

Written Exam for the M.Sc. in Economics winter 2014-15

**Advanced development economics:  
Applied macroeconomic and policy analysis**

Master's Course

08 January 2015

(3-hour closed book exam)

Please note that the language used in your exam paper must correspond to the language of the title for which you registered during exam registration. I.e. if you registered for the English title of the course, you must write your exam paper in English. Likewise, if you registered for the Danish title of the course or if you registered for the English title which was followed by “eksamen på dansk” in brackets, you must write your exam paper in Danish.

**This exam question consists of 7 pages in total (including this cover page).**

**Advanced development economics: Applied macroeconomic and policy analysis**

**Exam**

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**INSTRUCTIONS**

- All questions (and associated sub-components) must be answered, in English.
- Each of the three questions makes the same contribution to the total grade.
- Percentages in square brackets after each question sub-component give the *approximate* weight of that sub-component within each question – e.g., 1(a) carries an approximate weight of 20% in question 1, or  $0.2/3 = 6.67\%$  overall.
- Remember to manage your time (3 hours).

**Question 1**

Read the material in Appendix A, which considers the impact of International Monetary Fund [hereafter, IMF] programs in developing countries. Making reference to this material (where appropriate), answer the following questions:

1(a) Describe, in general terms, the typical objectives of IMF stabilization programs.

[20%]

To understand the typical objectives of IMF stabilization programs, one must recall that the primary purpose of the IMF is to facilitate international trade and promote exchange stability. As such, an integral objective is to support members in their efforts to correct misaligned balance of payments positions without undermining the stability of the global economic system and/or national prosperity. It follows that typical objectives of IMF stabilization programs include support to:

- achieve a (more) sustainable balance of payments position;
- finance essential imports; and
- measures to achieve price stability / “normal” economic functioning.

Note that the immediate objective of IMF stabilization programs is typically not to stimulate growth and development *per se*, but rather is to provide minimum preconditions such that these goals might be achieved and to avoid economic destruction.

1(b) Outline the research question addressed by the author (in Appendix A) and the empirical strategy adopted.

[25%]

The author is interested in the extent to which principal-agent problems are associated with access to IMF credit. Specifically, the intuition is that access to IMF credit may induce agents (i.e., recipient governments) to adopt less

sustainable (unsound) macroeconomic policies precisely because they are aware they have access to IMF credit that can ameliorate the negative consequences (costs) of these policies. This is analogous to the moral hazard problem associated with insurance policies.

To test for the presence of moral hazard the author compares macroeconomic policies in two inter-program periods, which are defined as periods *between* the ending of one IMF program and the beginning of another. If moral hazard is present, the author suggests that metrics of these policies will be weaker/worse in the second inter-program period compared to the first. Implicitly, the logic is that after the first IMF program, the recipient has learnt that access to IMF is (easily) available and thus that the costs of pursuing poor policies are low(er).

Technically, the author undertakes a number of separate *t-tests* of metrics of differences in mean macroeconomic policies between the second and first inter-program periods. Observations are countries, for which there are 42 that provide data on two inter-program periods over the interval 1971-1997.

1(c) In light of your answer to question 1(b), interpret the main findings from the analysis reported in Appendix A Table A1.

[25%]

The results in Table A1 consistently indicate that macroeconomic policies (as defined and chosen by the author, see answer below) in the second period were consistently worse than those in the first period. For instance, the inflation rate in the second inter-program period was 0.1192 points higher, on average, in the second inter-program period. Similarly, reserves (as a % GDP) were 0.0116 points lower.

All t-tests reported are individually significant at the 5% level or below.

If we accept these tests are valid for testing for the presence of moral hazard, then the evidence from the table rejects the null hypothesis that there is no moral hazard in use / access to IMF credit.

1(d) Based on your knowledge of other literature on the impact of IMF and World Bank programs, evaluate the strengths and weaknesses of the empirical strategy pursued by the author in Appendix A.

[30%]

The strengths of the empirical strategy include (but are not restricted to):

- The author considers multiple outcomes, which are consistent with and relevant to the typical objectives of IMF stabilization programs (as opposed to just growth).
- The approach is simple and transparent.
- The approach is quite innovative in the sense that it focuses on differences *between* inter-program periods for individual countries, as opposed to investigating simple before/after comparisons or treatment/control groups. To some extent this avoids problems associated with unobserved country-specific fixed factors that may lead to the adoption of IMF programs,

The weaknesses of the empirical strategy include (but are not restricted to):

- The author does not consider or attempt to correct for the endogeneity of IMF programs. This arises in various forms here. The key point is that countries adopt IMF programs because macroeconomic *outcomes* are unsound. By construction, the author only considers countries that have had at least two programs rather than those that have had just one (either successfully completed or have been continuously under a program). This is a selective sample for which the author does not correct. A further aspect of this problem is that macroeconomic *outcomes* are not uniquely attributable to *policies* – external shocks (which were prevalent during the 1970s and 1980s) and can well provoke a deterioration in macroeconomic outcomes, regardless of the policy stance. Minimally, some controls for these external determinants of outcomes should be used.
- In keeping with the previous point, it is not clear how or why the adopted metrics reflect unsound *policies* as opposed to poor outcomes.

- The author undertakes multiple tests, which are unlikely to be independent. Thus, some correction for multiple testing is necessary.

## Question 2

Consider the material in Appendix B, which is taken directly from Rao et al. (1999). Table B1 is a macroeconomic consistency matrix for India (1999-1998). Column and row 10 of Table B2 is a sub-total of the capital account entries.

For reference purposes, Table B2 is a general macroeconomic Social Accounting Matrix on the same form as Table B1. Note that  $G$ ,  $P$  and  $E$  refer to the government, the private sector and the external sectors respectively; a “ $\delta$ ” preceding any variable denotes a one period change.

Answer the following questions:

2(a) Calculate the values of the following national accounting entities from Table B1:

- (2a1) GDP at market prices;
- (2a2) the trade balance as a share of GDP; and
- (2a3) foreign exchange reserves in months of imports.

[20%]

2a1. GDP at market prices:

$$\begin{aligned} &= C_g + C_p + X + I_g + I_p - Z \\ &= 225491 + 866975 + 163711 + 128467 + 246873 - 219006 \\ &= 1412511 \end{aligned}$$

2a2. Trade balance as a share of GDP:

$$\begin{aligned} &= X - Z / \text{GDP} \\ &= (163711 - 219006) / 1412511 \\ &= -0.03915 \\ &\approx -4\% \end{aligned}$$

2a3. Foreign exchange reserves in months of imports cannot be calculated from the SAM, as the latter only counts flows. However the *change* in reserves can be calculated, as follows:

$$\begin{aligned} &= 12 * \delta R * / (Z) \\ &= 12 * 16654 / 219006 \\ &= 0.9125 \\ &\approx 1 \end{aligned}$$

2(b) Using the notation in Table B2, formally define the *intra*-temporal government budget constraint.

[20%]

The intra-temporal government budget constraint connects the current and capital account identities.

The current account identity (total current income = total current expenditure) is given from the entries in C2 and R2 of Table B2. Ignoring all subscripts this is given by:

$$Y_{mp} + T_d + NTR = C + N_p + INV + S$$

Simplifying, this yields an expression for income as current expenditure + savings:  $Y = CEXP + S$

The capital account identity (change in assets = change in liabilities) is given by the entries in C6 and R6. Ignoring all subscripts this is given by:

$$S + \delta B + \delta F + \delta DC = I$$

Putting these expressions together yields:

$$Y_{mp} + T_d + NTR = C + Np + INV + I - (\delta B + \delta F + \delta DC)$$

$$Y = CEXP + I - (\delta B + \delta F + \delta DC)$$

$$(\delta B + \delta F + \delta DC) = (CEXP + I) - Y$$

The final line says that the net change in assets/liabilities (LHS) is equal to total public expenditures ( $CEXP + I$ ) minus total government income ( $Y$ ).

2(c) What were the main sources of financing of the government's budget deficit in India 1997-98?

[20%]

The gross budget deficit is the excess of total expenditure over income. Thus, the sources of a budget deficit must be increases in net liabilities. According to the SAM (also see above) the main *potential* sources of such financing are net direct borrowings from the private sector ( $\delta B$ ), net foreign borrowings ( $\delta F$ ), and borrowings from the monetary system (commercial and central banks,  $\delta DC$ ).

The budget deficit for the period shown was equal to 112554 (Rs crore), and the shares of the deficit attributable to the three components were:  $\delta B = 60\%$ ;  $\delta F = 3\%$ ;  $\delta DC = 37\%$ . Thus, one concludes that domestic sources of financing were most important, among which direct financing from the private sector (e.g., emission of government bonds) contributed the majority.

2(d) Discuss both the validity and potential policy applications of macroeconomic consistency matrices (Social Accounting Matrices) in low income settings.

[40%]

From a theoretical perspective, macroeconomic consistency matrices are true or valid 'by definition' – i.e., they contain no behavioural assumptions and simply reflect accounting definitions and identities. However, concerns regarding their validity arise when one moves from theory to practice. It is well established (e.g., Jerven, 2012) that national accounts of low income countries contain often serious discrepancies and provide a partial or imperfect picture of the underlying real economy. This has been demonstrated by the recent rebasing of national accounts in various African countries (e.g., Kenya, Nigeria, Ghana, Tanzania, Uganda), which has led to large increases in stated *levels* of GDP in each case. The relevant point here is that the validity or accuracy of entries in the SAM cannot be taken for granted and some entries (e.g., national accounts) may be more prone to error than others.

In light of the above, an important policy application of SAMs is to provide an internally consistent snapshot of the economy. That is, a statistical snapshot ensures consistency across different sources – e.g., government accounts, national accounts, monetary statistics. Typically, these different sources will not immediately reconcile, implying effort must be expended to balance the row and column totals. This can help pinpoint specific errors or inconsistencies.

A second critical application of (macroeconomic) SAMs is that, as a snapshot of the key sectoral inter-relations (flow of incomes) in the economy, it captures critical aspects of the structure of the economy. For instance, it highlights where specific liabilities are being accrued and to whom. As such, it provides a useful analytical basis to understand potential vulnerabilities in a given economy. These can be used to inform country-specific risk analysis and identify specific accounts (cells) that should be tracked in real time.

The other main uses of SAMs are as empirical foundations for a range of (equilibrium) economic models. These include basic multiplier analysis as well as dynamic computable general equilibrium models.

### Question 3

Consider the following scenario: You work as a country analyst for an investment bank covering Zimbabwe. Zimbabwe is facing a large current account deficit, which was equal to 30% of GDP in 2013. The real effective exchange rate (REER) index for the same period was 85 (relative to a base year of 2005=100). You have been asked to estimate the equilibrium REER that is consistent with a medium-term current account balance target of zero (percent of GDP).

Answer the following questions:

(3a) Define the bilateral real exchange rate (RER) and show how this captures aspects of internal and external balance.

[25%]

A bilateral real exchange rate is typically defined as a ratio of foreign to domestic price levels. More specifically it can be defined as:

$$Q = E P_f / P_d$$

Where E is the bilateral nominal exchange rate,  $P_f$  is the foreign price level (index) and  $P_d$  is the domestic price level.

To see how this captures aspects of *both* internal balance (domestic price stability, associated with domestic output being at or around potential) and external balance (associated with current account sustainability) define each price as being composed of traded and non-traded goods. In logs:

$$p_f = \alpha_f p_{fN} + (1 - \alpha_f) p_{fT}$$

Thus, without loss of generality, assuming  $\alpha_f = \alpha_d = \alpha$ , gives:

$$q = e + \alpha p_{fN} + (1 - \alpha) p_{fT} - [\alpha p_{dN} + (1 - \alpha) p_{dT}]$$

$$q = (e + p_{fT} - p_{dT}) - \alpha [(p_{fT} - p_{fN}) - (p_{dT} - p_{dN})] \dots (1)$$

An alternative expression is:  $q = (1 - \alpha_f) q_T + \alpha_f q_N \dots (2)$

Equations (1) and (2) show that the RER is composed of traded and non-traded price components. If there is serious misalignment in the former, one would reasonably expect the current account to be misaligned. For instance, a serious over-appreciation of the RER would typically be associated with an excessive current account (trade) deficit and thus external imbalance. Equally, for a small open economy, persistent and/or increasing misalignment between domestic and foreign prices is often symptomatic of some form of internal imbalance. For example, excess domestic inflation ( $p_{dN} > p_{dT}$ ) can be generated by excess government spending leading to high levels of domestic demand.

(3b) Assuming that you have access to estimates of export and import elasticities for Zimbabwe (i.e., the elasticity of export supply and import demand to changes in the REER), explain how one can use these elasticities to calculate the required magnitude of adjustment of the real exchange to achieve a current account target (norm) of zero.

[25%]

The most practical approach is to assume that adjustment of the current account to its target occurs *only* through the trade balance (*TB*). An expression for the (semi-)elasticity of the current account as a share of GDP to relative changes in the RER (*Q*) is derived as follows:

$$P_d TB = P_d X - P_f E_d M$$

$$TB = X - QM$$

$$\frac{TB}{y} = tb = x - Qm$$

Where *y* is real GDP such that nominal income is defined as  $Y = y P_d$ .

Using the final expression above and taking the (total) derivative with respect to *Q*:

$$\frac{\partial tb}{\partial Q} = \frac{\partial x}{\partial Q} - m - \frac{Q \partial m}{\partial Q}$$

$$\frac{\partial tb}{\partial Q/Q} = \frac{\partial x}{\partial Q} Q x/x - mQ - \frac{Q \partial m}{\partial Q} Q m/m$$

$$\frac{\partial tb}{\partial Q/Q} = x \epsilon_x - mQ(1 + \epsilon_m)$$

$$\frac{\partial tb}{\partial Q/Q} = x \epsilon_x - (x - tb)(1 + \epsilon_m)$$

$$\partial tb / \partial Q/Q = x(\epsilon_x - \epsilon_m - 1) + tb(1 + \epsilon_m) \dots (3)$$

where  $\epsilon_x$  is the supply elasticity of exports (to the exchange rate) and  $\epsilon_m$  is the demand elasticity of imports.

It follows that the estimated relative (%) change in  $Q$  that is necessary to achieve a specific absolute change in the trade balance as a share of GDP (current account) is given by the value of this change divided by the value of the sum of the terms on the RHS of equation (3).

(3c) Give possible reasons why policy-makers in Zimbabwe may not wish to pursue a strategy of real exchange rate devaluation, despite facing a current account deficit.

[25%]

Four of the main reasons are as follows:

- As shown in the answer to 3b, it may be the case that the trade balance contracts as a share of GDP despite a devaluation. This would be because the price effect (on imports) outweighs the quantity effect (on net exports). This mechanism is associated with a failure of the Marshall-Lerner conditions to hold.
- The above mechanism is one part of what is described as a contractionary devaluation – i.e., GDP falls in response to the devaluation. More generally, if short- and medium-term losses associated with a devaluation (e.g., unemployment) are politically or socially unacceptable, this may produce significant resistance to a devaluation. This point may be particularly relevant in Zimbabwe – when the country is reliant on food imports then significant devaluations can lead to social unrest.
- High levels of exchange rate pass through would imply that a (large) devaluation would lead to an increase in inflation, with possible distributional consequences depending on the structure of imports (see above).
- High levels of liability dollarization would imply that a devaluation leads to higher costs of debt financing, which in extreme circumstances could destabilize the banking system and/or provoke sovereign default.

(3d) Building on your previous answers, discuss the potential benefits and risks (for developing countries) of employing a fixed exchange rate or currency peg. Make reference to the experience of specific countries / examples in your answer.

[25%]

Fixed exchange rates come in various forms, the extreme case being the full adoption of a foreign currency as legal tender.

The benefits of fixing the exchange rate include (but are not restricted to):

- To the extent that the fix is credible then the (stable) exchange rate serves as a nominal anchor and the domestic economy effectively imports the monetary policy and price stability of the foreign currency (which one assumes is that of a more advanced/credible/competent government). In so doing the domestic Central Bank has “tied its hands” and inflation expectations are no longer influenced by potential domestic monetary policy shocks. A prime example of the benefits of imported monetary policy is Zimbabwe: once the Zimbabwean dollar was abolished as legal tender hyperinflation was rapidly terminated.
- Associated with the previous point, fixing the exchange rate can reduce the volatility of output if nominal (monetary) shocks are typically larger than real shocks (see Calvo, 1999).
- When the exchange rate is used as the nominal anchor for monetary policy this has the advantage that it is a highly visible and homogeneous price measure. Evidence from across developing countries indicates that domestic prices are far from homogeneous across space (e.g., Mozambique); this makes measures of a single “inflation target” rather abstract.



- The previous points refer to macro monetary policy benefits. A range of micro-benefits also accrue from adopting a credible, fixed (highly stable) exchange rate. These include reduction of trade transaction and hedging costs as well as lower uncertainty for investors.
- A final benefit is that a fixed exchange rate can assist domestic agents raise external debt financing. However, this (almost) inevitably leads to liability dollarization, which may “lock in” the fix permanently.

The primary risks of fixing the exchange rate include (but are not restricted to):

- Trivially, microeconomic benefits from fixing the exchange rate assume it is fixed at a reasonably competitive and sustainable position. If this is not the case, then macroeconomic (external) imbalances may emerge.
- Associated with the previous point, under a fix all external adjustment (e.g., to terms of trade shocks) must occur through domestic prices (internal devaluation). This is not necessarily problematic IF domestic prices are flexible. However, this is not typically the case – e.g., wages. Thus, adjustment can be particularly painful or even delayed leading to an accumulation of vulnerabilities. Examples of these problems have been evident when countries eventually “break” currency pegs or exit currency unions. Argentina is a case of the former, present discussions around Greece is a case of the latter.
- Fixing the exchange rate naturally implies the country no longer complete monetary policy sovereignty (and a lower capacity of the Central Bank to act as lender of last resort). This is not necessarily a problem to the extent that business cycles are synchronized (with the foreign currency economy). In turn, this connects to the difficulty of choosing the appropriate currency with which to “fix” (e.g., for Zimbabwe: the Rand vs the dollar).

## Appendix A: Material for Question 1

The following is an edited excerpt taken from Evrensel (2002), 'Effectiveness of IMF-supported stabilization programs in developing countries', *Journal of International Money and Finance* 21: 565-587

“

... The issue of moral hazard regarding IMF-supported programs implies the possibility that the governments of program countries may adopt unsustainable macroeconomic policies due to the availability of IMF credit. If stabilization programs created moral hazard, this would be inconsistent with the effectiveness of stabilization programs. Moreover, one would expect that inter-program periods [, defined as intervening periods between the conclusion of one Fund-supported program and the start of another,] would be associated with increasingly unsustainable macroeconomic policies as the number of programs a country receives increases. If a country has had IMF support before, the cost of macroeconomic policies that lead to the depletion of international reserves may be lower to the country.

... [T]here are only 42 countries for which two inter-program periods can be identified during the period 1971-1997. Table 1 shows the results of a temporal inter-program analysis. [This employs a set of *t*-tests to investigate the difference in means of the policy variables between the first and second inter-program periods]. ... The results of the temporal inter-program analysis should be interpreted in a strict all-else-equal sense.

”

Table A1. Temporal inter-program analysis

Policy variables <sup>a</sup>	Second vs. first inter-program period		
	Difference	<i>t</i> -value	Change with respect to the earlier period <sup>b</sup>
Reserves	-0.0116	-2.7245	Smaller***
Domestic credit	0.1639	4.1875	Larger***
Inflation rate	0.1192	3.5838	Higher***
Budget deficit	0.0126	1.7148	Larger*
Net domestic borrowing	0.0449	2.5896	Larger**
Net foreign borrowing	0.0078	2.8405	Smaller***
Net domestic debt	0.1922	2.683	Larger***
Net foreign debt	0.2757	3.3762	Larger***

<sup>a</sup> Policy variables are expressed as percentage of GDP except for the inflation rate.

<sup>b</sup> \*, \*\*, \*\*\* denote 10, 5, and 1% level of significance, respectively.

## Appendix B: Material for Question 2

Table B1. SAM for India (1997-98)

Sources (Across) and Uses (Down)	Current Account of					Capital Account of					Total
	(C1) National Accounts	(C2) Government Sector	(C3) Private Sector	(C4) External Sector	(C5) Monetary Sector	(C6) Government Sector	(C7) Private Sector	(C8) External Sector	(C9) Monetary Sector	(C10) Total Investment	
National Accounts (R1)		$C_g = 225491$	$C_p = 866975$	$X = 163711$		$I_g = 128467$	$I_p = 246873$			$I = 375340$	1631517
Government sector (R2)	$Ymp_g = 283818$		$Td = 69931$	$NTR_{eg} = 1305$							355054
Private sector (R3)	$Yfc_p = 1128693$	$Np_{gp} = 111292$		$NER_{cp} = 42639$							1282624
External sector (R4)	$Z = 219006$	$INV_{ge} = 2358$	$INV_{pe} = 10846$								232210
Monetary sector (R5)											
<i>Savings and borrowing of:</i>											
Government sector (R6)		$S_g = 15913$					$\delta B = 67201$	$\delta F_g = 3353$	$\delta DC_g = 42000$		128467
Private sector (R7)			$S_p = 334872$					$\delta F_p = 37856$	$\delta DC_p = 55882$		428610
External sector (R8)				$CAD = 24555$					$\delta R^* = 16654$		41209
Monetary sector (R9)							$\delta M = 114536$				114536
Total savings (sum of previous 4 rows (R10))		$S_g = 15913$	$S_p = 334872$	$CAD = 24555$							375340
Total	1631517	355054	1282624	232210		128467	428610	41209	114536	375340	

Table B2. Generic Social Accounting Matrix (consistency matrix) [table excludes row &amp; column totals]

Sources (Across) and Uses (Down)	Current Account of:					Capital Account of:				
	(C1) National Accounts	(C2) Government Sector	(C3) Private Sector	(C4) External Sector	(C5) Monetary Sector	(C6) Government Sector	(C7) Private Sector	(C8) External Sector	(C9) Monetary Sector	(C10) Total Investment
National Accounts (R1)		Government Consumption (Cg)	Private Consumption (Cp)	Exports of goods and services (X)		Gross Govt. Investment (Ig) or ( $\delta K_g$ )	Gross Private Investment (Ip) or ( $\delta K_p$ )			Total Investment (Gross) (I) or ( $\delta K$ )
Government Sector (R2)	Net Operating Surp of G plus Dep <sub>g</sub> plus Indirect Taxes less Subs [OSg + Dg + (Ti-Sb)]		Direct Taxes (Td)	Net Transfers from E to G (NTReg)						
Private Sector (R3)	Wages plus Net Profit accruing to P plus Dep <sub>p</sub> [(W + $\pi$ ) + Dp]	Net G transfers to P & Interest on Dom. Debt [NTRep + NFPe]		Net transfers and factors payments from E to P [NTRep + NFPe]						
External Sector (R4)	Imports of goods and services (Z)	Inv inc of E from G including interest payment (INVge)	Inv inc of E from P including interest payment (INVpe)							
Monetary Sector (R5)										
Savings and Borrowings of:										
Government Sector (R6)		Gross Government Savings (Sg)					Net change in G borrowings from P ( $\delta B$ )	Net change in Foreign borrowings of G ( $\delta F_g$ )	Change in Domestic Credit to G ( $\delta DC_g$ )	
Private Sector (R7)			Gross Private Savings (Sp)					Net change in E borrowing of P ( $\delta F_p$ )	Change in Dom Credit to P ( $\delta DC_p$ )	
External Sector (R8)				E Savings or CAD of the Domestic Economy					Change in Foreign Exchange Reserves ( $\delta R^*$ )	
Monetary Sector (R9)							Change in Broad Money plus other liabilities ( $\delta M$ )			
Total Savings (Sum of 4 Rows) (R10)		Gross Government Savings (Sg)	Gross Private Savings (Sp)	Current Account Deficit (CAD)						