Carry Trades, Monetary Policy and Speculative Dynamics

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Introduction

- Carry trades: selling forward currencies that are at a significant forward premium

=borrowing in low rates currencies and investing in high rate currencies

- One of the most widespread trading strategies, sophisticated and retail
  - Before the 2008 crisis: yen or Swiss franc into Iceland, New Zealand, Australia, Hungary, Turkey,..
  - After the crisis : USD into emerging economies
- Carry trades accused of unduly destabilizing exchange rates and target economies

Introduction

- This paper
  - develops a stylized model of (possibly but not necessarily) destabilizing carry trades
  - main contribution: interesting model of speculative dynamics - simple, tractable, equilibrium is unique
  - High rate target currencies go "up in the stairs, down in the elevator"

Introduction

- Destabilizing mechanism:
- Positive feedback between the size of the carry trade and the stance of monetary policy in the presence of inflation targeting
- High official rate$\longrightarrow$Carry trades$\longrightarrow$Capital inflows$\longrightarrow$Overheating economy$\longrightarrow$Higher official rate

Introduction

- Poster child for this feedback loop: Iceland 2001-2006
- Overheating economy+inflation targeting=high rates
- "Arbitrage" by international banks, selling "glacier bonds" (including to euro retail investors)
- More overheating, higher rates, more glacier bonds
- Glacier bonds up to 30% of GDP

Introduction

- Textbook macroeconomics predict that exchange rate appreciation
  - reduces competitiveness of domestic firms
  - shifts demand towards imported goods

and that this should compensate the expansionary impact of capital inflows

Introduction

- Did not work in Iceland
  - main export=fish, with binding catch constraints
  - capital inflows were fuelling a housing boom and housing prices were in the CPI: mechanical rate hikes!
- In sum, the exchange rate channel fails to offset the expansionary impact of capital inflows
- We write down a simple model in which we take this as a primitive and study carry traders' behavior

Model

- Two currencies:
  - Japanese yen (JPY)
  - New Zealand dollar (NZD)
- Continuum of carry traders with unit mass
- Carry traders consume only in JPY
- Risk neutral, instantaneous discount rate $\delta > 0$
- Carry traders can invest in JPY and NZD-denominated assets
- JPY-denominated assets in perfectly elastic supply at the expected (real) return δ

Model-Trading (1)

- Exogenous trading limits:
  - No short positions,
  - Long positions worth less than 1 JPY
- Each trader can rebalance portfolio at discrete dates with arrival intensity $\lambda > 0$

Model-Trading (2)

- Return on investments in NZD-denominated assets depends on the evolutions of
  - the exchange rate p_t (JPY for one NZD)
  - the official NZD rate r_t
- Final date with arrival intensity ρ: the NZD/JPY market shuts down and all NZD investments return v JPY

$v =$"fundamental value" of the exchange rate

Model-Trading (3)

- Expected excess return when rebalancing from JPY assets into NZD assets at date t:

$$\int_0^{+\infty} e^{-(\delta+\lambda+\rho)u} \left(\underbrace{\frac{\dot{p}_{t+u}}{p_{t+u}}}_{\text{FX fluctuations}} + \underbrace{r_{t+u} - \delta}_{\text{Domestic rates differential}} + \underbrace{\rho \frac{v - p_{t+u}}{p_{t+u}}}_{\text{"Fundamental risk"}} \right) du$$

- Need to describe the formation of
  - FX rate p_t
  - official rate r_t

Model-FX Rate

- x_t the average NZD holdings at date t
- Carry traders have a collective price impact in the FX market:

$$\frac{\dot{p}_t}{p_t} = m\dot{x}_t$$

- Micro-foundation: liquidity suppliers averse to NZD/JPY imbalances (decreasing returns on investments in either currency)

Model-NZD official rate

- RBNZ has a strict inflation targeting
- At each period, carry traders move first and the central bank follows
- Monetary rule:

$$r_t = \delta - \eta - \alpha \frac{\dot{p}_t}{p_t} + \beta x_t$$

$\alpha > 0$: exchange rate appreciation reduces the price of tradable goods

$\beta > 0$: carry trade is expansionary (Key assumption)

Putting the pieces together (1)

- Expected excess NZD return

$$\int_0^{+\infty} e^{-(\delta+\lambda+\rho)u} \left(\frac{\dot{p}_{t+u}}{p_{t+u}} + r_{t+u} - \delta + \rho \frac{v - p_{t+u}}{p_{t+u}} \right) du$$

- Plugging in

$$\begin{aligned} \frac{\dot{p}_t}{p_t} &= m\dot{x}_t \\ r_t &= \delta - \eta - \alpha \frac{\dot{p}_t}{p_t} + \beta x_t \end{aligned}$$

Steady-states (1)

$$\int_0^{+\infty} e^{-(\lambda+\rho+\delta)u} \left[\begin{array}{l} m(1-\alpha)\dot{x}_{t+u} + \beta x_{t+u} \\ +\rho\left(ve^{-mx_{t+u}} - 1\right) - \eta \end{array} \right] du$$

- x^* s.t.

$$\beta x^* + \rho\left(ve^{-mx^*} - 1\right) - \eta = 0$$

- UIP interpretation:

$$\underbrace{\delta - \eta + \beta x^*}_{\text{NZD rate}} + \underbrace{\rho\left(\frac{v - p^*}{p^*}\right)}_{\text{Appreciation/depreciation}} = \delta$$

Steady-states (2)

- *If ρ is sufficiently large or sufficiently small, there exists a unique steady-state with constant x^**
- *If ρ is sufficiently small, the unique steady-state with constant x^* is not the unique equilibrium*
- In particular, it is possible to leave the steady state x^* and head off to 0 or 1 at any time
- Destabilizing speculation

Uniqueness of equilibrium with shocks

- Suppose the instantaneous return on NZD assets is now

$$\frac{\dot{p}_t}{p_t} + r_t - \delta + \rho \frac{v - p_t}{p_t} + w_t,$$

where

$$w_t = \sigma W_t,$$

with W_t Brownian motion, and $\sigma > 0$.

E.g., policy shocks

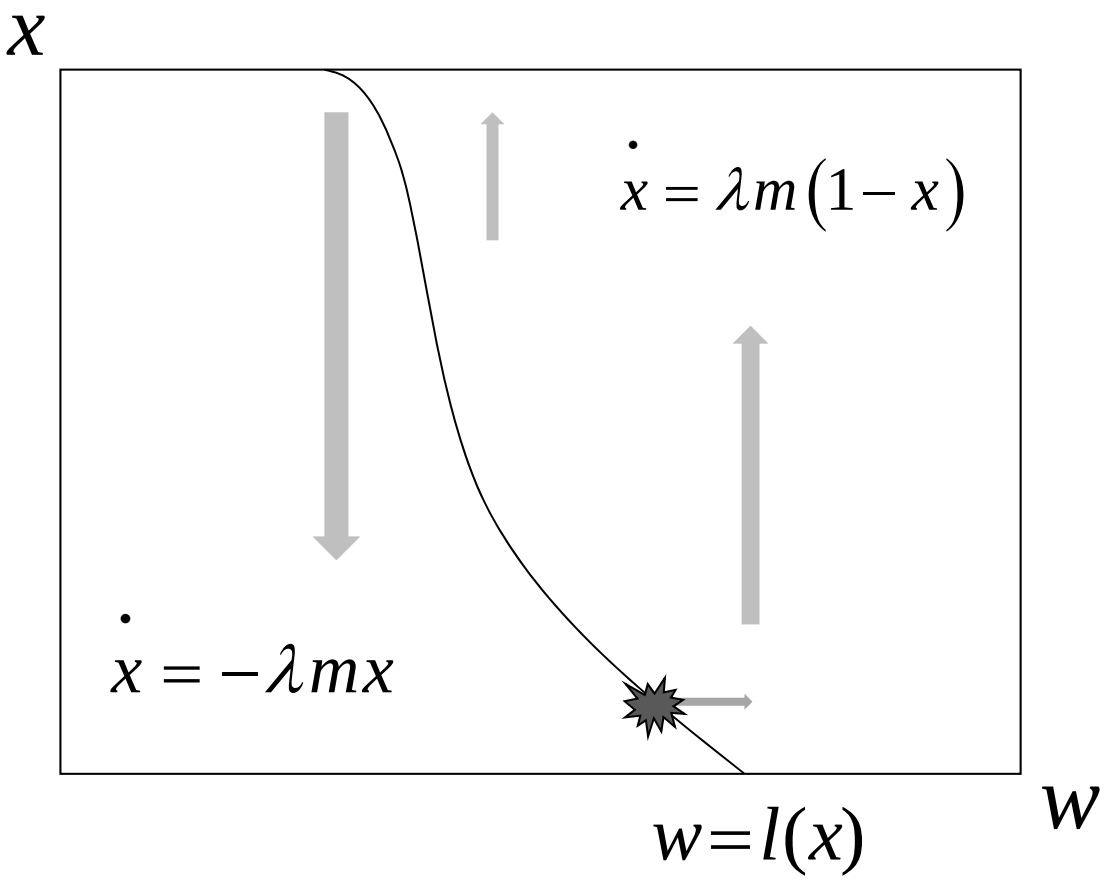
Uniqueness of equilibrium with shocks

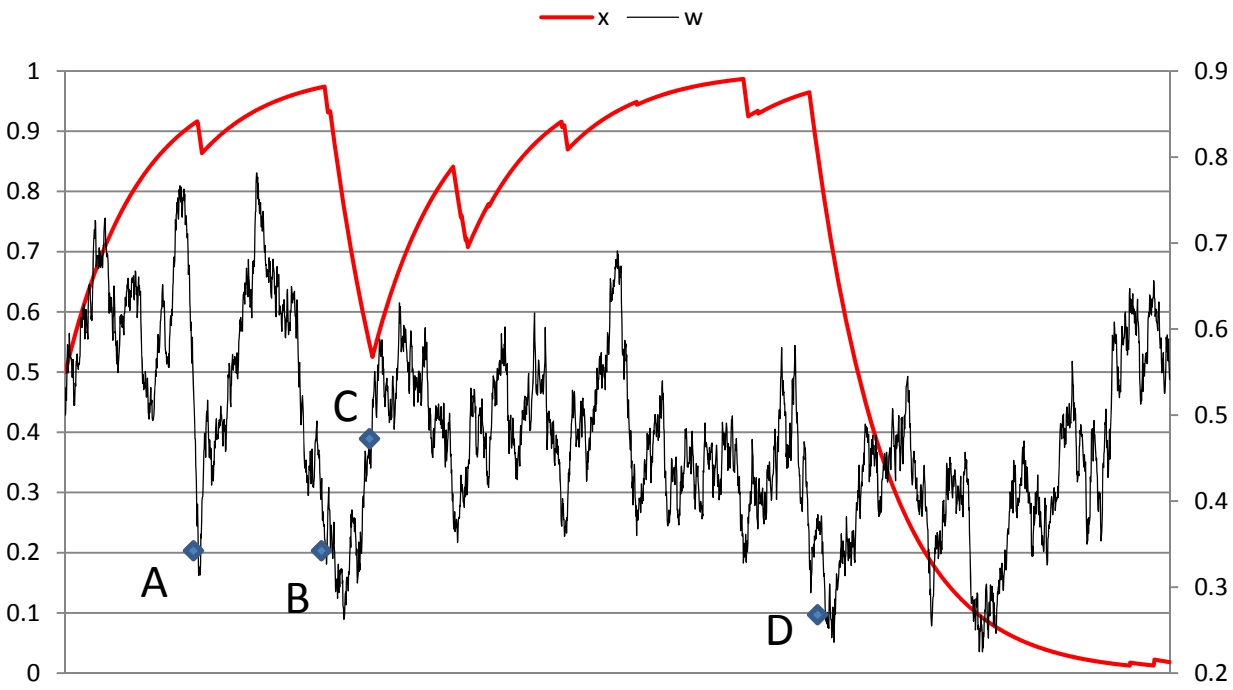
- *Suppose*

$$\beta > m\left(\lambda\left(1-\alpha\right)+\rho v\right)$$

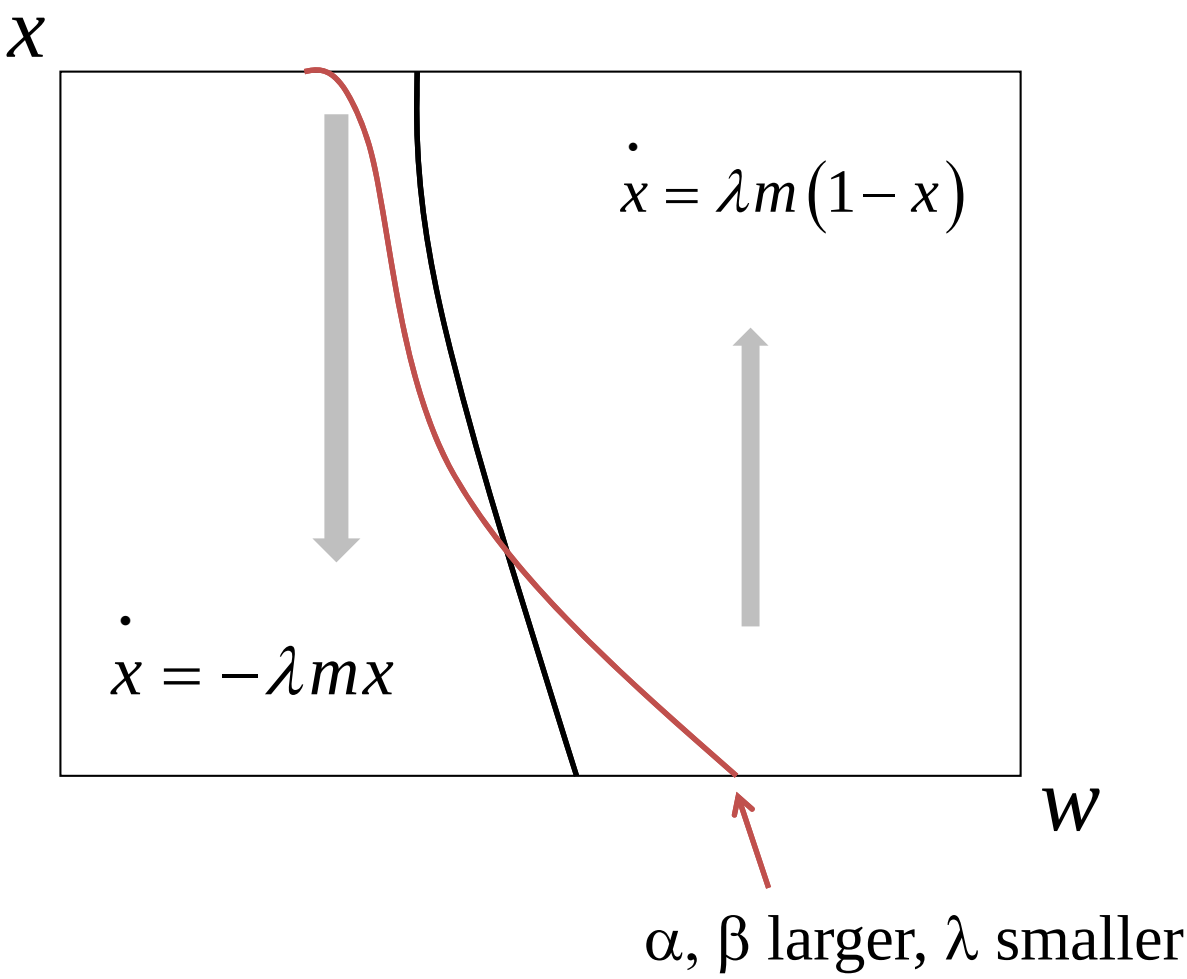
Then there exists a unique equilibrium. It is characterized by a decreasing function l such that

$$\begin{cases} \dot{x}_t = \lambda\left(1-x_t\right) & \text{if} \quad w_t > l\left(x_t\right) \\ \dot{x}_t = -\lambda x_t & \text{if} \quad w_t < l\left(x_t\right) \end{cases}$$


x
$\dot{x} = \lambda m(1-x)$
$\dot{x} = -\lambda m x$
$w = l(x)$
w



Sample paths of x and w. The frontier is $w=0.65-0.3x$ and the system starts on the frontier at (0.5,0.5). The scale of x is on the left, w on the right.


x
$\dot{x} = \lambda m(1-x)$
$\dot{x} = -\lambda m x$
w
α, β larger, λ smaller

Conclusion

- Rich speculative dynamics with
  - unique (dominance-solvable) equilibrium
  - simple closed-form when σ small, simple to compute otherwise

Basis for econometric model with endogenous regime switching?

- On the other hand,
  - Still not up to the GE standards of macro-money literature
  - Progress in that direction needed to compare/confront this type of model to the standard ones