Feedback Trading and Asian Exchange Rate Dynamics Post-1998

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Abstract

This paper applies the non-fundamental feedback trading model of Tambakis (2007) to the behavior of six Asian countries' nominal dollar exchange rates since the currency crises of 1997-98. Theoretically, the stability of the exchange rate dynamics depends on the combination of monentum and risk (volatility) feedback. Empirically, the framework facilitates identification of the average strength of momentum and risk feedback intensities and average market liquidity.

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JEL classification: G12, G14

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1. Feedback trading and exchange rate dynamics

Let s_t be the log level of the spot exchange rate in period t in home currency units per USD. Nominal exchange rate depreciation from $t-1$ to t then is $x_t = \Delta s_t$. We assume the home currency's return dynamics follow the nonlinear difference equation

$$x_t = \lambda_t \omega_t = \lambda_t(\gamma_{1t} x_{t-1} + \gamma_{2t} x_{t-1}^2) + \varepsilon_t \tag{1}$$

The FX market microstructure is such that a risk-neutral market maker receives net orderflow ω_t and adjusts the spot rate using price impact parameter λ_t, that is inversely related to market liquidity. ε_t is an iid error reflecting noise traders' returns contribution, and γ_{1t} and γ_{2t} measure the time-varying intensity of two types of feedback trading.[1]

Specifically: (i) the case $\gamma_{1t} > 0$ captures short-term momentum strategies; (ii) $\gamma_{1t} < 0$ corresponds to contrarian trading rules; (iii) $\gamma_{2t} < 0$ corresponds to FX traders' belief in a weaker USD, or stronger home currency, justifying always selling volatility (pessimism); and (iv) $\gamma_{2t} > 0$ reflects an expectation of a stronger USD justifying buying volatility (optimism). The short-term profitability of strategies (iii)-(iv) can induce changes in trading behavior from "chartist" to "fundamentalist" (mean/variance), as follows

	$\gamma_{2t} < 0$	$\gamma_{2t} > 0$
$x_{t-1} > 0$	$\pi < 0$	$\pi > 0$
	Mean-variance (stop-loss)	Optimism
$x_{t-1} < 0$	$\pi > 0$	$\pi < 0$
	Pessimism	Mean-variance (value)

By far the most interesting feedback combination is $\gamma_{1t} > 0$ and $\gamma_{2t} < 0$. Equation (1) then becomes a logistic mapping, h_t, whose two fixed points

[1] On high-frequency market miscrosructure and speculative trading see Bask (2007) and Evans and Lyons (2002). Rational FX speculation is studied by Stockman and Duarte (2005); time-varying price impact is modeled by Acharya and Pedersen (2005).

$x = h_t(x)$ represent equilibrium steady states. These are

$$x^{(1)} = 0 \quad , \quad x_t^{(2)} = \frac{1}{\gamma_{2t}}\left(\gamma_{1t} - \frac{1}{\lambda_t}\right)$$

Note that, while $x^{(1)}$ corresponds to a currency peg (or other fixed exchange rate regime), the magnitude of $x_t^{(2)}$ is nonzero and depends on time-varying feedback intensities and market liquidity. When the zero fixed point is unstable, the market dynamics may progressively become stressed, turbulent and chaotic; see Tambakis (2007).

2. Preliminary estimation findings: East Asia 1998-2007

In this paper we estimate the average feedback intensities and average liquidity at low (monthly) frequency. We consider the USD exchange rates of Thailand, Indonesia, South Korea, the Phillipines, China and Japan over the post-Asian crisis period 1998:10-2007:08, 107 end-of-month observations. We have excluded Malaysia because its exchange rate was exactly fixed for much of the period.

Equation (1) suggests the regression

$$x_t = \beta_0 + \beta_1 x_{t-1} + \beta_2 x_{t-1}^2 + \varepsilon_t \tag{2}$$

For identification purposes, we assume there is only two types of feedback traders: momentum/contrarian (fraction $\beta_1 = \gamma$) and volatility buyers/sellers (fraction $\beta_2 = 1 - \gamma$), whose total measure sums to unity ($\beta_1 + \beta_2 = 1$). Combining momentum ($\beta_1 > 0$) and volatility sellers ($\beta_2 < 0$) then yields the following testable parametric restrictions: $\beta_0 = 0$, $x^{(2)} = \frac{1-\beta_1}{\beta_2}$, average price impact $\lambda = \beta_1 - \beta_2$, and average momentum intensity $\gamma = \beta_1/\lambda$.

Preliminary OLS estimates with GARCH residuals yield the results reported in Table below[2]

[2] $\beta_0 = 0$ is strongly not rejected in all cases so we do not report it. p-values of other parameters are given in parentheses. Data source: IMF/IFS.

	$x^{(2)}$	$\widehat{\beta}_1$	$\widehat{\beta}_2$	γ	$1-\gamma$	λ	GARCH
THA	-0.46	0.42 (0.00)	-1.25 (0.63)	0.25	0.75	1.67	(1,0)
IND	14.50	0.13 (0.19)	0.06 (0.96)	0.68	0.32	0.19	(1,1)
KOR	-0.63	0.04 (0.69)	-1.51 (0.37)	0.03	0.97	1.55	(1,1)
PHI	-0.27	0.12 (0.19)	-3.25 (0.19)	0.04	0.96	3.37	(1,0)
CHI	n/a	-0.06 (0.59)	35.20 (0.13)	n/a	n/a	n/a	(0,0)
JPN	-3.11	0.03 (0.80)	-0.31 (0.86)	0.08	0.92	0.34	(0,1)

3. Policy implications

With the exception of the Thai baht's strong momentum, the results are not significant because of the small sample. We intend to apply the bootstrap techniques to narrow the confidence intervals. Accuracy notwithstanding, the estimates suggest the feedback combination of momentum and volatility selling applies to 4 out of 6 dollar exchange rates. China's quasi-fixed exchange rate manifests itself in $\beta_1 < 0$, which prevents identification. Excluding Indonesia, the nonzero fixed point is negative, suggesting home currency appreciation in steady-state. We will investigate the relative stability of the nonzero steady state using Monte Carlo simulations. Average FX market liquidity is lowest for the Phillipines and highest for Japan.

References

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