What drives RMB excess returns?

Fundamentals or speculation

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Motivation——RMB has become one of the major targeted currencies for international investors.

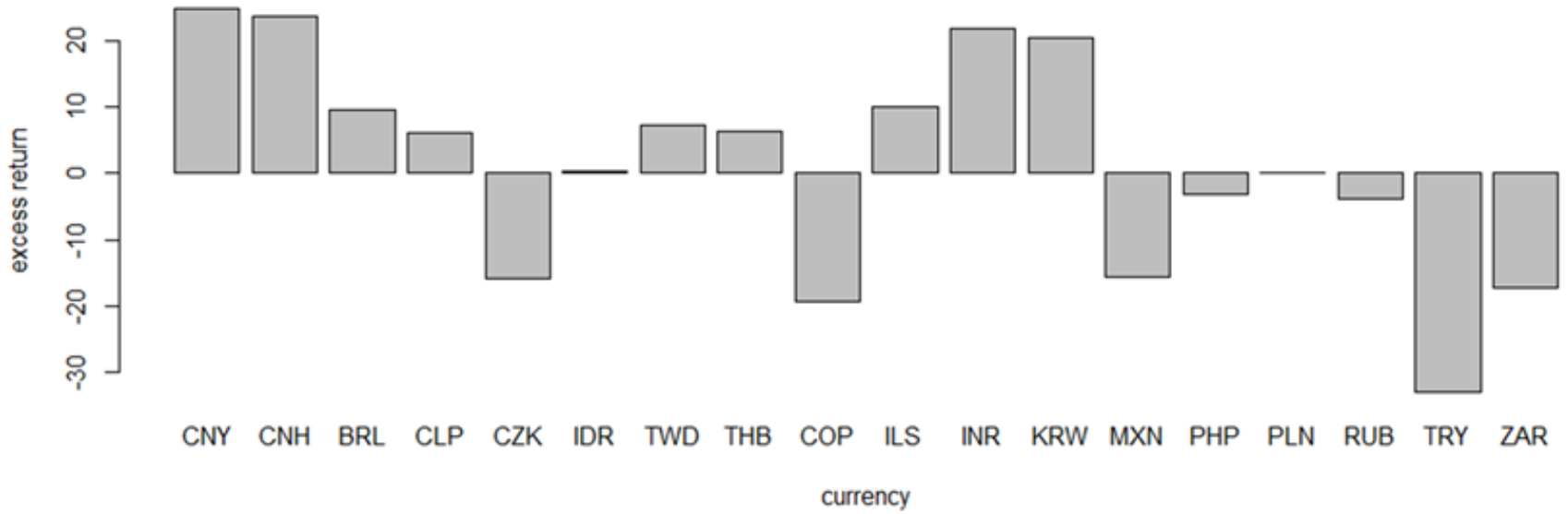

Figure 1: Cumulative excess returns on currencies of major emerging market economies. Note: Funding currency: US Dollar. Target currency: Onshore RMB (CNY), Offshore RMB (CNH), Brazil (BRL), Chile (CLP), the Czech republic (CZK), Indonesia (IDR), Taiwan (TWD), Thailand (considered), Colombia (COP), Israel insurance-linked securities (ILS), India (INR), South Korea (HAS), Mexico (MXN), Philippines (PHP), Poland (PLN), Russia (RUB), Turkey, South Africa (ZAR) (TRY). Sample period is from 2010.9 to 2017.12. Data source: Datastream.

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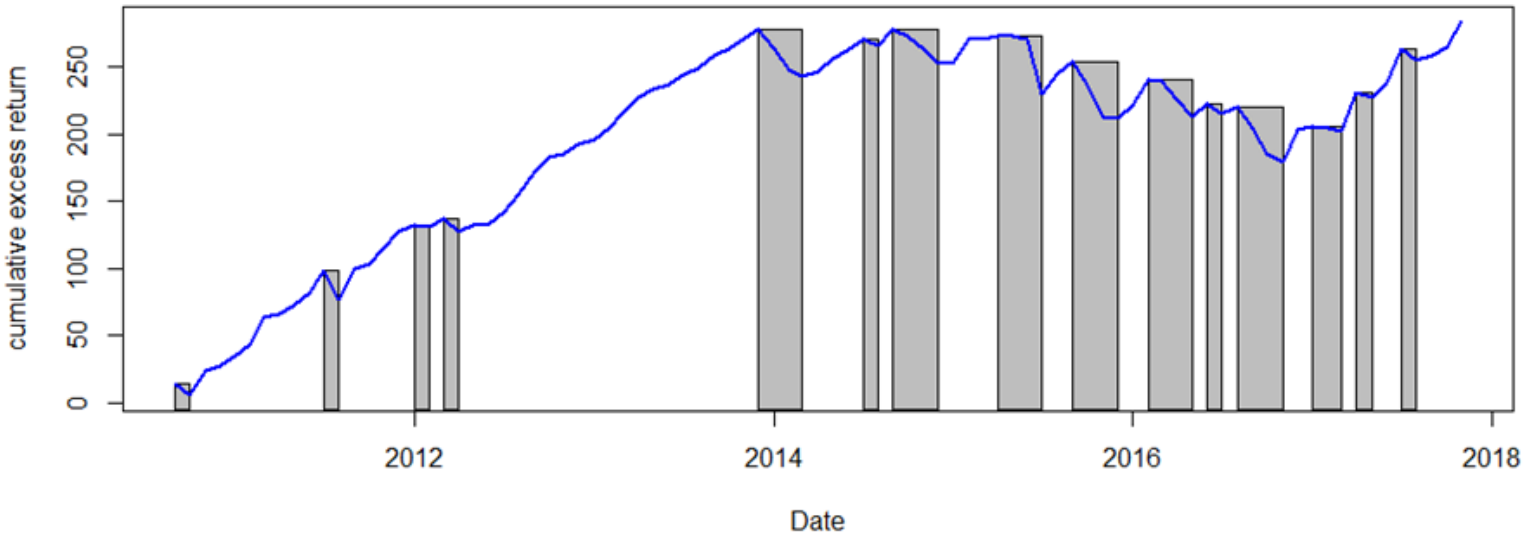


Figure 2: Retreats of RMB cumulative excess returns. Note: Sample period is from 2010.9 to 2017.12. Shadow areas indicate top ten retreats measured in size. Funding currency: US Dollar. Target currency: Offshore RMB (CNH)

Fundamentals

- On the one hand, currency trading behavior may be based on an investor's judgment regarding a currency's intrinsic value.
- The real exchange rate is considered by academics and practitioners as an indicator reflecting a currency's intrinsic value (Froot and Ramadorai, 2005).
- For any investment in a currency with a higher intrinsic value measured by real exchange rates, we label it as fundamentals-driven currency trading.

Speculations

- On the other hand, the currency markets are awash with short-term speculative trading.
- Among them, carry trade is regarded as one of the most popular speculative strategies.
- For any currency trading that based on the carry signal, we label it as speculation-driven currency trading.

Research questions

- Do fundamentals and speculative factors have explanatory power for the dynamics of RMB excess returns?
- Do the relative importance of fundamentals and speculative factors driving RMB excess returns change over time with the market environment?
- Finally, this study will also discuss whether combining fundamentals and speculative factors together can improve the performance in explaining RMB excess returns.

Literature review

1. RMB has become an important target currency for carry trades in international financial markets.

- There is also evidence indicating the existence of carry trade via current account transactions (Shao, 2014; Bruno and Shin, 2017

- Chen and Liu (2018) and Chen and Fei (2018) further investigated the impact of carry trades on China's capital flows.

- This paper, on the other hand, examines the driving forces of RMB excess returns.

Literature review

2. Literature examining the forces driving the RMB internationalization.

- Zhang and Xu (2012): RMB internationalization under the exchange and capital account controls is mainly driven by interest and exchange arbitrage activities.
- Hu and Ding (2018): speculation is the main force driving the internationalization of the RMB.
- Li, Zhang and Zhu (2018): speculative factors has more significant impact on the capital outflow, while fundamentals factors are more important in determining capital inflow.

- The literatures have different definition for fundamentals and speculations.
- The literatures do not compare fundamentals and speculation factors directly, nor do they analyze the ability of the fundamentals and speculative factors in driving RMB excess returns.

Literature review

3. Predictability of currency excess returns

- Speculative factors (carry)： Verdelhan (2011) 、 Ang and Chen (2010)
- Fundamentals (real exchange rate)： Jorda and Taylor(2012)、 Menkhoff et al (2016)
- Both cross-section and time-series

- These studies did not provide empirical evidence on the RMB excess return predictability, nor did they compare the predictive power of the real exchange rates and carry.

- We aim to fill this gap to study the issue of RMB currency excess returns' predictability, and compare the relative importance of real exchange rates and carry.

Literature review

4. Application of the Bayesian approach in asset return predictability

- Bayes dynamic linear model (West and Harrison, 1989) and Bayesian model average (Leamer, 1978): allow for coefficient and model uncertainty in the form of a state-space framework.

- Cremer (2002), Dangl and Halling (2012), and Johannes, Korteweg, and Polson (2014) applied BDLM and BMA to the prediction of excess return on the stock market.

- This paper applies the BDLM model and BMA method to investigate the time-varying predictive power of real exchange rates and carry for RMB excess returns, and compare their changing relative importance over time.

Contributions

- First, this paper is the first, to our knowledge, to study the driving forces of RMB excess returns. Not only do we distinguish between fundamentals and speculative motives, but also taking into account the time-varying nature of their explanatory power for RMB excess returns.

- Second, this study aims to fill a gap by providing a comparison between real exchange rates and carry's explanatory powers for the currency excess returns using RMB as the target currency: changing relative importance of real exchange rates and carry

- Third, this study introduces Bayes dynamic linear model (BDLM) and the Bayesian model average (BMA) to the predictability of currency excess returns.

Research design

1. The RMB Excess returns

2. Fundamentals and speculative factors in the RMB markets

3. Time-varying predictability & Bayesian dynamic linear model

time-varying fundamentals and speculative factors→ time-varying of coefficient→ BDLM

4. Relative importance of fundamentals and speculations & Bayesian model average

relative importance of fundamentals and speculative factors→ model uncertainty → BMA

Variable definition

- **Excess return of RMB**: $er_{t+1} = \frac{S_t}{S_{t+1}}(1 + i_t^*) - (1 + i_t) = \frac{F_{t+1} - S_{t+1}}{S_{t+1}}(1 + i_t)$

- **Real exchange rate**: $RER_t = \frac{S_t P_t^*}{P_t^*}$

- **Carry**: $ID_t = i_t^* - i_t$

Bayesian dynamic linear model & Bayesian model selection

$$er_{t+1} = X_t'\theta_t + v_{t+1}, \quad v \sim \mathrm{N}(0, \mathrm{V}) \quad (observation\ equation) \qquad (4)$$

$$\theta_t = \theta_{t-1} + \omega_t, \quad \omega \sim \mathrm{N}(0, W_t) \quad (system\ equation) \qquad (5)$$

$$er_{t+1} = E(r_{t+1}|D_t) = \sum_{i=0}^{2^k-1} \tilde{r}_{t+1,j} P(M_i|D_t), \qquad (6)$$

$$P(M_i|D_t) = \frac{P(D_t|M_i)P(M_i)}{\sum_{i=0}^{2^k-1} P(D_t|M_i)P(M_i)} \qquad (7)$$

Data source

- Sample period：2010.09-2017.12
- HIBOR：Hong Kong Interbank Offered Rate
- SHIBOR：Shanghai Interbank Offered Rate （robustness check）
- LIBOR：London Interbank Offered Rate
- CNH：exchange rate of offshore RMB（baseline result）
- CNY：exchange rate of Onshore RMB （robustness check）
- China CPI of China(monthly)
- US CPI (monthly)

- Data source：wind

Descriptive Statistics

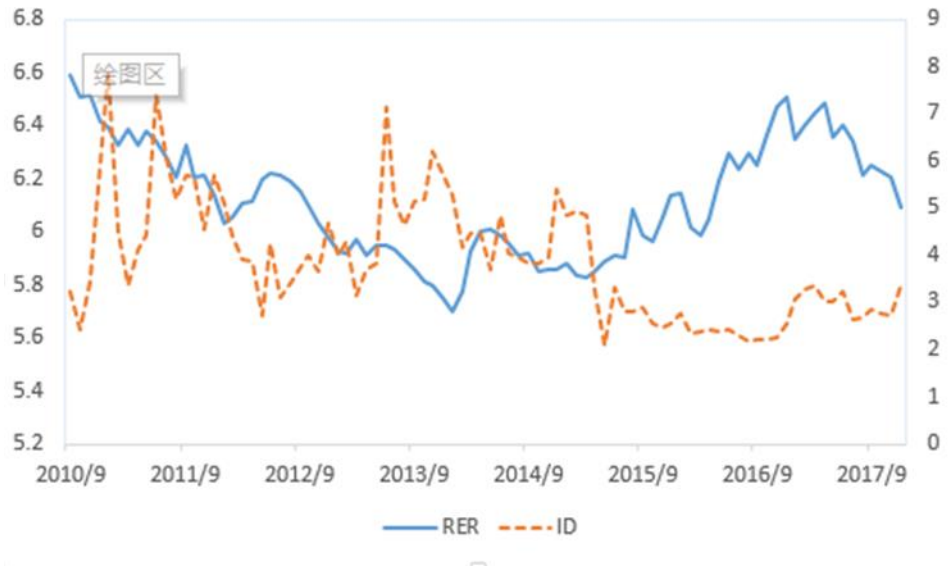


Figure 3: The interest rate differentials and the real exchange rate fluctuations.

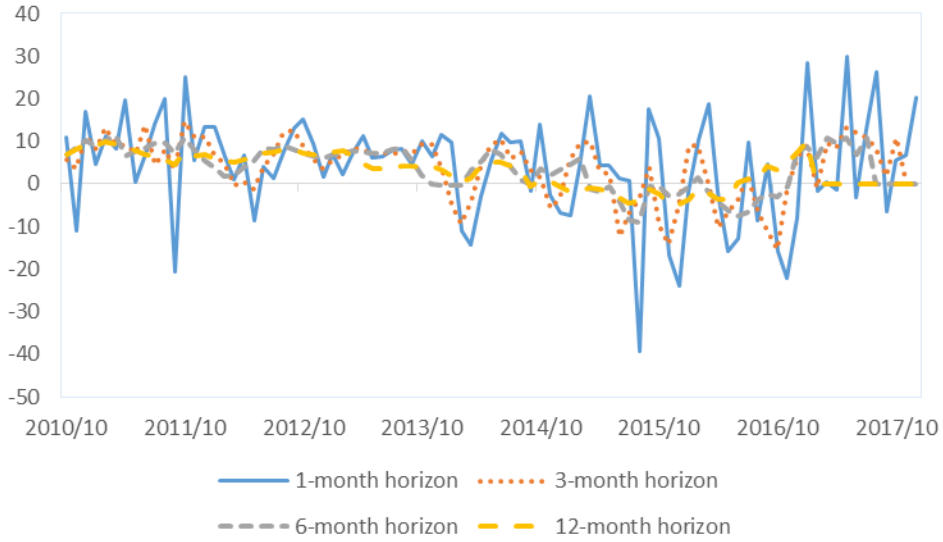


Figure 4: RMB excess returns (%)

Descriptive Statistics

Table 1. Descriptive Statistics

variable names	minimum	mean	maximum	standard error
excess return(1m)	-39.12	2.94	36.93	12.10
excess return(3m)	--14.40	2.79	14.18	6.71
excess return(6m)	-7.60	2.70	11.34	4.55
excess return(12m)	-4.58	2.30	11.03	3.21
interest differential	1.04	2.73	11.09	1.29s
real exchange rate	5.39	5.78	6.16	0.21

Speculations and RMB excess returns

Carry model vs. random walk

Table 2: Out-of-sample statistics of the conditional models of carry and the random walk model

	Random walk	Carry			
δ	-	1	0.9	0.8	0.7
MAPE	2.63	1.80	1.67	1.54	1.43
MAD	12.16	7.82	6.97	6.02	5.17
MSE	279.92	130.92	102.61	78.48	59.60
R^2_{oos}		0.14	0.28	0.42	0.54

Note: when δ is 1, the time-varying coefficient dynamic linear model reduces to the constant coefficient model. As δ decreases, the degree of time variation in coefficients increases. MAPE is the average absolute percentage error, MAD is the average absolute difference and MSE is the average squared error.

Figure: Cumulative SSE of the carry models relative to the random walk model.

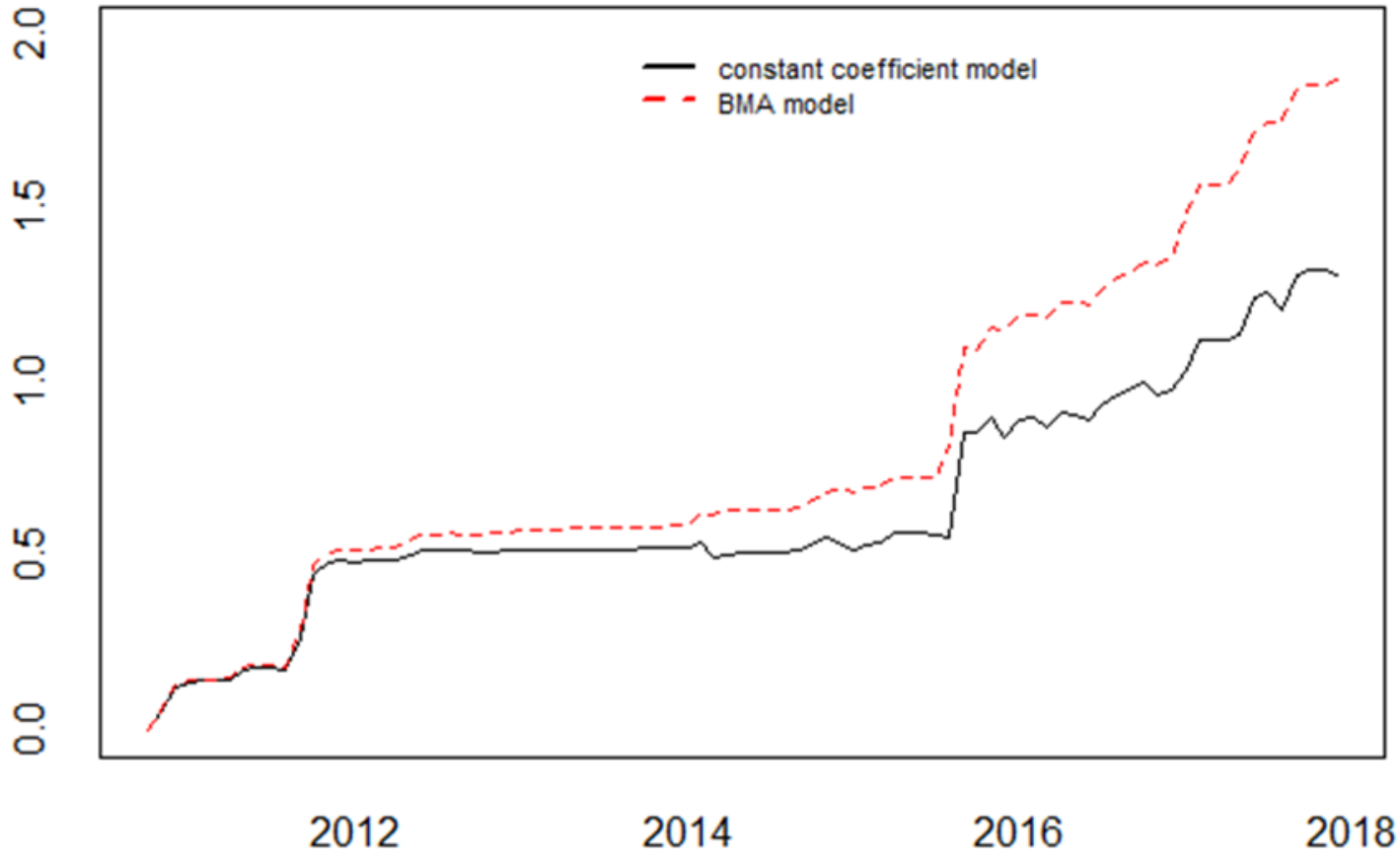


Figure: prediction and true value

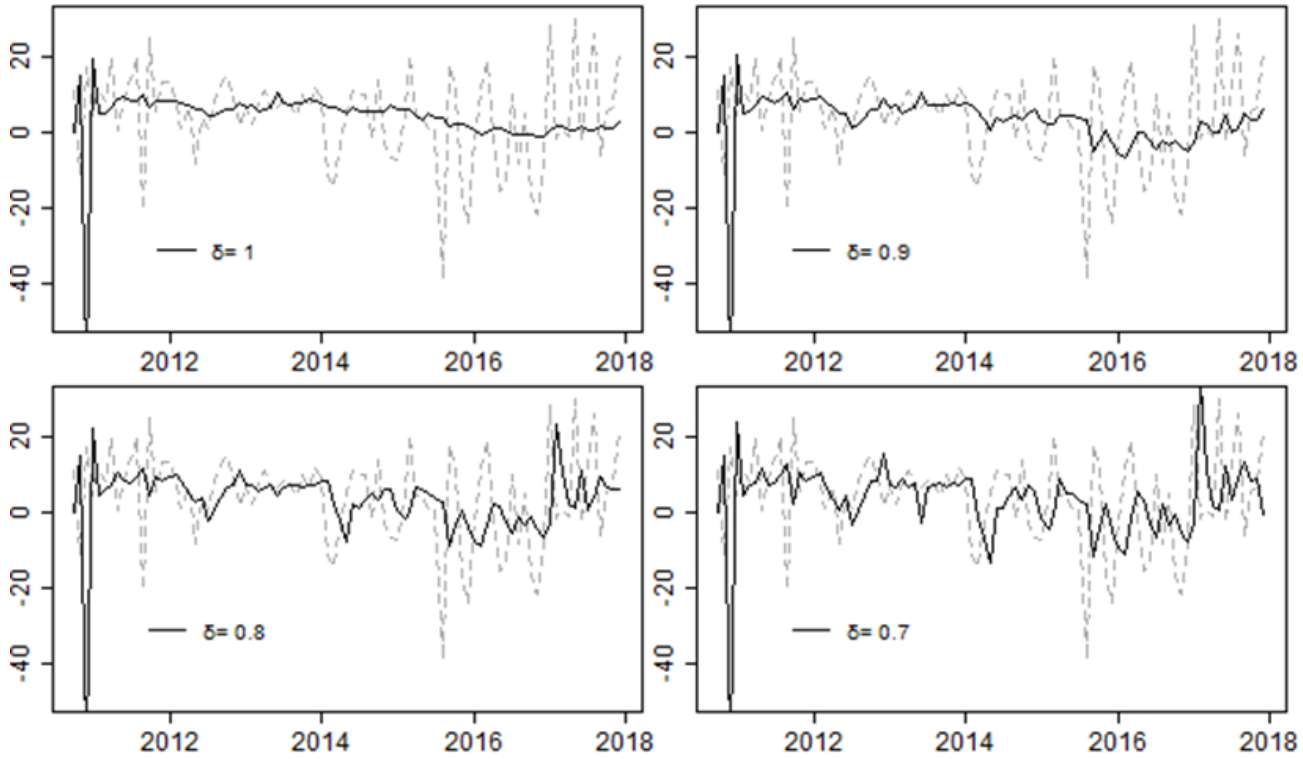
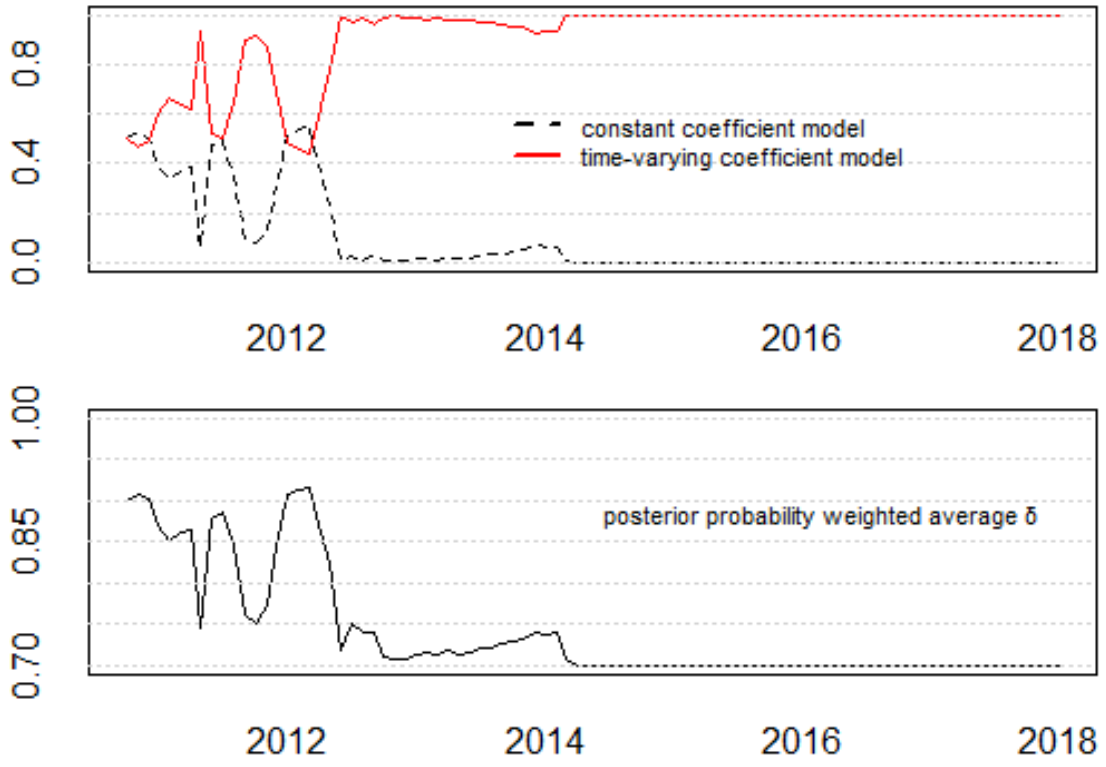


Figure 6:the prediction of the spread model with different time variability
Note: this figure depicts the predicted value and real value of the interest rate model when δ=1,0.9,0.8,0.7.The solid line represents the predicted value and the dashed line represents the true value. When δ=1, the model is a constant coefficient model.(unit:%)

Figure : The degree of time variation in carry's ability to predict RMB excess returns.



Fundamentals and RMB excess returns

RER model and random walk

Table 3: Out-of-sample statistics of the conditional models of RER and the RW

	Random walk	Real exchange rate			
δ	-	1	0.9	0.8	0.7
MAPE	2.63	2.10	2.16	1.85	1.57
MAD	12.16	8.03	6.85	5.73	4.78
MSE	279.92	135.59	100.31	74.11	51.96
R^2_{oos}		0.15	0.38	0.56	0.69

Note: when δ =1, the time-varying coefficient dynamic linear model becomes a constant coefficient dynamic linear model. As δ decreases, the variance of the state equation increases, and the variable degree of the coefficient of the dynamic linear model increases. MAPE is the average absolute percentage error, MAD is the average absolute difference and MSE is the average squared error. The unit of error term is %.

Figure: Cumulative SSE of the RER models relative to the random walk model.

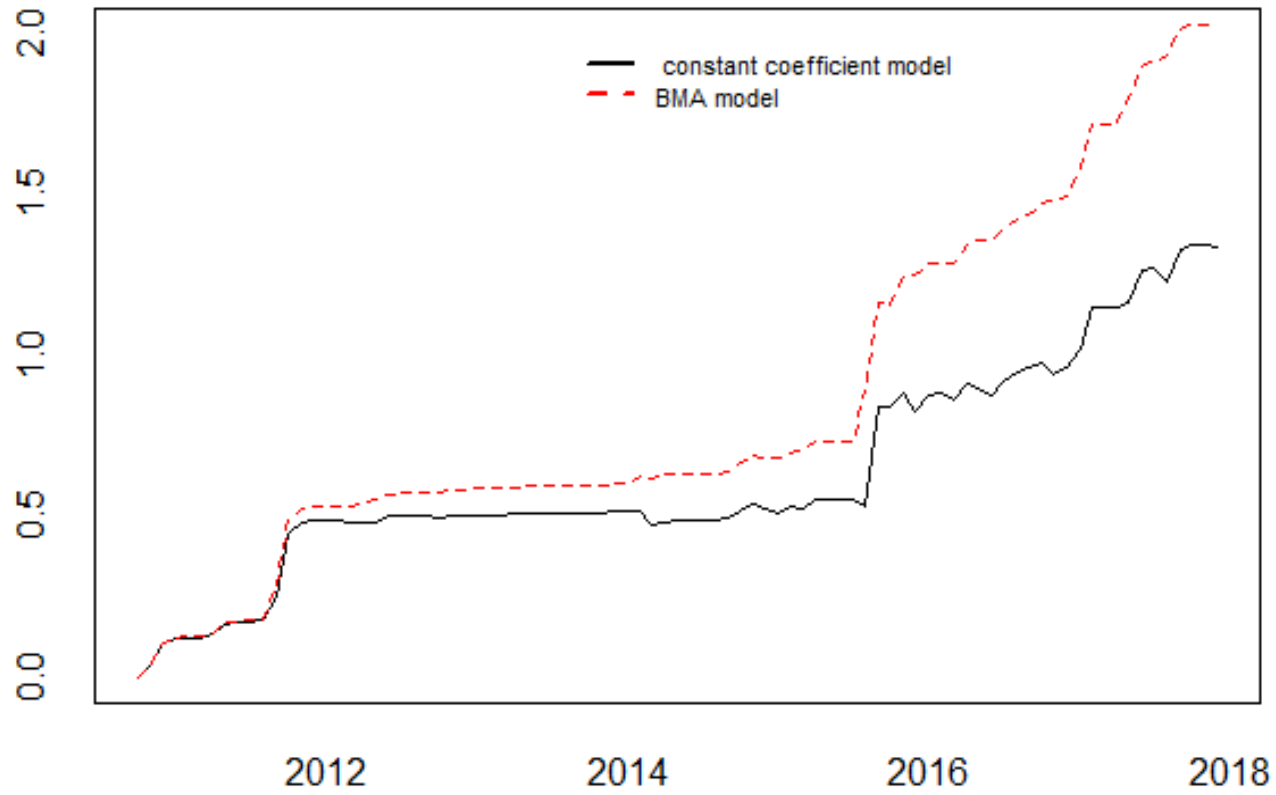


Figure: prediction and true value

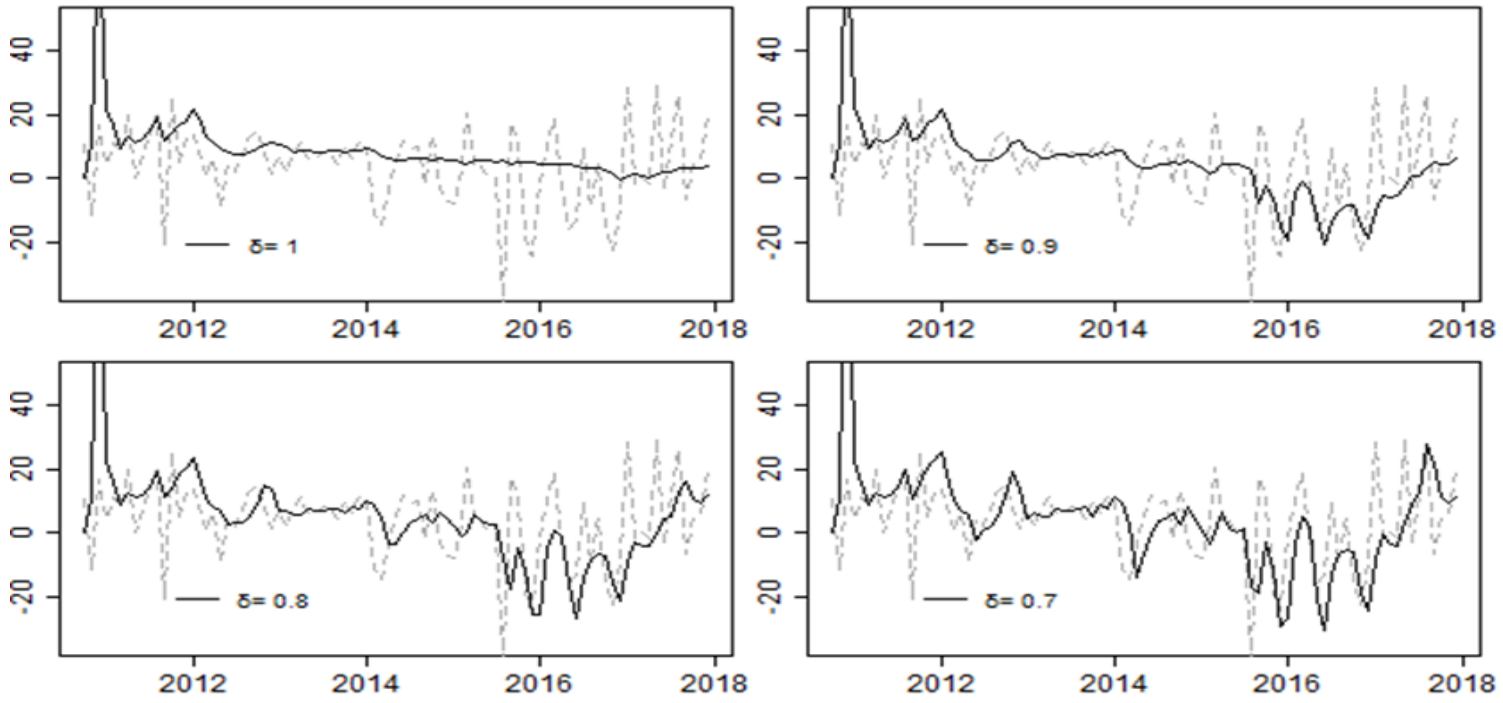
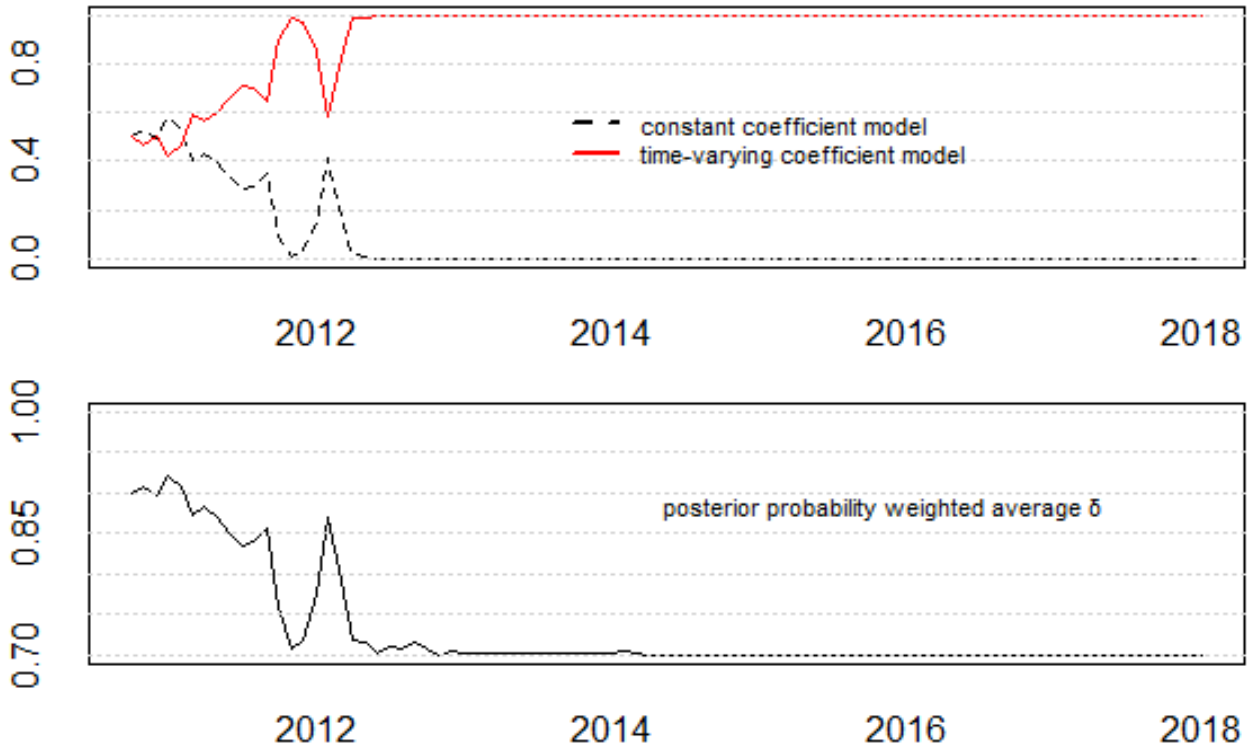


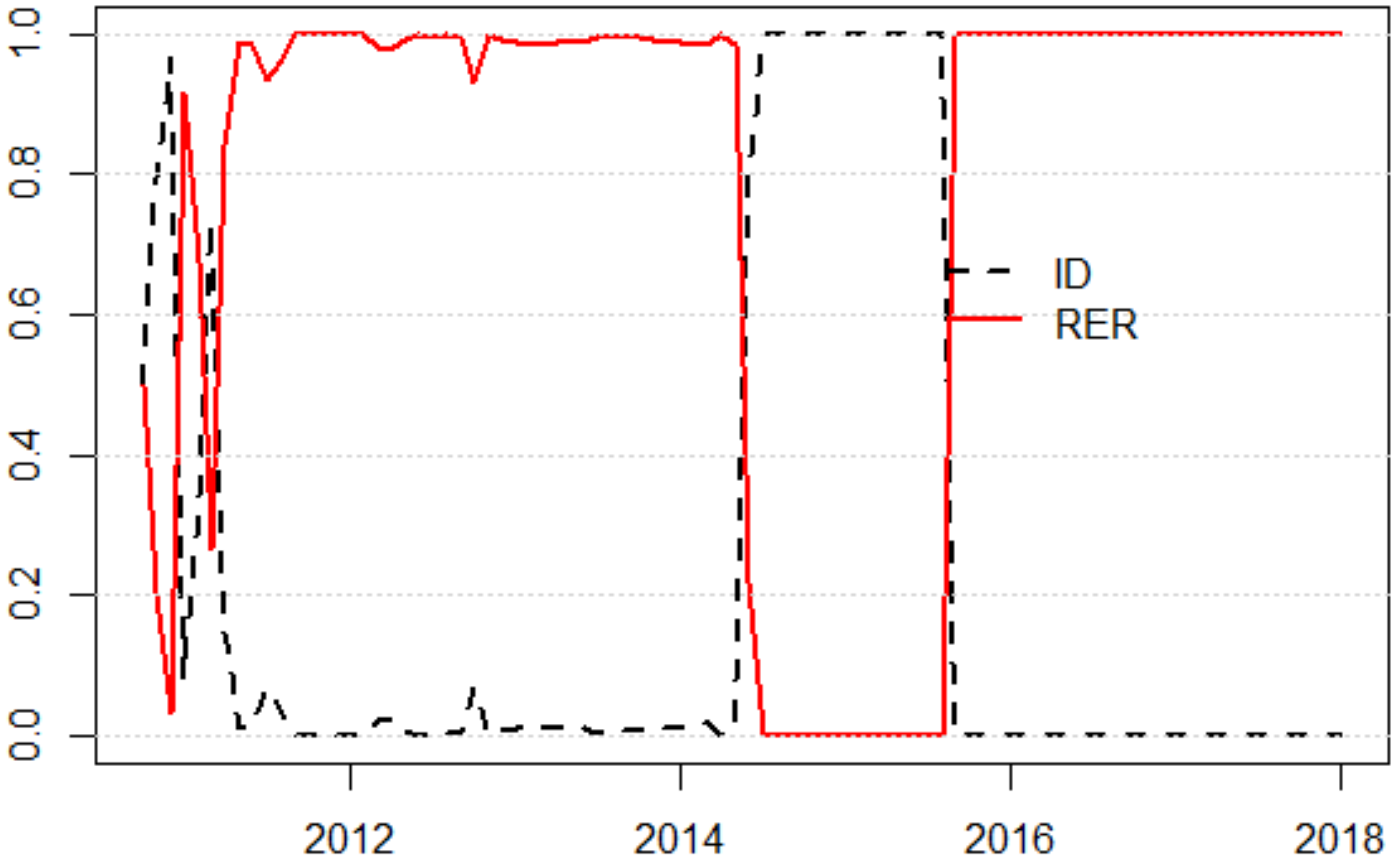
Figure 7:the predicted value of the real exchange rate model under invariability
Note: the above figure respectively represents the predicted value and the true value when δ=1, 0.9, 0.8 and 0.7, and the model becomes a constant coefficient model when δ=1.The solid line represents the predicted value and the dotted line represents the true value.

Figure : The degree of time variation in RER's ability to predict RMB excess returns.



The relative importance of fundamentals and speculative factors

Posterior probability: RER vs. Carry



BMA to combine fundamentals and speculative factors

Combining Carry and RER: prediction errors

Table 4: Prediction results of the univariate BDLM models and the BMA

	ID	RER	BMA
MAPE	1.17	1.08	1.07
MAD	5.67	4.74	4.58
MSE	61.67	49.10	47.26

Note: the predicted value of BMA is obtained according to the weighted average of ID prediction model and RER prediction model, and the weight is the posterior probability of spread and real exchange rate. The evaluation index of the univariate BDLM model is obtained by the weighted average of posterior probability when δ=1, 0.9, 0.8 and 0.7.

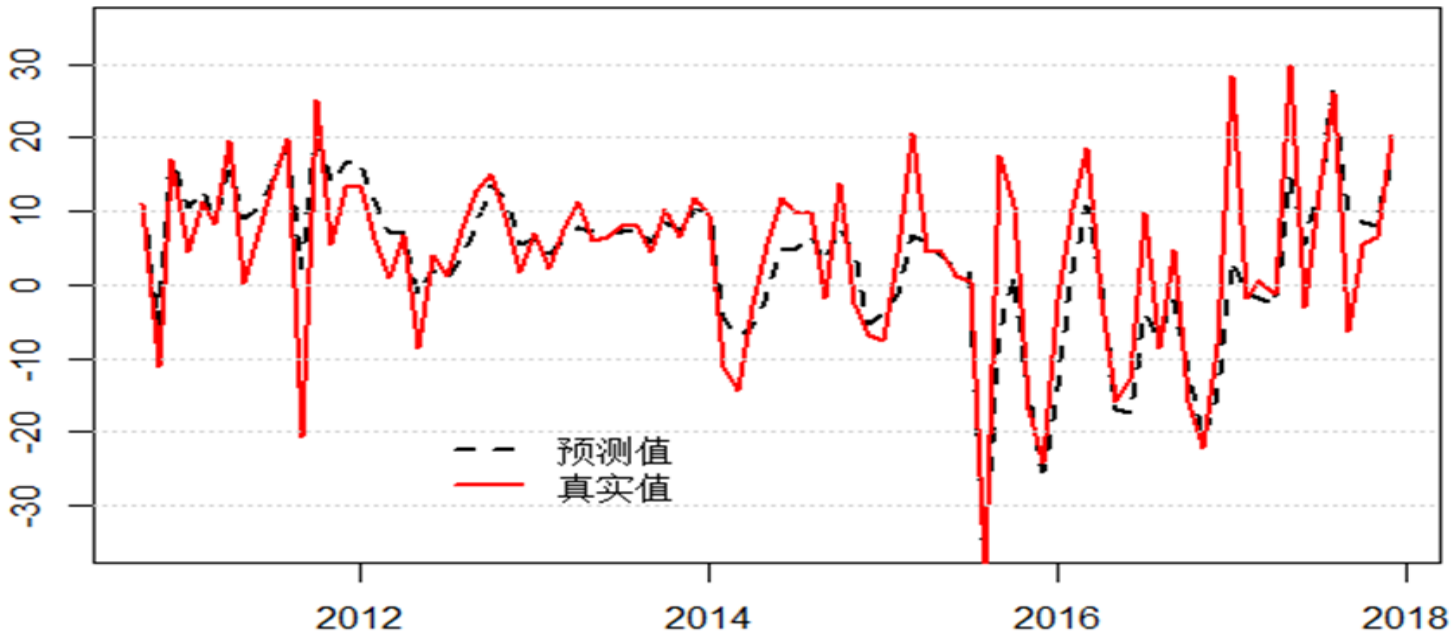
Combining Carry and RER: posterior probablity

Table 5: Posterior probabilities of alternative models

Intercept	ID	RER	Coef.ID	Coef.RER	Post Prob
1	1	1	2.15	11.87	1
1	0	1	—	—	0
1	1	0	—	—	0

Note: "1" indicates that the prediction model contains this explanatory variable, "0" indicates that the prediction model does not contain this explanatory variable. coef.ID and coef.RER respectively represent the weighted average coefficient of spread and real exchange rate, and Post Prob represents the posterior probability of the model.

Prediction vs. true value



图(10) BMA方法预测值与真实值比较

注：BMA根据ID预测模型与RER预测模型的后验概率，将两个模型的预测值加权平均求BMA预测值.

Robustness check

- **1. Alternative sample periods**
- From September 2006 to December 2017

- **2. Alternative time-horizons**

  Uses RMB excess return of different horizons periods (3 month,6 month) as the explanatory variable.

- **3.Onshore data**

  The use of CNY rates and SHIBOR rates.

- Our results are robust to the use of alternative sample periods and investment horizons, as well as data from the onshore RMB market.

Conclusions

1. YES!

Both the real exchange rate and carry have time-varying predictive power for RMB excess returns

2. YES!

The real exchange rates is the primary force driving the RMB excess returns, while the relative importance of speculative carry trade strategy seemed to increase significantly during the period of RMB market reforms.

3. YES!

Only by combining investment and speculation can we better understand the foreign exchange market and its behavior in the process of RMB internationalization.

Implications for RMB exchange rate regime's reform

- Given the fact that fundamentals are the main driving force in affecting RMB excess returns, China should take advantage of the time window in which its economy is still in a phase of high economic growth, to further promote the market-oriented reform of the RMB exchange rate regime.

- In doing so, China may increase the attractiveness of its currency for international investors.

- However, due to the rise of speculative factors in the window of the exchange rate reform, Chinese authority should be fully prepared to avoid the negative impacts of speculative factors in the process of market reform.

Implications for macro prudential policies

- China has now entered a new phase of medium-high growth while the US economy is experiencing rapid recovery accompanied by gradual interest rate hikes.

- China should pay more attention to the risk of capital outflow caused by changes in fundamentals when liberalizing its capital account, and choose the appropriate time window for further opening up.

- China should also not ignore the importance of speculative factors in the RMB markets when liberalizing its capital account.

- It might be a good idea to open up its capital account further only after RMB exchange regime's reform, and reserve the capital control as a tool to counterstrike the negative impacts of speculations during market-oriented reforms.

Implications for RMB internationalization

- China should focus more on the fundamental factors when pushing its currency's internationalization.

- It means China should rely more on policies that enhance the fundamentals and the intrinsic value of RMB rather than short-term speculative gains to attract international investors to the RMB markets.