

The consumption-real exchange rate anomaly with extensive margins

Masashige Hamano

University Luxembourg

November 2011

Structure of the presentation

- Introduction
- The static model (analytical explanation)
- The dynamic model (quantitative analysis)
- Conclusion.

Introduction: Perfect risk sharing condition with complete asset markets

- Under the assumption of complete asset markets, one countries' consumption should rise when its price decreases relative to other countries (real exchange rate depreciation):
- With the standard CRRA preference:

$$U = \frac{C^{1-\gamma}}{1-\gamma}$$

We have

$$Q \equiv \frac{P^*}{P} = \left(\frac{C}{C^*} \right)^\gamma$$

In log deviations,

•

$$Q \equiv P^* - P = \gamma (C - C^*)$$

But this is not observed in reality, known as the Backus-Smith puzzle (Kollmann (1995), Backus and Smith (1993))

Table: BS correlation

Country	U.S.	ROW	Country	U.S.	ROW
Austria	-0.11	0.05	Italy	-0.28	-0.52
Belgium/Luxembourg	-0.16	0.50	Japan	0.05	0.25
Canada	-0.52	-0.31	Netherlands	-0.45	-0.20
Denmark	-0.14	-0.10	Portugal	-0.61	-0.77
Finland	-0.30	-0.49	Spain	-0.63	-0.64
France	-0.20	0.43	Sweden	-0.56	-0.40
Germany	-0.51	-0.27	U.K.	-0.51	-0.21
Greece	-0.45	-0.35	U.S.	N/A	-0.71
Ireland	-0.39	0.72	Median	-0.42	-0.27

Source: Corsetti et al. (2008a)

- What we observe is zero or even negative correlation between relative consumption and real exchange rate (Medium is -0.27)
- Put another way, a country consumes more relative to ROW when the price of its consumption basket becomes expensive, namely when the real exchange rate appreciates.

How can these zero or even negative correlations arise?

- No complete asset markets which tightly link relative consumption and real exchange rate.
- However, under incomplete assets markets, the standard international macroeconomic model with differentiated traded goods fails to reproduce a realistic BS correlation: real exchange rate depreciates along with the terms of trade depreciation following a positive productivity shock.

- Under incomplete asset markets and with non-traded sector, zero or even negative correlation may arise through the Harrod-Balassa-Samuelson effect (Benigno and Thoenissen (2008)).
- Also under incomplete markets, zero or even negative correlation may arise when a strong income effect takes place due to a low elasticity of substitution between local and imported goods (Corsetti et al. (2008a), henceforth CDL).

Contribution of the paper

- The paper explores how extensive margins (the number of varieties) and market incompleteness might contribute to the resolution of the puzzle.
- Consumers take care of not only price of goods but also the variety of goods they consume.
- What really matters for international risk sharing is the “welfare-based” real exchange rate fluctuations including those in extensive margins.
- Fundamentally, the BS puzzle cannot be tested fully because we systematically fails to observe fluctuations in extensive margins with standard “empirical-based” price indices (Broda and Weinstein (2004,2006,2010)).

Intuition of the paper

- Under incomplete markets, when a country is hit by a positive productivity shock, it produces more in terms of extensive margins relative to ROW.
- Labor demand which comes from these new entrants/varieties further pushes up wage rate in the country.
- It follows that the “empirical-based” real exchange rate appreciates.
- The higher the love for variety or the substitution effect between local and imported goods is, the stronger the real exchange rate appreciation. A realistic BS correlation may arise when the elasticity of substitution between local and imported goods is high (elasticity optimism).

Intuition of the paper

- Following a positive productivity shock, $z^R \uparrow \Rightarrow N^R \uparrow$ and $w^R \uparrow$.
- In welfare-based, $Q \uparrow$ and $C - C^* \uparrow$.

Intuition of the paper

- Following a positive productivity shock, $z^R \uparrow \Rightarrow N^R \uparrow$ and $w^R \uparrow$.
- In welfare-based, $Q \uparrow$ and $C - C^* \uparrow$.
- In empirical-based, $\tilde{Q} \downarrow$ and $\tilde{C} - \tilde{C}^* \uparrow$.

The static model

- A two country general equilibrium model based on monopolistic competition.
- The number of firms in each country (product varieties or extensive margins) is determined endogenously through free entry condition as in Krugman (1980).
- No international lending and borrowing (the balanced trade or extremely incomplete markets).

The terms of trade with extensive margins

$$\text{TOT} = \underbrace{\frac{1}{1 + 2\alpha(\omega - 1)} z^R}_{\text{CDL term}} - \underbrace{\psi \frac{2\alpha(\omega - 1)}{1 + 2\alpha(\omega - 1)} N^R}_{\text{Variety effect}}.$$

- where $\text{TOT} \equiv p_f^* - p_h$, $\alpha (> 1/2)$: home bias in consumption, $\omega (> 0)$: elasticity of substitution between local and imported goods, $\psi (> 0)$: love for variety.
- From the first CDL term, the terms of trade can appreciate when $\omega < 1 - 1/2\alpha$ while depreciate when $1 - 1/2\alpha < \omega$.
- But with love for variety $\psi (> 0)$, the second term is also at work. A positive extensive margins $N^R > 0$ makes them appreciated.
- The appreciation is higher the higher the elasticity of substitution ω or love for variety ψ .

Calibration with and without love for variety

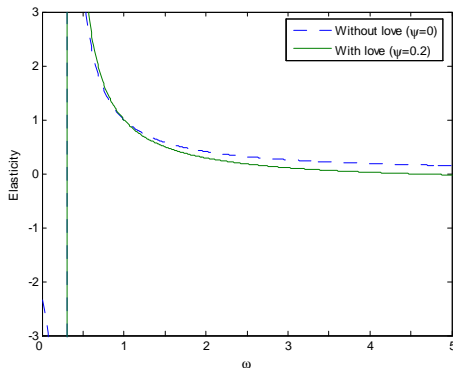


Figure 1: Terms of trade ($\alpha = 0.72$)

The BS correlation in “welfare-based”

From the balanced trade condition, we can get

$$Q = \frac{2\alpha - 1}{2\alpha\omega - 1} (C - C^*).$$

- This is exactly the same expression as in CDL. The coefficient can be negative only when $\omega < 1/2\alpha$.
- But in "welfare-basis" the above real exchange rate Q and consumption $C - C^*$ include unobservable fluctuations in extensive margins N^R .

The "empirical-based" measure

- Fluctuations in the welfare-based real exchange rate and relative consumption can be decomposed into those empirically observable parts (\tilde{Q} and $\tilde{C} - \tilde{C}^*$) and extensive margins N^R as follows:

$$Q = \tilde{Q} + \psi (2\alpha - 1) N^R,$$

where

$$\tilde{Q} = (2\alpha - 1) \text{TOT}.$$

- And

$$C - C^* = \tilde{C} - \tilde{C}^* + \psi (2\alpha - 1) N^R.$$

The BS correlation in “empirical-based”

Using the above relations, we have

$$\tilde{Q} = \underbrace{\frac{2\alpha - 1}{2\alpha\omega - 1} (\tilde{C} - \tilde{C}^*)}_{\text{CDL term}} - \underbrace{\psi \frac{2\alpha (2\alpha - 1) (\omega - 1)}{2\alpha\omega - 1} N^R}_{\text{Variety effect}}.$$

- Unobservable positive extensive margins ($N^R > 0$) can bring the empirical-based real exchange rate into an appreciation ($\tilde{Q} < 0$) while consumption rise ($\tilde{C} - \tilde{C}^* > 0$). This is more so when the elasticity of substitution is ω or love for variety ψ is high.

Calibration with and without love for variety

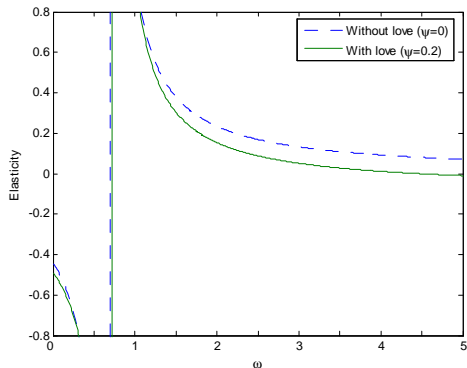


Figure 2: BS correlation ($\alpha = 0.72$)

- Introducing full dynamics based on Ghironi and Melitz (2005). But for simplicity firms are homogenous.
- For more realistic specification, firms are required to pay sunk costs in terms of capital goods as well as labor.
- Labor supply is assume to be endogenous.
- A part of consumption risk is insured by non-contingent bonds. Thus financial markets are incomplete but not totally.

Impulse response function

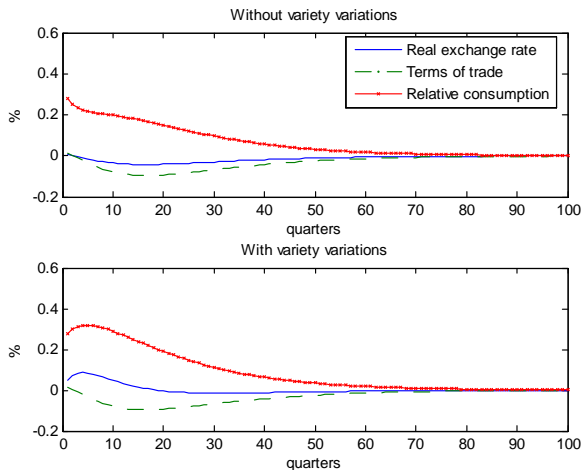


Figure 3: IRF under Incomplete markets.

Sensitivity analysis

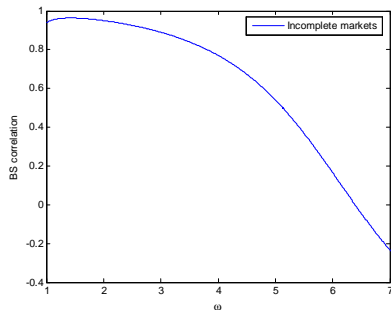


Figure 4: BS correlation and the elasticity of substitution.

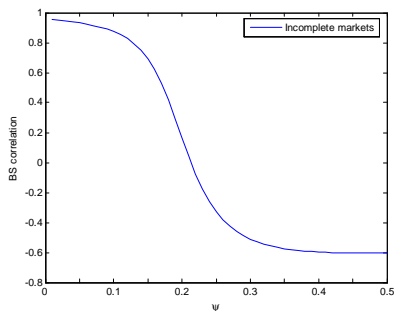


Figure 5: BS correlation and the love for variety.

- This paper investigates how the interaction of extensive margins and market incompleteness may contribute to the resolution of the BS puzzle.
- International risk sharing is fundamentally for welfare-based real exchange rate and consumption.
- A realistic BS correlation is reproduced when the elasticity of substitution between local and imported goods is high.
- The model predicts that in welfare-based, a positive BS correlation tends to remain.