Written Exam for the B.Sc. or M.Sc. in Economics, Winter 2013/2014

Advanced development economics: Applied Macroeconomics and Policy Analysis

Master's Course

09/01/2014

(3-hour closed book exam)

The exam has 9 pages in total (including this cover page)

ADVANCED DEVELOPMENT ECONOMICS: APPLIED MACROECONOMIC AND POLICY ANALYSIS

WINTER 2013/2014

MASTER'S COURSE EXAM

3HRS CLOSED BOOK

INSTRUCTIONS

- There are three primary questions in this exam.
- Each question has a set of sub-questions; these are labelled (a), (b), etc..
- You should attempt to answer all three questions and all corresponding sub-questions.
- When answering, please refer to the equations and notations given in the text (where relevant).
- Answers to each sub-question should be concise (i.e., relatively brief).

QUESTION 1

Overview

The text below summarises the method and results of an empirical investigation into the macroeconomic policy 'trilemma' for two countries -- China and India. It is taken from an article by Joshua Aizenmann & Rasjesawri Sengupta (2013), 'Financial trilemma in China and a comparative analysis with India', *Pacific Economic Review* 18(2):123-146.

The objective of the analysis is to trace the evolution of the financial trilemma in China and India over time from 1990 to 2010 and analyse the extent of the trade-offs faced by policy-makers in both countries. To do so, the authors calculate a trilemma index for each of the two countries separately, using a methodology developed for a cross-section of countries presented in Aizenman et al. (2008, 2011, 2013).

Data

The authors follow the methodology of Aizenman et al. (2008, 2011, 2013) in constructing indices for each of the trilemma policy objectives; namely, monetary independence, exchange rate stability and capital account openness. However, while Aizenman et al. analyse the trilemma configurations for a host of countries and study the associated implications, the authors do so individually for two key emerging market economies, China and India, and compare results. In order to have more observations in the data set and, hence, more time variation for a single country, the authors use quarterly data as opposed to annual data used in previous analysis.

The authors measure monetary independence (MI) as the reciprocal of the correlation of quarterly interest rates in the home country (here, China and India, respectively) and the base country (the United States). They calculate quarterly correlations using weekly interest rate data. The precise formula is as follows:

$$\mathrm{MI}_i = 1 - \frac{cor(i_i, i_j) + 1}{2} \tag{1.1}$$

where i_i is the interest rate in the home country and i_j is the interest rate in the base country. By definition, the index lies between 0 and 1. The highest value indicates the greatest degree of monetary independence.

The authors calculate the exchange rate (ES) index using quarterly standard deviations of the weekly change in the natural logarithm of the local currency unit–US$ exchange rate (in this case, the RMB-US$ exchange rate for China and the rupee-US$ exchange rate for India). The formula used for the construction of the index is as follows:

$$\mathrm{ES}_i = \frac{0.01}{0.01 + stdev(\Delta \ln(e_{ij}))} \tag{1.2}$$

where e_{ij} is the bilateral exchange rate. Like the MI Index, by definition, the ES index ranges from 0 to 1 and the higher the value the greater is the exchange rate stability.

The authors depart from Aizenman et al. (2008; 2013) for the construction of the capital account openness (KO) index. Instead of using the Chinn–Ito index (that gives a number between 0 and 1 for a country's financial openness), they use a simple *de facto* measure of capital account openness. They define the KO index as the ratio of the sum of inward and outward foreign investment flows to GDP. In doing so, they consider three types of capital flows: FDI, portfolio and others, as reported by SAFE for China and the IFS for India.

One drawback of this new approach to measuring capital account openness is that the KO index is not bound between 0 and 1 by definition. To resolve this, the authors rescale the KO index [rescaled index = (Actual index - Minimum value of the series)/(Maximum – Minimum of the series)], such that it lies between 0 and 1. Hence, the range of the rescaled KO index (used below) is comparable to that of the other two indices.

Methods

Following Aizenman et al. (2008; 2013), the authors employ a regression-based approach to test whether the trilemma is binding. Specifically, they regress a constant (value = 2) on all three indices at the same time, omitting an intercept term on the right-hand side of the equation. This yields the following linear specification:

$$2 = a_i \mathrm{MS}_{it} + b_i \mathrm{ES}_{it} + c_i \mathrm{KO}_{it} + \varepsilon_{\mathrm{it}} \tag{1.3}$$

where *i* refers to China or India; the parameters (coefficients) to be estimated are *a, b* and *c*.

Results

The main (baseline) results for each country – as per equation (1.3) -- are reported in Table 1.1. In addition, the authors split the sample into sub-periods and run separate regressions for each period. These results are reported in Tables 1.2 and 1.3, (for China and India respectively).

Table 1.1. Trilemma estimations: China and India, 1990–2010

Variables	China	India
MI	0.843** (0.383)	0.823*** (0.217)
ES	1.644*** (0.245)	1.837*** (0.137)
KO	0.190 (0.168)	1.000*** (0.315)
Observations	84	84
R2	0.974	0.926

Newey–West standard errors are in parentheses. ***p < 0.01, **p < 0.05, *p < 0.1. ES, index of exchange rate stability; KO, de facto capital account openness; MI, index of monetary independence.

Table 1.2. Baseline estimations for China: Truncating sample into sub-periods

Variables	1990Q1–1994Q1	1994Q2–1997Q4	1998Q1–2005Q3	2005Q4–2010Q4
MI	2.292*** (0.871)	0.388 (0.246)	0.222 (0.248)	0.119 (0.092)
ES	0.817*** (0.327)	1.550*** (0.253)	1.903*** (0.126)	2.310*** (0.125)
KO	0.748** (0.446)	0.419*** (0.166)	0.049 (0.075)	-0.233 (0.357)
Observations	17	15	31	21
R2	0.955	0.998	0.996	0.992

Newey–West standard errors are in parentheses. ***p < 0.01, **p < 0.05, *p < 0.1. ES, index of exchange rate stability; KO, de facto capital account openness; MI, index of monetary independence.

Table 1.3. Baseline estimations for India: Truncating sample into sub-periods

Variables	1990Q1–1994Q1	1994Q2–1997Q4	1998Q1–2005Q3	2005Q4–2010Q4
MI	0.442*** (0.166)	1.817*** (0.530)	0.197 (0.129)	1.315*** (0.408)
ES	1.760*** (0.187)	0.921*** (0.206)	2.235*** (0.144)	3.154*** (0.238)
KO	1.936* (1.088)	1.565*** (0.650)	0.534** (0.242)	-0.606 (0.404)
Observations	21	21	21	21
R2	0.899	0.938	0.980	0.955

Newey–West standard errors are in parentheses. ***p < 0.01, **p < 0.05, *p < 0.1. ES, index of exchange rate stability; KO, de facto capital account openness; MI, index of monetary independence.

Sub-questions

1.(a) What does the 'impossible trinity' (macroeconomic policy trilemma) refer to? In your answer, give examples of macroeconomic policy configurations that are **not** considered feasible under the trilemma hypothesis.

1.(b) Using your knowledge of international parity conditions, explain the theoretical rationale as to why the trilemma may be binding.

1.(c) With reference to the empirical test of the trilemma given by equation (1.3), what is the main hypothesis of interest?

1.(d) Comment on the strengths and weaknesses of the testing approach adopted by the authors.

1.(e) Interpret the results in Tables 1.1 to 1.3. In doing so comment on: what the results suggest about the macroeconomic policy stance (priorities) of China and India on average over the period; and how these choices have evolved over time (if at all).

1.(f) Briefly discuss what other factors (policy variables) may mitigate the extent to which the trilemma is binding for any given country.

QUESTION 2

Background

Consider the following situation: an analyst wishes to evaluate the behaviour of real exchange rates in developing countries. To investigate this, she uses the latest version of the Penn World Tables (v 8.0).

As a first stage of the investigation, she calculates the following two variables for use in further analysis:

$$ppp = \ln(P_d/P_f) = (p_d - p_f) \quad (2.1)$$

$$q_{df} = \ln(E_{df}) + \ln(P_f/P_d) = e_{df} + p_f - p_d \quad (2.2)$$

where *E* is the bilateral nominal exchange rate with the USA (expressed as the number of domestic currency units required to purchase one US Dollar); P_f is the general price level of GDP in the USA; and P_d is the domestic price level of GDP. Lower case variables indicate that a natural log. transformation has been applied.

As an attempt to assess whether Purchasing Price Parity (PPP) holds for a selection of individual countries, the analyst runs separate OLS regressions of the form:

$$e_{df} = \alpha + \beta(ppp) + \varepsilon \quad (2.3)$$

where α and β are parameters to be estimated; and ε is residual error. Results from this exercise for China, South Africa and Brazil are reported in Table 2.1.

As a next step, the analyst investigates whether the real exchange rate of these countries is over- or under-valued. To do so she runs the following OLS regression, using all countries in the sample over the period 1980-2011:

$$q_{df,t} = \alpha + \beta \ln\left({}^{y_{d,t}}/_{y_{f,t}}\right) + \gamma t + \delta t^2 + \varepsilon_t \quad (2.4)$$

where α, β, γ and δ are parameters to be estimated; t is a time index ranging from 0 (1960) to 31 (2011); $y_{d,t}$ is domestic real income per capita at time *t*; $y_{f,t}$ is real income per capita in the USA at time *t*; and ε is residual error. Results for these estimates are reported in Table 2.2.

Table 2.1: Summary OLS estimates of equation (2.3), for China, Brazil and South Africa

Parameter →	α		β		Summary statistics	
Country ↓	Coef.	(s.e.)	Coef.	(s.e.)	R-squared	RMSE
Brazil	0.384	(0.057)	0.991	(0.005)	0.999	0.256
China	1.229	(0.058)	0.813	(0.073)	0.806	0.247
South Africa	0.347	(0.053)	1.018	(0.045)	0.944	0.176

Note: '(Coef.)' is the estimated regression coefficient; '(s.e.)' gives the estimated standard error of the coefficient estimate; 'RMSE' is the root mean square error of the regression.

Table 2.2: OLS estimates of equation (2.4)

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Linear regression                                      Number of obs =     5105
                                                       F(  3,   166) =    41.52
                                                       Prob > F      =   0.0000
                                                       R-squared     =   0.2158
                                                       Root MSE      =   .44184
------------------------------------------------------------------------------
             |               Robust
           q |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    Constant |  -.0425949   .0496738    -0.86   0.392    -.1406688     .055479
      y_d/y_f|  -.1681385   .0245425    -6.85   0.000    -.2165942   -.1196828
           t |   .0353242   .0046048     7.67   0.000     .0262327    .0444157
          t2 |  -.0010073    .000132    -7.63   0.000    -.0012679   -.0007467
------------------------------------------------------------------------------
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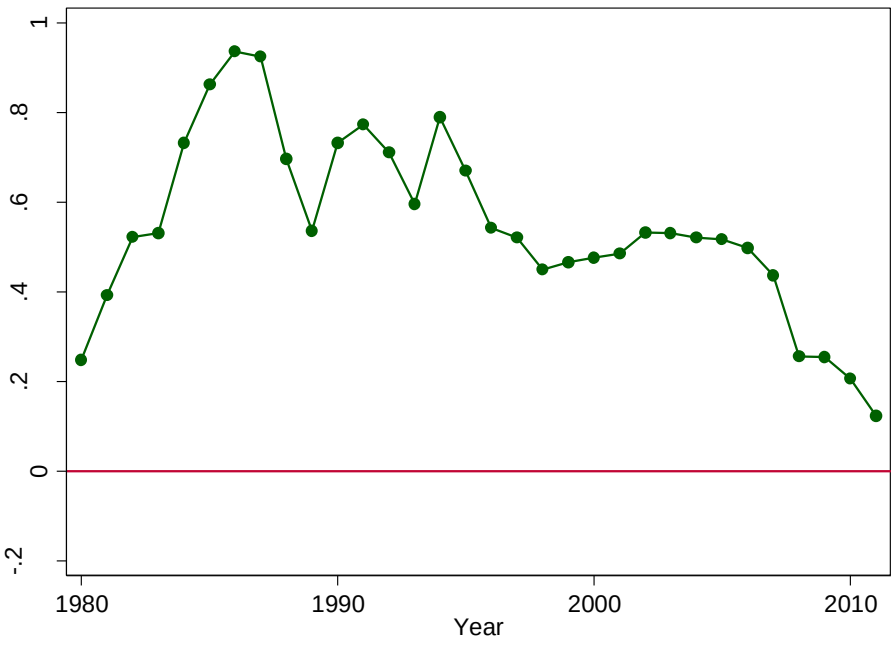
Figure 2.1: Estimates of Chinese exchange rate misalignment (based on estimates in Table 2.2)



Sub-questions

2.(a) Outline the theory of Purchasing Price Parity (PPP). Describe the assumptions required for PPP to hold in absolute form.

2.(b) Interpret the results in Table 2.1, making reference to the principal hypothesis being tested. Comment on the suitability of this approach as a means to test for PPP.

2.(c) What is the Balassa-Samuelson effect? Explain how equation (2.4) can be used to test for this effect as well as how it can be used to evaluate exchange rate misalignment.

2.(d) Briefly interpret the results of Table 2.2. Does it provide evidence for the Balassa-Samuelson effect?

2.(e) Figure 2.1 shows the results of estimates of exchange rate misalignment for the specific case of China. These are based on the cross-country estimates of Table 2.2 (equation 2.4). Interpret these findings and discuss whether they are consistent with other estimates of Chinese misalignment found in the literature.

2.(f) Why have Chinese authorities resisted letting their currency float freely? Does this have policy implications for other countries?

QUESTION 3

Sub-questions

3.(a) What are the primary instruments used by government to pursue (implement) monetary and exchange rate policies?

3.(b) Describe one way in which economists have attempted to estimate the welfare costs of inflation.

3.(c) Discuss the advantages and disadvantages of adopting a strict "inflation targeting framework" in lower income developing counties. (*You may wish to provide a slightly longer answer here*).