The Real Exchange Rate, Real Interest Rates, and the Risk Premium

by Charles Engel

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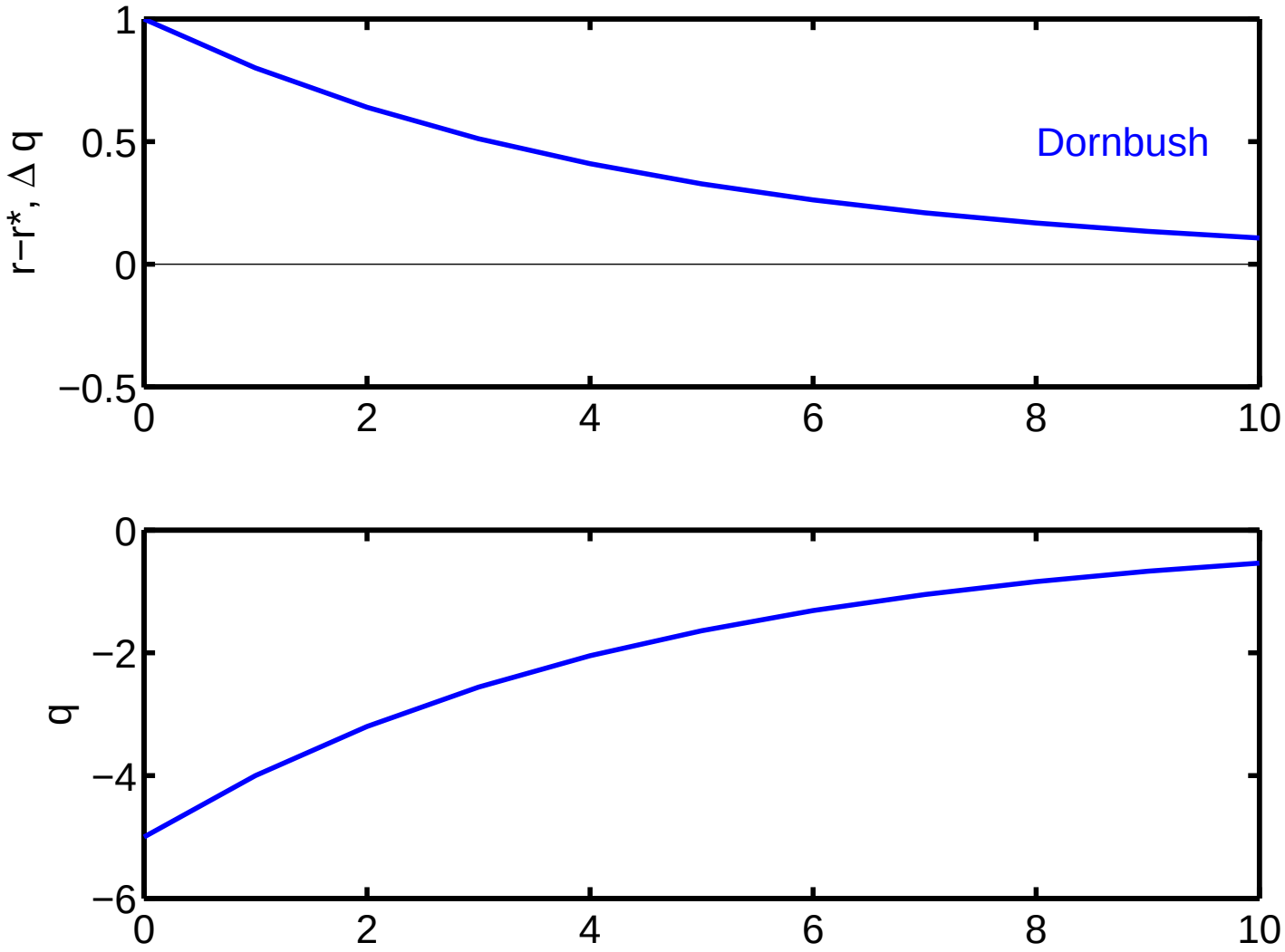
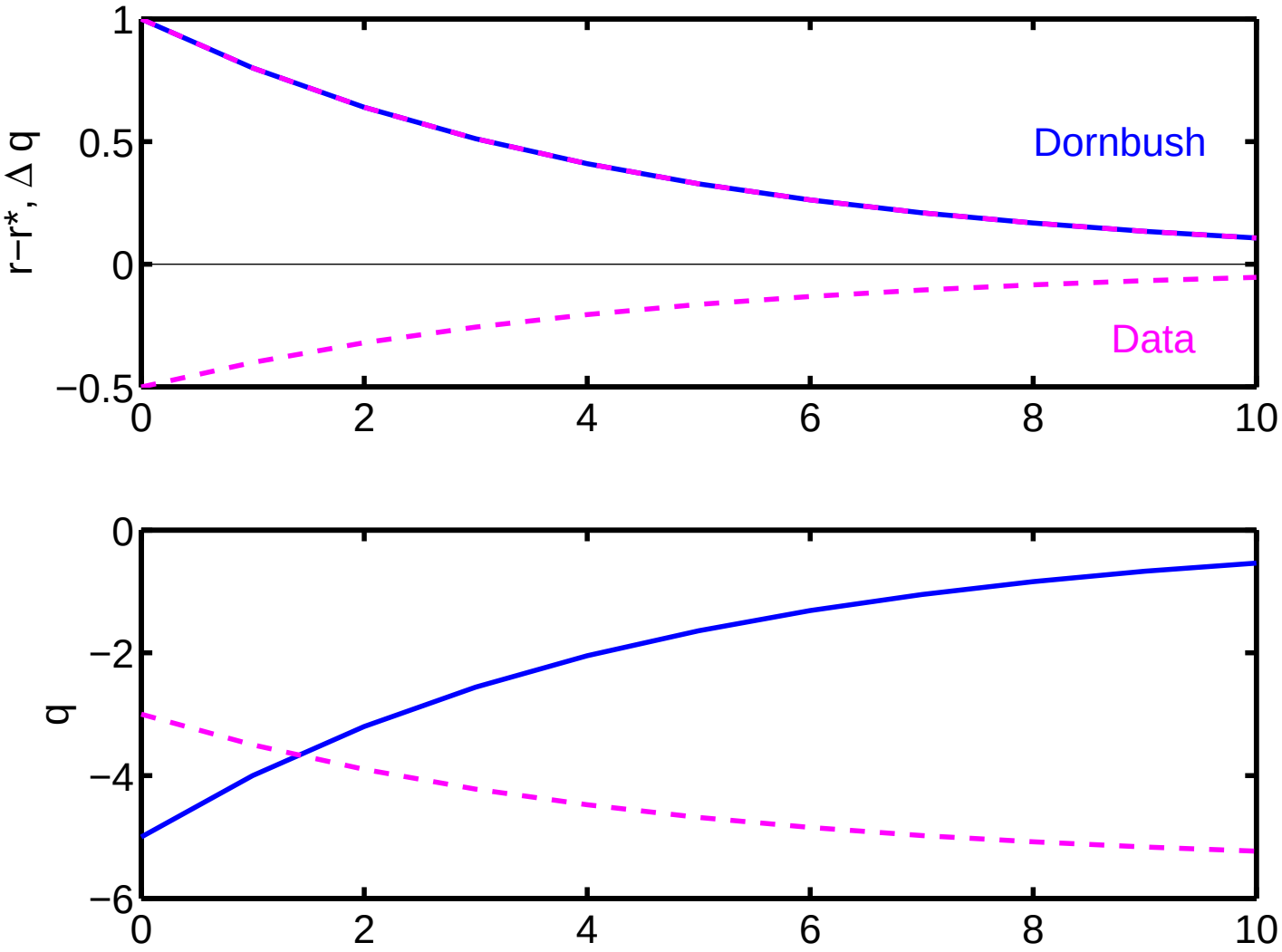
NYU STERN

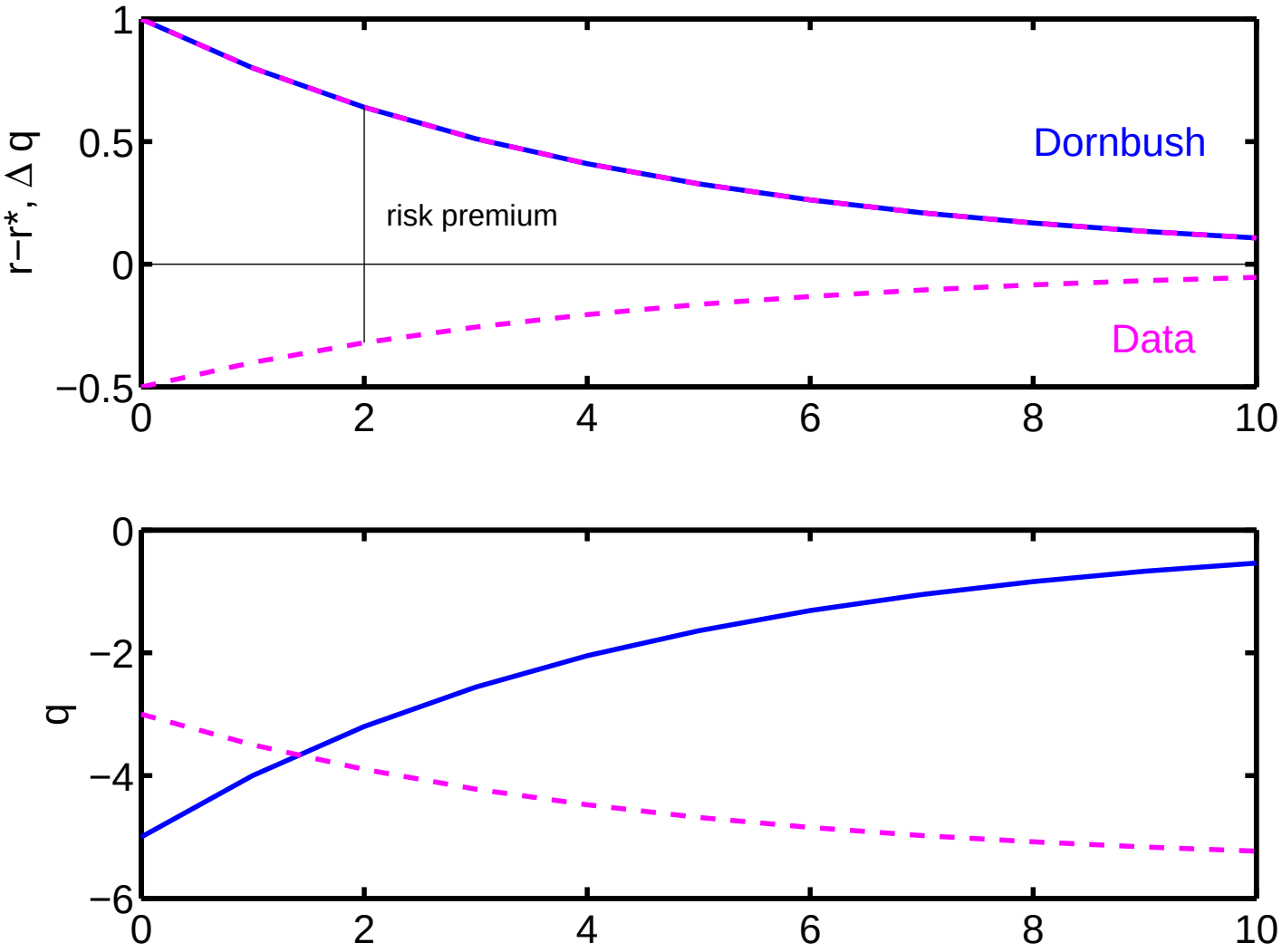
Dornbusch and data



Dornbusch and data



Dornbusch and data



Charles's insight

Via Chris Telmer:

> *Right now the Brazilian Real (BRL) is overvalued in real terms. Brazilian real interest rates are also high. The latter suggests more BRL appreciation. But ... we know that eventually PPP must kick in, with the BRL depreciating.*

Plan of attack

What we knew already

- Negative correlation of interest rate and exchange rate innovations
- Negative correlation of interest rate and subsequent exchange rate movements

What we learn from Charles

- Same holds for real exchange rate and real interest rates
- Suggests connection of risk premiums to real exchange rate

What's left for the rest of us

- Don't worry, lots left to do

What we knew: how risk works

Nominal pricing kernels n (dollars) and n^* (euros) drive everything

Exchange rates are about units

$$\begin{aligned} n^*_{t+1} &= n_{t+1}(s_{t+1}/s_t) \\ \log s_{t+1} - \log s_t &= \log n^*_{t+1} - \log n_{t+1} \end{aligned}$$

Interest rates connected to cumulants κ_j of $\log n_{t+1}$

$$\begin{aligned} -i_t &= \log E_t n_{t+1} \\ &= \kappa_{1t} + (\kappa_{2t}/2! + \kappa_{3t}/3! + \kappa_{4t}/4! + \cdots) \\ &= \kappa_{1t}\ (\text{“mean”}) + \kappa_{-1t}\ (\text{“risk”}) \end{aligned}$$

What we knew: Fama regression

Components are

$$\begin{aligned} E_t(\log s_{t+1} - \log s_t) &= \kappa^*_{1t} - \kappa_{1t} \\ i_t - i^*_t &= (\kappa^*_{1t} - \kappa_{1t}) + (\kappa^*_{-1t} - \kappa_{-1t}) \end{aligned}$$

Expected excess return on foreign currency ("risk premium")

$$\lambda_t = (\kappa_{-1t} - \kappa^*_{-1t})$$

Fama regression (Table 2)

$$\log s_{t+1} - \log s_t = \zeta_s + \beta_s(i_t - i^*_t) + \text{residual}$$

Negative slope β_s tells us the action is in risk premium λ_t

What we learn: Fama regressions with real variables

Fama regression looks the same in real terms (Table 3A)

$$\log q_{t+1} - \log q_t \quad = \quad \zeta_s + \beta_s(r_t - r_t^*) + \text{residual}$$

The analysis does, too (inflation also about units)

$$\begin{aligned} m_{t+1} &= n_{t+1}/\pi_{t+1} \\ m^*_{t+1} &= m_{t+1}(q_{t+1}/q_t) \\ -r_t &= \log E_t m_{t+1} = \kappa_{1t}(m) + \kappa_{-1t}(m) \end{aligned}$$

Digression: a real or nominal phenomenon?

What we learn: real exchange rates

Real exchange rate q looks stationary

- Unit root tests
- VAR

$\text{Cov}(q, r - r^*) < 0$ (Table 4)

- Regression, expected inflation inferred from VAR

Risk premiums connected to real exchange rate (Table 5)

- VAR, regression based on VAR-based risk premium

Question: is risk associated with high or low q?

What we learn: what a model must look like

Properties of real pricing kernels suggested by Charles

- Fama regressions
- Stationary real exchange rate
- Negative correlation of real exchange rate and interest differential

Properties I'd add

- Strong correlation of $(\log m, \log m^*)$
- Unit roots in $(\log m, \log m^*)$
  Aside: define $M_{t+1} = M_t m_{t+1}$; then $(\log M, \log M^*)$ cointegrated

Is this possible?

- Charles thinks no — but is there a theorem?
- I'd bet yes — but no example yet

What's left to do?

More evidence

- Fama regressions with real exchange rate added
- Cross-correlation functions for returns and real exchange rate
- Real exchange rate portfolios
- Are rich and poor countries similar?

More theory

- Focus on real variables provides nice link to standard pricing models
- Connect risk to real exchange rate?
- A role for "disasters"?

Let's get to work!

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Related work

Macro evidence

- Eichenbaum & Evans, QJE, 1995 (VARs)
- Faust & Rogers, JME, 2003 (VARs)

Finance evidence

- Ang and Chen, ms, 2010 (interest rates)
- Jorda & Taylor, ms, 2010 (real exchange rate)
- Jurek, ms, 2009 (options)
- Lustig & Verdelhan, AER, 2007 (portfolios)
- Lustig, Roussanov, & Verdelhan, ms, 2010 (currency factor)

Macro structure

- Alvarez, Atkeson, & Kehoe, REStud, 2009 (heterogeneity)
- Backus, Gavazzoni, Telmer, & Zin, ms, 2010 (Taylor rules)