Globalization, Pass-through and the Optimal Policy Response to Exchange Rates

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Outlines

• Introduction
• The evolution of emerging Asian economies
• Policy responses to exchange rates
• An open economy model
• Results
• Conclusions
INTRODUCTION
Motivation

• Nominal exchange rate stability
  Economies in Asia

• Nominal anchor

• Choice of optimal nominal anchor
  After industrial and financial market structure change
East Asia, In The Past

• Low goods market integration
  Domestic consumption was heavily weighted towards domestically produced goods, and trade was concentrated in raw material imports and finished good exports intended for the so-called advanced economies.

• High degree of exchange rate pass-through to domestic prices
  ➢ high degree of complementarity between exchange rate stability and inflation stability
  ➢ exchange rate changes can play a powerful real role by generating expenditure switching
East Asia, In The Past (cont.)

• Low levels of financial internationalization
  ➢ Domestic financial markets were relatively underdeveloped.
  ➢ External investors had little choice of domestic assets that they could purchase.
  ➢ Effective capital controls further limited the scope for international risk sharing

• Exchange rate reserves
  In such an environment, official holdings of foreign exchange reserves may be an effective substitute for private holdings in increasing international risk sharing and improving global welfare
East Asia, Nowadays

• More integrated goods markets
  consumer preferences across different economies have moved closer together

• Less degree of exchange rate pass-through
  As average inflation rates have come down, prices have tended to become stickier, slowing the rate at which exchange rate shocks are passed on to domestic price levels.

• Integrated financial markets with global markets
  ➢ Developing domestic financial markets
  ➢ Declining barriers to international capital flows
Related Researches

• Taylor (2001)
  Including the exchange rate in monetary policy reaction functions and finds that this can result in only modest improvements (or even a deterioration) in terms of output and inflation outcomes in standard small open economy macro models.

• Garcia et al (2011)
  Central bank response to exchange rates may be desirable, especially in financially vulnerable economies (defined as those where agents have limited access to saving and borrowing facilities, limiting inter-temporal optimization).
Related Researches (cnt.)

• Sutherland (2005)
  The **optimal variance of exchange rates** depends on a variety of factors, including the degree of pass-through, the size and openness of the economy, the elasticity of labour supply and the volatility of foreign producer prices.

• Engel (2011)
  Monetary policy should respond to **currency misalignments**

• Corsetti and Pesenti (2005)
  using monetary policy to reduce exchange rate volatility may be welfare enhancing, even if it leads to increased output gap volatility, because **risk-averse** foreign exporters are likely to reduce average mark-ups in response to decreased exchange rate volatility.
Related Researches (cnt.)

- Devereux (2004)

  a world with nominal rigidities and incomplete international financial markets, then, even if a flexible nominal exchange rate would serve as a perfect shock absorber, fixed exchange rates may be preferable. Effectively, flexible exchange rates can lead to inefficient output responses to demand shocks in that output may be too stable.
Our Model

- New Keynesian model
- Degree of goods market integration
  Reduction in the degree of home bias in the consumer’s utility function
- Degree of exchange rate pass-through
  Some portion of imports is priced in local currency, with the remainder priced in the producers’ currency
- Degrees of financial integration
  From financial autarky to full international risk-sharing
- Capturing some of the most salient features economies in Asia
Review Of Results

• Financial developments reduce the gains of using sterilized intervention.

• The more goods market integration, the less gains of using sterilized & unsterilized intervention.
THE EVOLUTION OF EMERGING ASIAN ECONOMIES
Exchange Rate Pass-Through

Vector Auto Regression, economy-by economy

- Quarterly data for real GDP growth, inflation, the change in the policy rate and the change in the nominal effective change rate
- Include four seasonal dummies and three lags
- Choleski decomposition
- Impulse response of inflation, in per cent, to a 10% depreciation shock to the nominal effective exchange rate.
- Monte Carlo methods and plot the median projection along with the 10th and 90th percentiles (as confidence bands) in Graph 1
Exchange Rate Pass-Through (cnt.)

Impulse response of CPI inflation to NEER shock
10% depreciation

Graph 1

Vertical axis in per cent. Dashed lines display 90 per cent confidence bands.
Exchange Rate Pass-Through (cont.)

• Prices stickiness
  Improved inflation control, leading to declines in both the level and volatility of inflation, is associated empirically with lower levels of exchange rate pass-through, as prices become more sticky (Devereux and Yetman, 2010; Choudry and Hakura, 2006; Gagnon and Ihrig, 2004)

• Composition of import bundles
  Changes in the composition of import bundles, from high pass-through commodities to lower pass-through manufactured goods and food products (Campa and Goldberg, 2005) and increased trade in final goods (Choi and Cook, 2013).
Integration Of Goods Markets

As we will see, in our model, the mechanics of international risk sharing depend in part on the degree to which consumption bundles overlap between economies.

Graph 2

Trade integration
Imports plus exports of goods and services as a percentage of GDP

Simple average across economies

Aggregated ratio

Source: IMF World Economic Outlook, April 2013.
Financial Internationalization

• International **risk sharing** is likely to be increasing

\[ \Delta \log C_n - \Delta \log C_j = \alpha_i + \beta_i (\Delta \log Y_n - \Delta \log Y_j) + \varepsilon_{ij}, \]

(1)

• estimates of \( \beta \)

Together with 95% confidence bands based on robust standard errors, for the nine economies displayed in Graph 1, on 15-year rolling samples, for four different specifications: one-year, five-year and ten-year differences in consumption and output, and in levels.

http://mbri.ac.ir/esa
Financial Internationalization (cnt.)

Asia ex-Japan risk sharing

Graph 3

<table>
<thead>
<tr>
<th>1-year differences</th>
<th>5-year differences</th>
<th>10-year differences</th>
<th>Levels</th>
</tr>
</thead>
</table>

- Estimated $\beta$ ---- 95% conf

* China, Hong Kong SAR, India, Indonesia, Korea, Malaysia, Philippines, Singapore and Thailand.
Financial Internationalization (cont.)

- The economies in emerging Asia are increasingly internationalized and integrated into global financial markets.
- So the scope for policymakers to use sterilized foreign exchange intervention to stabilize exchange rate movements may be becoming more limited.
- Increased financial openness reduces the possibility of sterilized intervention – where the exchange rate can be controlled without changing domestic interest rates – while leaving open the possibility of unsterilized intervention.
POLICY RESPONSES TO EXCHANGE RATES
Balance Sheet of Central Banks

• Management of exchange rate
  ➢ Traditional
  ➢ After crisis

• The need for foreign reserve is increased
Balance Sheet of Central Banks (cont.)

Change in composition of central bank assets in Asia, 2002–12
As a percentage of change in total assets

Graph 4

<table>
<thead>
<tr>
<th>CN</th>
<th>HK</th>
<th>ID</th>
<th>IN</th>
<th>KR</th>
<th>MY</th>
<th>PH</th>
<th>SG</th>
<th>TH</th>
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<td>-20</td>
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</table>

Foreign assets
Claims on government and public enterprises
Claims on private sector
Claims on banks
Claims on other financial sector entities

CN = China; HK = Hong Kong SAR; ID = Indonesia; IN = India; KR = Korea; MY = Malaysia; PH = Philippines; SG = Singapore; TH = Thailand.

Liability Side

• Only a small portion of the increase in foreign exchange reserves has been financed via an increase in the amount of currency in circulation.

• The case for sterilization
  increased required reserves and the issuance of sterilization instruments have been used to effectively sterilize the effects of the increase in foreign exchange reserves.
Liability Side (cont.)

Change in composition of central bank liabilities in Asia, 2002-12

As a percentage of change in total liabilities

http://mbri.ac.ir/esa

CN = China; HK = Hong Kong SAR; ID = Indonesia; IN = India; KR = Korea; MY = Malaysia; PH = Philippines; SG = Singapore; TH = Thailand.

° Reserves and deposits of banks.  ° Central bank bonds and securities.  ° Including other liabilities (foreign liabilities, loans and other net items) and equity capital.

New Issues

• Financial integration
  Asia is becoming more financially internationalized. Thus attempts to intervene in foreign exchange markets are increasingly likely to be offset by other market participants, so that policy measures fail to have their desired effect on exchange rates.

• Risk & cost
  already large holdings of foreign exchange reserves are very costly to the central banks in the region, and are only likely to become more so if reserves grow larger, as would occur if appreciation pressures remain dominant.
New Issues (cont.)

- Estimates of sterilisation costs and valuation losses from currency appreciation

<table>
<thead>
<tr>
<th>Country</th>
<th>FX reserves (USD billions)</th>
<th>Short-term rate (%)</th>
<th>Central bank equity</th>
<th>100% sterilisation cost</th>
<th>Valuation loss for a 10% appreciation of domestic currency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>3331.12</td>
<td>3.78</td>
<td>0.04</td>
<td>1.11</td>
<td>4.04</td>
</tr>
<tr>
<td>Hong Kong SAR</td>
<td>317.23</td>
<td>0.40</td>
<td>31.17</td>
<td>-0.31</td>
<td>12.30</td>
</tr>
<tr>
<td>India</td>
<td>270.59</td>
<td>8.74</td>
<td>0.07</td>
<td>0.73</td>
<td>1.39</td>
</tr>
<tr>
<td>Indonesia</td>
<td>106.04&lt;sup&gt;c&lt;/sup&gt;</td>
<td>4.92</td>
<td>2.02</td>
<td>0.64&lt;sup&gt;d&lt;/sup&gt;</td>
<td>1.18&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
<tr>
<td>Korea</td>
<td>323.21</td>
<td>2.89</td>
<td>0.88</td>
<td>0.90</td>
<td>2.81</td>
</tr>
<tr>
<td>Malaysia</td>
<td>137.75</td>
<td>3.21</td>
<td>0.01</td>
<td>1.22</td>
<td>4.48</td>
</tr>
<tr>
<td>Philippines</td>
<td>73.48</td>
<td>0.83</td>
<td>0.55</td>
<td>0.89</td>
<td>3.05</td>
</tr>
<tr>
<td>Singapore</td>
<td>259.09</td>
<td>0.31</td>
<td>20.49</td>
<td>-0.12</td>
<td>9.67</td>
</tr>
<tr>
<td>Thailand</td>
<td>173.33</td>
<td>2.93</td>
<td>2.61</td>
<td>0.98</td>
<td>4.60</td>
</tr>
</tbody>
</table>

<sup>a</sup> As a percentage of nominal GDP.  
<sup>b</sup> Provisions and other liabilities for SG; net worth or own capital for others.  
<sup>c</sup> Assumes entire FX reserve is invested in 1-3 year US government bonds and the funding rate is the domestic deposit rate.  
<sup>d</sup> As of September 2012.

Sources: IMF /IFS, Bloomberg; Datastream; BIS calculations.
AN OPEN ECONOMY MODEL
Model

- Financial integration (risk sharing)
- Home consumption bias
- Pricing of imported commodity (pass-through)
- Sterilized & unsterilized intervention
  - Taylor rule
  - Augmented Taylor rule (unsterilized)
  - Augmented Taylor rule + intervention (Sterilized)
  - Optimal Ramsey
Model (cont.)

\[
\left( \frac{C_t^{-\sigma}}{C_t^{*-\sigma}} \right) \left( \frac{S_t P_t^*}{P_t} \right) \lambda = 1.
\]

\[
C = (C_H)^{u/2} (C_F)^{1-u/2}.
\]

\[
\Delta(FR)_t = \left( S_{t-1} / S_t \right)^\chi.
\]
6th

RESULTS
Methodology

- Welfare function (Woodford 2003)
- Global welfare function
- Cooperative framework
- Monetary policy
  - Taylor rule
  - Augmented Taylor rule (unsterilized)
  - Augmented Taylor rule + intervention (Sterilized)
  - Optimal Ramsey
Methodology (cont.)

• Cost-push & productivity shock
  ➢ AR(1), persistence coef. = 0.9

• Varying parameters
  ➢ International risk sharing
  ➢ Short run pass-through
  ➢ Good market integration
## Variables

<table>
<thead>
<tr>
<th>Names</th>
<th>Description</th>
<th>Name</th>
<th>Description</th>
<th>Table 2 Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$c$</td>
<td>Consumption</td>
<td>$\sigma$</td>
<td>Inverse of elasticity of inter-temporal substitution</td>
<td>2.0</td>
</tr>
<tr>
<td>$p$</td>
<td>Price level</td>
<td>$\nu$</td>
<td>Home bias in consumption</td>
<td>1-2</td>
</tr>
<tr>
<td>$s$</td>
<td>Nominal exchange rate</td>
<td>$\theta$</td>
<td>Elasticity of substitution between different varieties of home (foreign) goods</td>
<td>11.0</td>
</tr>
<tr>
<td>$y$</td>
<td>Output</td>
<td>$\delta$</td>
<td>Share of imports that are LCP (remainder are PCP)</td>
<td>0-1</td>
</tr>
<tr>
<td>$\tau$</td>
<td>Terms of trade</td>
<td>$\lambda$</td>
<td>Degree of financial internationalisation</td>
<td>0-1</td>
</tr>
<tr>
<td>$\Delta$</td>
<td>Deviation from law of one price</td>
<td>$\chi$</td>
<td>Response of foreign exchange reserves to nominal exchange rate changes</td>
<td>0-∞</td>
</tr>
<tr>
<td>$\phi$</td>
<td>Foreign exchange reserves</td>
<td>$\beta$</td>
<td>Discount rate</td>
<td>0.99</td>
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<tr>
<td>$u$</td>
<td>Cost-push shock</td>
<td>$\kappa$</td>
<td>Degree of price stickiness</td>
<td>0.075</td>
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<tr>
<td>$a$</td>
<td>Productivity shock</td>
<td>$\phi$</td>
<td>Elasticity of labour supply</td>
<td>1.0</td>
</tr>
<tr>
<td>$\nu$</td>
<td>Welfare</td>
<td>$\xi$</td>
<td>Interest rate response to inflation</td>
<td>0-∞</td>
</tr>
<tr>
<td>$\gamma$</td>
<td></td>
<td>$\gamma$</td>
<td>Home interest rate response to the change in exchange rates</td>
<td>0-∞</td>
</tr>
</tbody>
</table>
Welfare effects of productivity shocks

Home bias ($\nu=1.5$)

Graph 6

Financially closed ($\lambda=0.0$)

Financially open ($\lambda=1.0$)

All outcomes are relative to the Ramsey policy.
Impulse responses to domestic productivity shock

$\lambda = 0.0, \ \delta = 0.5, \ \nu = 1.5$

Graph 7
Results

• In less internationalized financial market Taylor Rule + sterilized intervention is close to optimal Ramsey.

• there is little substitutability between sterilized and unsterilized intervention.

  ➢ This is because any improvement in outcomes with unsterilized intervention is the result of a trade-off: a single policy instrument (interest rates) is being used to respond to an additional variable.

  ➢ In welfare terms, that trade-off is barely worth making: the paths of all nominal and real variables are little changed whether the central bank responds only to inflation or to both inflation and exchange rate changes optimally.
Welfare effects of productivity shocks

Mixture of local and producer currency pricing ($\delta=0.5$)

Financially closed ($\lambda=0.0$)

Financially open ($\lambda=1.0$)

\[\text{Welfare} = \begin{cases} \text{Taylor} & \text{Goods market Integration}^b \\ \text{Taylor + sterilised} & \text{Goods market Integration}^b \\ \text{Taylor + unsterilised} & \text{Goods market Integration}^b \end{cases}\]

$^a$ Half of all import varieties are assumed to be priced in the local currency and half in the producer currency. $^b$ Goods market integration is defined as $2-n$. 

http://mbri.ac.ir/esa
Result 2

• Exchange rate intervention is welfare improving
• This results are robust due to financial integration
Cost Push Shock

Welfare effects of cost-push shocks

Home bias ($\nu=1.5$)

Graph 9

Financially closed ($\lambda=0.0$)

Financially open ($\lambda=1.0$)
Cost Push Shock

Welfare effects of cost-push shocks
Mixture of local and producer currency pricing ($\delta = 0.5$)

Financially closed ($\lambda = 0.0$)

Financially open ($\lambda = 1.0$)

- Half of all import varieties are assumed to be priced in the local currency and half in the producer currency.
- Goods market integration is defined as $2 - \nu$. 

http://mbri.ac.ir/esa
Reserve volatility

Welfare effects of productivity shocks with costly reserves volatility
Home bias ($\nu = 1.5$)

Graph 1

<table>
<thead>
<tr>
<th>$\lambda$</th>
<th>Welfare</th>
<th>Portion of Imports priced In local currency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td><img src="image" alt="Graph" /></td>
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<td>0.25</td>
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<td>0.50</td>
<td><img src="image" alt="Graph" /></td>
<td></td>
</tr>
<tr>
<td>0.75</td>
<td><img src="image" alt="Graph" /></td>
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</tbody>
</table>

Taylor | Taylor + sterilised | Taylor + unsterilised

http://mbri.ac.ir/esa
CONCLUSION
Conclusions

• Sterilized intervention can be a potent tool that offers policymakers an additional degree of freedom in maximizing global welfare.
  ➢ If goods markets are poorly integrated
  ➢ If exchange rate pass-through is high
• Unsterilized intervention is less effective
• Sterilized intervention
• the role of exchange rate movements in the optimal setting of monetary policy is decreasing across the region.
APPENDIX
\[ Y_t(i)^{pcp} = \left( \frac{P_{Ht}(i)}{P_{Ht}} \right)^{-\theta} \left[ \frac{\nu}{2} \frac{P_t}{P_{Ht}} C_t + \left( 1 - \frac{\nu}{2} \right)(1 - \delta) \frac{S_tP_t^*}{P_{Ht}} C_t^* \right], \] (21)
Welfare effects of cost-push shocks with costly reserves volatility
Home bias ($\alpha=1.5$)

Graph A1