Crash Risk in Currency Markets
- Supplementary Appendix -

5 Appendix A: Derivations

5.1 Some Useful Lemmas

We start with a well-known Lemma, whose proof we provide for completeness.

Lemma 3. *(Discrete-time Girsanov's lemma) Suppose that* (x, y) *are jointly Gaussian distributed random variables under probability measure* P. *Consider the measure* Q *such that* $dQ/dP = \exp(x - E[x] - \operatorname{var}(x)/2)$. *Then, under* Q, y *is Gaussian, with distribution*

$$y \sim^Q \mathcal{N}\left(E[y] + \operatorname{cov}(x, y), \operatorname{var}(y)\right), \tag{11}$$

where $E[y], \operatorname{cov}(x, y), \operatorname{var}(y)$ *are calculated under* P.

Proof. We calculate that the characteristic function of y. For a purely imaginary number k, $E^Q\left[e^{ky}\right]$ is given by

$$E\left[e^{x-E[x]-\sigma_x^2/2}e^{ky}\right] = \exp\left(kE[y] + \frac{k^2\sigma_y^2}{2} + k\,cov(x, y)\right) = \exp\left(k\left(E[y] + \operatorname{cov}(x, y)\right) + \frac{k^2\sigma_y^2}{2}\right).$$

That is indeed the characteristic function of distribution (11).

□

Lemma 4. *For* $\ln X$, $\ln Y$ *jointly Gaussian distributed,*

$$\begin{aligned} E\left[(X - Y)^+\right] &= V_{BS}^C\left(E[X], E[Y], \operatorname{var}(\ln X - \ln Y)^{1/2}\right) \\ &= V_{BS}^P\left(E[Y], E[X], \operatorname{var}(\ln X - \ln Y)^{1/2}\right), \end{aligned}$$

where the convention is $V_{BS}^C(S_0, K, \sigma)$ *and* $V_{BS}^P(S_0, K, \sigma)$ *are the Black-Scholes call and put prices with interest rate 0 and horizon* 1.

Proof. Observe that our Black-Scholes functions are:

$$V_{BS}^P(S, K, \sigma) = E\left[\left(K - Se^{\sigma u - \sigma^2/2}\right)^+\right], \qquad V_{BS}^C(S, K, \sigma) = E\left[\left(Se^{\sigma u - \sigma^2/2} - K\right)^+\right],$$

where u is a normal with mean 0 and variance 1.

Write $X = E[X]\, e^{x-\mathrm{var}(x)/2}$ and $Y = E[Y]\, e^{y-\mathrm{var}(y)/2}$, where (x, y) are jointly Gaussian distributed with mean 0 and respective variance $\mathrm{var}(\ln X)$ and $\mathrm{var}(\ln Y)$. Use Lemma 3, calling P the underlying probability measure, and defining measure $dQ/dP = \exp(x - E[x] - \mathrm{Var}(x)/2)$,

$$\begin{aligned} E\left[(X-Y)^+\right] &= E\left[\left(E[X]\, e^{x-\mathrm{var}(x)/2} - E[Y]\, e^{y-\mathrm{var}(y)/2}\right)^+\right] \\ &= E\left[e^{x-\mathrm{var}(x)/2}\left(E[X] - E[Y]\, e^{z}\right)^+\right] \\ &= E^Q\left[\left(E[X] - E[Y]\, e^{z}\right)^+\right], \end{aligned}$$

with $z = y - \mathrm{var}(y)/2 - x + \mathrm{var}(x)/2$. Applying Lemma 3, $z \sim^Q \mathcal{N}\left(E^Q[z], \mathrm{var}(y-x)\right)$, with:

$$\begin{aligned} E^Q[z] &= -\mathrm{var}(y)/2 + \mathrm{var}(x)/2 + \mathrm{cov}(x, y-x) \\ &= -\mathrm{var}(y-x)/2, \end{aligned}$$

and

$$z \sim^Q \mathcal{N}\left(-\mathrm{var}(y-x)/2, \mathrm{var}(y-x)\right).$$

So

$$E\left[(X-Y)^+\right] = V_{BS}^P\left(E[Y], E[X], \mathrm{var}(\ln X - \ln Y)^{1/2}\right).$$

The same reasoning shows that $E\left[(X-Y)^+\right] = V_{BS}^C\left(E[X], E[Y], \mathrm{var}(\ln X - \ln Y)^{1/2}\right)$. □

Lemma 5. *For* $\ln X$, $\ln Y$, $\ln Z$ *jointly Gaussian distributed,*

$$\begin{aligned} \mathrm{cov}\left(Z, (X-Y)^+\right) &= V_{BS}^C\left(E[ZX], E[ZY], \mathrm{var}(\ln X - \ln Y)^{1/2}\right) \\ &\quad - E[Z]\, V_{BS}^C\left(E[X], E[Y], \mathrm{var}(\ln X - \ln Y)^{1/2}\right) \\ &= V_{BS}^P\left(E[ZY], E[ZX], \mathrm{var}(\ln X - \ln Y)^{1/2}\right) \\ &\quad - E[Z]\, V_{BS}^P\left(E[Y], E[X], \mathrm{var}(\ln X - \ln Y)^{1/2}\right). \end{aligned}$$

Proof. It comes directly from the previous Lemma. □

5.2 Proofs

5.2.1 Proof of Proposition 1

Call $H = pE[J-1]$. We have:

$$e^{-r\tau} = E[M_{t,t+\tau}] = e^{-g\tau}(1 + H\tau).$$

Taking logs,

$$-r\tau = -g\tau + \ln(1 + H\tau) = -g\tau + H\tau + o(\tau),$$

so $r = g - H + o(1)$.

5.2.2 Proof of Proposition 2

Unhedged Returns The trade has return X in domestic currency, and does not require any investment, so $E[M_{t,t+\tau}X_{t,t+\tau}] = 0$. Hence:

$$\begin{aligned} 0 &= (1-p\tau) E^{ND}[M_{t,t+\tau}X_{t,t+\tau}] + p\tau E^{D}[M_{t,t+\tau}X_{t,t+\tau}] \\ &= (1-p\tau)\left(E^{ND}[M_{t,t+\tau}] E^{ND}[X_{t,t+\tau}] + cov^{ND}(M_{t,t+\tau}, X_{t,t+\tau})\right) + p\tau E^{D}[M_{t,t+\tau}X_{t,t+\tau}]. \end{aligned}$$

Hence

$$E^{ND}[X_{t,t+\tau}] = \frac{-p\tau E^{D}[M_{t,t+\tau}X_{t,t+\tau}] - (1-p\tau)cov^{ND}(M_{t,t+\tau}, X_{t,t+\tau})}{(1-p\tau)E^{ND}[M_{t,t+\tau}]}.$$

Note that

$$E^{ND}[M_{t,t+\tau}] = 1 + o(1),$$

$$cov^{ND}(M_{t,t+\tau}, X_{t,t+\tau}) = cov^{ND}(\varepsilon, \varepsilon^{\star} - \varepsilon)\tau + o(\tau),$$

and

$$E^{D}[M_{t,t+\tau}X_{t,t+\tau}] = E[(J^{\star} - J)] + o(1).$$

Therefore,

$$E^{ND}[X_{t,t+\tau}]/\tau = pE[J - J^{\star}] - \text{cov}(\varepsilon, \varepsilon^{\star} - \varepsilon) + o(1).$$

Hedged returns By the same reasoning as above, and using $\lambda^{P}_{t,t+\tau} = 1 + o(1)$, $\lambda^{C}_{t,t+\tau} = 1 + o(1)$,

$$\begin{aligned} E^{ND}[X_{t,t+\tau}(K)] &= p\tau E[J - J^{\star}] - p\tau E\left[(KJ - J^{\star})^{+}\right] \\ &\quad - cov^{ND}\left[M_{t,t+\tau}, \left(K - \frac{S_{t+\tau}}{S_t}\right)^{+}\right] - cov^{ND}\left[M_{t,t+\tau}, \frac{S_{t+\tau}}{S_t}\right]. \end{aligned}$$

We see that

$$\begin{aligned} cov^{ND}\left[M_{t,t+\tau}, \frac{S_{t+\tau}}{S_t}\right] &= \text{cov}\left(\varepsilon\sqrt{\tau}, (\varepsilon^{\star} - \varepsilon)\sqrt{\tau}\right) + o(\tau) \\ &= \text{cov}(\varepsilon, \varepsilon^{\star} - \varepsilon)\tau + o(\tau). \end{aligned}$$

Call $Z = M_{t,t+\tau}$, $X = K$, $Y = S_{t+\tau}/S_t$, so that

$$E[Z] = e^{-g\tau},\ E[Y] = e^{(-g^{\star} + g - cov(\varepsilon, \varepsilon^{\star} - \varepsilon))\tau},\ E[ZY] = e^{-g^{\star}\tau}.$$

We use Lemma 5. We have:

$$cov^{ND}\left[M, \left(e^{\kappa\sqrt{\tau}} - \frac{S_{t+\tau}}{S_t}\right)^+\right] = V_{BS}^P\left(e^{g^\star\tau}, e^{\kappa\sqrt{\tau}}e^{g\tau}, \text{var}\left(\varepsilon^\star - \varepsilon\right)^{1/2}\sqrt{\tau}\right)$$
$$- V_{BS}^P\left(e^{g^\star\tau + \text{cov}(\varepsilon,\varepsilon^\star-\varepsilon)\tau}, e^{\kappa\sqrt{\tau}}e^{g\tau}, \text{var}\left(\varepsilon^\star - \varepsilon\right)^{1/2}\sqrt{\tau}\right)$$
$$= \Delta_{BS}^P(\kappa)\,\text{cov}\left(\varepsilon, \varepsilon^\star - \varepsilon\right)\tau + o(\tau).$$

We conclude:

$$\lim_{\tau\to 0} E^{ND}\left[X\left(e^{\kappa\sqrt{\tau}}\right)\right]/\tau = pE\left[J - J^\star\right] - pE\left[\left(KJ - J^\star\right)^+\right] - \text{cov}\left(\varepsilon, \varepsilon^\star - \varepsilon\right)\left(1 + \Delta_{BS}^P(\kappa)\right).$$

5.2.3 Proof of Lemma 1

It follows directly from the calculations done in the proof of Proposition 3. The disaster risk premium is proportional to $p\tau$, while the disaster risk premium is proportional to $\sqrt{\tau}$. So in the limit of small times, the option price is equal to its no-disaster component up to smaller $O(\tau)$ terms.

5.2.4 Proof of Lemma 2

We have

$$E\left[M_{t,t+\tau}\right] = e^{-r\tau} \text{ and } E\left[M_{t,t+\tau}^\star\right] = e^{-r^\star\tau}.$$

Also, define $\sigma = \text{var}\left(\varepsilon^\star - \varepsilon\right)^{1/2}$. So, the call price is:

$$C(K) = E\left[M_{t,t+\tau}\left(\frac{S_{t+\tau}}{S_t} - K\right)^+\right] = E\left[\left(M_{t,t+\tau}^\star - KM_{t,t+\tau}\right)^+\right]$$
$$= V_{BS}^C(E\left[M_{t,t+\tau}^\star\right], E\left[KM_{t,t+\tau}\right], \sigma\sqrt{\tau}) \text{ by Lemma 4}$$
$$= V_{BS}^C(e^{-r^\star\tau}, Ke^{-r\tau}, \sigma\sqrt{\tau}).$$

The price of a put with strike $\widetilde{K}$ is:

$$P\left(\widetilde{K}\right) = E\left[M_{t,t+\tau}\left(\widetilde{K} - \frac{S_{t+\tau}}{S_t}\right)^+\right] = E\left[\left(\widetilde{K}M_{t,t+\tau} - M_{t,t+\tau}^\star\right)^+\right]$$
$$= V_{BS}^C(\widetilde{K}E\left[M_{t,t+\tau}\right], E\left[M_{t,t+\tau}^\star\right], \sigma\sqrt{\tau}) \text{ by Lemma 4}$$
$$= V_{BS}^C(\widetilde{K}e^{-r\tau}, e^{-r^\star\tau}, \sigma\sqrt{\tau}).$$

so, when $\widetilde{K} = K^{-1}e^{2(r-r^\star)\tau}$,

$$\begin{aligned} P\left(\widetilde{K}\right) &= V_{BS}^C(K^{-1}e^{2(r-r^\star)\tau}e^{-r\tau}, e^{-r^\star\tau}, \sigma\sqrt{\tau}) \\ &=^{(a)} K^{-1}e^{(r-r^\star)\tau}V_{BS}^C(e^{-r^\star\tau}, Ke^{-r\tau}, \sigma\sqrt{\tau}) \\ &= K^{-1}e^{(r-r^\star)\tau}C(K), \end{aligned}$$

where $=^{(a)}$ is because $V_{BS}^C(S, k, \sigma\sqrt{\tau})$ is homogenous of degree 1 in (S, k). So indeed,

$$RR = P\left(K^{-1}e^{2(r-r^\star)\tau}\right) - K^{-1}e^{(r-r^\star)\tau}C(K) = 0.$$

5.2.5 Proof of Proposition 3

We start with a lemma characterizing the price of puts for slightly more general strikes given by $e^{\kappa\sqrt{\tau}+\alpha\tau}$. The price of a put with strike $e^{\kappa\sqrt{\tau}+\alpha\tau}$ is by definition

$$C\left(e^{\kappa\sqrt{\tau}+\alpha\tau}\right) = E\left[M_{t,t+\tau}(\frac{S_{t+\tau}}{S_t} - e^{\kappa\sqrt{\tau}+\alpha\tau})^+\right] = C^D\left(e^{\kappa\sqrt{\tau}+\alpha\tau}\right) + C^{ND}\left(e^{\kappa\sqrt{\tau}+\alpha\tau}\right),$$

where

$$C^D\left(e^{\kappa\sqrt{\tau}+\alpha\tau}\right) = p\tau E^D\left[M_{t,t+\tau}(\frac{S_{t+\tau}}{S_t} - e^{\kappa\sqrt{\tau}+\alpha\tau})^+\right],$$

and

$$C^{ND}\left(e^{\kappa\sqrt{\tau}+\alpha\tau}\right) = (1-p\tau)\, E^{ND}\left[M_{t,t+\tau}(\frac{S_{t+\tau}}{S_t} - e^{\kappa\sqrt{\tau}+\alpha\tau})^+\right].$$

Let $\sigma = \text{var}\left(\varepsilon^\star - \varepsilon\right)^{1/2}$.

Lemma 6. *We have*

$$C^{ND}\left(e^{\kappa\sqrt{\tau}+\alpha\tau}\right) = e^{\kappa\sqrt{\tau}}V_{BS}^C\left(e^{-\kappa\sqrt{\tau}}, 1, \sigma\sqrt{\tau}\right) + \Delta_{BS}^C(\kappa)\left(r - r^\star - \alpha\right)\tau + o\left(\tau\right),$$

and

$$P^{ND}\left(e^{-\kappa\sqrt{\tau}+\beta\tau}\right) = V_{BS}^C\left(e^{-\kappa\sqrt{\tau}}, 1, \sigma\sqrt{\tau}\right) + \Delta_{BS}^C(\kappa)\left(r^\star - r + \beta\right)\tau + o\left(\tau\right).$$

Proof. We first calculate the value of the call. By Lemma 4, we have

$$\begin{aligned} C^{ND}\left(e^{\kappa\sqrt{\tau}+\alpha\tau}\right) &= (1-p\tau)\, V_{BS}^C\left(e^{-r^\star\tau}, e^{(-r+\alpha)\tau+\kappa\sqrt{\tau}}, \sigma\sqrt{\tau}\right) \\ &= (1-p\tau)\, e^{(-r+\alpha)\tau+\kappa\sqrt{\tau}}V_{BS}^C\left(e^{(r-r^\star-\alpha)\tau-\kappa\sqrt{\tau}}, 1, \sigma\sqrt{\tau}\right) \\ &= e^{\kappa\sqrt{\tau}}\left(1 + (-r-p+\alpha)\tau + o\left(\tau\right)\right) \\ &\quad \left[V_{BS}^C\left(e^{-\kappa\sqrt{\tau}}, 1, \sigma\sqrt{\tau}\right) + \Delta_{BS}^C(\kappa)\left(r - r^\star - \alpha\right)\tau + o\left(\tau\right)\right], \end{aligned}$$

by Taylor expansion. We observe that $V_{BS}^{C}\left(e^{-\kappa\sqrt{\tau}},1,\sigma\tau^{1/2}\right)=O\left(\sqrt{\tau}\right)$, so

$$C^{ND}\left(e^{\kappa\sqrt{\tau}+\alpha\tau}\right)=e^{\kappa\sqrt{\tau}}V_{BS}^{C}\left(e^{-\kappa\sqrt{\tau}},1,\sigma\sqrt{\tau}\right)+\Delta_{BS}^{C}(\kappa)\left(r-r^{\star}-\alpha\right)\tau+o\left(\tau\right).$$

□

The derivation of the put price is similar.

Lemma 7. $P\left(e^{-\kappa\sqrt{\tau}+\beta\tau}\right)-e^{-\kappa\sqrt{\tau}+\gamma\tau}C\left(e^{\kappa\sqrt{\tau}+\alpha\tau}\right)$ *is given by the following formula*

$$\begin{aligned}&p\tau E^{D}\left[\left(Je^{-\kappa\sqrt{\tau}+\beta\tau}-J^{\star}\right)^{+}-\left(e^{-\kappa\sqrt{\tau}+\gamma\tau}J-J^{\star}e^{(\alpha+\gamma)\tau}\right)^{+}\right]\\&+\Delta_{BS}^{C}(\kappa)\left(2\left(r-r^{\star}\right)+\beta+\alpha\right)\tau+o\left(\tau\right).\end{aligned}$$

Proof. Clearly $P^{ND}\left(e^{-\kappa\sqrt{\tau}+\beta\tau}\right)-e^{-\kappa\sqrt{\tau}+\gamma\tau}C^{ND}\left(e^{\kappa\sqrt{\tau}+\alpha\tau}\right)$ is given by

$$\begin{aligned}&\left\{V_{BS}^{C}\left(e^{-\kappa\sqrt{\tau}},1,\sigma\sqrt{\tau}\right)+\Delta_{BS}^{P}(\kappa)\left(r^{\star}-r+\beta\right)\tau\right\}\\&-e^{-\kappa\sqrt{\tau}+\gamma\tau}\left\{e^{\kappa\sqrt{\tau}}V_{BS}^{C}\left(e^{-\kappa\sqrt{\tau}},1,\sigma\sqrt{\tau}\right)+\Delta_{BS}^{C}(\kappa)\left(r-r^{\star}-\alpha\right)\tau+o\left(\tau\right)\right\}\\&=\Delta_{BS}^{C}(\kappa)\left(2\left(r^{\star}-r\right)+\beta+\alpha\right)\tau+o\left(\tau\right).\end{aligned}$$

The result follows. □

With those two lemmas, the result in the proposition can be derived by taking $\alpha=\beta=\gamma=r-r^{\star}$.

5.2.6 Proof of Proposition 4

The impact of risk on interest rate comes from 1, written for the foreign country (with starred variables). By examining (6) and (7), one sees that it increases when $F^{\star}$ decreases.

6 Appendix B: Results when the Home Currency is the Investment Currency

We define the hedged carry-trade returns $Y_{t,t+\tau}(K)$ as the payoff corresponding to the following zero investment trade: invest one in home at interest r, buy $\lambda_{t,t+\tau}^{C}(K)$ calls with strike K protecting against an appreciation of the foreign currency and, in order to finance these investments, borrow $\left(1+\lambda_{t,t+\tau}^{C}(K)C_{t,t+\tau}(K)\right)$ in the foreign currency at interest rate $r^{\star}$. Once again, we choose the hedge ratio $\lambda_{t,t+\tau}^{C}(K)$ to eliminate tail risk.

$$Y_{t,t+\tau}(K)=e^{r\tau}-\left(1+\lambda_{t,t+\tau}^{C}C_{t,t+\tau}(K)\right)e^{r^{\star}\tau}\frac{S_{t+\tau}}{S_{t}}+\lambda_{t,t+\tau}^{C}\left(\frac{S_{t+\tau}}{S_{t}}-K\right)^{+},$$

where $P_{t,t+\tau}(K)$ is the home currency price of a put yielding $\left(K - \frac{S_{t+\tau}}{S_t}\right)^+$ in the home currency, and $C_{t,t+\tau}(K)$ is home currency price of a call yielding $\left(\frac{S_{t+\tau}}{S_t} - K\right)^+$ in the home currency, and:

$$\lambda^C_{t,t+\tau} = \frac{e^{r^\star \tau}}{1 - C_{t,t+\tau}(K) e^{r^\star \tau}}.$$

Proposition 5. *In the limit of small time intervals ($\tau \to 0$), the carry trade expected returns (conditional on no disasters) are given by the following equation*

$$\lim_{\tau \to 0} E^{ND} \left[Y_{t,t+\tau} \right] / \tau = - \lim_{\tau \to 0} E^{ND} \left[X \right] / \tau.$$

In the same limit, the hedged carry trade expected returns (conditional on no disasters) are given by

$$\lim_{\tau \to 0} E^{ND} \left[Y_{t,t+\tau} \left(e^{\kappa \sqrt{\tau}} \right) \right] / \tau = -pE \left[(J - J^\star)^+ \right] - \operatorname{cov} \left(\varepsilon, \varepsilon - \varepsilon^\star \right) \left(1 - \Delta^C_{BS}(\kappa) \right),$$

where

$$\Delta^C_{BS}(\kappa) = \partial V^C_{BS} \left(s, e^\kappa, \operatorname{var} \left(\varepsilon^\star - \varepsilon \right)^{1/2} \right) / \partial s|_{s=1} \in (0, 1)$$

are the Black-Scholes deltas of the call.

7 Appendix C: Robustness Checks

In this Appendix we report additional results obtained on the whole sample of advanced and emerging countries.

- Table 9 reports higher moments and normality tests for country-by-country changes in exchange rates. Table 10 reports the same tests after GARCH(1,1) corrections. Table 11 reports equivalent results for portfolios of currency excess returns.
- Table 12 presents some examples of bid-ask spreads on advanced and emerging countries.
- Table 13 reports estimates of disaster risk premia for a subset of nine advanced countries.
- Table 14 reports average currency excess returns across portfolios using advanced and emerging countries. Table 15 reports implied volatilities and risk reversals for the same sample. Table 16 reports estimates of disaster risk premia. Table 17 takes into account bid ask spreads.
- Tables 18 and 20 report (contemporaneous and predictive) regressions on risk reversals, exchange rates and currency excess returns for advanced countries. Tables 19 and 21 report equivalent tests for advanced and emerging countries.
- Table 22 reports predictability tests on bilateral exchange rates for advanced countries.

Table 9: Higher Moments of Bilateral Exchange Rates - All Countries

Advanced Countries					Emerging Countries				
	Skew.	Kurt.	J.B	LL		Skew.	Kurt.	J.B	LL
Canada	0.06	3.09	0.15	0.04	Argentina	−5.79	40.88	5231.20	0.35
	[0.19]	[0.34]	0.50	0.50		[1.66]	[14.64]	0.00	0.00
Switzerland	0.22	2.30	4.23	0.06	Brazil	−0.25	7.31	90.07	0.09
	[0.12]	[0.18]	0.09	0.22		[0.71]	[1.16]	0.00	0.02
Euro area	0.18	2.81	0.77	0.06	Chile	−0.06	2.88	0.13	0.05
	[0.17]	[0.27]	0.50	0.35		[0.23]	[0.39]	0.50	0.50
United Kingdom	−0.33	3.89	7.69	0.04	Columbia	−0.42	5.00	20.86	0.13
	[0.30]	[0.74]	0.03	0.50		[0.42]	[0.74]	0.00	0.00
Japan	1.24	7.89	189.15	0.07	Indonesia	−0.43	15.38	847.09	0.24
	[0.62]	[2.96]	0.00	0.04		[1.50]	[3.67]	0.00	0.00
Sweden	0.26	2.88	1.73	0.05	India	0.53	10.38	317.38	0.18
	[0.16]	[0.29]	0.36	0.41		[0.97]	[2.42]	0.00	0.00
Australia	−0.06	2.84	0.25	0.05	Mexico	−0.97	6.03	81.21	0.09
	[0.19]	[0.33]	0.50	0.47		[0.45]	[1.69]	0.00	0.01
Norway	0.18	3.27	1.26	0.06	Malaysia	1.36	13.71	284.82	0.21
	[0.19]	[0.31]	0.48	0.14		[1.87]	[4.67]	0.00	0.00
New Zealand	−0.20	3.25	1.41	0.07	Peru	−1.44	12.28	531.58	0.18
	[0.18]	[0.32]	0.44	0.07		[0.96]	[3.40]	0.00	0.00
Israel	0.22	3.26	0.83	0.06	Philippines	−2.07	13.45	699.72	0.22
	[0.27]	[0.44]	0.50	0.50		[0.86]	[3.39]	0.00	0.00
Poland	−0.16	3.08	0.44	0.05	Thailand	1.16	14.55	768.74	0.14
	[0.23]	[0.41]	0.50	0.50		[1.32]	[4.91]	0.00	0.00
Singapore	0.37	6.31	72.46	0.08	Turkey	−0.44	3.57	4.17	0.11
	[0.54]	[1.34]	0.00	0.02		[0.30]	[0.71]	0.08	0.01
Czech Republic	0.04	2.96	0.04	0.06	Taiwan	−0.08	8.00	148.30	0.11
	[0.20]	[0.33]	0.50	0.40		[0.73]	[1.65]	0.00	0.00
South Korea	−2.52	23.41	2522.75	0.17	Venezuela	−0.15	2.44	0.18	0.19
	[1.73]	[7.97]	0.00	0.00		[0.56]	[0.87]	0.50	0.31
					South Africa	−0.13	3.19	0.62	0.05
						[0.18]	[0.33]	0.50	0.50

Notes: This table reports the skewness, kurtosis, and Jarque and Bera (1980) and Lilliefors (1967) normality tests of changes in exchange rates. The Jarque-Berra and Lilliefors's null hypothesis is a joint hypothesis of the skewness being zero and the excess kurtosis being 0. For the skewness and kurtosis, the table reports between brackets the standard error obtained by bootstrapping. For the Jarque-Berra and Lilliefors tests, the table reports the p-values. The sample exclude China, Hong Kong and Denmark whose exchange rate regimes are non-floating over the full sample period. The left panel focuses on advanced countries. The sample period is 1/1996 - 8/2008.

Table 10: Higher Moments of Bilateral Exchange Rates - GARCH(1,1) Correction - Advanced Countries

Advanced Countries				
	Skew.	Kurt.	J.B	LL
Canada	0.11	2.90	0.36	0.00
	[0.18]	[0.33]	0.50	0.50
Switzerland	0.22	2.30	4.23	0.00
	[0.12]	[0.18]	0.09	0.22
Euro area	0.16	2.83	0.72	0.00
	[0.16]	[0.27]	0.50	0.38
United Kingdom	−0.33	3.89	7.68	0.00
	[0.30]	[0.76]	0.03	0.50
Japan	1.14	7.18	142.95	0.00
	[0.57]	[2.63]	0.00	0.08
Sweden	0.26	2.88	1.73	0.00
	[0.15]	[0.30]	0.36	0.41
Australia	−0.14	2.73	0.93	0.00
	[0.17]	[0.30]	0.50	0.23
Norway	0.18	3.27	1.25	0.00
	[0.20]	[0.31]	0.49	0.14
New Zealand	−0.28	3.19	2.15	0.00
	[0.18]	[0.32]	0.28	0.06
Israel	−0.03	3.28	0.27	0.00
	[0.28]	[0.37]	0.50	0.48
Poland	−0.22	3.01	0.78	0.00
	[0.23]	[0.44]	0.50	0.50
Singapore	−0.16	3.62	3.03	0.00
	[0.24]	[0.39]	0.16	0.31
Czech Republic	0.09	2.89	0.25	0.00
	[0.21]	[0.32]	0.50	0.50
South Korea	−0.58	4.45	19.51	1.00
	[0.28]	[0.63]	0.00	0.01

Notes: This table reports the skewness, kurtosis, and Jarque and Bera (1980) and Lilliefors (1967) normality tests of *normalized* changes in exchange rates. In order to obtain these normalized series, we first estimate a GARCH(1,1) model for each country's exchange rate (in log differences) and then divide the exchange rate by the standard deviation. The Jarque-Berra and Lilliefors's null hypothesis is a joint hypothesis of the skewness being zero and the excess kurtosis being 0. For the skewness and kurtosis, the table reports between brackets the standard error obtained by bootstrapping. For the Jarque-Berra and Lilliefors tests, the table reports the p-values. The sample exclude China, Hong Kong and Denmark whose exchange rate regimes are non-floating over the full sample period. The left panel focuses on advanced countries. The sample period is 1/1996 - 8/2008.

Table 11: Higher Moments of Portfolio Currency Excess Returns

	Panel I: Advanced Countries			
Portfolios	1	2	3	
Skewness	0.47	0.28	−0.60	
	[0.16]	[0.19]	[0.40]	
Kurtosis	2.90	3.28	5.04	
	[0.39]	[0.35]	[1.16]	
Jarque-Berra	5.64	2.40	35.33	
p-value	0.05	0.23	0.00	
Lilliefors	6.19	6.02	5.80	
p-value	0.17	0.20	0.25	
	Panel II: All Countries			
Portfolios	1	2	3	4
Skewness	0.32	0.21	−2.23	1.26
	[0.18]	[0.21]	[0.95]	[0.85]
Kurtosis	3.01	3.64	15.29	10.73
	[0.37]	[0.35]	[5.26]	[3.61]
Jarque-Berra	2.55	3.63	1075.17	415.57
p-value	0.21	0.11	0.00	0.00
Lilliefors	6.00	7.51	12.16	10.13
p-value	0.20	0.04	0.00	0.00

Notes: This table reports higher moments of unhedged currency excess returns. The table reports the skewness and kurtosis of each portfolio and the corresponding standard errors. These are obtained by bootstrapping the monthly excess returns under the assumptions that they are i.i.d. The table also reports the Jarque and Bera (1980) and Lilliefors (1967) normality tests and the *p*-value of the null hypothesis (a *p*-value below 5% indicates rejection of normality at the 5% significance level). The Lilliefors test statistic is multiplied by 100. Portfolio 1 contains currencies with the lowest interest rates. Portfolio 3 contains currencies with the highest interest rates. The horizon of the excess returns and the option maturity are one month. Data are monthly, from JP Morgan. The sample period is 1/1996 - 8/2008.

Table 12: Bid-Ask Spreads - Examples

	EUR/USD	USD/CHF	AUD/USD	USD/BRL
		Panel I: November 10, 2008		
Spot	1.2890	1.1730	0.6950	2.1350
10δ Call	21.19/26.67	14.81/21.87	25.59/32.53	45/52
25δ Call	20.86/23.48	14.34/17.63	27.85/31.36	48/55
ATM	20.75/23.25	14.00/17.00	30.38/34.13	34/42
25δ Put	22.01/24.72	14.95/18.30	34.02/38.26	20/24
10δ Put	23.41/28.88	16.00/22.45	36.96/44.99	23/28
		Panel II: January 20, 2009		
Spot	1.2930	1.1450	0.6580	2.3650
10δ Call	22.60/25.00	19.80/22.80	20./22.50	31.50/34.00
25δ Call	21.50/23.00	19.00/20.50	19.00/20.50	30.50/35.00
ATM	21.5/22.50	18.70/20.20	18.70/20.20	34.50/36.50
25δ Put	22.30/23.50	19.30/21.00	19.50/21.20	48/52
10δ Put	23.80/26.00	20.50/23.50	20.70/23.80	41/43

Notes: This table reports spot rates and implied volatilities at one-month horizons for different pairs of currency options. Source: Bank of France (Broker-Dealers: UBS, Citibank, Deutsche Bank, JPM Chase). Panel I corresponds to quotes on November 10, 2008. Panel II corresponds to January 20, 2009.

Table 13: Disaster Risk Premia - Nine Advanced Countries Sorted on Interest Rates

Panel I: Carry Excess Returns					
	Unhedged Carry	Hedged at 10 δ	Hedged at 25 δ	Hedged ATM	
Mean	5.03	3.44	2.54	0.90	
	[1.64]	[1.54]	[1.41]	[1.23]	
Mean Spread		1.59	2.48	4.12	
		[0.40]	[0.84]	[1.30]	
Panel II: Estimations					
	10δ	25δ	ATM	10δ, 25δ, and ATM	GMM 2^{nd} Stage
$\overline{\pi}^D$	1.21	1.64	3.22	2.02	1.06
	[0.38]	[0.92]	[1.90]	[1.01]	[0.33]
$\overline{\pi}^G$	3.82	3.39	1.81	3.01	3.38
	[1.68]	[1.85]	[2.44]	[1.89]	[1.74]
$\overline{\pi}^D - \overline{\pi}^G$	−2.61	−1.75	1.41	−0.99	−2.32
	[1.82]	[2.44]	[4.07]	[2.57]	[1.85]

Notes: This first panel of this table reports average returns on hedged and unhedged currency carry trades and their standard errors. Due to the small number of countries in this sample, we only build two portfolios, sorting countries on interest rates. Carry trades correspond to returns on the second minus returns on the first portfolio. We consider different hedges: 10-delta, 25-delta and at-the-money. We also report the average difference between unhedged and hedged carry trades. The second panel reports structural estimates. $\overline{\pi}^D$ denotes the part of the carry excess return linked to disaster risk. $\overline{\pi}^G$ corresponds to the Gaussian, non-disaster part of the same excess return. These estimates are obtained using hedged returns at 10-delta (first column), 25-delta (second column), at-the-money (third column) or 10-, 25-delta and at-the-money (fourth and fifth columns). Standard errors are obtained by bootstrapping the monthly excess returns under the assumptions that they are i.i.d. Data are monthly, from JP Morgan. The sample period is 1/1996 - 8/2008.

Table 14: Excess Returns: All countries

Portfolios	1	2	3	4	1	2	3	4
	Going Long				Going Short			
	Panel I: Unhedged							
Mean	−2.35	1.10	0.48	12.59	2.35	−1.10	−0.48	−12.59
	[1.75]	[1.83]	[2.20]	[2.75]	[1.83]	[1.81]	[2.18]	[2.79]
Sharpe Ratio	−0.36	0.17	0.06	1.30	0.36	−0.17	−0.06	−1.30
	Panel II: Hedged at 10-delta							
Mean	−3.20	0.58	0.62	11.19	1.75	−1.16	−0.52	−11.89
	[1.73]	[1.65]	[1.65]	[2.50]	[1.66]	[1.68]	[2.13]	[2.40]
Sharpe Ratio	−0.52	0.10	0.10	1.27	0.29	−0.20	−0.07	−1.37
	Panel III: Hedged at 25-delta							
Mean	−2.87	0.37	0.26	8.85	1.44	−1.03	−0.46	−10.55
	[1.50]	[1.47]	[1.43]	[2.18]	[1.41]	[1.34]	[1.79]	[2.01]
Sharpe Ratio	−0.55	0.07	0.05	1.16	0.28	−0.21	−0.07	−1.42
	Panel IV: Hedged ATM							
Mean	−1.91	0.23	0.01	5.35	0.39	−0.87	−0.47	−7.27
	[1.05]	[1.12]	[0.98]	[1.50]	[1.01]	[0.98]	[1.60]	[1.46]
Sharpe Ratio	−0.51	0.06	0.00	0.98	0.11	−0.25	−0.08	−1.38

Notes: This table reports reports average currency excess returns that are unhedged, hedged at 10-delta, at 25-delta and at-the-money for our four portfolios. The last panel reports average risk reversals at 10- and 25-delta. In the left section, we assume that the US investor goes long the foreign currency. In the right section, we assume that the US investor goes short the foreign currency. In each case, we report the mean excess return, its standard deviation and the corresponding Sharpe ratio. The mean and standard deviations are annualized (multiplied respectively by 12 and $\sqrt{12}$). The Sharpe ratio corresponds to the ratio of the annualized mean to the annualized standard deviation. Portfolio 1 contains currencies with the lowest interest rates. Portfolio 4 contains currencies with the highest interest rates. The horizon of the excess returns and the option maturity are one month. Data are monthly, from JP Morgan. The sample period is 1/1996 - 8/2008.

Table 15: Implied Volatilities and Risk Reversals: All Countries

Portfolios	1	2	3	4
		Panel I: Implied Volatilities		
$10\delta-$Put	9.64	9.90	11.26	17.44
	[0.21]	[0.20]	[0.40]	[0.66]
$25\delta-$Put	9.12	9.29	10.21	15.57
	[0.18]	[0.19]	[0.35]	[0.60]
ATM	8.91	8.79	9.31	13.99
	[0.19]	[0.18]	[0.34]	[0.59]
$25\delta-$Call	9.25	8.93	9.24	13.39
	[0.20]	[0.18]	[0.32]	[0.56]
$10\delta-$Call	9.89	9.31	9.49	13.29
	[0.20]	[0.17]	[0.34]	[0.55]
		Panel II: Risk Reversals (Implied Volatilities)		
Mean RR10	−0.25	0.59	1.77	4.15
	[0.08]	[0.06]	[0.10]	[0.17]
Mean RR25	−0.13	0.36	0.97	2.18
	[0.04]	[0.03]	[0.05]	[0.08]

Notes: This table reports average implied volatilities and risk reversals by portfolios. The first panel reports average implied volatilities on put and call contracts for strike prices 10-, 25-delta and at-the-money. The second panel reports risk reversals at 10- and 25-deltas measured in implied volatilities. They are quoted in annual percentages. The third panel corresponds to differences in prices. They are quoted in basis points ($1/100^{th}$ of a percentage point). Standard errors are obtained by bootstrapping the monthly excess returns under the assumptions that they are i.i.d. Portfolio 1 contains currencies with the lowest interest rates. Portfolio 4 contains currencies with the highest interest rates. The horizon of the excess returns and the option maturity are one month. Data are monthly, from JP Morgan. The sample period is 1/1996 - 8/2008.

Table 16: Disaster Risk Premia - All Countries

Panel I: Carry Excess Returns					
	Unhedged Carry	Hedged at 10δ	Hedged at 25δ	Hedged ATM	
Mean	14.94	12.95	10.28	5.74	
	[2.85]	[2.64]	[2.31]	[1.54]	
Mean Spread		1.99	4.66	9.20	
		[0.50]	[0.96]	[1.70]	

Panel II: Estimations					
	10δ	25δ	ATM	10δ, 25δ, and ATM	GMM 2^{nd} Stage
$\overline{\pi}^D$	0.55	1.23	3.46	1.75	0.41
	[0.47]	[0.85]	[1.61]	[0.92]	[0.44]
$\overline{\pi}^G$	14.39	13.71	11.48	13.19	12.39
	[2.93]	[3.02]	[3.02]	[2.80]	[2.87]
$\overline{\pi}^D - \overline{\pi}^G$	−13.83	−12.48	−8.01	−11.44	−11.98
	[3.08]	[3.35]	[3.94]	[3.11]	[2.97]

Notes: This first panel of this table reports average returns on hedged and unhedged currency carry trades and their standard errors. We use the currency portfolios presented in Table 14. Carry trades correspond to returns on the last minus returns on the first portfolio. We consider different hedges: 10-delta, 25-delta and at-the-money. We also report the average difference between unhedged and hedged carry trades. The second panel reports structural estimates. $\overline{\pi}^D$ denotes the part of the carry excess return linked to disaster risk. $\overline{\pi}^G$ corresponds to the Gaussian, non-disaster part of the same excess return. These estimates are obtained using hedged returns at 10-delta (first column), 25-delta (second column), at-the-money (third column) or 10-, 25-delta and at-the-money (fourth column). Standard errors are obtained by bootstrapping the monthly excess returns under the assumptions that they are i.i.d. Data are monthly, from JP Morgan. The sample period is 1/1996 - 8/2008.

Table 17: Disaster Risk Premia - All Countries - With Transaction Costs

Panel I: Carry Excess Returns					
	Unhedged Carry	Hedged at 10δ	Hedged at 25δ	Hedged ATM	
Mean	13.76	11.05	7.98	3.30	
	[2.71]	[2.52]	[2.24]	[1.58]	
Mean Spread		2.71	5.79	10.46	
		[0.50]	[0.99]	[1.78]	

Panel II: Estimations					
	10δ	25δ	ATM	10δ, 25δ, and ATM	GMM 2^{nd} Stage
$\overline{\pi}^D$	1.48	3.13	7.16	3.92	0.95
	[0.49]	[0.87]	[1.68]	[0.95]	[0.52]
$\overline{\pi}^G$	12.28	10.63	6.60	9.84	9.40
	[2.97]	[3.02]	[3.14]	[2.98]	[3.38]
$\overline{\pi}^D - \overline{\pi}^G$	-10.80	-7.51	0.56	-5.92	-8.44
	[3.10]	[3.36]	[4.10]	[3.33]	[3.49]

Notes: This first panel of this table reports average returns on hedged and unhedged currency carry trades and their standard errors. We use the currency portfolios presented in Table 14. Carry trades correspond to returns on the last minus returns on the first portfolio. We consider different hedges: 10-delta, 25-delta and at the money. We also report the average difference between unhedged and hedged carry trades. The second panel reports structural estimates. $\overline{\pi}^D$ denotes the part of the carry excess return linked to disaster risk. $\overline{\pi}^G$ corresponds to the Gaussian, non-disaster part of the same excess return. These estimates are obtained using hedged returns at 10-delta (first column), 25-delta (second column), at-the-money (third column) or 10-, 25-delta and at-the-money (fourth column). Standard errors are obtained by bootstrapping the monthly excess returns under the assumptions that they are i.i.d. Data are monthly, from JP Morgan. The sample period is 1/1996 - 8/2008. We assume annual transaction costs on unhedged returns of 0.25% and 2% on respectively advanced and emerging countries. We assume bid-ask spreads of 5% and 10% on implied volatilities (respectively for advanced or developing countries).

Table 18: Changes in Risk Reversals and Exchange Rates: Contemporaneous Specifications

Dependant Variable:	Exchange Rates							
	Panel I: Raw Variables				Panel II: Demeaned Variables			
Risk Reversals	-49.95				-41.02			
Strike: Forward +/- 10%	[9.47]***				[6.24]***			
Risk Reversals		-32.78				-26.22		
Strike: Forward +/- 5%		[2.21]***				[2.47]***		
Risk Reversals			-102.65				-41.02	
Strike: Delta 10			[7.03]***				[6.24]***	
Risk Reversals				-63.14				-30.69
Strike: Delta 25				[3.99]***				[3.95]***
Observations	1667	1759	1776	1776	1667	1759	1776	1776
R^2	0.08	0.21	0.23	0.23	0.04	0.05	0.04	0.05

Notes: This table documents contemporaneous relationships between changes in nominal exchange rates and changes in risk reversals. All specifications include currency-fixed effects. Panel I presents results based on raw variables. Panel II uses cross-sectionally demeaned variables to control for the specific role of the US Dollar. Changes in exchange rates correspond to monthly log changes. Changes in risk reversals correspond to first differences. risk reversals are normalized by spot rates. Standard errors obtained from bootstrap procedures using 1000 replications are presented below the point estimates. The symbols ***, ** and * indicate statistical significance at 1, 5 and 10 percent confidence levels. The sample comprises currencies from advanced countries. Data are monthly, from JP Morgan. The sample period is 01/1996 -08/2008.

Table 19: Risk Reversals and Exchange Rates: Contemporaneous Specifications - All Countries

Dependant Variable:	Exchange Rates							
	Panel I: Raw Variables				Panel II: Demeaned Variables			
Risk Reversals	-19.71				-19.07			
Strike: Forward +/-10%	[7.07]***				[7.35]***			
Risk Reversals		-18.23				-15.93		
Strike: Forward +/-5%		[2.76]***				[3.58]***		
Risk Reversals			-18.48				-10.28	
Strike: Delta 10			[34.78]				[33.21]	
Risk Reversals				-9.90				-6.84
Strike: Delta 25				[17.25]				[15.44]
Observations	1638	1741	1760	1760	1638	1741	1760	1760
R-squared	0.05	0.18	0.21	0.2	0.03	0.05	0.06	0.04

Notes: This table documents contemporaneous relationships between changes in nominal exchange rates and changes in risk reversals. All specifications include currency-fixed effects. Panel I presents results based on raw variables. Panel II uses cross-sectionally demeaned variables to control for the specific role of the US Dollar. Changes in exchange rates correspond to monthly log changes. Changes in risk reversals correspond to first differences. risk reversals are normalized by spot rates. Standard errors obtained from bootstrap procedures using 1000 replications are presented below the point estimates. The symbols ***, ** and * indicate statistical significance at 1, 5 and 10 percent confidence levels. The sample comprises currencies for the full sample of available countries. Data are monthly, from JP Morgan. The sample period is 01/1996 -08/2008.

Table 20: Risk Reversals, Exchange Rates and Currency Excess Returns: Predictive Specifications

Dependant Variable:	Panel I: Exchange Rates					Panel II: Currency Excess Returns				
Interest Rate Differential	-0.58	-0.61	-0.58	-0.72	-0.732	-1.58	-1.61	-1.73	-1.78	-1.74
	[0.616]	[0.626]	[0.36]	[0.41]	[0.4]*	[0.615]**	[0.37]***	[0.41]***	[0.40]***	[0.41]***
Risk Reversal		2.37					2.31			
Strike: Forward +/-10%		[6.15]					[5.86]			
Risk Reversal			-1.87					-1.82		
Strike: Forward +/-5%			[1.85]					[1.86]		
Risk Reversal				-5.4					-5.28	
Strike: Delta 10				[2.93]*					[2.89]*	
Risk Reversal					-7.1					-6.96
Strike: Delta 25					[4.45]					[4.79]
R^2	0.01	0.015	0.01	0.01	0.01	0.034	0.037	0.036	0.035	0.038
Observations	1776	1666	1738	1750	1750	1776	1738	1750	1750	1750

Notes: This table presents results of predictability tests. We regress monthly changes in nominal exchange rates (panel I) or monthly currency excess returns (panel II) on risk reversals and interest differentials. The interest differential is defined as the difference between the domestic and the foreign interest rate. The null hypothesis of UIP not being rejected is a coefficient of 1 for the interest rate differential in panel I and a coefficient of zero in panel II. All specifications include currency-fixed effects. Standard errors obtained from a bootstrap procedure using 1000 replications are presented below their respective point estimates. ***,**,* indicates statistical significance at 1, 5, 10 percent confidence levels. The sample comprises currencies from advanced countries. Data are monthly, from JP Morgan. The sample period is 01/1996 -08/2008.

Table 21: Risk Reversals, Exchange Rates and Currency Excess Returns: Predictive Specifications - All Countries

Dependant Variable:	Panel I: Exchange Rates					Panel II: Currency Excess Returns				
Interest Rate Differential	0.86	0.96	0.89	0.79	0.78	-0.13	-0.00	-0.09	-0.12	-0.09
	[0.32]***	[0.37]**	[0.34]***	[0.31]***	[0.36]**	[0.34]	[0.38]	[0.36]	[0.33]	[0.34]
Risk Reversal		2.99					3.96			
Strike: Forward +/-10%		[2.39]					[2.43]			
Risk Reversal			1.82					2.21		
Strike: Forward +/-5%			[1.18]					[1.24]*		
Risk Reversal				-2.42					0.29	
Strike: Delta 10				[5.95]					[5.57]	
Risk Reversal					-1.07					0.55
Strike: Delta 25					[3.72]					[3.4]
R-squared	0.0711	0.0788	0.075	0.0716	0.016	0.025	0.021	0.0167	0.0163	0.0167
Observations	3580	3129	3427	3576	3576	3580	3129	3427	3576	3576

Notes: This table presents results of predictability tests. We regress monthly changes in nominal exchange rates (panel I) or monthly currency excess returns (panel II) on risk reversals and interest differentials. The interest differential is defined as the difference between the domestic and the foreign interest rate. The null hypothesis of UIP not being rejected is a coefficient of 1 for the interest rate differential in panel I and a coefficient of zero in panel II. All specifications include currency-fixed effects. Standard errors obtained from a bootstrap procedure using 1000 replications are presented below their respective point estimates. ***,**,* indicates statistical significance at 1, 5, 10 percent confidence levels. The sample comprises currencies from advanced and emerging countries. Data are monthly, from JP Morgan. The sample period is 01/1996 -08/2008.

Table 22: Risk Reversals and Exchange Rate Changes: Currency by Currency Predictive Specifications

Country Code	CAN	CAN	CHE	CHE	EUR	EUR	GBR	GBR	JPN	JPN	AUS	AUS	SWE	SWE
Interest Rate Differential	-2.23	-2.23	-4.1	-3.96	-4.13	-3.96	-0.91	-0.74	-1.37	-1.28	-4.26	-4.48	-3.49	-3.18
	[1.66]	[1.64]	[1.80]**	[1.86]**	[1.68]**	[1.72]**	[1.84]	[1.82]	[1.64]	[1.65]	[1.66]**	[1.69]***	[1.37]**	[1.38]**
Risk Reversal		0.3		-4.93		-8.1		-9.8		6.44		14.03		-22.29
Strike: Delta 10		[16.89]		[18.34]		[18.84]		[15.84]		[9.72]		[24.88]		[20.57]
Observations	150	150	150	150	115	115	150	150	150	150	150	150	150	150
R-squared	0.01	0.01	0.03	0.03	0.05	0.05	0	0	0	0.01	0.04	0.05	0.04	0.05
Country Code	NOR	NOR	NZL	NZL	ISR	ISR	POL	POL	SGP	SGP	CZE	CZE	KOR	KOR
Interest Rate Differential	-2.03	-2.22	-2.5	-2.49	0.47	1.21	0.59	1.23	-0.6	-0.6	0.37	0.11	1.7	1.92
	[1.12]*	[1.13]*	[1.54]	[1.55]	[1.14]	[1.51]	[0.72]	[1.07]	[1.92]	[1.92]	[0.39]	[0.38]	[0.62]***	[0.51]***
Risk Reversals		9.65		3.11		13.28		17.23		4.14		-12.61		14.98
Strike: Delta 10		[19.17]		[22.22]		[18.99]		[17.32]		[13.44]		[8.30]		[18.16]
Observations	150	150	150	150	78	78	99	99	150	150	134	134	136	134
R-squared	0.02	0.02	0.02	0.02	0	0.01	0.01	0.01	0	0	0	0.02	0.12	0.14

Notes: This table presents results of predictability tests. We regress monthly changes in nominal exchange rates on risk reversals and interest differentials. The interest differential is defined as the difference between the domestic and the foreign interest rate. The null hypothesis of UIP not being rejected is a coefficient of 1 for the interest rate differential. Standard errors obtained from a bootstrap procedure using 1000 replications are presented below the point estimates. The symbols ***, **, * indicate statistical significance at 1, 5, and 10 percent confidence levels. We focus on advanced countries. We exclude observations that do not correspond to a floating exchange rate regime according to IMF De Facto classification. Data are monthly, from JP Morgan. The sample period is 01/1996 -08/2008.