Capital Flow and the Real Exchange Rate

Rob Hayward

April 7, 2014

Outline

Introduction

- There are prolonged and significant deviations from **PPP**

Introduction

- There are prolonged and significant deviations from **PPP**
- How far are deviations from PPP a function of **International Capital Flows?**

Introduction

- There are prolonged and significant deviations from **PPP**
- How far are deviations from PPP a function of **International Capital Flows?**
- Are some **capital flows** more powerful than others?

Introduction

- There are prolonged and significant deviations from **PPP**
- How far are deviations from PPP a function of **International Capital Flows?**
- Are some **capital flows** more powerful than others?
- Are some **exchange rates** more vulnerable than others?

Microstructure

Order Flow at the macro level

- Evans and Lyons (2002) add order flow to conventional exchange rate model

Microstructure

Order Flow at the macro level

- Evans and Lyons (2002) add order flow to conventional exchange rate model
- $$\Delta s_t = f(i, m, z,) + g(X, I, Z) + \epsilon_t \qquad (1)$$

Microstructure

Order Flow at the macro level

- Evans and Lyons (2002) add order flow to conventional exchange rate model
- $$\Delta s_t = f(i, m, z,) + g(X, I, Z) + \epsilon_t \qquad (1)$$
- Construct model of **international capital flows**

Microstructure

Order Flow at the macro level

- Evans and Lyons (2002) add order flow to conventional exchange rate model
- $$\Delta s_t = f(i, m, z,) + g(X, I, Z) + \epsilon_t \qquad (1)$$
- Construct model of **international capital flows**
- **Signed** order flow is deliberate and is offset by a **passive** balancing flow

Measuring Capital Flows

- Capital flow is hard to measure

Measuring Capital Flows

- Capital flow is hard to measure
- Portfolio balance models (Kouri and Porter, 1974) use bonds as a proxy

Measuring Capital Flows

- Capital flow is hard to measure
- Portfolio balance models (Kouri and Porter, 1974) use bonds as a proxy
- However, **international agencies (BIS, IMF)** as well as **national statistical agencies** and **private economists** have sought to improve the measurement of capital flows

Measuring Capital Flows

- Capital flow is hard to measure
- Portfolio balance models (Kouri and Porter, 1974) use bonds as a proxy
- However, **international agencies (BIS, IMF)** as well as **national statistical agencies** and **private economists** have sought to improve the measurement of capital flows
- Monthly capital flows and measure of returns with equity flows significant while bond flows are not (Siouronis 2008)

Capital Flow Series

- RTWI - Real Trade Weighted Index

Capital Flow Series

- RTWI - Real Trade Weighted Index
- CNB - Cumulative net bonds per GDP

Capital Flow Series

- RTWI - Real Trade Weighted Index
- CNB - Cumulative net bonds per GDP
- CNE - Cumulative net equity per GDP

Capital Flow Series

- RTWI - Real Trade Weighted Index
- CNB - Cumulative net bonds per GDP
- CNE - Cumulative net equity per GDP
- CNFDI - Cumulative net equity per GDP

Capital Flow Series

- RTWI - Real Trade Weighted Index
- CNB - Cumulative net bonds per GDP
- CNE - Cumulative net equity per GDP
- CNFDI - Cumulative net equity per GDP
- COT - Cumulative Official Treasuries per GDP

Capital Flow Series

- RTWI - Real Trade Weighted Index
- CNB - Cumulative net bonds per GDP
- CNE - Cumulative net equity per GDP
- CNFDI - Cumulative net equity per GDP
- COT - Cumulative Official Treasuries per GDP
- Spread - Three month interest rate spread

Capital Flow Series

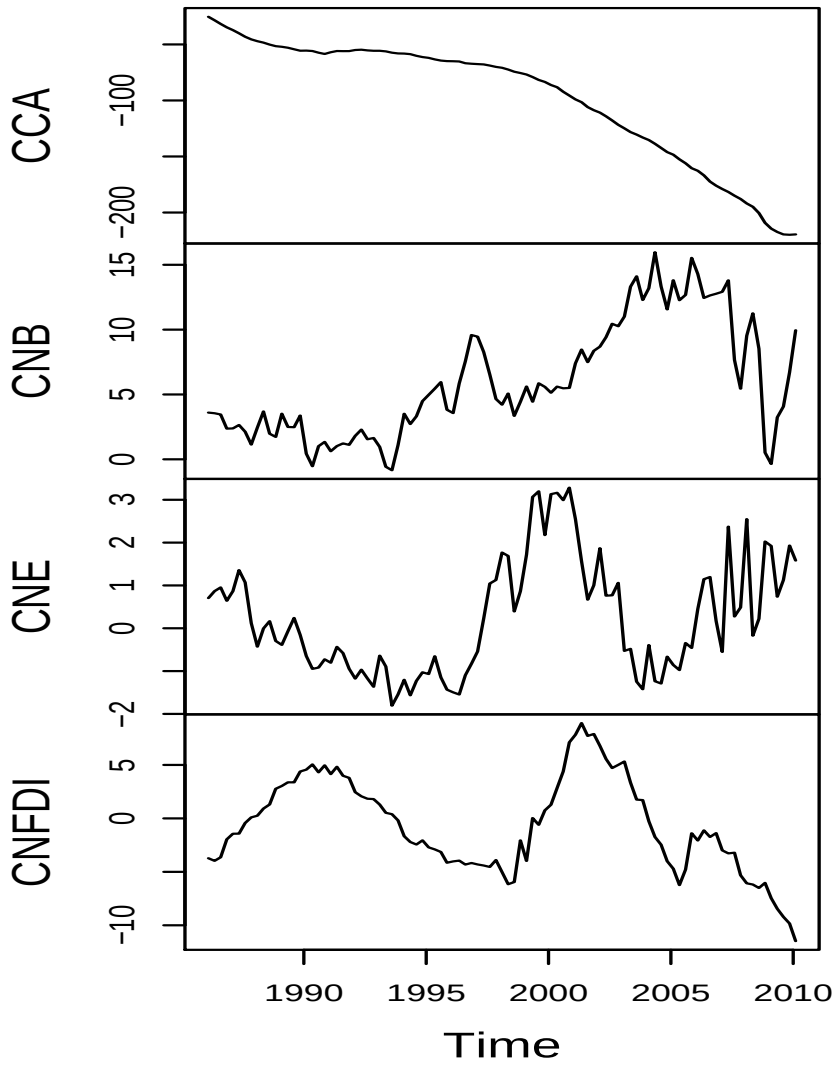
- RTWI - Real Trade Weighted Index
- CNB - Cumulative net bonds per GDP
- CNE - Cumulative net equity per GDP
- CNFDI - Cumulative net equity per GDP
- COT - Cumulative Official Treasuries per GDP
- Spread - Three month interest rate spread
- S1 - CFTC FX Derivative Positions (non-commercial per open interest)

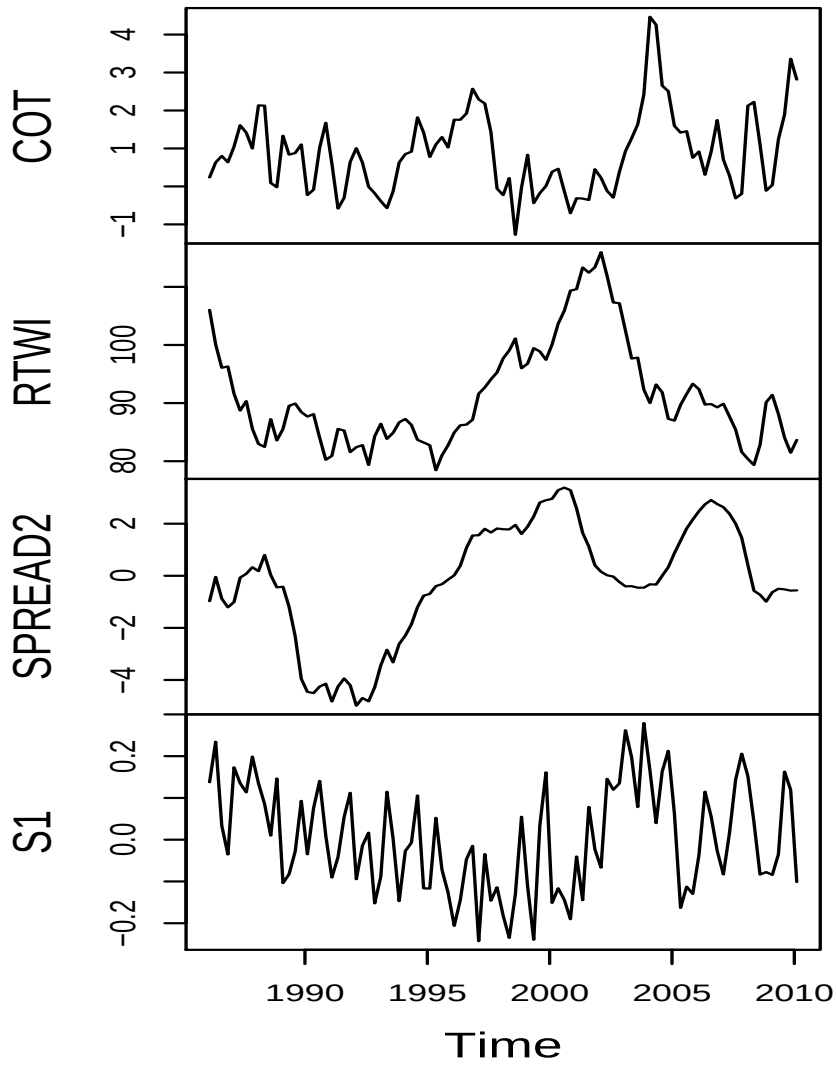
Capital Flow Series

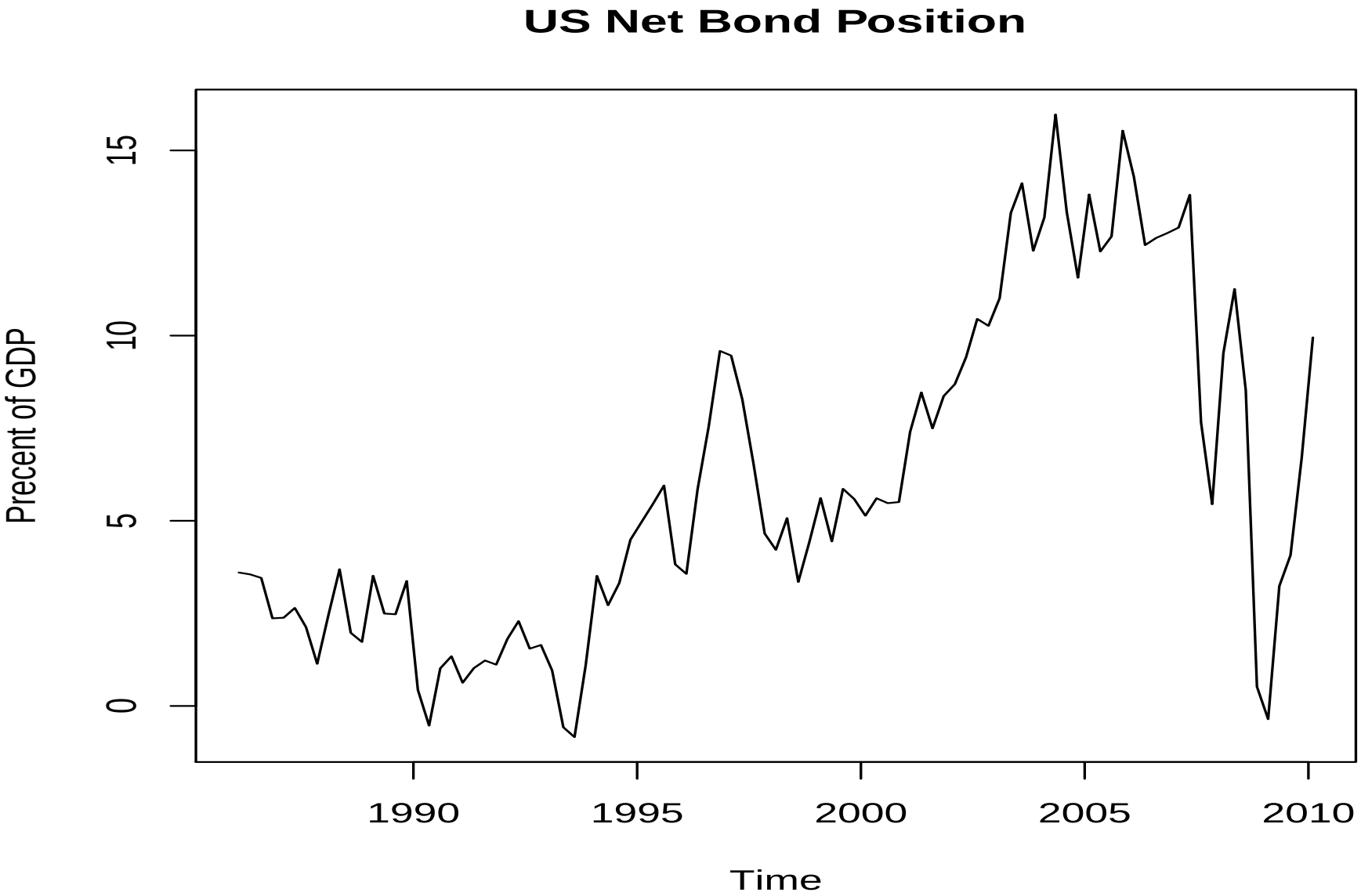
Descriptive Statistics

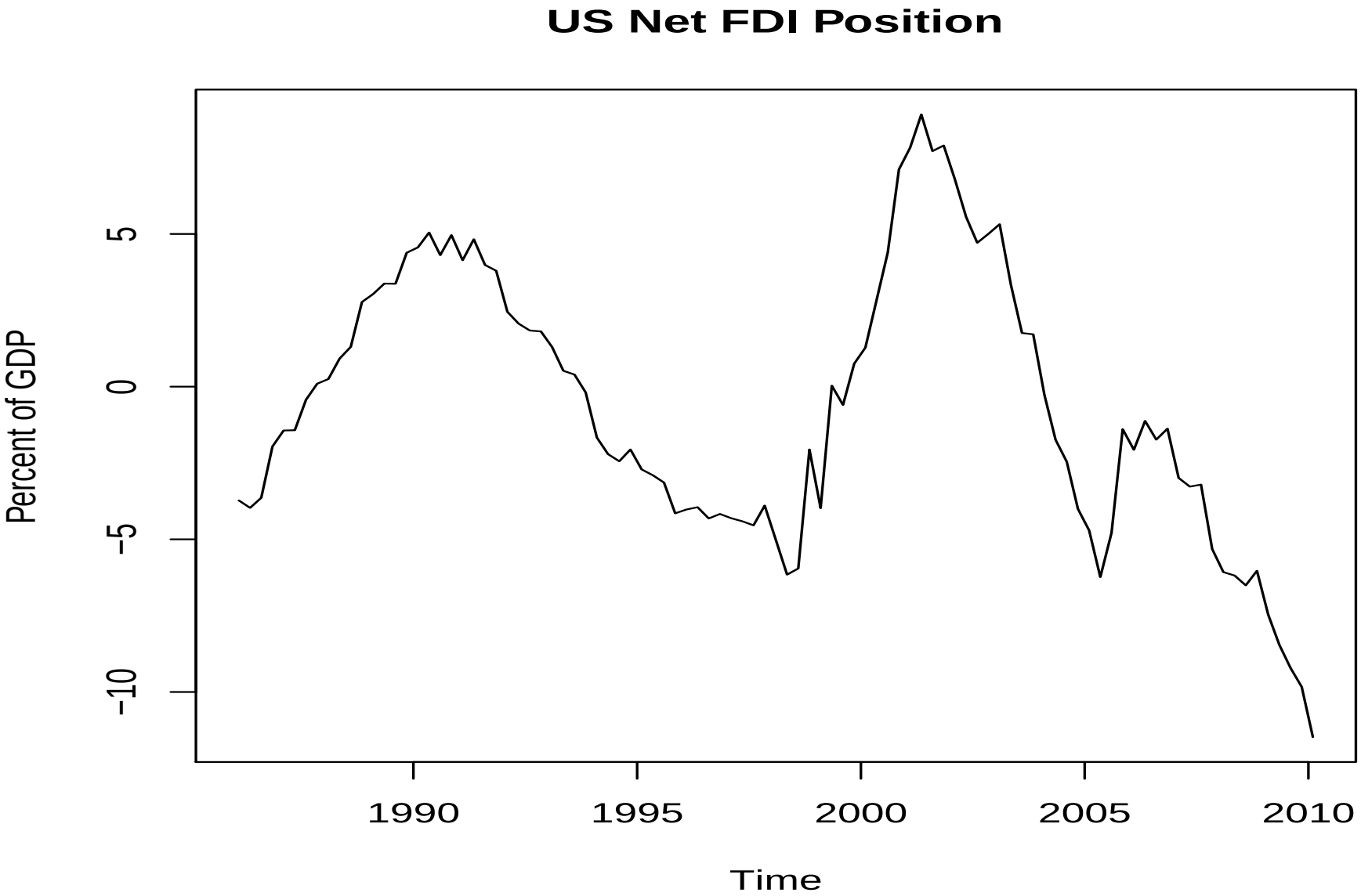
Series	Units	Mean	Median	Max	Min
RTWI	index	91.24	89.26	115.96	78.44
CNB	% GDP	6.00	5.07	15.97	-0.84
CNE	% GDP	0.23	-0.00	3.28	-1.81
CNFDI	% GDP	-0.67	-1.29	8.91	-11.48
COT	% GDP	0.88	8.32	4.47	-1.27
SPREAD	pp	-0.20	-0.07	3.38	-4.99
S1	NC/OI	47.0	3.00	70.0	-69.0

Cumulative Capital Flow, Current Account and Exchange F






US Net Bond Position
Precent of GDP
0
5
10
15
1990
1995
2000
2005
2010
Time


US Net FDI Position
Percent of GDP
5
0
−5
−10
1990
1995
2000
2005
2010
Time

Vector Auto Regression

Structural Equation $Bx_t = \Gamma_0 + \Gamma_1 x_{t-1} + \epsilon_t$

Vector Auto Regression

Structural Equation $Bx_t = \Gamma_0 + \Gamma_1 x_{t-1} + \epsilon_t$

Where: x_t is a vector of endogenous variables; matrix B contains the coefficients for the contemporaneous relationships between the endogenous variables; Γ_0 contains exogenous variables such as a constant, trend or seasonal; ϵ is a vector of errors that are assumed to IID; and Γ_1 are the parameters to be estimated.

Vector Auto Regression

Structural Equation $Bx_t = \Gamma_0 + \Gamma_1 x_{t-1} + \epsilon_t$

Where: x_t is a vector of endogenous variables; matrix B contains the coefficients for the contemporaneous relationships between the endogenous variables; Γ_0 contains exogenous variables such as a constant, trend or seasonal; ϵ is a vector of errors that are assumed to IID; and Γ_1 are the parameters to be estimated.

Vector Auto Regression 2

Standard Form of VAR $x_t = A_0 + A_1 x_{t-1} + e_t$

Vector Auto Regression 2

Standard Form of VAR $x_t = A_0 + A_1 x_{t-1} + e_t$

Multiplying $Bx_t = \Gamma_0 + \Gamma_1 x_{t-1} + \epsilon_t$ through by B^{-1} will give $x_t = A_0 + A_1 x_{t-1} + e_t$ With $A_0 = B^{-1}\Gamma_0$, $A_1 = B^{-1}\Gamma_1$ and $e_t = B^{-1}\epsilon_t$.

Vector Auto Regression 2

Standard Form of VAR $x_t = A_0 + A_1 x_{t-1} + e_t$

Multiplying $Bx_t = \Gamma_0 + \Gamma_1 x_{t-1} + \epsilon_t$ through by B^{-1} will give $x_t = A_0 + A_1 x_{t-1} + e_t$ With $A_0 = B^{-1}\Gamma_0$, $A_1 = B^{-1}\Gamma_1$ and $e_t = B^{-1}\epsilon_t$.

Allows OLS to be used

Identification

Restrictions $K\frac{(K-1)}{2}$ restrictions are needed

Identification

Restrictions $K\frac{(K-1)}{2}$ restrictions are needed

Restrictions on the B matrix can be imposed in an arbitrary fashion (Make B a *lower triangle*) or by using economic theory and other prior information.

Identification

Restrictions $K\frac{(K-1)}{2}$ restrictions are needed

Restrictions on the B matrix can be imposed in an arbitrary fashion (Make B a *lower triangle*) or by using economic theory and other prior information.

Each method is used here.

Results are compared

SVAR Restrictions

NA is estimated

	CNB	CNE	CNFDI	COT	RTWI	SP	S1
CNB	1	NA	0	0	0	NA	0
CNE	NA	1	NA	0	NA	0	NA
CNFDI	0	NA	1	0	NA	0	0
COT	NA	0	0	1	NA	0	NA
RTWI	0	NA	NA	NA	1	NA	NA
SPR'D	NA	0	0	0	NA	1	0
S1	0	NA	0	NA	NA	0	1

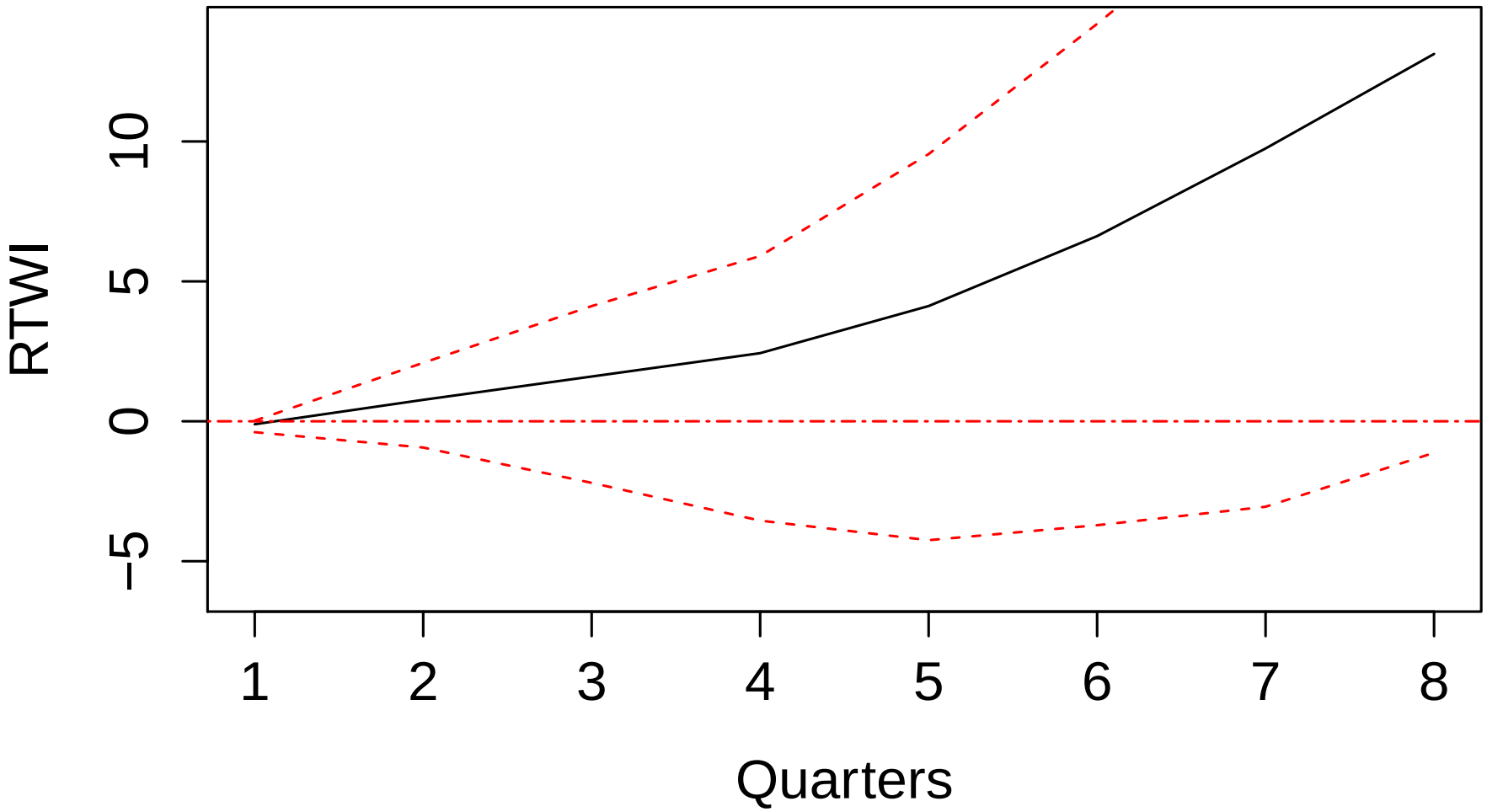
Impulse Response Functions

What is the effect of an innovation or shock?

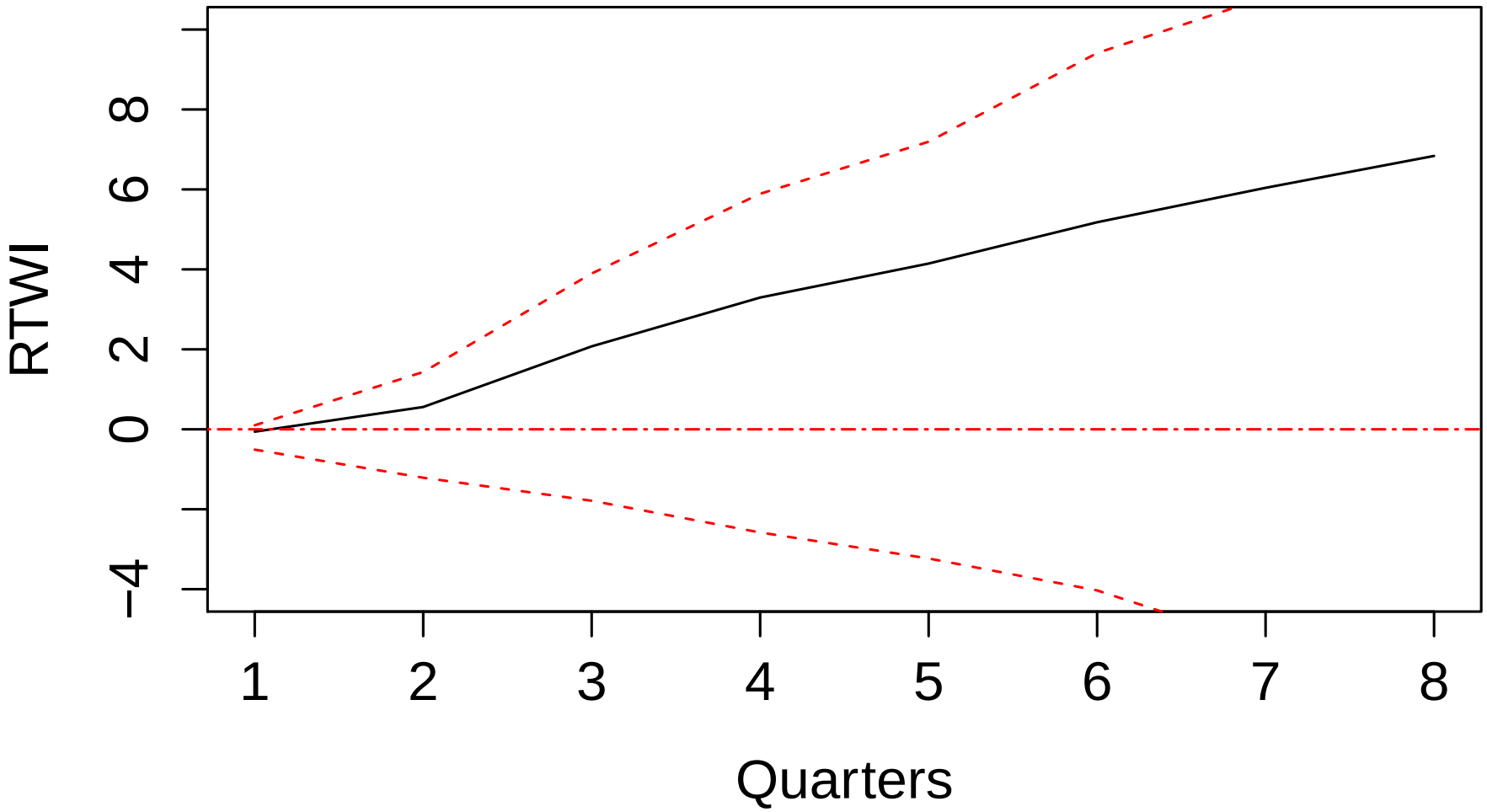
$$x_t = \mu + \sum_{i=0}^{i=n} \frac{A_t^i}{1 - b_{12}b_{21}} \begin{bmatrix} 1 & -b_{12} \\ -b_{21} & 1 \end{bmatrix} \tag{2}$$

For n periods

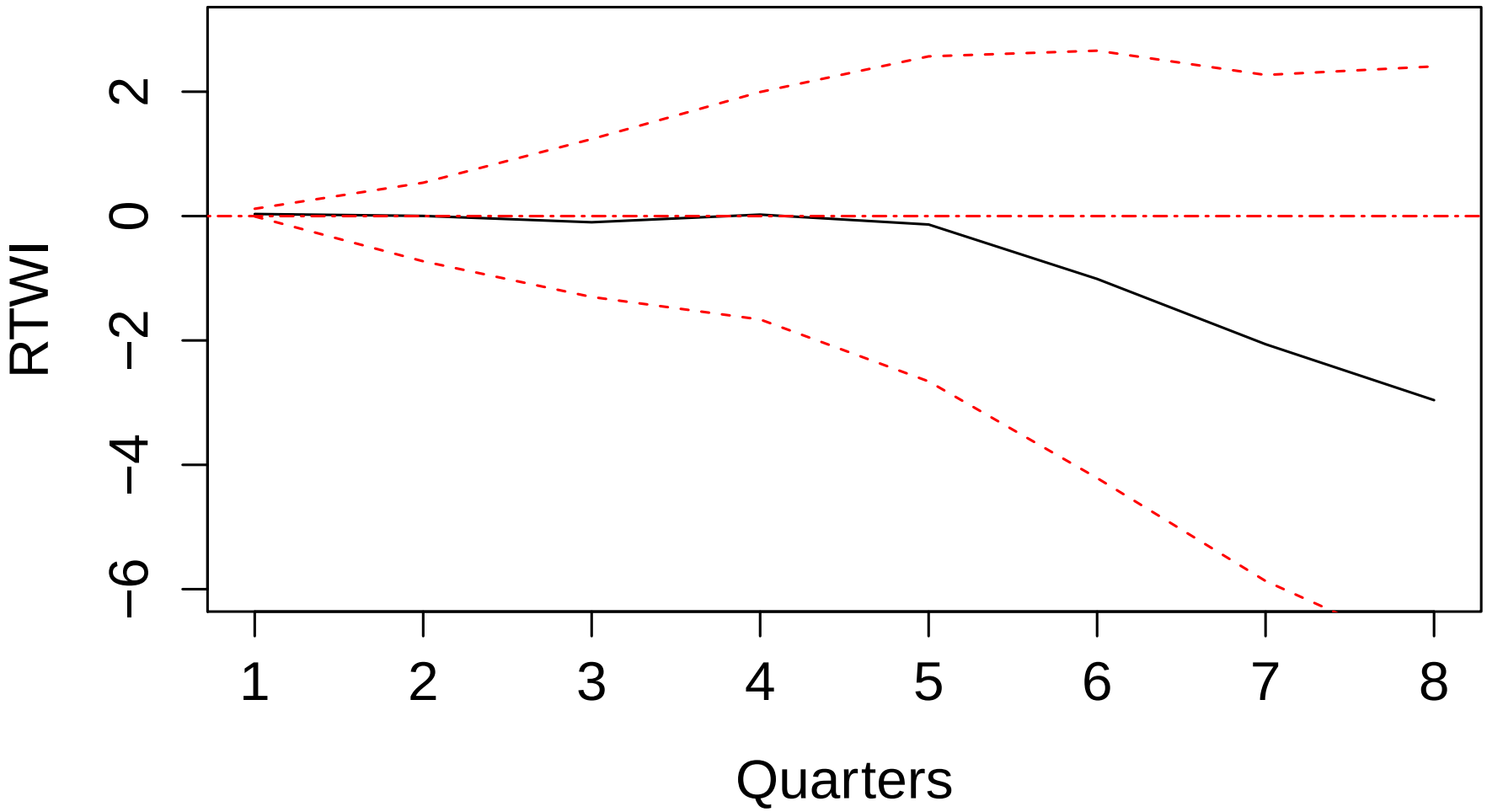
Spread shock System 3



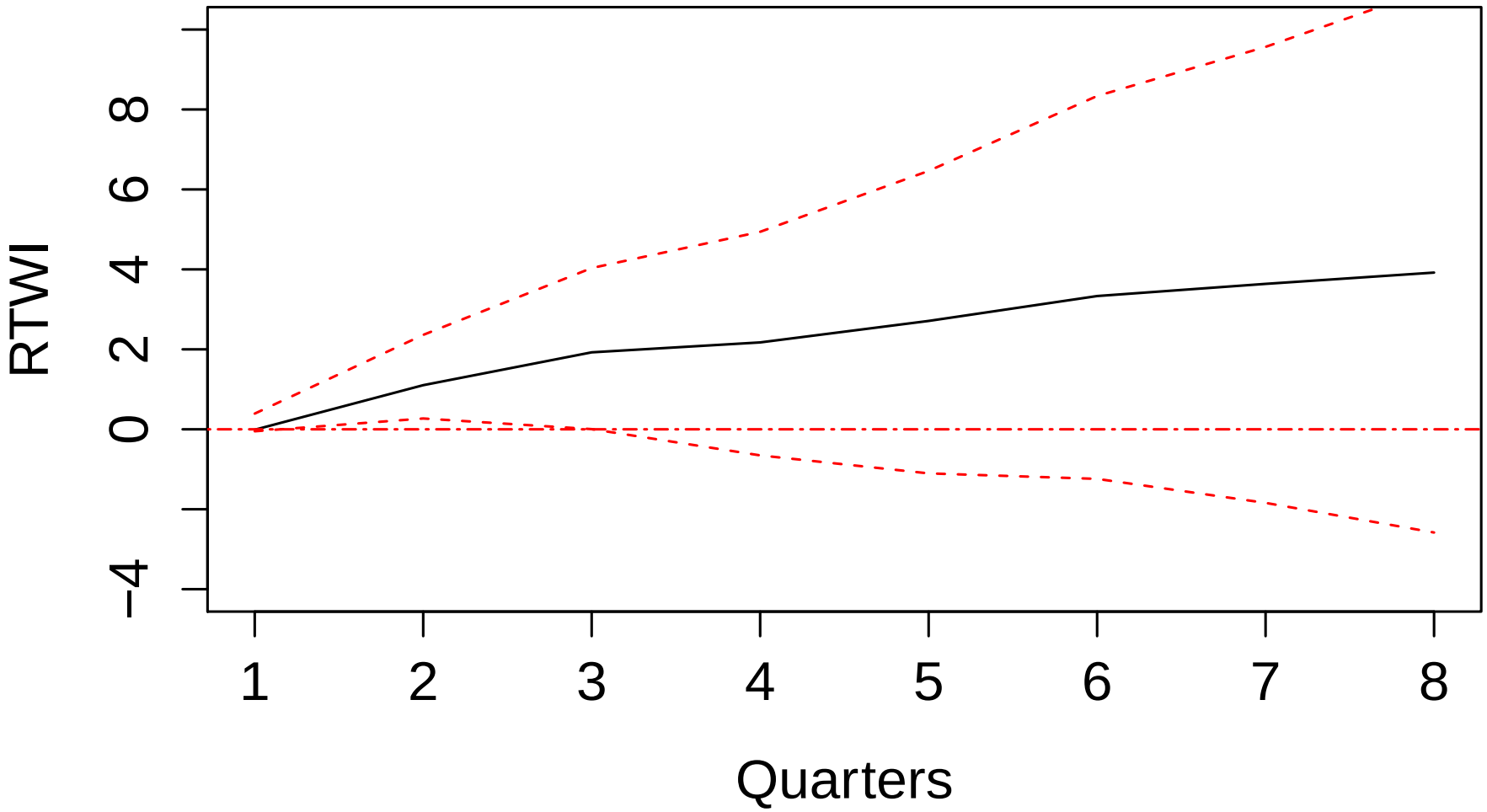
Cot shock: System 3



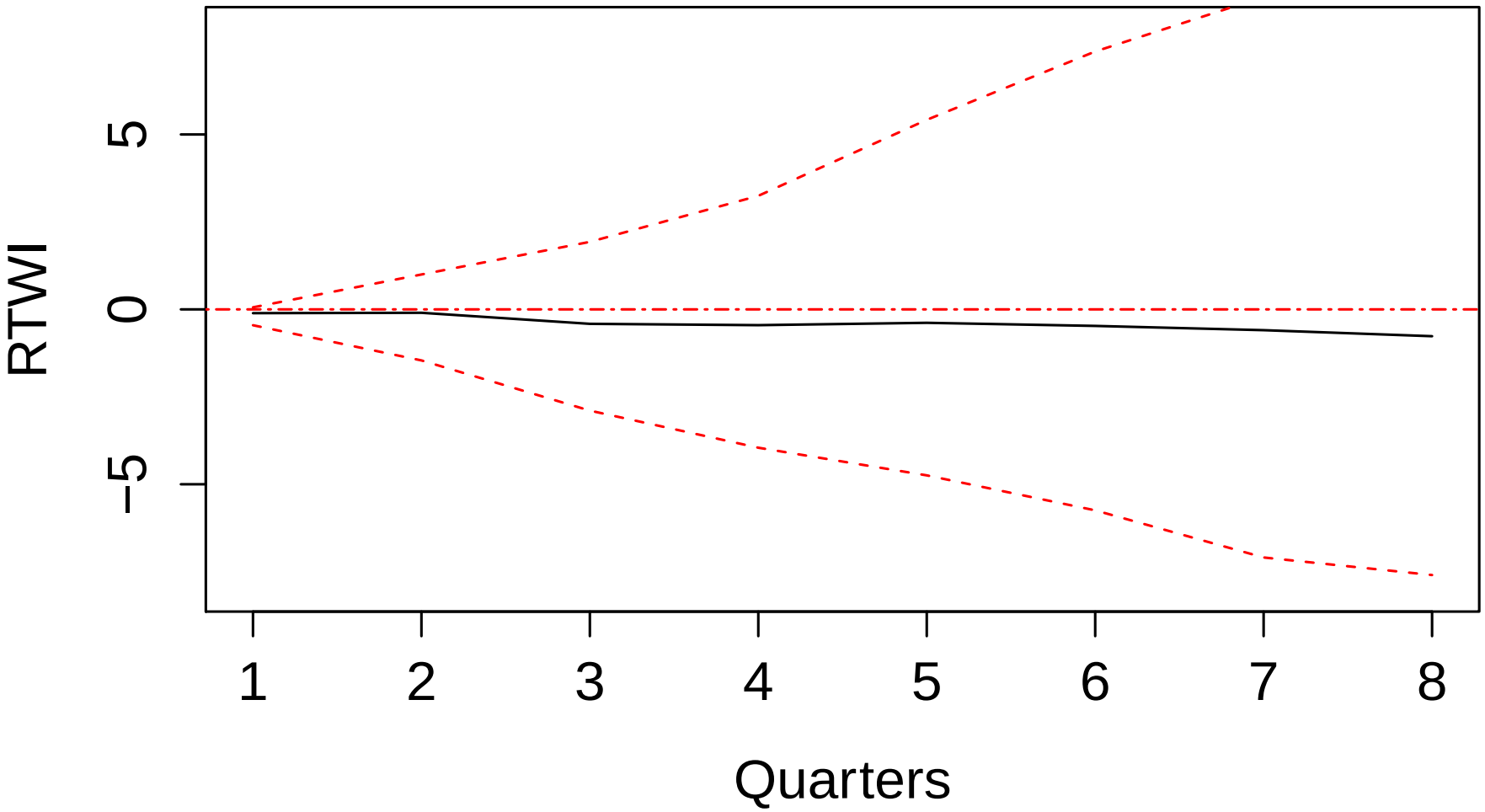
CNB shock: System 3



Speculative shock: System 3



CNE shock: System 3



Findings

- **Speculative flow** seems to have a significant and persistent effect on the real exchange rate

Findings

- **Speculative flow** seems to have a significant and persistent effect on the real exchange rate
- There is a positive relationship between **interest rate differentials** and the US dollar

Findings

- **Speculative flow** seems to have a significant and persistent effect on the real exchange rate
- There is a positive relationship between **interest rate differentials** and the US dollar
- **FDI**, **Bond flow** and **Equity flows** seem to have minimal influence on the real exchange rate

Findings

- **Speculative flow** seems to have a significant and persistent effect on the real exchange rate
- There is a positive relationship between **interest rate differentials** and the US dollar
- **FDI**, **Bond flow** and **Equity flows** seem to have minimal influence on the real exchange rate
- https://github.com/RobHayward/SVARdoc

References

Lyons and Evans (2002), 'Order Flow and Exchange Rate Dynamics', *Journal of Political Economy*, 110 (1)
Kouri and Porter (1974), 'International Capital Flows and Portfolio Equilibrium', *Journal of Political Economy*, 82
Sims (1980), 'Macroeconomics and Reality', *Econometrica* 48(1)