Identifying Korean Won Value

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Introduction

- A local currency value in foreign exchange markets is fluctuating over time. A spot rate gives relative value of a local currency against the numeraire, typically the USD.
- How to measure the absolute value of a local currency? (for any time period)
- This paper provides a statistical method to estimate the value of local currencies by utilizing the common factor identification method
- Prove that the nominal effective exchange rate is not a consisten measure for the absolute value of the currency.
- Provide the estimation of the absolute Korean Won values after 1999.M1.

Understanding Cross Sectional Dependence

- Exchange rates are highly dependent each other. Recent studies (Engel, Mark and West, 2015; Verdelhan, 2015, Greenaway et al, 2016) model the exchange rates as

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Review of Parker and Sul (2016)'s Identification Procedure

- Suppose that G_{1t} and G_{2t} (observed series) be the true factors. Run the following regression

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- The regression residuals are the consistent estimators for the idiosyncratic errors (Δs_{it}^o)
- Let i be Korea. Then $\Delta \hat{s}_{it}^o$ becomes the estimate of the Korean Won value.

Empirical Models

The value of the ith currency $(-m_{it})$ per the value jth currency $(-m_{jt})$, $s_{i,j,t}$, at time t can be written as

$$s_{i,j,t} = m_{it} - m_{jt}, \text{ or } \Delta s_{i,j,t} = \Delta m_{it} - \Delta m_{jt}. \tag{1}$$

Assume that Δm_{it} follows the following static factor structure.

$$\Delta m_{it} = \delta_i' G_t + \Delta m_{it}^o. \tag{2}$$

$$G_{1t} = \Delta m_{\text{us},t}^o, \quad G_{2t} = \Delta m_{\text{eu},t}^o, \tag{3}$$

$$\begin{aligned} \Delta m_{\text{us},t} &= \Delta m_{\text{us},t}^o + \delta_{\text{us}} \Delta m_{\text{eu},t}^o, \\ \Delta m_{\text{eu},t} &= \delta_{\text{eu}} \Delta m_{\text{us},t}^o + \Delta m_{\text{eu},t}^o. \end{aligned} \tag{4}$$

$$\Delta s_{i,\text{us},t} = \Delta s_{it} = (\delta_{1i} - 1) \Delta m_{\text{us},t}^o + (\delta_{2i} + \delta_{\text{us}}) \Delta m_{\text{eu},t}^o + \Delta m_{it}^o. \tag{5}$$

Empirical Models

The sample cross sectional average of Δs_{it} becomes

$$\begin{aligned}\Delta \bar{s}_{\mathrm{us},t} &= \Delta \bar{s}_t = \frac{1}{n}\sum\nolimits_{i\neq \mathrm{us}}^{n} \Delta s_{it} \\ &= \left(\bar{\delta}_{1,n} - 1\right) \Delta m^o_{\mathrm{us},t} + \left(\bar{\delta}_{2,n} + \delta_{\mathrm{us}}\right) \Delta m^o_{\mathrm{eu},t} + \frac{1}{n}\sum\nolimits_{i\neq \mathrm{us}}^{n} \Delta m^o_{it},\end{aligned}$$

$$\begin{aligned}\Delta \bar{s}_{\mathrm{eu},t} &= \left(\bar{\delta}_{1,n} + \delta_{\mathrm{eu}}\right) \Delta m^o_{\mathrm{us},t} + \left(\bar{\delta}_{2,n} - 1\right) \Delta m^o_{\mathrm{eu},t} + \frac{1}{n}\sum\nolimits_{i\neq \mathrm{eu}}^{n} \Delta m^o_{it} \\ &\to^{p} \left(\delta_1 + \delta_{\mathrm{eu}}\right) \Delta m^o_{\mathrm{us},t} + \left(\delta_2 - 1\right) \Delta m^o_{\mathrm{eu},t} \text{ as } n \to \infty. \qquad (6)\end{aligned}$$

Estimation of the Korean Won Value

First Candidate:

$$\Delta \bar{s}_{\mathrm{w},t} = \frac{1}{n} \sum_{i \notin \mathrm{w}}^{n} \Delta s_{i,\mathrm{w},t}. \tag{7}$$

Second Candidate:

$$\Delta s_{i,\mathrm{w},t} = a_i + \beta_{1_i} \Delta \bar{s}_{\mathrm{us},t} + \beta_{2_i} \Delta \bar{s}_{\mathrm{eu},t} + u_{it}. \tag{8}$$

Denote $\hat{u}_{n,t}$ as

$$\hat{u}_{n,t} = \frac{1}{n} \sum_{i \notin \mathrm{w}}^{n} \hat{u}_{it}. \tag{9}$$

The Last Candidate: $\hat{u}_{\mathrm{w},t}$ from

$$\Delta s_{\mathrm{us,w},t} = -a_w + \psi_{1_i} \Delta \bar{s}_{\mathrm{us},t} + \psi_{2_i} \Delta \bar{s}_{\mathrm{eu},t} + u_{\mathrm{w},t},$$

Main Results

Theorem

Theorem

(Inconsistency of the sample cross sectional average): Under (5), as $n \longrightarrow \infty$,

$$plim_{n\rightarrow\infty}\Delta\bar{s}_{w,t} \neq -\Delta s^{o}_{w,t}.$$

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Theorem

(Consistent Estimator of the Korean Won Value) Under (5) and regularity conditions, as $n, T \longrightarrow \infty$, *jointly,*

$$plim_{n,T\rightarrow\infty}\hat{u}_{w,t} = -\Delta m^{o}_{w,t}. \quad (10)$$

Effective Exchange Rate

$$\Delta \bar{s}_{\text{eff},t} = \frac{1}{n} \sum_{i \notin \text{w}}^{n} \omega_{it} \Delta s_{i,\text{w},t}$$

where

$$\omega_{it} = \frac{\text{Trading volume weights with the } i\text{th country}}{\text{Total Trading volume}}$$

It is easy to show that

$$\text{plim}_{n \to \infty} \Delta \bar{s}_{\text{eff},t} \neq -\Delta s^{o}_{\text{w},t}$$

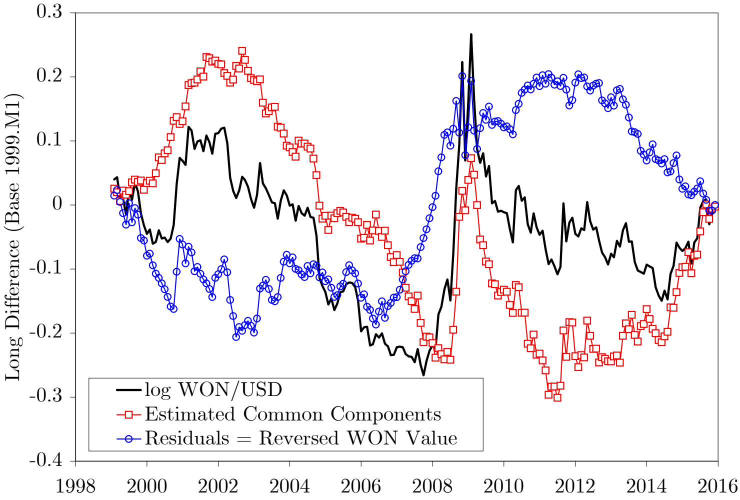
Empirical Results

$$\Delta s_{\text{us,w},t} = \Delta \hat{s}_{c,t} + \hat{u}_{\text{w},t}$$

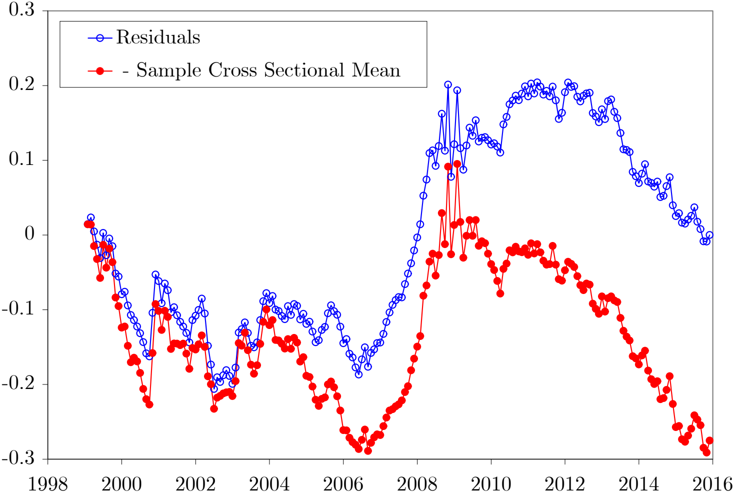
$$\Delta \hat{s}_{c,t} = -\hat{a}_w \underset{(16.2)}{- 1.086} \Delta \bar{s}_t \underset{(4.33)}{- 0.346} \Delta \bar{s}_{\text{eu},t}, \quad (11)$$

$$-\Delta m^o_{\text{w},t} = \hat{u}_{\text{w},t}. \quad (12)$$

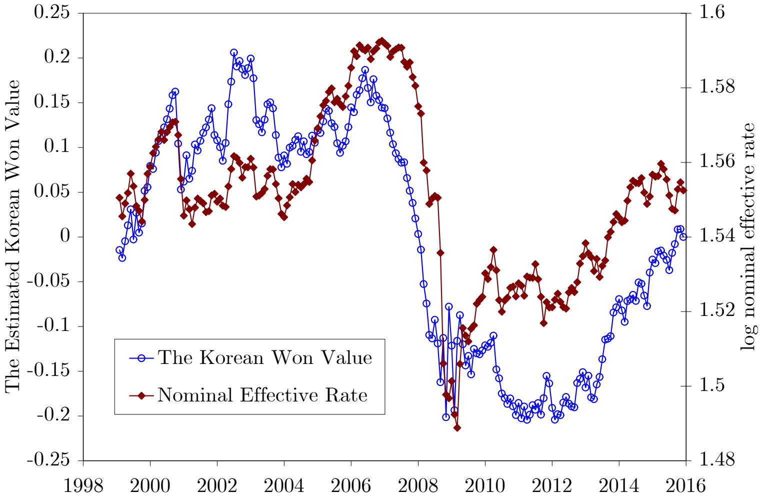
Empirical Results



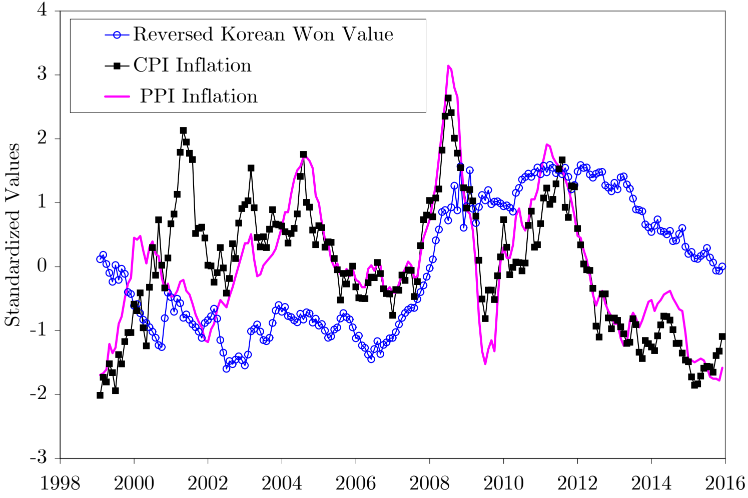
Theorem 1: Empirical Results



Effective Rates v.s. The Korean Won Value



Macro Fundamentals and the Korean Won Value



Conclusion

- This paper provided a novel method to estimate the idiosyncratic Korean Won value consistently.
- The estimated results are compared by the two standard measures of the Korean Won: Effective exchange rate and the inflation rate.
- The effective exchange rate is inconsistently estimating the true idiosyncratic Korean Won value.
- The estimated idiosyncratic Korean Won value is not highly correlated with the inflation rate.
- The determination of the idiosyncratic Korean Won value is a very interesting and promising topic.