significant negative relationship between investment behavior and EPU (Fujitani et al., 2021, Fujitani et al., 2022). By contrast, our results show that the usage of derivatives is hardly affected by the uncertainty reflected by EPU indexes.

References

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