Carry-trade and transition

Rob Hayward and Jens Hölscher

September 6, 2014

Outline

Introduction

- There has been a substantial inflow of capital to transition economies since the 2007-08 financial crisis

Introduction

- There has been a substantial inflow of capital to transition economies since the 2007-08 financial crisis
- There are three factors that could encourage a reversal

Introduction

- There has been a substantial inflow of capital to transition economies since the 2007-08 financial crisis
- There are three factors that could encourage a reversal
  - US monetary policy

Introduction

- There has been a substantial inflow of capital to transition economies since the 2007-08 financial crisis
- There are three factors that could encourage a reversal
  - US monetary policy
  - International risk aversion

Introduction

- There has been a substantial inflow of capital to transition economies since the 2007-08 financial crisis
- There are three factors that could encourage a reversal
  - US monetary policy
  - International risk aversion
  - International liquidity

Introduction

- There has been a substantial inflow of capital to transition economies since the 2007-08 financial crisis
- There are three factors that could encourage a reversal
  - US monetary policy
  - International risk aversion
  - International liquidity
- This research seeks to understand more about how financial instability evolves and to assess the relative importance of these factors.

Literature

Literature on *Sudden Stops* tried to understand financial turmoil that ran from Mexico, through Asia and into Russia and Latin America.

- Calvo (1998, 1999)

Literature

Literature on *Sudden Stops* tried to understand financial turmoil that ran from Mexico, through Asia and into Russia and Latin America.

- Calvo (1998, 1999)

Literature

Literature on *Sudden Stops* tried to understand financial turmoil that ran from Mexico, through Asia and into Russia and Latin America.

- Calvo (1998, 1999)

Renewed interest, particularly after May 2013

- Ahmed (2014) Panel student of Gross and Net capital flows
- Baele et al. (2014) Look at causes of Flight-to-Safety
- Ceruttie et al. (2014) Measure global liquidity

The carry-trade

Attempts to take advantage of the breakdown in uncovered interest parity

$$y_{t+1} \equiv (i^{*} - i) - \Delta s_{t+1} \tag{1}$$

The carry-trade

Attempts to take advantage of the breakdown in uncovered interest parity

$$y_{t+1} \equiv (i^* - i) - \Delta s_{t+1} \tag{1}$$

Where y_{t+1} are the profits from the carry trade, $i^* - i$ is the interest rate differential (overseas less home) and Δs_{t+1} is the change in the exchange rate.

Hidden Markov Chain

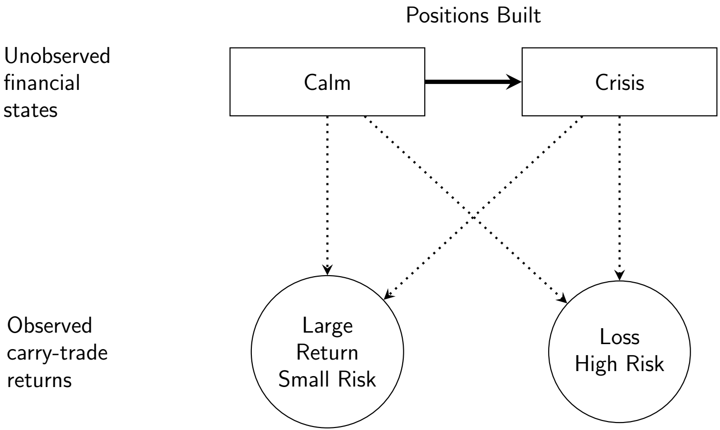


Figure : Two-Regime Hidden Markov Model (HMM)

Three components of HMM

The HMM has three components: π, A, B where,

- The prior model: $P(S_1 = n|\theta_{prior})$ (π)

Three components of HMM

The HMM has three components: π, A, B where,

- The prior model: $P(S_1 = n|\theta_{prior})$ (π)
- The transition model: $P(S_t|S_{t-1}, \theta_{trans})$ (A)

Three components of HMM

The HMM has three components: π, A, B where,

- The prior model: $P(S_1 = n|\theta_{prior})$ (π)
- The transition model: $P(S_t|S_{t-1}, \theta_{trans})$ (A)
- The response model: $P(Y_t|S_t, \theta_{resp})$ (B)

Three components of HMM

The HMM has three components: π, A, B where,

- The prior model: $P(S_1 = n|\theta_{prior})$ (π)
- The transition model: $P(S_t|S_{t-1}, \theta_{trans})$ (A)
- The response model: $P(Y_t|S_t, \theta_{resp})$ (B)

Three components of HMM

The HMM has three components: π, A, B where,

- The prior model: $P(S_1 = n|\theta_{prior})$ (π)
- The transition model: $P(S_t|S_{t-1}, \theta_{trans})$ (A)
- The response model: $P(Y_t|S_t, \theta_{resp})$ (B)

Where there are n states or regimes; y_t are the observed carry-trade returns; and θ_{prior}, θ_{trans} and θ_{resp} are the parameters of the prior, transition and response models respectively.

Transition matrix

The transition matrix is

$$\begin{bmatrix} P(S_t = 1|S_{t-1} = 1), & P(S_t = 2|S_{t-1} = 1) \\ P(S_t = 1|S_{t-1} = 2), & P(S_t = 2|S_{t-1} = 2) \end{bmatrix}$$

For Hungary, it is

$$\begin{bmatrix} 0.88, & 0.12 \\ 0.42, & 0.58 \end{bmatrix}$$

Response

For the simple two-regime case, a linear response is modelled as

$$y_t = \beta_0 + \sum_{i=1}^{i=n} S_{i,t} + \varepsilon_t$$

For, Hungary Poland, Romania and Czech, there are the following results.

Regime		HUF	PLN	CZK	RON
Calm	Mean	1.0165	1.0173	1.0129	1.0150
	St-Dev	0.0519	0.0486	0.0542	0.0433
Crash	Mean	0.9905	0.9862	0.9963	0.9969
	S-Dev	0.1085	0.1026	0.0886	0.0878

The models

1. Base model $y_t = \beta_1 + \varepsilon_t$ (M1)

The models

1. Base model $y_t = \beta_1 + \varepsilon_t$ (M1)
2. 2 Regime $y_t = \beta_1 + \sum_{i=1}^{i=n} S_{i,t} + \varepsilon_t, \quad n = 2$ (M2)

The models

1. Base model $y_t = \beta_1 + \varepsilon_t$ (M1)
2. 2 Regime $y_t = \beta_1 + \sum_{i=1}^{i=n} S_{i,t} + \varepsilon_t, \quad n = 2$ (M2)
3. 3 Regime $y_t = \beta_1 + \sum_{i=1}^{i=n} S_{i,t} + \varepsilon_t, \quad n = 3$ (M3)

The models

1. Base model $y_t = \beta_1 + \varepsilon_t$ (M1)
2. 2 Regime $y_t = \beta_1 + \sum_{i=1}^{i=n} S_{i,t} + \varepsilon_t, \quad n = 2$ (M2)
3. 3 Regime $y_t = \beta_1 + \sum_{i=1}^{i=n} S_{i,t} + \varepsilon_t, \quad n = 3$ (M3)
4. 2 Regime Z response $y_t = \beta_1 + \beta_2 Z_t + \varepsilon_t$ (M4)

The models

1. Base model $y_t = \beta_1 + \varepsilon_t$ (M1)
2. 2 Regime $y_t = \beta_1 + \sum_{i=1}^{i=n} S_{i,t} + \varepsilon_t, \quad n = 2$ (M2)
3. 3 Regime $y_t = \beta_1 + \sum_{i=1}^{i=n} S_{i,t} + \varepsilon_t, \quad n = 3$ (M3)
4. 2 Regime Z response $y_t = \beta_1 + \beta_2 Z_t + \varepsilon_t$ (M4)
5. 2 Regime Z transition
   $y_t = \beta_t + \sum_{i=1}^{i=n} (S_{i,t}|z_t) + \varepsilon_t, \quad n = 2$ (M5)

The models

1. Base model $y_t = \beta_1 + \varepsilon_t$ (M1)
2. 2 Regime $y_t = \beta_1 + \sum_{i=1}^{i=n} S_{i,t} + \varepsilon_t, \quad n = 2$ (M2)
3. 3 Regime $y_t = \beta_1 + \sum_{i=1}^{i=n} S_{i,t} + \varepsilon_t, \quad n = 3$ (M3)
4. 2 Regime Z response $y_t = \beta_1 + \beta_2 Z_t + \varepsilon_t$ (M4)
5. 2 Regime Z transition
   $y_t = \beta_t + \sum_{i=1}^{i=n} (S_{i,t} | z_t) + \varepsilon_t, \quad n = 2$ (M5)
   - transition model $log(a_{ij}/a_{i1}) = \alpha_j + \beta_j z_t$

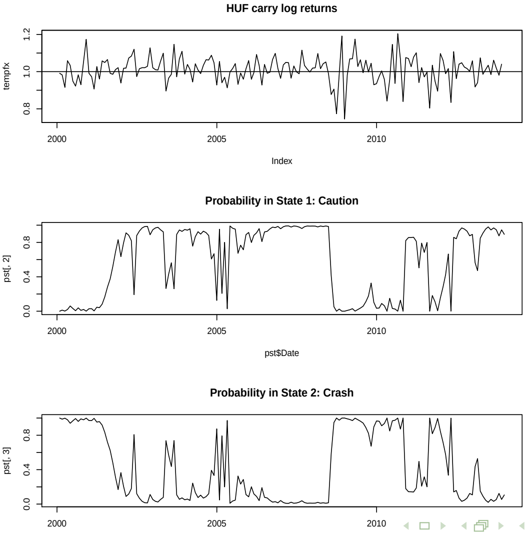
Transition and risk aversion

The VIX is scaled to have a mean of zero and S-dev of 1.

	-3sd	-1sd	Mean	+1sd	+2sd	+3sd
HUF	0.0020	0.0242	0.0807	0.2375	0.5249	0.7967
PLN	0.0004	0.0063	0.0242	0.0887	0.2766	0.6003
CZK	0.0000	0.0034	0.0717	0.6367	0.9755	0.9989
RON	0.0014	0.0131	0.0392	0.1119	0.2799	0.5453

The probability of switching to a crash once in a state of calm.

Calm and Crash probabilities



Next Steps

- Repeat this for US monetary policy and international liquidity

Next Steps

- Repeat this for US monetary policy and international liquidity
  - US short-term interest rate, TED spread. LSAP?

Next Steps

- Repeat this for US monetary policy and international liquidity
  - US short-term interest rate, TED spread. LSAP?
- Common factors and common dates

Next Steps

- Repeat this for US monetary policy and international liquidity
  - US short-term interest rate, TED spread. LSAP?
- Common factors and common dates
- The preferred model for each country

Bibliography I

G. Calvo.
Capital flows and capital market crisis: the simple economics of sudden stops
Journal of Applied Economics, 1(1):34–54, 1998.

S. Ahmed and A. Zlate.
Capital flows to emerging economies: A brave new world?
Journal of International Money and Finance, 2014.

Bibliography II

J.D. Hamilton.
Rational expectations: Econometric analysis of changes in regime
Journal of Economic Dynamics and Control, 12(2):385–423, 1988.