

# Discussion of "Currency Risk, FX Options and Financial Crisis" by Yu-chin Chen and Ranganai Gwati

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## Summary

- Use moments from option-implied risk-neutral distributions (RNDs) to explain currency expected returns
  - For a fixed maturity, extracted moments - implied volatility, skewness and kurtosis - of corresponding maturity are used (role of volatility smile)
  - For a given currency pair, term structure of implied moments are regressed on the excess returns
- The regressions show a high adjusted  $R^2$  across the maturity structure

$$f_t^{t+\tau} - s_{t+\tau} = \gamma_0 + \gamma_1 stdev_{t,\tau} + \gamma_2 skew_{t,\tau} + \gamma_3 kurt_{t,\tau} \\ + \delta_0 D_1 + \delta_1 D_1 stdev_{t,\tau} + \\ + \delta_2 D_2 skew_{t,\tau} + \delta_3 D_3 kurt_{t,\tau} + \varepsilon_{t+\tau}$$

	1 mon	6 mon	12 mon
AUSUSD	0.26	0.65	0.86
EURUSD	0.19	0.53	0.78
YENUSD	0.12	0.42	0.31

# Discussion

- Empirical strategy
  - Large daily data set of options from Jan 2007- April 2011 for five currency pairs
  - Use the volatilities of option straddles (ATMs, RRs and VWBs) to back out implied exercise and corresponding strike prices for the  $25\Delta p$ , *ATM* and  $25\Delta c$
- Suggestions
  - Effects of macro announcements
  - Subjective expectations
  - Term structure of implied moments after structural break and associated PDFs

# Option-implied moments and macro announcements

- For the given data period, do the option-implied moments react significantly to macroeconomic announcements?
  - Grad (2010) constructs similar options-implied moments for a comparable data period, and finds that standard deviation, skewness and kurtosis react in statistically significant manner to announcements such as jobs reports
  - Moench and Lucca (2011) show that equity expected excess returns react significantly in the 24 hours leading up to the FOMC announcements

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- Dates for the structural break in the regression, found by the Bai-Perron test:

	<i>1 mon</i>	<i>6 mon</i>	<i>12 mon</i>
<i>AUSUSD</i>	2/16/09	8/4/08	8/7/08
<i>EURUSD</i>	2/11/09	8/7/08	8/7/08
<i>YENUSD</i>	1/7/09	4/22/08	<i>na</i>

# Option-implied moments and the Crisis

- Key FOMC statements during the crisis
  - 3/11/08: Announcement of the TSLF
  - 10/28/08: Joint statements by the FRB, BoEngland, BoCanada among others, and endorsement by the BoJapan; coordinated interest rate reductions
  - 3/26/09: FRB announces the \$750billion purchase of MBSs

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- Could the moments and excess returns be reacting to FOMC statements?

$$Moment_{t,\tau} = \gamma_0 + \sum_i \gamma_{i,\tau} D_i + \varepsilon_{t,\tau}$$

- Are there statistically significant effects across maturities?
  - May indicate how market expectations, as proxied by the RND moments, are changing in response of anticipated news (more volatility or tail risk?)

## Option moments and subjective expectations

- The null hypothesis of the original regression:  $f_t^{t+\tau} - E_t s_{t+\tau}$  is uncorrelated with the information set at time  $t$
- $E_t s_{t+\tau}$  is proxied by realized spot rate assuming  $s_{t+\tau} = E_t s_{t+\tau} + v_{t,t+\tau}$ , assuming rational expectations

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- Investigate subjective expected excess returns and expectational errors by using survey forecasts by running the following regression:

$$\begin{aligned} X_{t,t+\tau} = & \gamma_0 + \gamma_1 stdev_{t,\tau} + \gamma_2 skew_{t,\tau} + \gamma_3 kurt_{t,\tau} \\ & \delta_0 D_1 + \delta_1 D_1 stdev_{t,\tau} + \\ & \delta_2 D_2 skew_{t,\tau} + \delta_3 D_3 kurt_{t,\tau} + \varepsilon_{t+\tau} \end{aligned}$$

where  $X_{t,t+\tau} = f_t^{t+\tau} - \tilde{E}_t s_{t+\tau}$  and  $X_{t,t+\tau} = \tilde{E}_t s_{t+\tau} - s_{t+\tau}$ ;  $\tilde{E}_t s_{t+\tau}$  are obtained from the median survey responses

- FX4casts.com (takes over from the CFD) provides monthly data on consensus forecasts for 1 - 24 month horizons for major currencies
- Size and sign of the coefficients on regressors in the above regression, and how they are different from the original regressions?

## Option moments and term structure volatilities

- Standard deviation seems to be especially important across currencies and tenors (coefficients of original regression without and with the break)

$$f_t^{t+\tau} - s_{t+\tau} = \gamma_0 + \gamma_1 stdev_{t,\tau} + \delta_0 D_1 + \delta_1 D_1 stdev_{t,\tau} + \dots$$

	1 mon		12 mon	
	$\gamma_1$	$\delta_1$	$\gamma_1$	$\delta_1$
AUSUSD	0.72	-2.54	4.54	-6.82
EURUSD	-0.16	0.05	7.37	-8.03

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- Following the structural break date, what is the change in implied volatility/skewness/kurtosis, and is it similar across option tenors?
  - For a given currency pair, do the implied moments at different tenors approach the pre-break dates?
  - Are market perceptions and risk aversion changing for the short term or even for the longer horizon?
  - Showing the PDF of the option-implied probability distribution for some fixed maturity across currency pairs around break dates may aid the exposition

# Summary

- Nice paper!
- The dataset could lead to an even broader research agenda:
  - Do the model-free RND-implied moments depend on macroeconomic announcements
  - Parsing through the results to distinguish between the subjective excess returns and the risk premia stories