Appendix:

The effects of macroeconomic and policy uncertainty on exchange rate risk premium[§]

(Tables and Figures)

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Abstract:

The goal of this paper is to identify the main determinants of the risk premium in some European currency markets just before the EMU. To that extent, we start from Lucas (1982) exchange rate model and derive an analytical expression for the forward premium. This expression includes money and production variables and it is quite standard, except for the inclusion of macroeconomic policy risk. Under some standard assumptions, this formula simplifies substantially and becomes amenable to regression analysis. Then, using standard measures of money and production, as well as interest rate swaps as indicators of macroeconomic policy risk, the theoretical expression is estimated. We provide evidence suggesting that it is policy uncertainty, much more than fundamental macroeconomic uncertainty, which determined risk premium over the convergence process to the euro. Whether these results can be extended to similar experiences for other currency unions remains open for future research.

Keywords: Risk premium, *Peso Problem*, Macroeconomic policy risk, European monetary System

JEL Classification: F31, F41, G12, G15

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& Rodrigo died on October 1, 1999. He was Ph. D. from San Diego and professor at the Department of Economics in the Universidad Complutense of Madrid. His research areas were Macroeconomics (mostly, International Finance) and Econometrics. The co-author of this paper wants to give special thanks to Rodrigo Peruga for excellent research assistance.

Appendix

Table 1. Maximum likelihood estimation. GARCH models

$$\left(I + \begin{bmatrix} \phi_{11}^{1} & \phi_{12}^{1} \\ \phi_{21}^{1} & \phi_{22}^{1} \end{bmatrix} B + \begin{bmatrix} \phi_{11}^{2} & \phi_{12}^{2} \\ \phi_{21}^{2} & \phi_{22}^{2} \end{bmatrix} B^{2} + \begin{bmatrix} \phi_{11}^{3} & \phi_{12}^{3} \\ \phi_{21}^{3} & \phi_{22}^{3} \end{bmatrix} B^{3} \right) \bullet \left(I + \begin{bmatrix} \Phi_{1}^{1} & 0 \\ 0 & \Phi_{2}^{1} \end{bmatrix} B^{12} + \begin{bmatrix} \Phi_{1}^{2} & 0 \\ 0 & \Phi_{2}^{2} \end{bmatrix} B^{24} \right) \begin{pmatrix} \Delta \ln \left(m_{t} \right) \\ \Delta \ln \left(y_{t} \right) \end{pmatrix} = \begin{bmatrix} \lambda_{1} \\ \lambda_{2} \end{bmatrix} + \left(I + \begin{bmatrix} \theta_{11}^{1} & \theta_{12}^{1} \\ \theta_{21}^{1} & \theta_{22}^{1} \end{bmatrix} B \right) \begin{pmatrix} \varepsilon_{m_t} \\ \varepsilon_{y_t} \end{pmatrix}$$

$$\left(I - \begin{bmatrix} a_{11} + g_{11} & 0 & 0 \\ 0 & a_{22} + g_{22} & 0 \\ 0 & 0 & a_{33} + g_{33} \end{bmatrix} B \right) \begin{bmatrix} \varepsilon_{m_t}^{2} \\ \varepsilon_{m_t} \varepsilon_{y_t} \\ \varepsilon_{y_t}^{2} \end{bmatrix} = \begin{bmatrix} \mu_{1} \\ \mu_{2} \\ \mu_{3} \end{bmatrix} + \left(I - \begin{bmatrix} g_{11} & 0 & 0 \\ 0 & g_{22} & 0 \\ 0 & 0 & g_{33} \end{bmatrix} B \right) \begin{pmatrix} \xi_{m_t} \\ \xi_{m_t y_t} \\ \xi_{y_t} \end{pmatrix}$$

	SP	GER	UK	FR
ϕ^{1}_{11}	-0.9138 (-10.36)[(a)]	-0.1068 (-1.42)		
ϕ^{1}_{12}	0.0613 (1.79)		0.0338 (1.33)	-0.0853 (-1.74)
ϕ^{1}_{21}	-1.7730 (-4.00)	-0.3494 (-2.47)		-0.2876 (-2.83)
ϕ^{1}_{22}	0.2998 (2.01)	0.2364 (3.14)	0.3158 (3.85)	0.4582 (5.74)
θ^{1}_{11}	-0.5086 (-4.07)			
θ^{1}_{12}	0.0512 (1.71)			
θ^{1}_{21}	-1.1043 (-1.87)			
θ^{1}_{22}	-0.2876 (-1.98)			
ϕ^{2}_{11}			-0.2258 (-3.08)	
ϕ^{2}_{12}			0.1022 (3.95)	
ϕ^{2}_{21}		0.2666 (1.91)	-0.1915 (-3.49)	-0.3235 (-3.13)
ϕ^{2}_{22}				0.1110 (1.39)
ϕ^{3}_{11}		-0.3236 (-4.20)		-0.4059 (-5.13)
ϕ^{3}_{12}				-0.0544 (-1.12)
Φ^{1}_{1}	0.2488 (3.15)		0.2238 (3.02)	
Φ^{1}_{2}	0.1640 (2.15)		0.0702 (0.84)	
Φ^{2}_{1}				0.3974 (5.21)
Φ^{2}_{2}				0.1969 (2.40)
λ_1	0.1245 (1.09)	0.3725 (4.63)	0.9607 (8.74)	0.2025 (3.55)
λ_2	-2.0981 (-3.57)			
μ_1	0.0756 (8.57)	0.2313 (8.58)	0.0710 (5.79)	0.3385 (4.99)
μ_2	0.0595 (2.79)			
μ_3	1.5527 (8.57)	1.1964 (8.58)	0.9311 (2.00)	0.7385 (8.56)
$a_{11}+g_{11}$			-0.2790 (-2.05)	-0.9096 (-7.48)
$a_{22}+g_{22}$	-0.6156 (-1.85)	-0.8246 (-8.95)		-0.8992 (-3.38)
$a_{33}+g_{33}$			-0.9941 (-52.37)	
g_{11}				-0.8381 (-5.13)
g_{22}	-0.7092 (-2.37)	-0.9273 (-15.44)		-0.8741 (-2.95)
g_{33}			-0.9253 (-15.47)	

Notes:
(a) t-statistics in parentheses

Table 2

Least squares estimation of the risk premium associated to macroeconomic uncertainty.

Full sample: 1986:02-1998:04[(a)(b)]

$$PRM_t = \ln\left(\frac{S_{t+1}}{F_t^{t+1}}\right) = \alpha_0 + \alpha_1 \sigma^2_{m^D_{t+1}} + \alpha_2 \sigma^2_{m^F_{t+1}} + \alpha_3 \sigma_{y^D_{t+1} m^D_{t+1}} + \alpha_4 \sigma_{y^F_{t+1} m^F_{t+1}} + u_t$$

	ESP/DEM	FRF/DEM	GBP/DEM
C	-0.0017 (-1.03)	-0.0032* (-1.88)	-0.0033 (-0.66)
PRM(-1)[(c)]			0.1565* (1.87)
$\hat{\sigma}^2{}_{m^{SP} y^{SP}}$	-0.0541* (-2.80)		
$\hat{\sigma}_{y^{GER} m^{GER}}$	0.0047 (0.48)	0.0089* (1.76)	0.0200 (1.16)
$\hat{\sigma}^2{}_{m^{FR}}$		0.0042 (0.83)	
$\hat{\sigma}_{y^{FR} m^{FR}}$		0.0432* (1.98)	
$\hat{\sigma}^2{}_{m^{UK}}$			-0.0011 (-0.02)
R^2	0.053	0.051	0.034
Adj. R^2	0.040	0.031	0.014
COR(1)[(d)]	0.37	0.32	0.87
COR(12)[(d)]	0.73	0.16	0.47
ARCH(6)[(e)]	0.63	0.02	0.34

Notes:

(a) t-statistics in parentheses

(b) An asterisk denotes a coefficient significant at the 10 % level

(c) PRM(-1) denotes the lagged risk premium

(d) *P*-value of Breusch-Godfrey test statistic for residual serial correlation up to lag order *p*.

(e) Autoregressive conditional heteroskedasticity test. ARCH(6) is the p-value of LM test statistic.

Table 3[(a)]

Least squares estimation of the risk premium associated to policy uncertainty.

Sample: 1994:01-1998:04

$$PRM_t = \ln\left(\frac{S_{t+1}}{F_t^{t+1}}\right) = \gamma_0 + \gamma_1 IR\_SPR_t + \gamma_2 IR\_SPR2_t + u_t$$

	ESP/DEM	FRF/DEM	GBP/DEM
C	-0.0061 (-1.83)	-0.0016 (-1.46)	0.0242 (1.25)
IR_SPR	0.4651 (1.81)	0.8758 (1.87)	-1.5313 (-0.9)
***IR_SPR*2**	-10.017 (-2.33)	-101.11 (-2.84)	6.3577 (0.13)
Policy Uncertainty[(b)]	0.022	0.002	0.022
R^2	0.144	0.223	0.144
Adj. R^2	0.109	0.192	0.109
COR(1)[(c)]	0.87	0.24	0.53
COR(12)	0.90	0.59	0.30
ARCH(6)[(d)]	0.16	0.64	0.57

Notes:

(a) t-statistics in parentheses

(b) P-value of F-statistic for the null hypothesis: H_0: $\gamma_1 = \gamma_2 = 0$.

(c) *P*-value of Breusch-Godfrey test statistic for residual serial correlation up to lag order *p*

(d) Autoregressive conditional heteroskedasticity test. *ARCH(6)* is the p-value of LM test statistic.

Table 4

Least squares estimation of the risk premium equation [(a)]
Sample: 1994:01-1998:04

$$PRM_t = \ln\left(\frac{S_{t+1}}{F_t^{t+1}}\right) = \beta_0 + \beta_1 IR\_SPR_t + \beta_2 IR\_SPR2_t + \beta_3 \sigma^2_{m^D_{t+1}} + \beta_4 \sigma^2_{m^F_{t+1}} + \beta_5 \sigma_{y^D_{t+1} m^D_{t+1}} + \beta_6 \sigma_{y^F_{t+1} m^F_{t+1}} + u_t$$

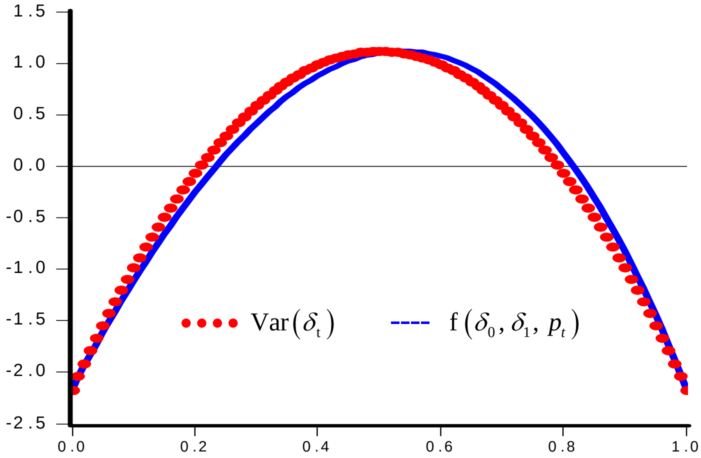
	ESP/DEM	FRF/DEM	GBP/DEM
C	-0.0080 (-1.62)	-0.0003 (-0.05)	0.0185 (0.18)
IR_SPR	0.4970 (1.88)	1.0438 (2.00)	-1.5600 (-0.81)
IR_SPR2	-9.866 (-2.22)	-98.427 (-2.56)	-0.8508 (-0.02)
$\hat{\sigma}^2_{m^{SP} y^{SP}}$	0.0152 (0.39)		
$\hat{\sigma}_{y^{GER} m^{GER}}$	0.0121 (0.86)	0.0096 (1.11)	0.0316 (1.02)
$\hat{\sigma}^2_{m^{FR}}$		-0.0061 (-0.32)	
$\hat{\sigma}_{y^{FR} m^{FR}}$		0.0409 (0.69)	
$\hat{\sigma}^2_{m^{UK}}$			0.1704 (1.35)
Policy Uncertainty[(b)]	0.076	0.040	0.009
Fundamental Uncertainty[(c)]	0.636	0.666	0.249
R^2	0.160	0.249	0.194
Adj. R^2	0.089	0.167	0.143
COR(1)[(d)]	0.76	0.25	0.35
COR(12)	0.91	0.31	0.35
ARCH(6)[(e)]	0.21	0.76	0.40

Notes:

(a) t-statistics in parentheses.
(b) P-value of F-statistic for the null hypothesis: H_0: $\beta_1 = \beta_2 = 0$.
(c) P-value of F-statistic for the null hypothesis: H_0: $\beta_3 = \beta_4 = \beta_5 = \beta_6 = 0$
(d) *P*-value of Breusch-Godfrey test statistic for residual serial correlation up to lag order *p*
(e) Autoregressive conditional heteroskedasticity test. ARCH(6) is the p-value of LM test statistic.

Figure 1

Effects on the risk premium and the variance of fiscal policy of a change in p_t



Notes:

(a) Both variables are standardized

(b) p_t : probability that there might be a change in fiscal policy, is shown in the horizontal axis

(c) $f(\delta_0, \delta_1, p_t)$ is the non-linear function of p_t measuring the effect on the risk premium of changes in p_t, as in (18).

(d) $Var(\delta_t)=p_t(1-p_t)(\delta_1-\delta_0)^2$ is the non-linear function of p_t providing the variance of fiscal policy

Figure 2

Interest rate swap spreads (IR_SPR) and observed risk premium (PRM)

Sample: 1994:01-1998:04

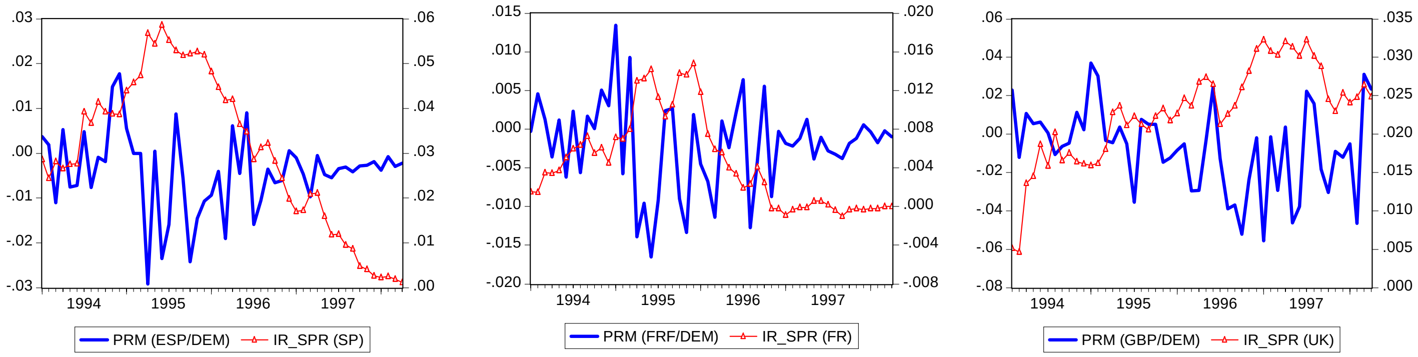
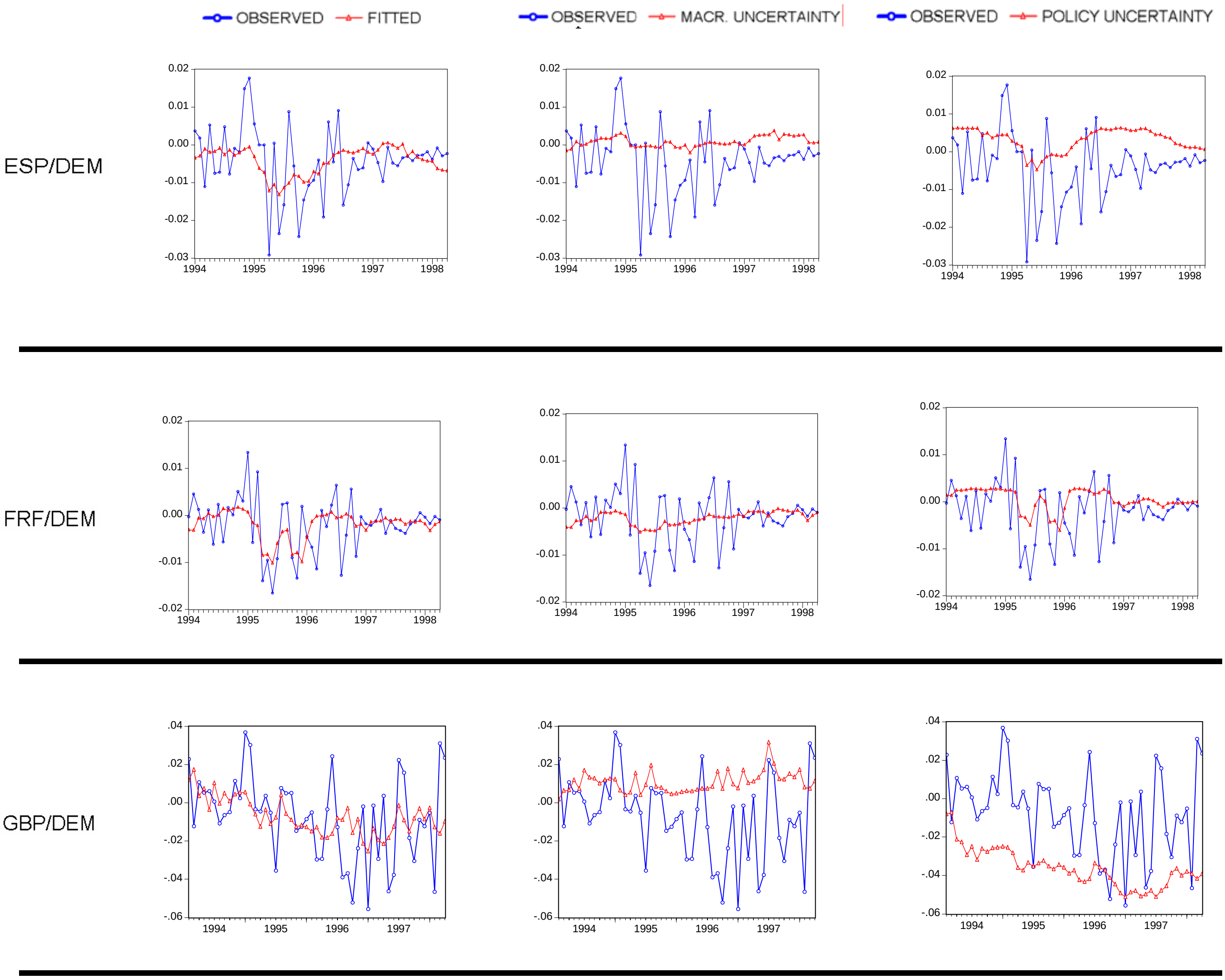


Figure 3

Observed risk premium, fitted risk premium, macroeconomic uncertainty and policy uncertainty[(a)(b)(c)]

Sample: 1994:01-1998:04



Notes:

(a) Left column: Observed exchange risk premium versus the fitted value from the model in Table 4

(b) Middle column: Observed exchange risk premium versus macroeconomic uncertainty contribution

(c) Right column: Observed exchange risk premium versus fiscal policy uncertainty contribution

Figure 4

Probability indicator for Spain, France and United Kingdom

Sample: 1994:01-1998:04

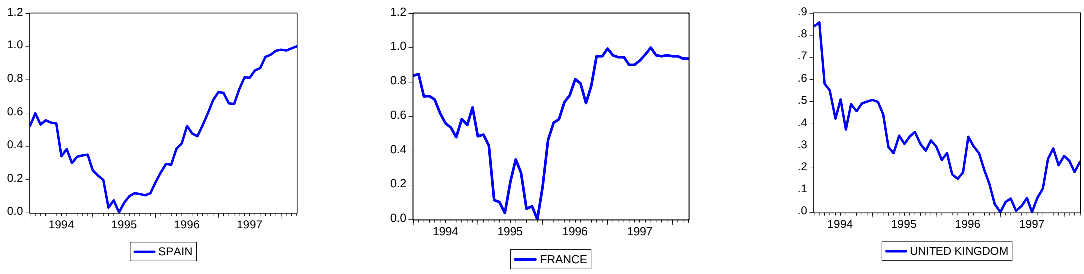


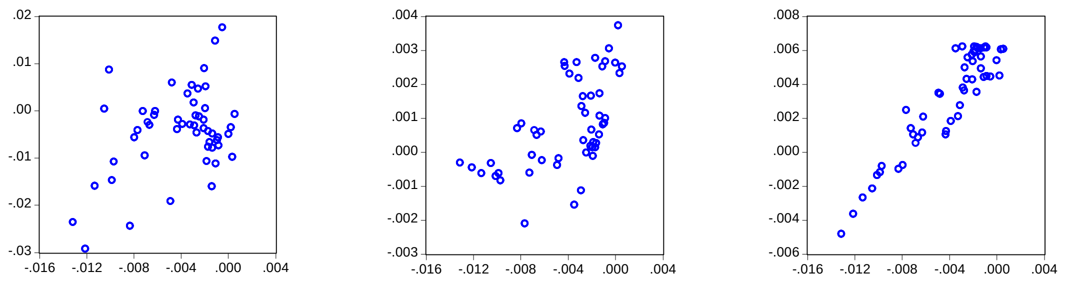
Figure 5

Scatter diagrams: fitted risk premium (horizontal axis) versus observed risk premium, policy and macroeconomic uncertainty contribution [(a)(b)(c)].

Sample: 1994:01-1998:04

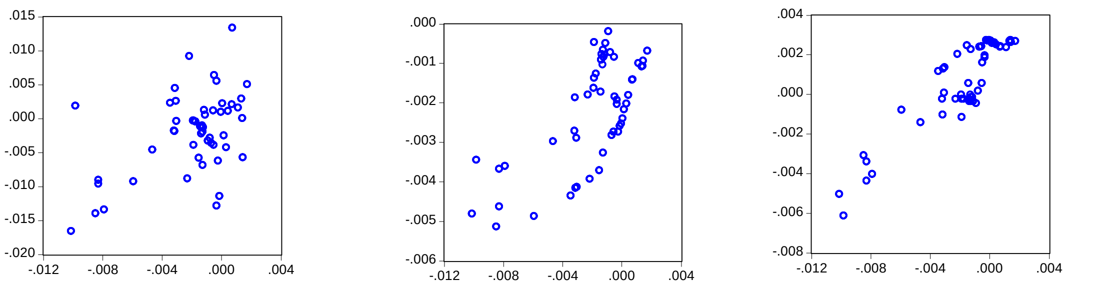
OBSERVED/FITTED | MACR. UNCERTAINTY / FITTED | POLICY UNCERTAINTY / FITTED

ESP/DEM



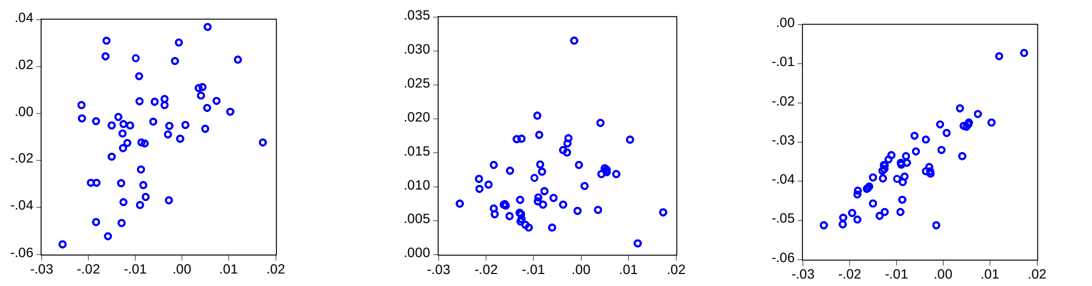
Correlation[(d)] **0.40** **0.58** **0.93**

FRF/DEM



Correlation[(d)] **0.35** **0.32** **0.70**

GBP/DEM



Correlation[(d)] **0.41** **0.19** **0.85**

Notes:

(a) Left column: observed risk premium versus the fitted risk premium from the model in Table 4
(b) Middle column: Macroeconomic uncertainty contribution versus the fitted risk premium
(c) Right column: Policy uncertainty contribution versus the fitted risk premium
(d) Correlation between variables in scatter diagrams