

Online Course on Debt Sustainability Analysis (DSAX)

Part 1: Principles of Debt Sustainability

DSAx Part 1:

Principles of Debt
Sustainability

Part 1 Unit 1:

Learning Objectives and
Structure of Part 1

Learning Objectives of Part 1

- ✓ Learn about key concepts of debt sustainability analysis
- ✓ Understand the dangers of high debt
- ✓ Derive debt dynamics for different types of debt
- ✓ Discuss the role of fiscal adjustment and other macroeconomic policies

Structure of Part 1

- ✓ Unit 1: Overview
- ✓ Unit 2: Defining debt sustainability
- ✓ Unit 3: Why is debt sustainability analysis important?
- ✓ Unit 4: Public debt sustainability in a closed economy: part 1
- ✓ Unit 5: Debt dynamics Public debt sustainability in a closed economy: part 2

Structure of Part 1

- ✓ Unit 6 Public debt sustainability in an open economy
- ✓ Unit 7 Chipping away at public debt (Adjustment paths and their implications)
- ✓ Unit 8 Role of macroeconomic policies
- ✓ Unit 9 External debt sustainability: part 1
- ✓ Unit 10 External debt sustainability: part 2

Part 1 Unit 2:

Defining Debt Sustainability

UNIT OBJECTIVES

- ✓ Understand the concept of sustainability
- ✓ Master the relevant terminology
- ✓ Identify relevant indicators of solvency and liquidity
- ✓ Familiarization with various types of DSA conducted by the IMF/World Bank

UNIT OUTLINE

- ✓ Debt sustainability from different angles
- ✓ Debt burden indicators
- ✓ Introduction to IMF/World Bank Debt Sustainability Analysis (DSA)

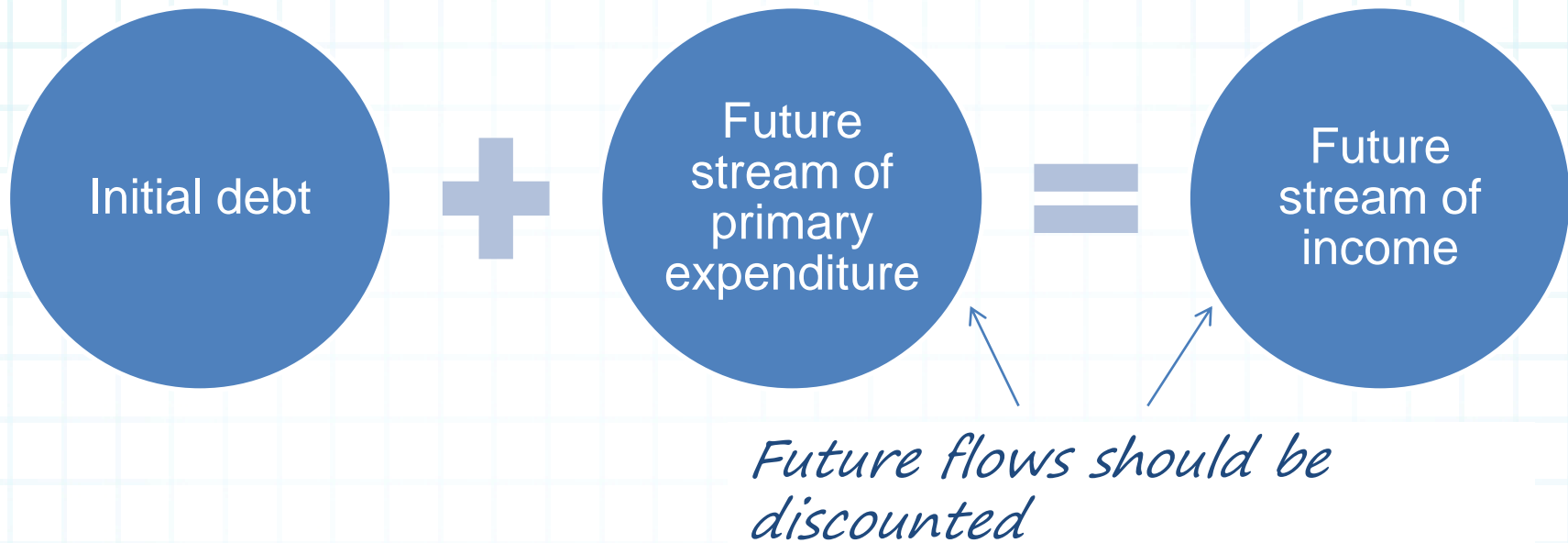
Part 1 Unit 2: Lecture 1

What is Sustainability?

OUTLINE

- ✓ Debt Sustainability from Different Angles:
 - 📌 Academic
 - 📌 Pragmatic

Intertemporal Solvency Condition



- ✓ Primary expenditure = Expenditure – Interest expenditure
- ✓ Discounting: refers to calculating the present discounted value

Intertemporal Solvency Condition

- ✓ When a government, business or individual is solvent, it is able to service its current debt out of future income or surpluses. A person with a small debt and large future income is solvent.
- ✓ Example: Consider a business with debt of \$20,000 and a prospect of annual profits of \$10,000. The business is solvent as this debt can be serviced from future profits.

Intertemporal Solvency Condition

- ✓ A counter-example is a Ponzi-scheme. In such schemes, initial debt is serviced by relying on new investors, rather than serviced out of future surpluses.

Solvency is

“very much like honesty:
it can never be fully certified,
and proofs are slow to materialize.”

Guillermo Calvo

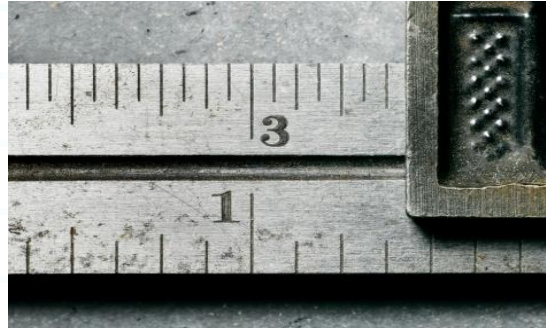
Academic Definition of Debt Sustainability

Debt is sustainable if the intertemporal solvency condition is satisfied, that is, if the expected present value of future primary balances covers the existing stock of debt.

The ability to
postpone generating primary surpluses
to cover for the existing debt obligations
into the future
makes solvency
a relatively weak requirement

Academic Perspective

Precise



Unobservable



Forecasting
Future



Pragmatic Definition of Debt Sustainability

Debt is sustainable if projected debt ratios are stable or decline, while also being sufficiently low.

Debt is unsustainable if projected debt ratios increase or remain high.

Pragmatic Definition of Debt Sustainability

Pragmatism consists in recognizing that the ratio of debt to capacity to pay is what matters in order to avoid a debt crisis.

To be sustainable, debt cannot grow faster than incomes and the capacity to repay it.

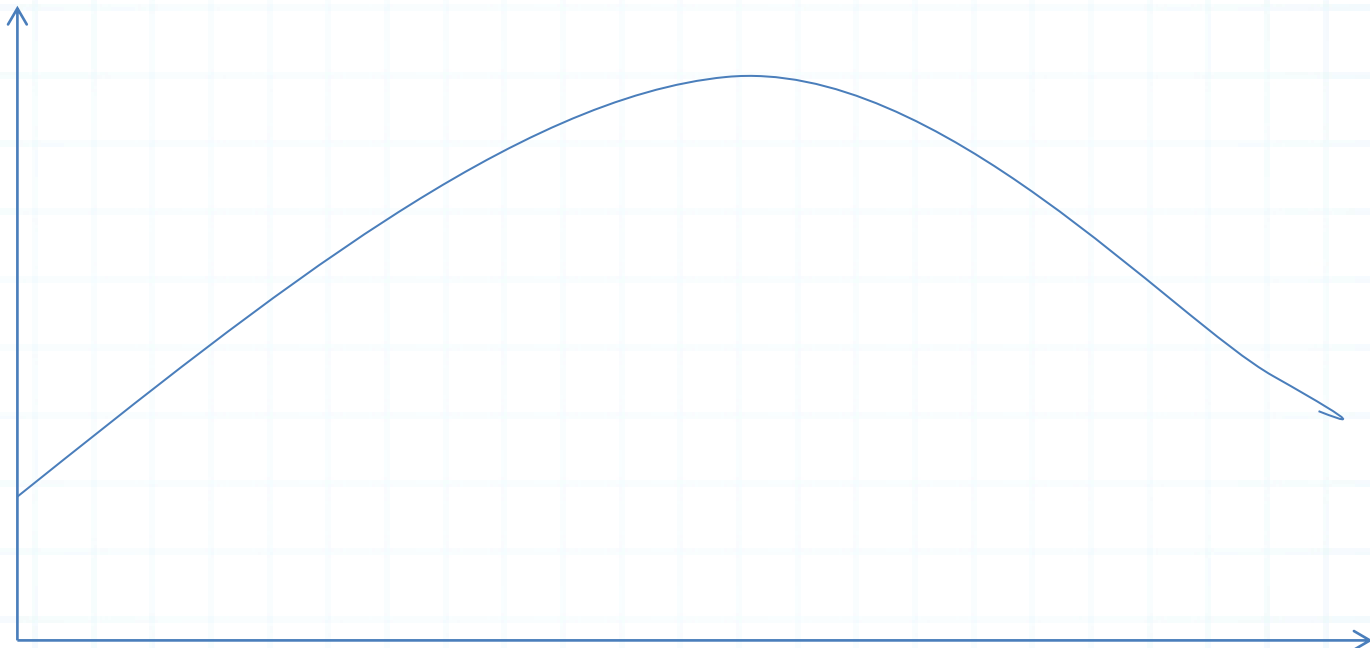
Pragmatic Definition of Debt Sustainability

Another aspect of pragmatism is to recognize that economies are subject to shocks.

A debt ratio which is declining but high can still be unsustainable if it associated with a high risk of default.

Example of Pragmatic View of Sustainable Debt

Debt/GDP



Time

Taking Solvency Condition to the Data

Solvency vs. Non-explosive Debt Ratios:

- ✓ Useful result when interest rates are higher than the growth rate:

if the ratio of debt to GDP is either stable or declining in the long run, the solvency condition is automatically met.

Risks to Sustainability

The projected trajectory and the level of debt should be based on realistic assumptions about the underlying macroeconomic variables

The resulting gross financing needs have to be evaluated

The market perception of the sovereign risks has to be factored in based on debt maturity structure, its currency composition, its creditor base, etc.

Part 1 Unit 2: Lecture 2

Define Debt Sustainability

OUTLINE

- ✓ Debt Sustainability from Different Angles:
 - 📌 Economic Policy Definition

Economic Policy Definition of Debt Sustainability

Debt is sustainable if the country (or its government) does NOT, in the future, need to default or renegotiate or restructure its debt or make implausibly large policy adjustments.

Default

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Today's

September 19, 2004 11:14 pm

Argentina nears \$100bn debt default agreement

By Adam Thomson

Argentina's battle to get bondholders to accept the largest sovereign debt reduction in the history of capitalism is almost won.

Wall Street analysts and, privately, some bondholder representatives agree that most of the country's creditors would accept a proposal to restructure about \$100bn in defaulted debt that offered recovery values of a little over 30 cents in the dollar. That is just above the price of defaulted bonds on the secondary market.

Debt Restructuring

EU Economy

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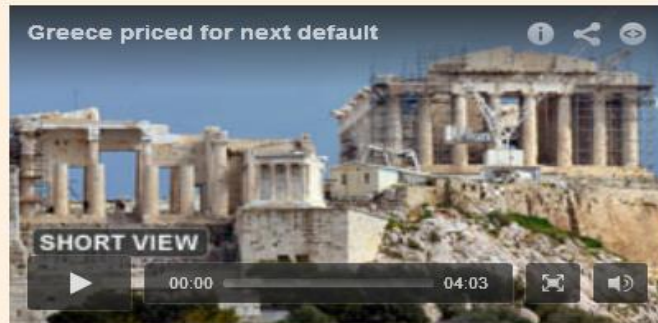
Last updated: March 8, 2012 10:22 pm

Greek debt swap support close to 95%

By Richard Milne in Oslo, Kerin Hope in Athens and Peter Spiegel in Brussels

The **largest debt restructuring in history** was heading for a successful outcome last night as Greece looked set to see a participation rate of close to 95 per cent for its €206bn bond exchange.

One person involved in the deal said that more than 90 per cent and possibly more than 95 per cent of investors had taken part, assuming collective action clauses (CACs) were used to bind dissenting holders of some bonds.



▶ More video

“PSI is a success. Will it exceed 95 per cent? There is a good chance,” the person said. A Greek cabinet minister said: “It will be good news tonight.”

The Greek government will announce the official results of its two-week campaign to win over private holders of its debt early on Friday morning. But late on Thursday night bankers and senior Greek officials briefed in the results said an overwhelming majority of investors had voted in favour of the deal, which will see them suffer

MARKETS INSIGHT

March 7, 2012 9:49 pm

Greek deal will buy time but hard work lies ahead

By Richard Milne

It is as complex as it is big. Greece’s €206bn debt restructuring has left people drowning in a sea of figures, struggling to make sense of the deal.

Investors will get up to 24 new securities for each existing bond, a 66 per cent threshold for use of so-called “collective action clauses” but a 50 per cent quorum, and a participation rate that needs to be 95 per cent – or is it 90 or 70 per cent instead? Confused?



More

ON THIS STORY

[Greece inches closer to €206bn debt deal](#)

[Bondholders in stand-off with Athens](#)

[Investors help Athens over bailout hurdle](#)

[The Short View Greece ditto Argentina](#)

[Video No PSI for Portugal](#)

MARKETS INSIGHT

[Prompt action required on eurozone deflation](#)

[Debt crisis has left Germany vulnerable](#)

[Curse of euro lands ECB in tricky dilemma](#)

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The simple fact is that, for all its complexity, Greece has structured this deal so that it is likely to be reasonably successful. Retroactively inserting collective action clauses, which allow the decision of a majority of bondholders to bind all investors, may seem unfair to holdouts. But it all but ensures that Greece will be able to get all its Greek law bondholders to take part, giving it about 86 per cent participation.

The question will then be to see how many international law bonds, which account for the other 14 per cent of the €206bn, are tendered in the exchange. It is unlikely enough will be tendered to reach the 95 per cent the International Monetary Fund has said is necessary to get Greece’s debt down to 120 per cent of gross domestic product by 2020.

Greece has threatened not to pay any international law holdouts at all. That would open the way for a legal battle. But it also raises the prospect that Athens could raise more money than expected by simply not paying some bondholders.

Policy Adjustments

Last updated: November 8, 2012 10:09 am

Athens narrowly passes austerity bill

By Kerin Hope in Athens



The Greek parliament narrowly approved a [fresh austerity package](#) on Wednesday night, opening the way for international lenders to transfer a long-delayed €31.5bn slice of funding and take steps to ease the terms of the country's €174bn bailout.

Lawmakers barely voted for to 128 votes against. There were 18 abstentions. Parties forming the coalition government.



More

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- ['Lagarde list' journalist faces retrial](#)
- [Protesters disrupt Greek-German meeting](#)
- [Greece's recession deepens amid austerity](#)
- [Editorial Europe plays a Greek shell game](#)
- [IMF and eurozone split over Greece](#)

ON THIS TOPIC

- [Troika sees €2bn fiscal gap in Greek budget](#)
- [Analysis Third time lucky? The latest Greek rescue](#)
- [Slideshow How the latest bailout may play out](#)

Antonis Samaras, the center-right leader, said he would remain a member of the coalition government, but he said the country's economic isolation, collapse into bankruptcy and the devaluation of the drachma.

Provided parliament back another vote due on Sunday, ministers are expected to vote on Greece's bailout loan on Monday. The vote still have to be endorsed by the European Parliament.

The vote was held after a series of measures, including cuts in pensions and public sector wages, fuel and cigarettes, and health care. The retiree unions have been protesting for recent entrants to the

8/20/13

Dutch mood shifts against austerity and the EU - FT.com

FINANCIAL TIMES

August 8, 2013 5:35 pm

Dutch mood shifts against austerity and the EU

By Matt Steinglass in The Hague



The Netherlands' parliament is empty for the summer recess, but on Thursday the country's powerful labour unions staged at its doors a noisy rally, featuring angry workers, an accordion band and a wall of shoes.

The unions represented the "walk a mile in our shoes" campaign in an attempt to block €6bn in austerity measures the government is planning for 2014 to be unveiled by early September. Those cuts are intended to keep the Netherlands' budget deficit under the 3 per cent limit set by EU rules, but it is not clear whether the government can push through the plan.

The Netherlands has undergone a slow but significant shift, as this prosperous Calvinist country, which has gradually turned against it. The Dutch government is the strongest advocates of tough European budget deficit rules and has been at the start of the euro crisis in 2010. Now that the EU is forcing budget deficits, public support for Europe in this once strongly prolonged.

8/20/13

Middle-class Greeks sacrifice island holidays - FT.com

FINANCIAL TIMES

August 9, 2013 2:54 pm

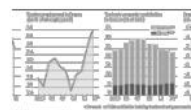
Middle-class Greeks sacrifice island holidays

By Kerin Hope in Athens



Shielded from the midday glare under a blue-and-white striped umbrella, Giorgos Priftis glances around a small beach an hour's drive from Athens which is jammed with picnicking families.

"Everyone here is in the same situation as we are - they can't afford to go away for a holiday," says the 46-year-old local government worker on his annual leave.



His wife Anna, busy unpacking a cold box, adds: "Last year we spent a week in a self-catering apartment on an island... This year I lost my job and that means we can't even eat at the beach café."

Economic Policy Definition of Debt Sustainability

Sustainability rules out any of the following situations:

- ✓ a debt restructuring is already needed
- ✓ the borrower accumulates debt at a rate faster than the growth in its capacity to service debt
- ✓ the borrower lives beyond its means by accumulating debt in the knowledge that a major retrenchment will be needed to service these debts

RECAP

Intertemporal solvency condition is weaker than the economic policy definition of sustainability

We call debt sustainable if a country or a government is able to service its debts without the need for implausibly large policy adjustments; renegotiating the terms of debt; or simply defaulting.

Part 1 Unit 2: Lecture 3

Debt Burden Indicators for Solvency and Liquidity: Commonly Used Ratios

OUTLINE

- ✓ The concept of liquidity
- ✓ Debt burden indicators and their role
 - 📌 Key solvency indicators
 - 📌 Key liquidity indicators

Liquidity

We define an entity as liquid if, regardless of whether it satisfies the solvency condition, its liquid assets and available financing are sufficient to meet or roll-over its maturing liabilities.

What to Watch for to Minimize Liquidity Risks

The projected trajectory AND the level of debt should be based on realistic assumptions

Risk factors include

- ✓ Market perception of the sovereign
- ✓ Debt maturity structure
- ✓ The currency composition of debt
- ✓ The availability of liquid assets
- ✓ The creditor base (notably, the share of non-resident creditors)

Insolvency vs. Illiquidity

Sometimes it can be difficult to distinguish between insolvency and illiquidity situations

- ✓ Liquidity problems are often symptoms of underlying solvency problems: creditors refuse to roll over maturing debt because of solvency concerns
- ✓ Liquidity problems may give rise to insolvency, by raising interest rates or pressuring the exchange rate

Vulnerability

When we talk about debt sustainability,

vulnerability is defined as a risk that the liquidity or solvency conditions are violated and the borrower enters a crisis

How Do We Assess the Debt Burden?

By examining the projected evolution of a set of debt burden indicators over time

What are the indicators?

Debt Burden Indicators

- ✓ Ratios of the debt stock or debt service relative to what we define as measures of the ability to service debt (*repayment capacity*), e.g.
 - GDP
 - export proceeds
 - fiscal revenue
 - Other

- ✓ Gross financing needs, either in level or scaled by the above measures

Debt Burden Indicators as Measures of Solvency and Liquidity

- ✓ Ratios of debt stock relative to repayment capacity are indicators of solvency
- ✓ Ratios of debt service are indicators of potential liquidity problems
- ✓ Gross financing needs is an indicator of potential liquidity problems

Definitions of Gross Financing Needs

- ✓ Gross financing needs are the amount of financing necessary to cover the deficit plus amortization of debt

$$GFN = \text{Deficit} + \text{Amortization}$$

$$GFN = \text{Primary Deficit} + \text{Debt Service}$$

- ✓ GFN can be positive or negative

Definitions of Debt Service and Amortization

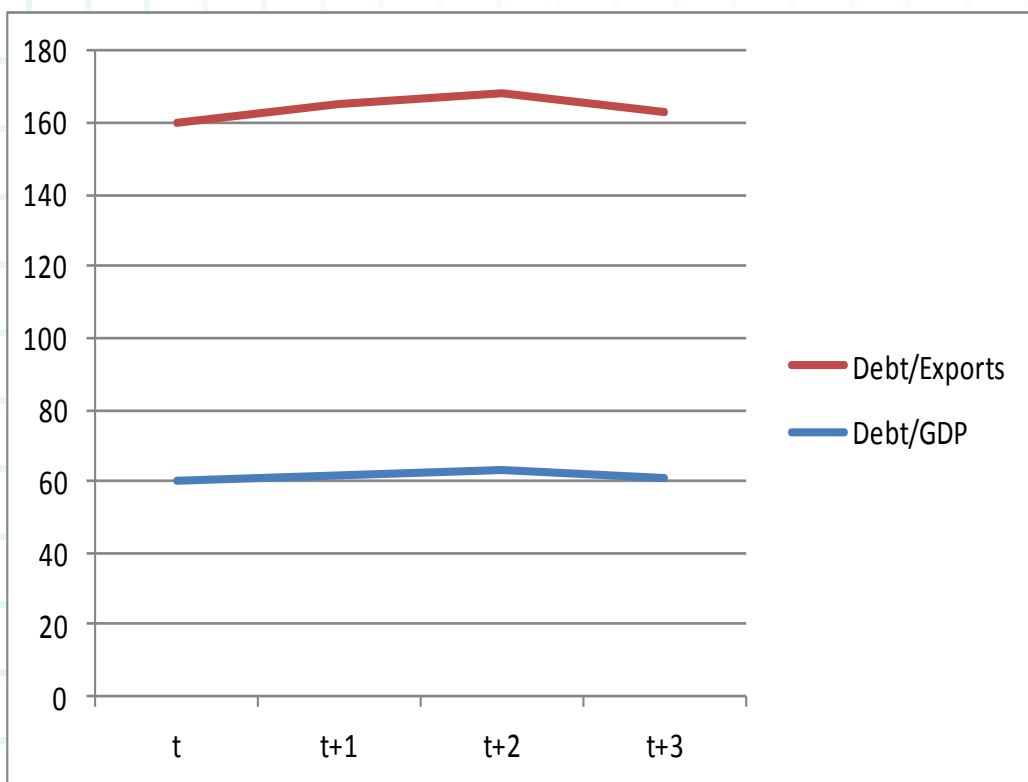
✓ Debt service

$$DS = \text{Interest} + \text{Amortization}$$

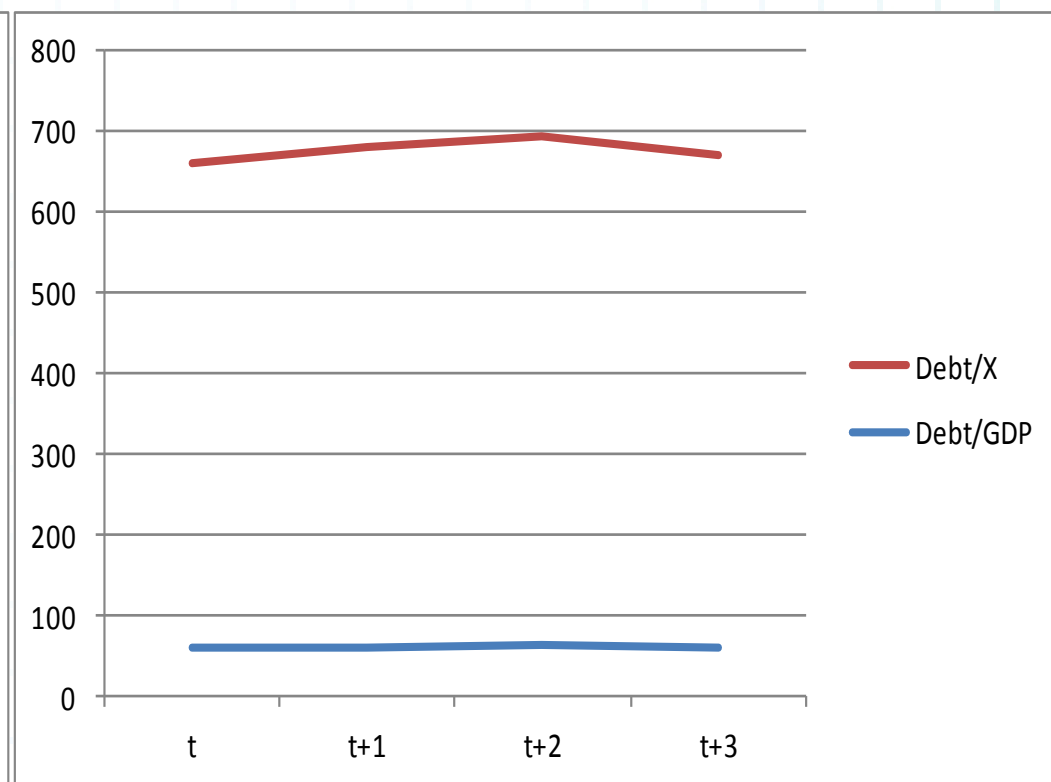
✓ Amortization = principal payments coming due on medium- and long-term debt plus short-term debt coming due (maturity of 1 year or less)

Illustration: debt/GDP vs. debt/exports

Debt Ratios for an Open Economy
(exports/GDP=60%)



Debt Ratios for a Closed Economy
(exports/GDP=10%)



Both countries have the same debt/GDP ratio, but very different debt/exports ratio.

Illustration: Gross Financing Needs and Other Debt Burden Indicators

| | STD=10% total debt | STD=60% total debt |
|--|--------------------|--------------------|
| | (bill LCU) | |
| Gross Financing Needs (deficit plus amortization) | 360 | 906 |
| Deficit | | |
| Primary deficit | 22 | 22 |
| Interest payments | 108 | 108 |
| Amortization Payments | | |
| Short-term debt | 121 | 728 |
| Medium and long-term debt | 109 | 49 |
| Debt service (interest plus amortization) | 338 | 884 |
| | (%) | |
| Gross financing needs-to-GDP | 18% | 44% |
| Gross financing needs-to-Revenue | 73% | 184% |
| Debt service-to-GDP | 17% | 43% |
| Debt service-to-Revenue | 69% | 180% |
| Total public debt-to-GDP | 66% | 66% |
| Total public debt-to-Revenue | 273% | 273% |

RECAP

- ✓ Concept of Liquidity
- ✓ Debt Burden Indicators:
 - Repayment Capacity (the ability to service debt).
 - Solvency and Liquidity

Part 1 Unit 2: Lecture 4

Scope of Debt Sustainability Analysis

OUTLINE

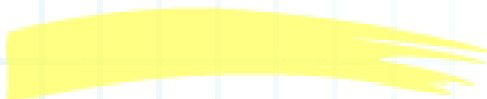
- ✓ Scope of the IMF/World Bank Debt Sustainability Analysis (DSA)
- ✓ DSA for Different Types of Debt

DSA and DSF

- ✓ A DSA is produced for a particular country
- ✓ The Debt Sustainability Framework (DSF) is the framework within which DSAs are produced.
- ✓ The DSF is needed to ensure comparability across DSAs produced for different countries.

MAC DSA

For advanced and emerging economies with access to financial markets, we use the Framework for Fiscal Policy and Public Debt Sustainability Analysis in Market-Access Countries (MAC DSA)



MAC DSA (www.imf.org)



The screenshot shows the IMF website's navigation bar with the logo and name 'International Monetary Fund'. The main menu includes 'Home', 'About the IMF', 'Research', 'Country Info', 'News', 'Videos', and 'Data and Statistics'. A search bar is located on the right. The page content is titled 'Debt Sustainability Analysis for Market-Access Countries' and includes a sub-section for 'Introduction' and a 'Guidance Note on DSA for Market-Access Countries'. A 'Related Factsheets' section lists 'IMF Surveillance' and 'Vulnerability Indicators'. A 'DSA Templates' section mentions 'MAC DSA Templates: External Debt' and 'Public Debt (forthcoming)'. The main text describes the IMF's approach to debt sustainability analysis for market-access countries, noting that the framework was reformed in 2011 and introduced in May 2013. It also mentions the 2002 framework and subsequent refinements in 2003 and 2005.

International Monetary Fund

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Publications

Debt Sustainability Analysis—Introduction

Guidance Note on DSA for Market-Access Countries

Related Factsheets

IMF Surveillance

Vulnerability Indicators

DSA Templates

MAC DSA Templates:
External Debt

Public Debt
(forthcoming)

Debt Sustainability Analysis for Market-Access Countries

Last Updated: May 22, 2013

The Fund's approach to debt sustainability analysis differentiates between market-access countries, that typically have significant access to international capital markets, and low-income countries, which meet their external financing needs mostly through concessional resources. The assessments of public and external debt sustainability are conducted in the context of both IMF program design and reviews, and Article IV surveillance. The assessments are performed through standardized templates.

The framework for public debt sustainability analysis was reformed in 2011 and guidance to staff on the implementation of the new framework was introduced in May 2013.

The assessment of external debt sustainability continues to be anchored by the framework introduced in June 2002 (see "Assessing Sustainability"). This framework was subsequently refined in June 2003 and July 2005 (see "Sustainability Assessments—Review of Application and Methodological Refinements" and Information Note On Modifications To The Fund's Debt Sustainability Assessment Framework For Market-Access Countries).



LIC DSF

The DSF originated as the framework to assess debt sustainability in low-income countries (LICs)



LIC DSF (www.imf.org)

[Español](#) ■ [Français](#)

FACTSHEET

[Full text](#) 

The Joint World Bank–IMF Debt Sustainability Framework for Low-Income Countries

September 30, 2013

Low-income countries have often struggled with large external debts. Debt burdens have been reduced, thanks in large part to international debt relief initiatives. As part of the Millennium Development Goals (MDGs), the IMF and the World Bank have developed a framework to help guide countries and donors in mobilizing the financing of low-income countries' development needs, while reducing the chances of an excessive build-up of debt in the future. The joint World Bank–International Monetary Fund (IMF) Debt Sustainability Framework (DSF) was introduced in April 2005, and is periodically reviewed, to address this challenge. The most recent review was discussed by the Executive Boards of the International Development Association and the IMF in February 2012.

External DSA

Public and publicly
guaranteed (PPG)
external debt



Private external debt
(non-guaranteed)



Public domestic debt

Public DSA

Sample DSA (www.imf.org)



INTERNATIONAL MONETARY FUND

CYPRUS

December 6, 2013

SECOND REVIEW UNDER THE EXTENDED ARRANGEMENT UNDER THE EXTENDED FUND FACILITY AND REQUEST FOR

| | |
|---|----|
| 4. Balance of Payments, 2008-20 | 42 |
| 5. External Financing Requirements and Sources, 2012-20 | 43 |
| 6. Monetary Survey, 2008-20 | 44 |
| 7. Indicators of Fund Credit, 2012-20 | 45 |
| 8. Schedule of Reviews and Purchases | 46 |
| 9. Restrictive Measures on Transactions | 47 |
| 10. Selected Reforms—Measures Completed | 48 |
| 11. MEFP Commitments for the Financial Sector | 49 |
| 12. MEFP Commitments for the Fiscal Sector | 50 |
| ANNEXES | |
| 1. Public Sector Debt Sustainability Analysis | 51 |
| 2. External Sector Debt Sustainability Analysis | 60 |

CYPRUS

___ 12

___ 18

___ 39

___ 40

___ 41

___ 42

___ 43

___ 44

___ 45

___ 46

___ 47

___ 48

___ 49

___ 50

___ 51

___ 60

Scope of Public DSA

The public DSA (also called the fiscal DSA) covers total debt of the public sector, to external and domestic creditors

- MAC DSA for public debt covers only public debt, not publicly guaranteed debt (PPG)
- LIC DSA for public debt covers public and publicly guaranteed debt (PPG)

Scope of External DSA

The external DSA covers external debt in the economy

- MAC DSA for external debt covers debt owed by both the public sector and the private sector
- LIC DSA for external debt covers public and publicly guaranteed (PPG) external debt

Selected Features of DSA

- ✓ To inform a judgment on debt sustainability, the DSA for MAC and LIC combine
 - the indicators of solvency and liquidity
 - the trajectory and the level of debt and financing needs under a baseline scenario
 - the adverse scenarios recognizing the uncertainty and macro-fiscal risks, e.g.
 - economic cycle (boom-bust) analysis
 - shocks to contingent liabilities, growth, interest rate, exchange rate, etc.

Selected Features of MAC DSA

- ✓ DSA MACs for public debt considers
 - 📌 The market perception of the sovereign
 - 📌 Risks stemming from the debt profile
 - 🖌️ Creditor base
 - 🖌️ Maturity
 - 🖌️ Currency composition
 - 📌 The realism of the underlying assumptions

Selected Features of LIC DSA

- ✓ LIC DSA considers
 - 📌 a long-term prospective
 - 📌 the concessionality of debt
 - 📌 risk rating: an explicit assessment of the risk of external debt distress

RECAP

- ✓ Scope of Debt Sustainability Analysis (DSA)
 - MAC or LIC
- ✓ DSA for Different Types of Debt
 - Public or External

Part 1 Unit 3:

Why is Debt Sustainability
Analysis Important?

UNIT OBJECTIVES

- ✓ Understanding the costs of high debt
- ✓ Learn the definition and origin of debt and other crises
- ✓ Understanding the mechanism of debt crisis

UNIT OUTLINE

- ✓ Costs Associated with High Debt
- ✓ Types of Economic Crisis
- ✓ Mechanism of Debt Crisis

Part 1 Unit 3: Lecture 1

Costs Associated with High
Debt

UNIT OUTLINE

Consequences of High Debt

- 📌 Vulnerability to Sudden Stops
- 📌 Crowding out of private investment
- 📌 Loss of policy flexibility
- 📌 Debt Overhang
- 📌 Debt Restructuring

Consequences of High Debt

- ✓ For both public debt and total external debt:
 - 📌 Vulnerability to a sudden stop in financing (official or private flows)

Impact of Sudden Stops

✓ External debt:

- 📌 current and capital account restrictions
- 📌 currency crisis, banking crisis, recession, default

✓ Public debt

- 📌 drastic reduction in primary spending
- 📌 currency crisis, banking crisis, recession, default

Consequences of High Debt

For public debt, consequences include

- ✓ Higher interest rates and crowding out of private investment
- ✓ Less flexibility to conduct countercyclical policy
- ✓ Debt overhang

Debt Overhang

- ✓ Definition: The expected tax burden to finance debt is so high that it is a disincentive to current investment/consumption and hence a drag on the economic activity
- ✓ Consequences:
 - lower growth, lower government revenues
 - insufficient funds for primary expenditures
 - higher chance of default

Debt Overhang



Consequences of Sovereign Debt Restructuring

- ✓ Political and economic penalties
- ✓ Spillovers across segments of the economy (especially if banks are major holders of government debt)
- ✓ Contagion to other countries
- ✓ The 1998 Russian sovereign default and fears in 2010 of a possible Greek default are examples of strong contagion to other countries

RECAP

✓ Costs Associated with High Debt:

- Vulnerability
- Crowding out
- Loss of flexibility
- Debt Overhang
- Debt Restructuring

Part 1 Unit 3: Lecture 2

Types of Economic Crises

OUTLINE

- ✓ Types of Economic Crises
 - 📌 Currency Crises
 - 📌 Banking Crises
 - 📌 External Debt Crises
 - 📌 Sovereign Debt Crises

Currency Crises

- ✓ What: an attack in a country's currency results in one, or a combination, of the following
 - large devaluation
 - sharp depreciation
 - large increase in interest rates
 - large fall in reserves
- ✓ When: concerns about the viability of the exchange rate regime or the level of the exchange rate

Currency Crises

✓ Why:

- 📌 market expects that foreign exchange (FX) reserves will run out because of inconsistent policies or be insufficient to cover short-term debt
- 📌 market expects government to devalue in order to address a policy goal, such as improved competitiveness

Banking Crises

- ✓ What: run on banks or large-scale government intervention to rescue banks
- ✓ When: concerns about solvency and liquidity of banks

Banking Crises

✓ Why:

- bursting bubble in equity or real estate prices
- interest rate, exchange rate, or growth shocks
- bust typically follows lending booms (stimulated by financial liberalization/capital inflows)

Debt Crises

Debt crises can be associated with either sovereign (public) or commercial (private) debt

Sovereign Debt Crises

- ✓ What: defaults, involuntary restructuring of sovereign debt, or belief that this is about to occur
- ✓ When: often combined (or immediately following) banking crises:
 - 📌 this was true for over 60 percent of all sovereign debt crises after 1970 (Rogoff and Reinhart, 2010)

Sovereign Debt Crises

✓ Why:

- 📌 financial rescue packages
- 📌 extended period of low growth
- 📌 fiscal profligacy (including war finance)
- 📌 failed state-owned enterprises
- 📌 natural disasters
- 📌 etc.

External Debt Crises

- ✓ What: payment arrears on a substantial fraction of external debt
- ✓ When: cash flow problems or difficulties obtaining foreign exchange
- ✓ Why:
 - 📌 “sudden stops” following capital inflow episode
 - 📌 interest rate, exchange rate, or growth shocks

RECAP

✓ Different Types of Economic Crises:

- 📌 Currency Crises
- 📌 Banking Crises
- 📌 External Debt Crises
- 📌 Sovereign Debt Crises

Additional Resources

Please watch the
video on
Latvia :

Debt and BoP crisis with
internal devaluation and fiscal
adjustment

Part 1 Unit 3: Lecture 3

Mechanism of Sovereign
Debt Crises

OUTLINE

- ✓ Sample Mechanism of Debt Crisis
- ✓ Bank-sovereign Interdependence

A Sample Mechanism of a Sovereign Debt Crisis

- ✓ Financial sector rescue packages weigh on public debt and the deficit
- ✓ Economic activity nosedives
- ✓ Fiscal revenue collapses while expenditures skyrocket

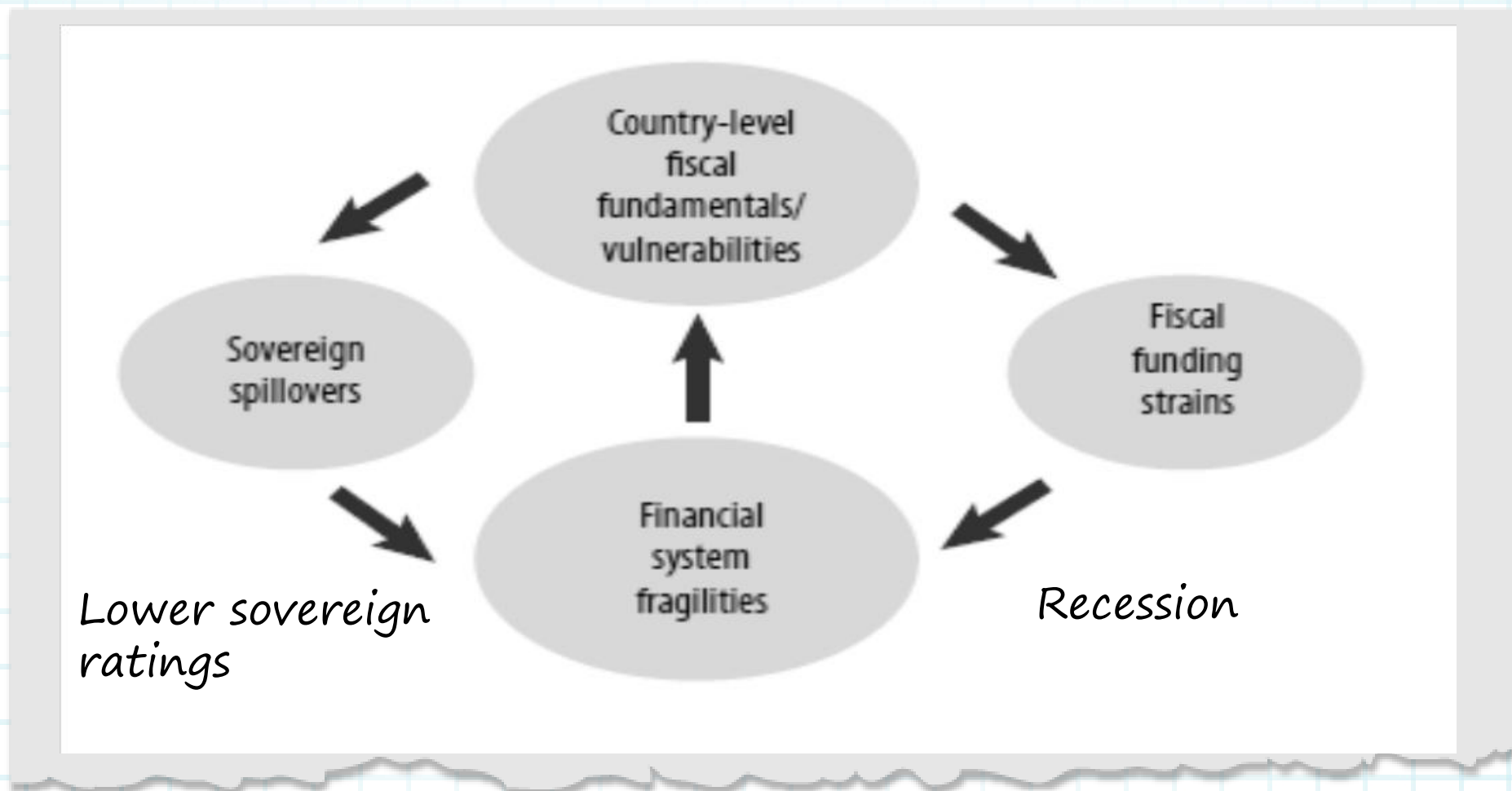
A Sample Mechanism of a Sovereign Debt Crisis

- ✓ The resulting spike in deficits and debt causes concerns about the fiscal balance and debt sustainability
- ✓ Costs of borrowing for the sovereign increase
- ✓ Fiscal position further worsens

Bank-Sovereign Interdependence

- ✓ Damage to bank balance sheets → bailout costs and increase in sovereign debt
- ✓ Increase in sovereign debt → higher possibility of sovereign default, lower ratings → damage to bank balance sheets

Bank-Sovereign Interdependence



RECAP

- ✓ Sample mechanism of debt crisis
- ✓ Bank-sovereign Interdependence

Part 1 Unit 4

Public Debt Sustainability in a Closed Economy

UNIT OBJECTIVES

- ✓ Learn how to derive the law of motion for public debt
- ✓ Learn how to derive the formal solvency condition for public debt

UNIT OUTLINE

Closed economy:

- ✓ Law of motion for public debt
- ✓ Solvency condition for public debt

Part 1 Unit 4: Lecture 1

Law of Motion for Public
Debt

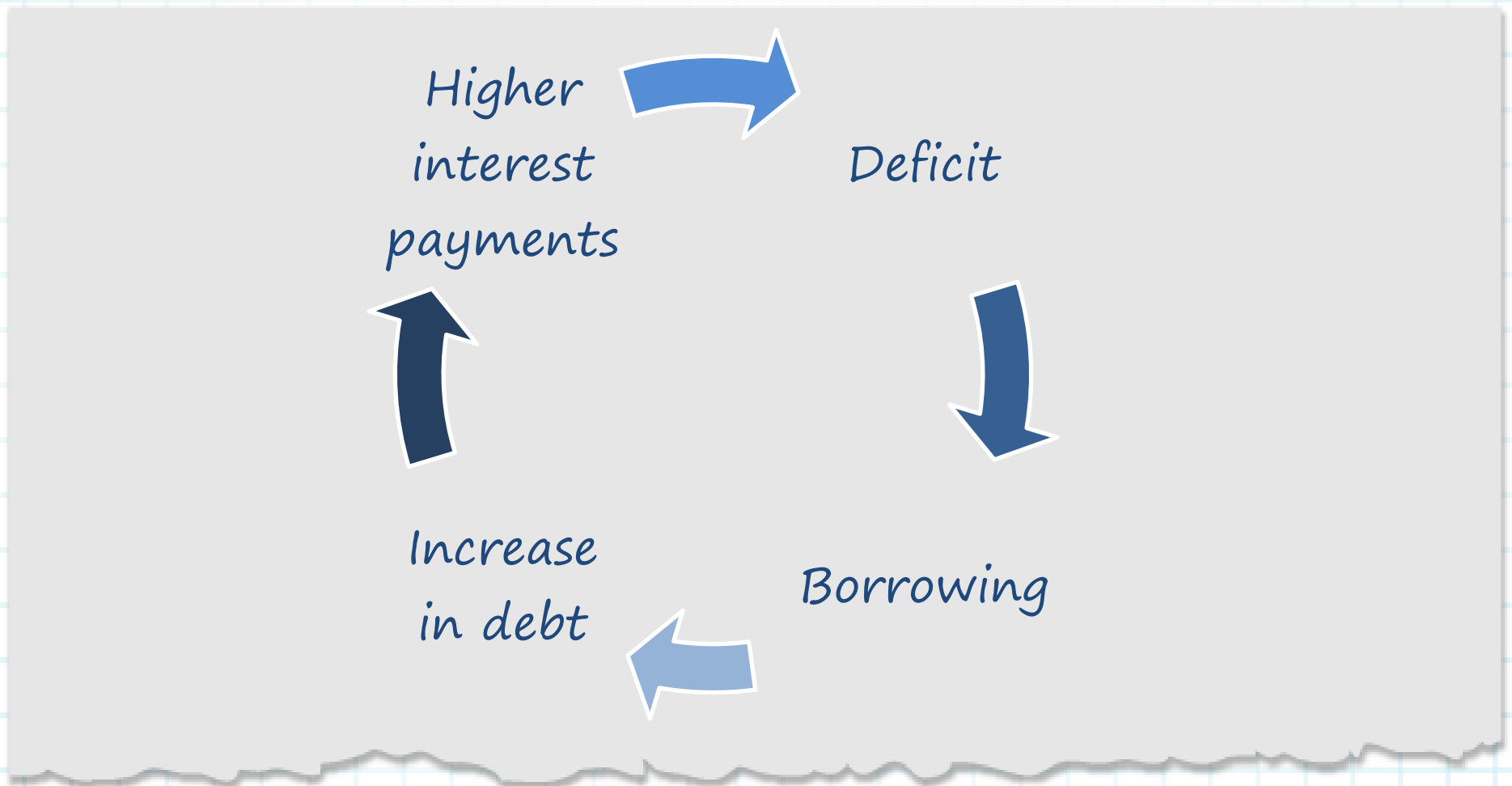
OUTLINE

- The debt-deficit relationship
- The primary balance
- The government budget constraint

The Relationship between Deficit and Public Debt

- ✓ $\text{Current Stock of Debt} = \text{Past Stock of Debt} + \text{Deficit} + \text{Other Flows} + \text{Exchange Rate Valuation}$
- ✓ In the closed economy, we assume debt is issued in local currency, so that there is no contribution of exchange rate valuation. In the open economy, we allow for debt issued in local currency and in foreign currency.

Vicious Circle of Debt and Deficit



Relationship between Deficit and Public Debt

- ✓ Budget deficit can be financed by borrowing or other means (e.g., printing money or selling assets)
- ✓ Net new borrowing necessary to finance budget deficit adds to the current stock of debt

+

PUBLIC DEBT DYNAMICS

CLOSED ECONOMY

NOTATION

D_t stock of debt

$$D_t = D_{t-1} + \Delta D_t$$

I_t interest spending

$$\underline{I_t = i_t D_{t-1}}$$

R_t government revenues

G_t government primary (non-interest) spending

PB_t primary or (non-interest) surplus

$$PB_t = R_t - G_t$$

i_t nominal interest rate

r_t real interest rate

$$\underline{(1+i_t) = (1+\pi_t)(1+r_t)}$$

π_t inflation rate

$P_t Y_t$ nominal GDP

g_t real GDP growth rate

$$\underline{P_t Y_t = (1+\pi_t)(1+g_t)P_{t-1} Y_{t-1}}$$

FLOW BUDGET CONSTRAINT

$$G_t + i_t D_{t-1} - R_t + OT_t = (D_t - D_{t-1})$$

Spending

Other flows,
e.g. bank
recapitalization

Revenues

Change
in debt

Note

Other flows include

- ✓ asset purchases and expenditure items not included in G
 - bank recapitalization
 - assumption of guaranteed state enterprise debt
 - ✓ non-debt sources of financing
 - asset sales such as privatization revenues
 - seigniorage
- Such non-debt sources of financing enter with a negative sign

Focusing on Primary Balance:

- ✓ Substitute the primary balance definition:

$$-PB_t + i_t D_{t-1} + OT_t = D_t - D_{t-1}$$

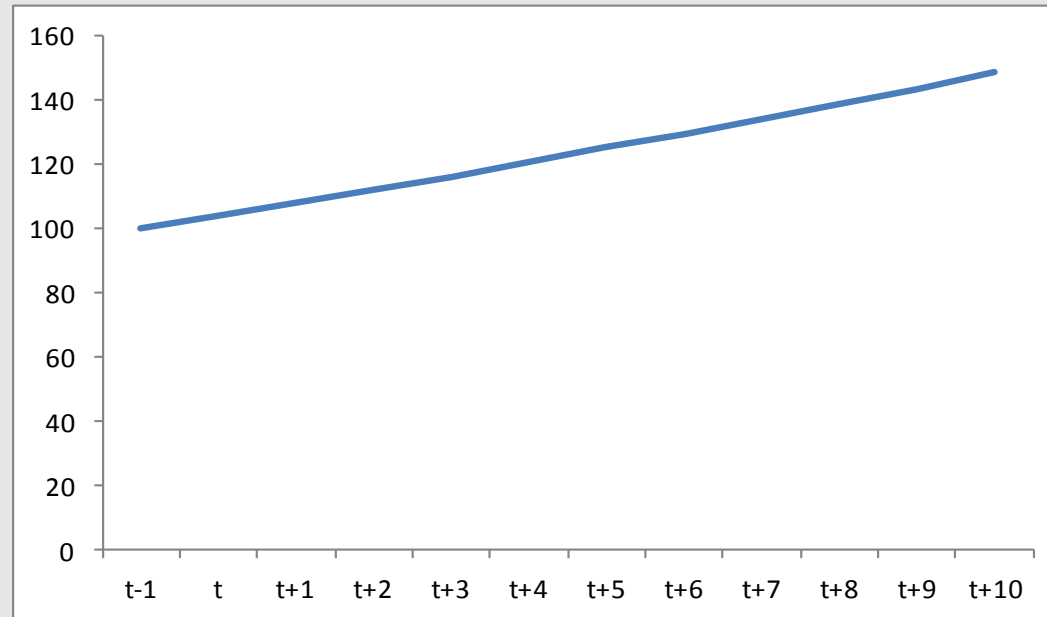
- ✓ Assume other flows are zero: $OT_t = 0$

Equation for Debt Dynamics:

$$D_t = (1 + i_t)D_{t-1} - PB_t$$

Example: Evolution of Debt over Time

$$D_t = (1 + i_t)D_{t-1} - PB_t$$



$$D_{t-1} = 100$$

$$i_t = 2\%$$

$$PB_t = -2$$

Part 1 Unit 4: Lecture 2

Deriving the Solvency Condition

OUTLINE

- ✓ Deriving the Solvency Condition from the Flow Budget Constraint:
 - 📌 Derive the Intertemporal Budget Constraint
 - 📌 Impose Transversality
 - 📌 Obtain Solvency Condition

Checkpoint: Where Are We?

- 📌 We talked about the debt-deficit relationship
- 📌 We derived the government budget constraint
- 📌 We derived one-period law of motion for public debt

Checkpoint: what's next?

- 📌 We will start with the flow budget constraint
- 📌 We will use forward substitution to derive the intertemporal budget constraint
- 📌 Which we need to obtain solvency condition (in present-value terms)

FLOW BUDGET CONSTRAINT

$$D_t = (1+i_t)D_{t-1} - PB_t$$

INTERTEMPORAL BUDGET CONSTRAINT FOR T=2

$$D_1 = (1+i)D_0 - PB_1$$

$$\begin{aligned} D_2 &= (1+i)D_1 - PB_2 \\ &= (1+i)\underbrace{((1+i)D_0 - PB_1)}_{=D_1} - PB_2 \end{aligned}$$

$$D_2 = (1+i)^2 D_0 - (1+i)PB_1 - PB_2$$

+

INTERTEMPORAL BUDGET CONSTRAINT FOR $T=N$

$$D_N = (1+i)^N D_0 - \sum_{j=1}^N (1+i)^{N-j} PB_j$$

DERIVING SOLVENCY CONDITION

By dividing both sides by $(1+i)^N$ and putting D_0 on the other side, we have the following expression:

$$D_0 = \sum_{j=1}^N \left(\frac{1}{1+i} \right)^j PB_j + \left(\frac{1}{1+i} \right)^N D_N$$

TRANSVERSALITY (NO-PONZI SCHEME) CONDITION

$$\lim_{N \rightarrow \infty} \left(\frac{1}{1+i} \right)^N D_N = 0$$

Meaning of Transversality Condition: it prohibits issuing more and more debt without ever repaying principal and interest on the previously accumulated stocks.

SOLVENCY CONDITION

Solvency: Assuming transversality (no-Ponzi scheme), the outstanding initial debt should be covered by the present value of future primary balances:

$$D_0 = \sum_{j=1}^{\infty} \left(\frac{1}{1+i} \right)^j PB_j$$

Part 1 Unit 5

Public Debt Sustainability In Closed Economy: Part 2

UNIT OBJECTIVES

- ✓ Learn how to derive the law of motion for the ratio of public debt-to-GDP for a closed economy
- ✓ Analyze contributions of key macroeconomic variables to debt dynamics
- ✓ Obtain the debt-stabilizing primary balance

UNIT OUTLINE

Closed economy:

- ✓ Law of motion for public-debt-to GDP ratio
- ✓ Automatic debt dynamics
- ✓ Debt-stabilizing primary balance

Part 1 Unit 5: Lecture 1

Law of Motion for Public Debt-to-GDP in a Closed Economy

OUTLINE

- ✓ Law of motion for public-debt-to GDP ratio
- ✓ Key macroeconomic variables affect debt sustainability
 - 📌 Primary balance
 - 📌 Initial level of debt
 - 📌 Growth
 - 📌 Real interest rate

Checkpoint: Where Are We?

- 📌 We are still in the case of a closed economy (to avoid worrying about the exchange rate-induced variations in debt)

Checkpoint: what's next?

- 📌 We are about to get pragmatic and do some derivations in terms of ratios of debt stock to the economy's capacity (GDP)
- 📌 Law-of-motion for debt-to-GDP in hand, we will look at the impact of the key macroeconomic variables on debt dynamics

LAW OF MOTION: THE DEBT-TO-GDP RATIO

Evolution of government debt at time t

$$D_t = (1+i_t) D_{t-1} - PB_t \quad (1)$$

By dividing (1) by nominal GDP, $P_t Y_t$

$$\frac{D_t}{P_t Y_t} = \frac{(1+i_t)}{(1+\pi_t)(1+g_t)} \frac{D_{t-1}}{P_{t-1} Y_{t-1}} - \frac{PB_t}{P_t Y_t}$$

$d_t \qquad \qquad \qquad d_{t-1} \qquad \qquad \qquad pb_t$

DYNAMICS OF DEBT-TO-GDP RATIO

Evolution of the debt-to-GDP ratio using the definition of the real interest rate

$$\phi_+ d_+ = \left(\frac{1+r_+}{1+g_+} \right) d_{+1} - pb_+ \quad (2)$$

$$\phi_+ = \frac{(1+i_+)}{(1+\pi_+) (1+g_+)} = \frac{(1+r_+)}{(1+g_+)}$$

CHANGE IN DEBT-TO-GDP RATIO

Deducting past debt from both sides:

$$d_t - d_{t-1} = \left[\frac{(1+r_t)}{(1+g_t)} - 1 \right] d_{t-1} - pb_t \quad (2)$$

Automatic debt dynamics

LAW-OF-MOTION FOR THE DEBT-TO-GDP RATIO

Evolution of the debt-to-GDP ratio

$$\phi_t d_t = \left(\frac{1+r_t}{1+g_t} \right) d_{t-1} - pb_t \quad (2)$$

- A higher primary balance $\rightarrow \rightarrow \rightarrow$ a lower debt/GDP ratio
- A higher initial debt $\rightarrow \rightarrow \rightarrow$ a higher debt/GDP ratio
- A higher growth rate $\rightarrow \rightarrow \rightarrow$ a lower debt/GDP ratio
- A higher real interest rate $\rightarrow \rightarrow \rightarrow$ a higher debt/GDP ratio

Part 1 Unit 5: Lecture 2

Stabilizing Debt in a Closed
Economy

OUTLINE

- ✓ Automatic debt dynamics
- ✓ Stability of debt
- ✓ Debt stabilizing primary balance
- ✓ The danger of debt momentum

AUTOMATIC DEBT DYNAMICS

We can distinguish favorable from unfavorable automatic debt dynamics:

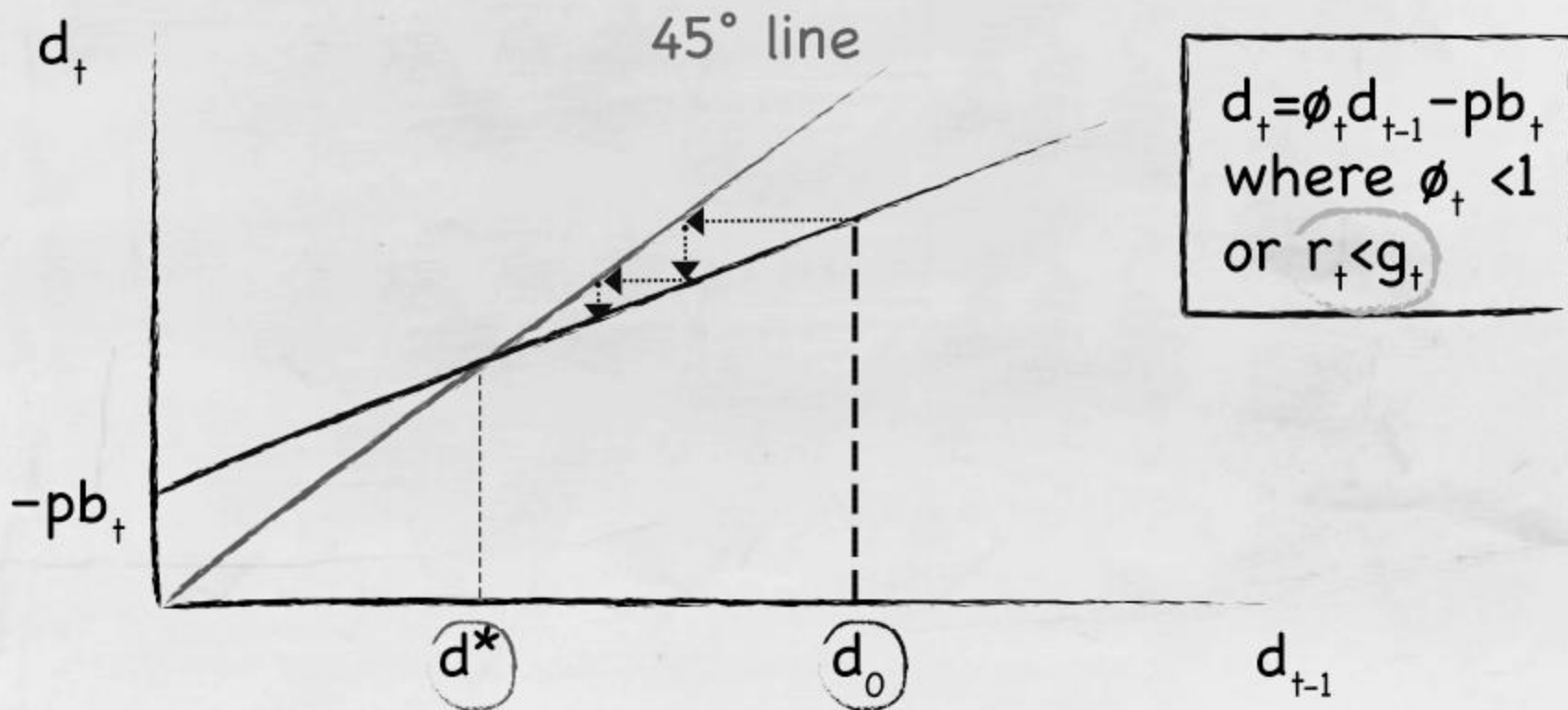
$$d_t - d_{t-1} = \left(\frac{r_t - g_t}{1 + g_t} \right) d_{t-1} - pb_t \quad (2)$$

Automatic
debt dynamics

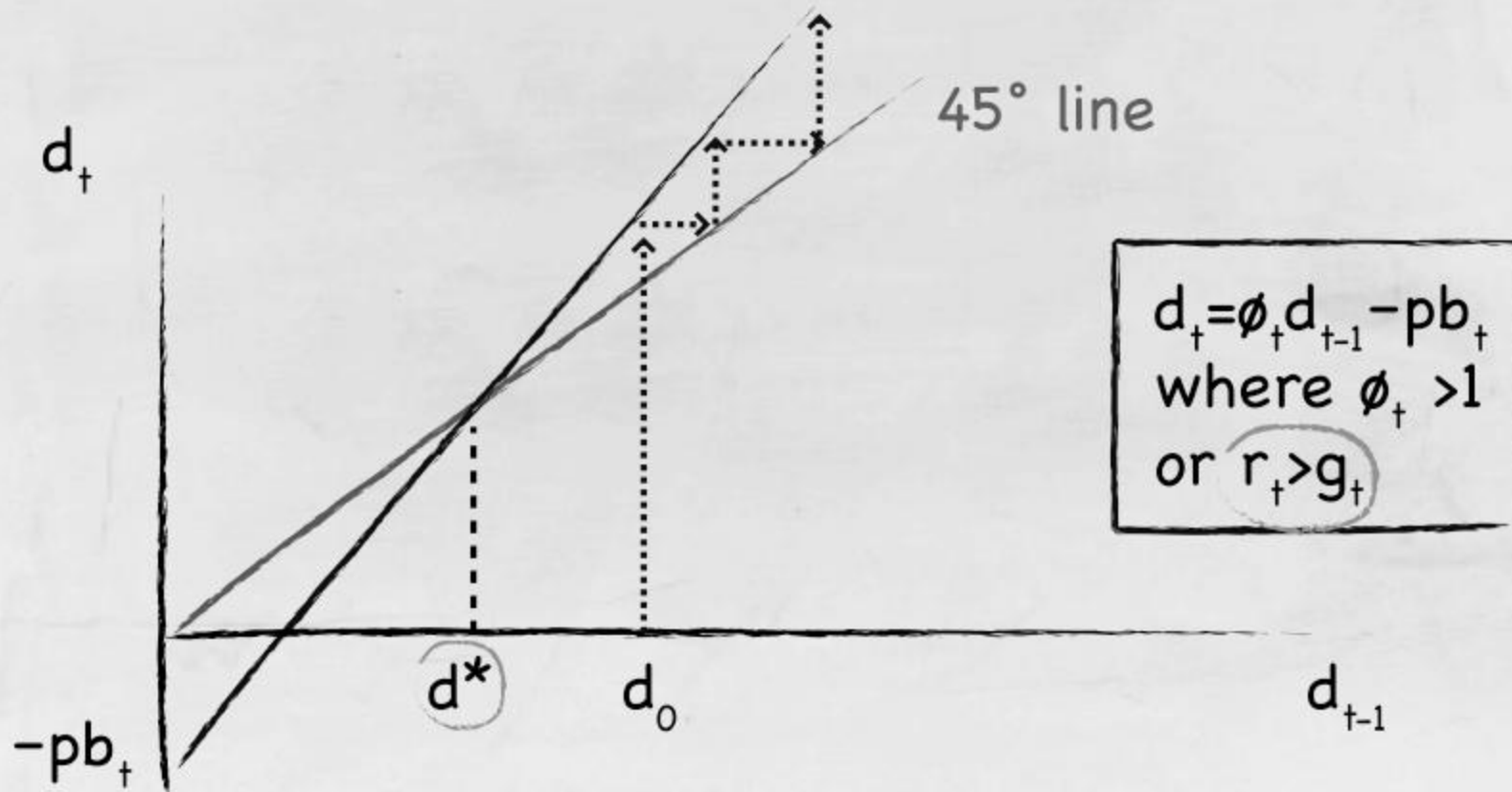
$r < g$: favorable debt dynamics

$r > g$: unfavorable debt dynamics

STABLE/SUSTAINABLE DEBT DYNAMICS



EXPLOSIVE DEBT DYNAMICS



Primary Balance to Stabilize Debt:

- ✓ Assuming d is constant one can solve for the debt stabilizing primary balance pb^* :

$$pb_t^* = \frac{r_t - g_t}{1 + g_t} d_{t-1}$$

Automatic debt dynamics

Primary Balance to Stabilize Debt:

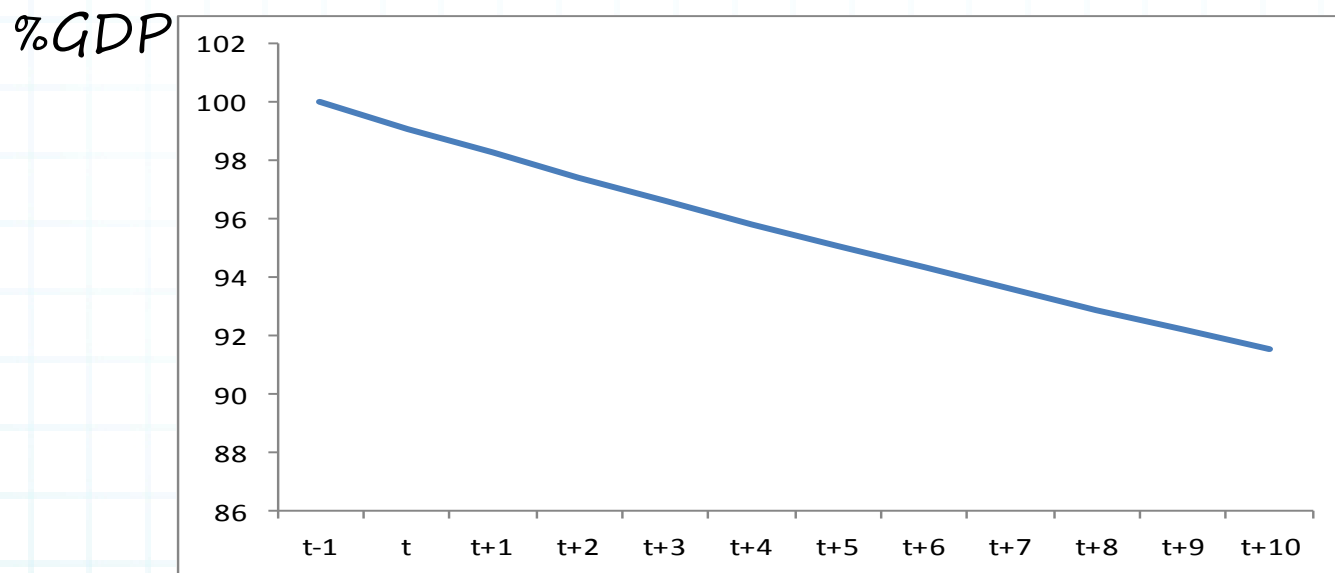
- ✓ The primary surplus needed to keep the debt/GDP constant equals the debt dynamics. It is proportionate to the gap between real interest rate and real growth rate
- ✓ The primary balance needed to keep the debt/GDP constant will rise directly with the size of the initial debt/GDP, if $r > g$
- ✓ We can also interpret the equation as telling us the level of debt which can be sustained for a given primary balance

The Danger of Debt Momentum:

- ✓ The primary surplus needed to keep the debt/GDP constant will rise directly with the size of the initial debt/GDP
- ✓ The higher is the initial debt stock, the more difficult it is to stabilize the debt/GDP ratio
- ✓ Danger of built in momentum, the higher debt-to-GDP ratio gets, the less likely it is to run a sufficiently large primary surplus → debt rises
- ✓ Thus, vulnerability rises with debt-to-GDP ratio

Illustration: Evolution of Debt/GDP over Time:

$$d_t = \frac{(1+r_t)}{(1+g_t)} d_{t-1} - pb_t$$



$$d_{t-1} = 100\% \quad r = 2\% \quad g = 5\% \quad pb_t = -2\%$$

UNIT RECAP

- ✓ Law of motion for public-debt-to GDP ratio
- ✓ Automatic debt dynamics
- ✓ Debt-stabilizing primary balance

Part 1 Unit 6

Public Debt Sustainability
In Open Economy

UNIT OBJECTIVES

- ✓ Learn how to derive the law of motion for public debt for an open economy
- ✓ Obtain the debt-stabilizing primary balance
- ✓ Analyze contributions of key macroeconomic variables to debt dynamics

UNIT OUTLINE

Open economy:

- ✓ Law of motion for public debt
- ✓ Debt-stabilizing primary balance
- ✓ Comparative statics

Part 1 Unit 6: Lecture 1

Law of Motion for Public
Debt in an Open Economy

OUTLINE

- ✓ Flow budget constraint with external financing
- ✓ Law of motion for the debt-to-GDP ratio
- ✓ Automatic debt dynamics

PUBLIC DEBT DYNAMICS

OPEN ECONOMY

NOTATION

| | |
|-----------------|---|
| D_t^D | stock of domestic currency denominated debt (domestic debt) |
| D_t^F | stock of foreign currency denominated debt (foreign debt) |
| i_t^D | nominal interest rate on domestic debt |
| i_t^F | nominal interest rate on foreign debt |
| i_t^w | effective nominal interest rate |
| e_t | nominal exchange rate (domestic currency per \$) |
| ε_t | rate of exchange rate depreciation |
| α_t | share of foreign currency denominated debt |

GOVERNMENT BUDGET CONSTRAINT

Now suppose the government can borrow from abroad as well as domestically.

$$D_t = D_t^D + e_t D_t^F$$

Domestic currency
denominated debt

Nominal exchange rate
(local currency per \$)

Foreign currency (\$)
denominated debt

FLOW BUDGET CONSTRAINT

The flow budget constraint becomes:

$$D_t^d + e_t D_t^f = (1+i_t^d) D_{t-1}^d + (1+i_t^f) e_t D_{t-1}^f - PB_t + OT_t \quad (1)$$

FLOW BUDGET CONSTRAINT

This can be re-expressed as:

$$D_t = (1+i_t^d)(1-\alpha_{t-1})D_{t-1} + (1+i_t^f)\alpha_{t-1}(1+\varepsilon_t)D_{t-1} - PB_t + OT_t$$

where we introduced the share of foreign currency denominated debt α and ε is the rate of exchange rate depreciation

$$\alpha_{t-1} = e_{t-1} D_{t-1}^f / D_{t-1}$$

DEBT DYNAMICS WITH EXTERNAL FINANCING

Dividing both sides by GDP at date t:

$$d_t = \frac{\left[1 + i_t^w + \alpha_{t-1} \varepsilon_t (1 + i_t^f) \right]}{(1 + g_t)(1 + \pi_t)} d_{t-1} - p b_t + o t_t \quad (2)$$

ϕ_t^*

- i^w weighted average of domestic and foreign nominal interest rates
- i^f nominal interest rates in foreign-currency denominated debt
- ε change in the exchange rate (local currency per U.S. dollar)
- α share of foreign-currency denominated public debt

DEBT LAW OF MOTION: LINKING TO THE REAL INTEREST RATE

Another way of expressing the debt-law-of motion:

$$d_t = \frac{(1+r_t^d)}{(1+g_t)} d_{t-1}^d + \frac{(1+i_t^f)(1+\varepsilon_t)}{(1+g_t)(1+\pi_t)} d_{t-1}^f - \text{pb}_t + \text{ot}_t \quad (2')$$

$$(1+r_t^d) = \frac{(1+i_t^d)}{(1+\pi)}$$

CHANGE IN DEBT TO GDP RATIO

$$d_t = \phi_t^* d_{t-1} - pb_t + ot_t$$

Subtract d_{t-1} on both sides:

$$\Delta d_t = (\phi_t^* - 1) d_{t-1} - pb_t + ot_t \quad (3)$$

Automatic debt dynamics

COEFFICIENT ON AUTOMATIC DEBT DYNAMICS:

$$\phi_t^* - 1 = \frac{i_t^w - \pi_t(1 + g_t) - g_t + \alpha_{t-1} \varepsilon_t (1 + i_t^f)}{(1 + g_t)(1 + \pi_t)} \quad (3)$$

AUTOMATIC DEBT DYNAMICS:

$$d_t - d_{t-1} = \frac{i_t^w - \pi_t(1+g_t)}{(1+g_t)(1+\pi_t)} d_{t-1} - \frac{g_t}{(1+g_t)(1+\pi_t)} d_{t-1} + \frac{\varepsilon_t \alpha_{t-1} (1+i_t^f)}{(1+g_t)(1+\pi_t)} d_{t-1} - pb_t + ot_t$$

Contribution of the
effective real interest
rate

Contribution of the
real GDP growth

Contribution of
exchange rate
depreciation

Part 1 Unit 6: Lecture 2

Stabilizing Debt in an Open
Economy

OUTLINE

- ✓ Debt stabilizing primary balance
- ✓ Comparative statics: role of key macroeconomic variables:
 - Initial level of debt
 - Growth
 - Interest Rate
 - Exchange Rate

+

DEBT-STABILIZING PRIMARY BALANCE IN AN OPEN ECONOMY:

$$\Delta d_t = (\phi_t^* - 1) d_{t-1} - pb_t + ot_t \quad (3)$$

$$d_t = d_{t-1}$$

$$pb_t^* = (\phi_t^* - 1) d_t + ot_t$$

DEBT-STABILIZING PRIMARY BALANCE

$$pb^* = \frac{(r_t^w - g_t) + \alpha_{t-1} \varepsilon_t^* (1 + r_t^f)}{(1 + g_t)} d_{t-1} + o_t$$

Automatic debt dynamics

$$r^w = \alpha r^f + (1 - \alpha) r^d$$

$$(1 + \varepsilon^*) = \frac{(1 + \varepsilon) (1 + \pi^*)}{(1 + \pi)}$$

Key Comparative Statics:

- ✓ The required primary balance is higher when:
 - The real interest rate - growth differential is large
 - Other flows contribute to an increase in debt (e.g. financial sector support measures, nationalization of private pensions)
 - There is exchange rate depreciation (ε) in countries with large foreign exchange denominated debt (α)
- ✓ Note: The last two are examples of “stock-flow adjustments” because they help reconcile the change in the value of debt with the deficit

Illustration:

Key Macro-Economic Variables

| | Country W | Country X | Country Y | Country Z |
|--------------------------|--------------|--------------|-------------|-------------|
| | (% change) | | | |
| r^d | 5 | 4 | 5 | 5 |
| r^f | .. | .. | .. | 5 |
| g | 4 | 5 | 4 | 4 |
| ε^* | 0 | 0 | 0 | 5 |
| | (% GDP) | | | |
| d^d | 100 | 100 | 20 | 50 |
| d^f | 0 | 0 | 0 | 50 |
| pb^* | 0.96 | -0.95 | 0.19 | 3.49 |

Illustration:

- ✓ We can calculate pb^* by applying the formula, while being careful to express interest rates and growth rates as a percent:

$$pb^* = \frac{(r_t^w - g_t)d + \varepsilon^*_t (1 + r_t^f)d^f}{(1 + g_t)}$$

- ✓ For country Z for example:

$$pb^* = \frac{(0.05 - 0.04) \cdot 1 + 0.05 \cdot (1 + 0.05) \cdot 0.5}{(1 + 0.04)} = 0.0349 = 3.49\%$$

UNIT RECAP

- ✓ Debt Law-of-Motion
- ✓ Debt-stabilizing Primary Balance
- ✓ Key Comparative Statics

Part 1 Unit 7

Chipping Away at Public Debt

UNIT OBJECTIVES

- ✓ Understand different adjustment paths and their implications
- ✓ Understand how fiscal adjustment may affect GDP and the risk premium on government debt

UNIT OUTLINE

- ✓ Adjustment Paths and Their Implications
 - Front-loaded and back-loaded adjustments
- ✓ Fiscal Adjustment, the Business Cycle, and the Risk Premium
- ✓ History of Past Fiscal Adjustments (video)

Part 1 Unit 7: Lecture 1

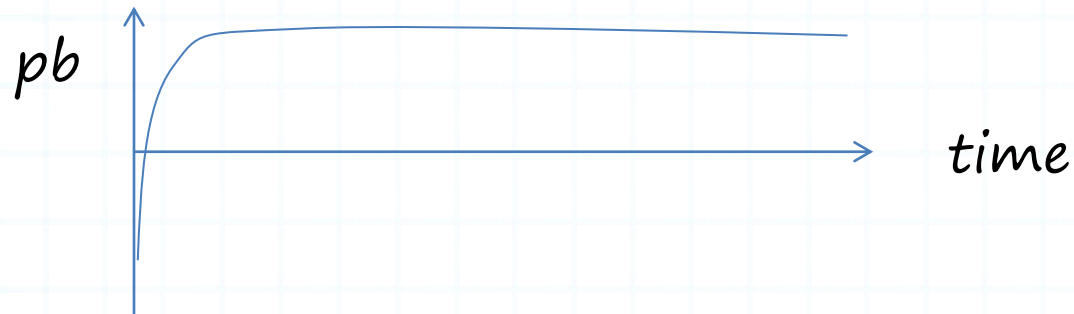
Adjustment Paths and Their
Implications

OUTLINE

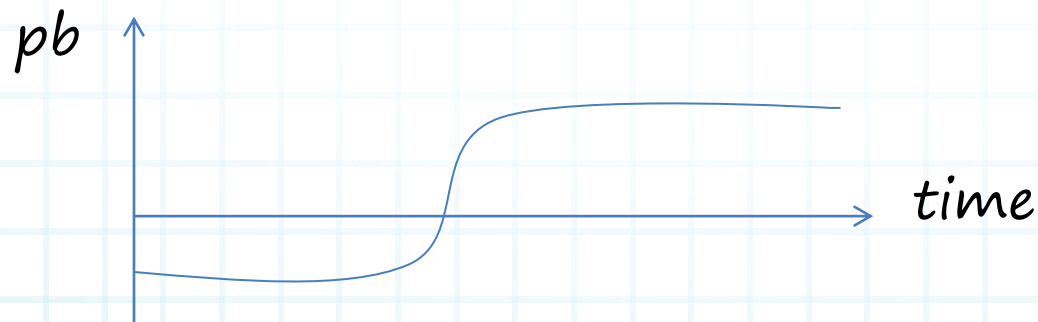
- ✓ Definition of front-loaded and back-loaded adjustment
- ✓ Circumstances favoring each

Front-loaded and Back-loaded Adjustment:

✓ Front-loaded adjustment:



✓ Back-loaded adjustment:



Front-loaded and Back-loaded Adjustment:

- ✓ Front-loaded fiscal adjustment quickly raises the primary balance to the “targeted” level
- ✓ Back-loaded adjustment phases in the adjustment over time

Circumstances Affecting the Timing of Adjustment:

- ✓ Front-loading may be necessary:
 - 📌 when facing severe financing constraints
 - 📌 to build credibility
 - 📌 to seize opportunity of political support
- ✓ Back-loading may be preferable to:
 - 📌 support to economic activity
 - 📌 ensure quality of measures

Circumstances Affecting the Timing of Adjustment:

- ✓ Credibility is very important in the context of high debt, because of its effect on the risk premium and therefore debt dynamics
- ✓ In the case of back-loading, credibility can be enhanced by institutional mechanisms, such as balanced budget rules and procedural rules

Circumstances Affecting the Timing of Adjustment:

- ✓ If fiscal adjustment has a negative impact on growth, it may undermine debt sustainability
 - 📌 undertake fiscal adjustment in the upswing of the business cycle
 - 📌 undertake fiscal adjustment during worldwide recoveries
 - 📌 support fiscal adjustment with accommodating monetary policy

Front-loaded and Back-loaded Adjustment

- ✓ In the Additional Resources we provide a formula for the fiscal adjustment necessary to reduce debt over a given number of periods. The formula allows one to distinguish front-loaded adjustment from back-loaded adjustment.

REDUCING DEBT IN k PERIODS

First, we define the future debt target as a proportion of the actual debt:

$$d_{t+k}^* = \gamma^* d_t \quad \text{with} \quad \gamma^* \leq 1$$

Assuming a constant interest rate, GDP growth rate, and government primary balance (pb^*) we can express the solvency condition as:

$$d_t = \left(\frac{1}{\phi}\right)^k \gamma^* d_t + pb^* \sum_{j=1}^k \left(\frac{1}{\phi}\right)^j$$

USEFUL FORMULA FOR GEOMETRIC SERIES

$$\sum_{j=1}^k ar^j = a \left(\frac{r - r^{k+1}}{1 - r} \right)$$

REDUCING DEBT IN k PERIODS

The needed primary balance (pb^*) to reduce the debt from d to d^* in k periods corresponds to:

$$pb^* = \left(\frac{(\phi - 1) (\gamma^* - \phi^k)}{1 - \phi^k} \right) d_t$$

The lower γ^* and/or k , the larger pb^* would need to be to reach the debt target in the desired time

Additional Resources

- ✓ This material took stock of:
 - 📌 The primary balance necessary to reduce debt to certain level
 - 📌 the potential impact on cost of funding

RECAP

- ✓ The tradeoff between front-loaded and back-loaded fiscal adjustment is
 - 📌 front-loading to ease financing constraints and gain credibility
 - vs.
 - 📌 back-loading to support growth and work out quality measures

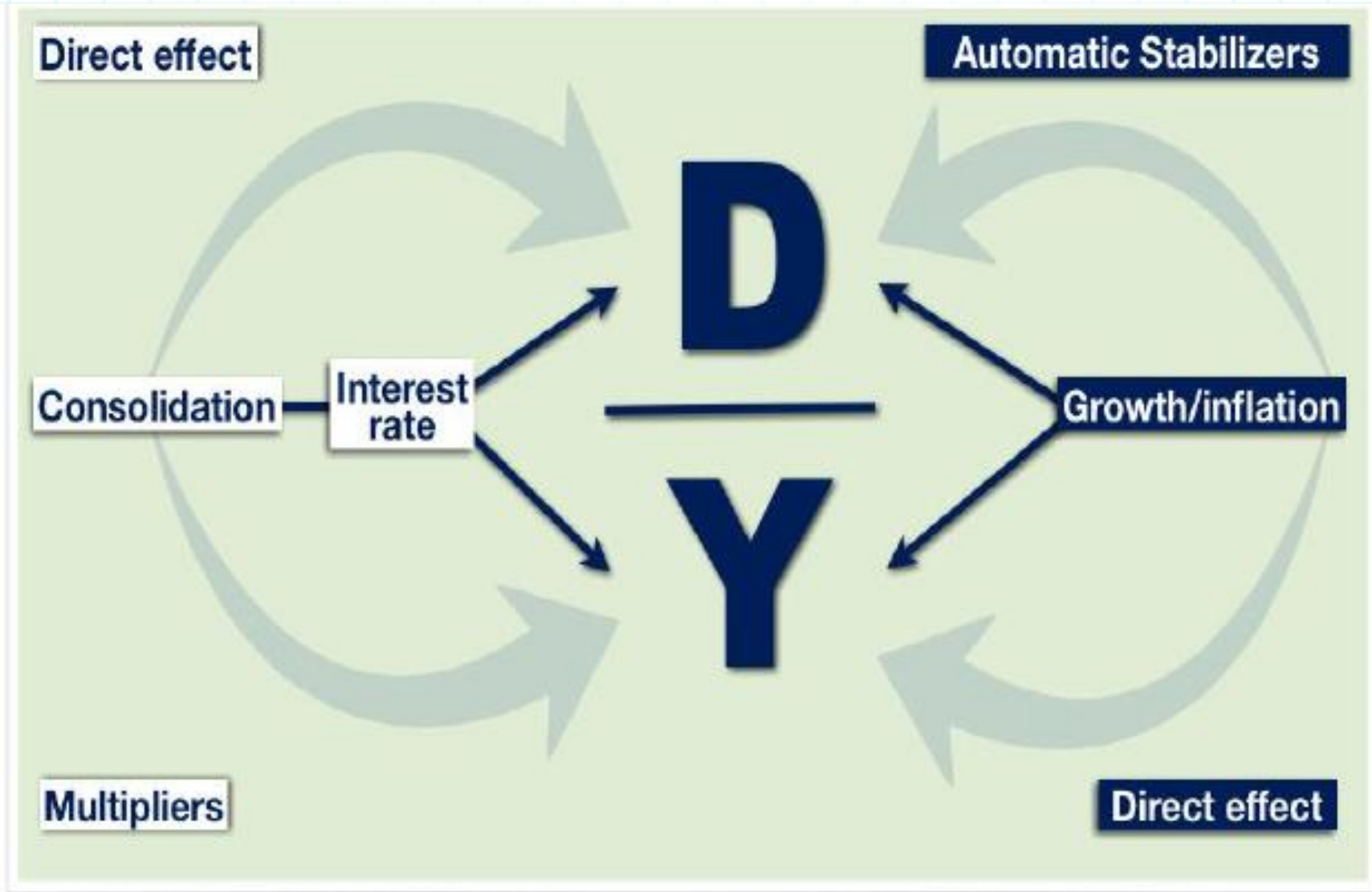
Part 1 Unit 7: Lecture 2

Fiscal adjustment and the business cycle

OUTLINE

- ✓ How the budget balance affects GDP
- ✓ How the budget balance affects the risk premium

Fiscal Adjustment and the Business Cycle



Fiscal Adjustment and the Business Cycle

- ✓ Three main channels from primary balance to debt/GDP:
 - directly via the primary balance in the debt dynamics
 - via GDP through demand
 - lower government spending and higher taxes reduce demand
 - via interest rates through credibility (risk premium) and demand
 - crowding out

Fiscal Adjustment and the Business Cycle

- ✓ Fiscal consolidation may lead to slower GDP growth
 - 🔑 High multiplier (closed economy, high unemployment)
 - 🔑 Coordinated consolidations in economic partners
- ✓ Fiscal consolidation may lead to lower interest rates
 - 🔑 In high-debt countries credibility effects are particularly important

UNIT RECAP

- ✓ Front-loaded vs back-loaded adjustment
- ✓ The speed at which debt can be reduced depends on how fiscal adjustment affects GDP and interest rates.

Additional Resources

Please watch the
video on
Chipping Away
At Public Debt

Part 1 Unit 8

Role of Macroeconomic
Policies

UNIT OBJECTIVES

- ✓ Understand the role of monetary policy
- ✓ Understand the economic policy tradeoffs

UNIT OUTLINE

- ✓ Monetary Policy Stance and Debt
- ✓ Policy Tradeoffs

Part 1 Unit 8: Lecture 1

Monetary Policy Stance and
Debt

OUTLINE

- ✓ Expansionary monetary policy—possible effects
- ✓ The effect of monetary policy on interest rates and inflation

Monetary policy stance and debt

✓ Interest rate

✓ Inflation

✓ Exchange rate

✓ Growth

Monetary policy stance and debt

✓ Expansionary monetary policy – possible effects

📌 Lower nominal interest rates

📌 Lower real interest rates

📌 Higher inflation

📌 Higher growth

📌 Depreciated exchange rate

Monetary policy stance and debt

- ✓ Use the debt dynamics equation and assuming at first no foreign currency debt:
 - if real interest rates fall and growth improves (therefore improving the primary balance), debt is reduced.

$$d_{t\downarrow} = \frac{(1 + r_{t\downarrow})}{(1 + g_{t\uparrow})} d_{t-1} - (pb_{t\uparrow} + ot_t)$$

Monetary policy stance and debt

- ✓ If there is foreign currency debt, the effect is no longer unambiguous. Debt/GDP could increase, in the case of less than complete pass-through of exchange rate depreciation to inflation.

$$d_t = \frac{(1 + r_t^d \downarrow)}{(1 + g_t \uparrow)} d_{t-1}^d + \frac{(1 + i_t^f)(1 + \varepsilon_t \uparrow)}{(1 + g_t \uparrow)(1 + \pi_t \uparrow)} d_{t-1}^f - (pb_t \uparrow + ot_t)$$

Illustration: Impact of Monetary Easing

$$d_t \approx (r_t^d - g_t)d_{t-1}^d + (i_t^f + \varepsilon_t - g_t - \pi_t)d_{t-1}^f - pb_t - ot_t$$

| | No easing | Easing of monetary policy | | |
|-----------------|-----------|----------------------------|-----------------|------------------|
| | | No change in exchange rate | Depreciation | |
| | | | Passthrough 20% | Passthrough 100% |
| | | (% change) | | |
| r^d | 6 | 4 | 4 | 4 |
| i^f | 3 | 3 | 3 | 3 |
| ε^* | 0 | 0 | 10 | 10 |
| π | 0 | 0 | 2 | 10 |
| g | 3 | 4 | 5 | 4 |
| pb | -2 | -1.5 | -1 | -1.5 |
| | | (% GDP) | | |
| d_{t-1}^d | 50 | 50 | 50 | 50 |
| d_{t-1}^f | 50 | 50 | 50 | 50 |
| d_t | 105.0 | 103.0 | 106.1 | 103.0 |

Monetary Policy Stance and Debt

- ✓ The effect of monetary policy on interest rates and inflation needs to be qualified
- ✓ Expansionary monetary policy tends to reduce short-term interest rates but increase long-term ones, reflecting expectations of future inflation

Monetary Policy Stance and Debt

✓ Fischer equation: $i = r^* + \pi^e$

✓ Interest rates are set based on a required real return r^*

📌 Given r^* , higher π^e translates into higher i

📌 Ex post r need not equal r^* if there is surprise inflation (in which case $r < r^*$)

Part 1 Unit 8: Lecture 2

Policy Tradeoffs

OUTLINE

- ✓ Sustainable Debt vs. Inflation
- ✓ Sustainable Debt vs. Competitiveness
- ✓ Sustainable Debt vs. Fairness

Policy Tradeoffs

- ✓ Fiscal dominance
- ✓ Fear of floating
- ✓ Fairness/income distribution

Policy Tradeoffs: Sustainable Debt vs. Inflation

- ✓ Fiscal dominance: inability to conduct contractionary monetary policy because it would jeopardize government debt dynamics
- ✓ Contractionary monetary policy, which would result in
 - 📌 higher real interest rates
 - 📌 lower growth
 - 📌 higher debt/GDP

Policy Tradeoffs: Sustainable Debt vs. Competitiveness

- ✓ Fear of Floating: reluctance to allow a floating exchange rate to depreciate
- ✓ Loose monetary policy is helpful for competitiveness and growth, but will raise the value of foreign currency debt expressed in local currency (public and private) and may cause bankruptcies

Policy Tradeoffs: Sustainable Debt vs. Competitiveness

- ✓ Fear of floating follows from the “original sin” —the inability of emerging markets to issue external debt in their own currency.

Policy Tradeoffs: Sustainable Debt vs. Fairness

✓ Inflation as default

- 📌 There is a thin line separating inflation from default since inflation erodes away the value of debt (especially when there is “financial repression” capping nominal interest rates)
- 📌 Inflation creates a redistribution of wealth from creditors to debtors

Part 1 Unit 9

External Debt Sustainability

UNIT OBJECTIVES

- ✓ Understanding similarities between external and fiscal sustainability
- ✓ Understanding external debt creating flows
- ✓ Understanding solvency condition for external debt

UNIT OUTLINE

- ✓ External DSA
- ✓ External debt creating flows
- ✓ Debt law-of-motion
- ✓ Solvency condition for external debt

Part 1 Unit 9: Lecture 1

External Debt Creating
Flows

OUTLINE

- ✓ External DSA
- ✓ External debt creating flows
- ✓ The adjusted balance

External DSA:

- ✓ Similarities between external and fiscal sustainability → apply similar methodologies
- ✓ Focus on external debt of the country (including the private sector debt)
- ✓ The current account balance of the balance of payments takes the place of the overall budget balance.

Key Differences with Public Debt:

- ✓ The government does not directly control the CAB
- ✓ In a healthy cycle, exports and CAB will improve over time, allowing for repayment of debt
- ✓ Exchange rate normally plays larger role in external sustainability

External Debt Creating Flows:

- ✓ Our goal in this unit is to derive a law of motion for external debt, which links debt to past debt and the current account balance.

$$D_t^f = (1 + i_t^f) D_{t-1}^f - AB_t$$

- ✓ In the process we will define the adjusted balance, AB , which is a modified current account balance.

Notation:

CA_t current account balance

AB_t adjusted balance

I_t interest payments on external debt

KA_t capital account

FA_t financial account

A_t external assets

L_t external liabilities

D_t^f external debt liabilities

E_t external equity liabilities

$(P_t Y_t)$ GDP expressed in USD = $P_t Y_t / e_t$

All variables are expressed in USD

The Adjusted Balance:

✓ Define:

$$AB_t = \underbrace{(CA_t + I_t)}_{\substack{\text{non-interest} \\ \text{current account} \\ \text{balance}}} + \underbrace{(\Delta E_t - \Delta A_t)}_{\text{non-debt financing}}$$

✓ The current account (the sum of net exports, income and current transfers) records interest payments on debt as a negative income item. Here we add interest back to obtain the non-interest CAB.

Part 1 Unit 9: Lecture 2

External Financing Constraint and Debt-Law- of-Motion

OUTLINE

- ✓ External Financing Constraint
- ✓ Debt Law-of-motion

External Financing Constraint

- ✓ Using the terminology of the BOP and IIP manual (6th edition), we write:

$$CA_t + KA_t = FA_t$$

- ✓ We assume for simplicity that the capital account KA (capital transfers for the most part) is zero.

$$KA_t = 0$$

External Financing Constraint

- ✓ The financial account of the BOP records the acquisition of assets and the incurrence of liabilities (e.g. as the result of external borrowing). These flows are called “transactions”.
- ✓ We assume for simplicity that valuation effects are zero, so that the change in the value of assets and liabilities is equal to these BOP transactions.

$$CA_t = \underbrace{\Delta A_t - \Delta L_t}_{FA_t}$$

External Financing Constraint

- ✓ Liabilities can be either debt liabilities or equity liabilities:

$$CA_t = \Delta A_t - \underbrace{(\Delta D_t^f + \Delta E_t)}_{\Delta L_t}$$

- ✓ Debt includes debt securities, loans, currency and bank deposits. Equity includes shares and foreign direct investment.

Debt Law-of-motion

- ✓ Rewriting the previous equation in terms of current period debt and adding and deducting interest:

$$D_t^f = D_{t-1}^f - CA_t - \underbrace{\Delta E_t + \Delta A_t - I_t + I_t}_{-AB_t}$$

- ✓ Next assume as before: $I_t = i_t^f D_{t-1}^f$

Debt Law-of-motion

✓ Finally, using the definition of the adjusted balance and grouping terms involving lagged debt, we find the law-of-motion we had set out to find:

$$D_t^f = (1 + i_t^f) D_{t-1}^f - AB_t$$

Part 1 Unit 9 Lecture 3:

Solvency condition for
external debt

Solvency condition for external debt

- ✓ From the debt law-of-motion we can obtain the intertemporal budget constraint through repeated substitution, as we did for public debt.
- ✓ We then obtain the solvency condition for external debt by imposing the transversality condition or No-Ponzi condition. Specifically, we require that the present discounted value of external debt at time infinity approaches zero.

Solvency Condition For External Debt

- ✓ Using the same method as for public debt, the intertemporal budget condition extended to N periods is:

$$D_0^f = \sum_{j=1}^N \left(\frac{1}{1+i_t^f} \right)^j AB_j + \left(\frac{1}{1+i_t^f} \right)^N D_N^f$$

- ✓ We extend this formula to time infinity and impose the transversality condition.

Solvency Condition

Solvency: the present value of all surpluses (of the adjusted balance) is equal to initial debt.

$$D_0^f = \sum_{j=1}^{\infty} \left(\frac{1}{1+i_t^f} \right)^j AB_j$$

RECAP

- ✓ External Debt Sustainability Analysis
- ✓ External Debt Creating Flows
- ✓ Debt Law-of-motion
- ✓ Solvency condition for external debt

Part 1 Unit 10 Lecture 1:

Deriving External Debt
Law-of-Motion

OUTLINE

- ✓ Debt Law-of-motion: The Debt-To-GDP Ratio
- ✓ Automatic Debt Dynamics

External Debt Law-of-Motion: the Debt-to-GDP Ratio

- ✓ Evolution of external debt at time t :

$$D_t^f = (1 + i_t^f) D_{t-1}^f - AB_t$$

- ✓ We divide by GDP expressed in USD, $(P_t Y_t)^*$, since external debt is expressed in USD.
- ✓ Using $(P_t Y_t)^* = P_t Y_t / e_t$

$$\frac{D_t^f}{(P_t Y_t)^*} = \frac{(1 + i_t^f) D_{t-1}^f}{\underbrace{(1 + g_t)(1 + \pi_t) P_{t-1} Y_{t-1} / e_t}_{P_t Y_t}} - \frac{AB_t}{(P_t Y_t)^*}$$

Debt Law-of-Motion: the Debt-To-GDP Ratio

- ✓ We convert GDP in local currency back to GDP in USD and use $1 + \varepsilon_t = e_t / e_{t-1}$

$$\frac{D_t^f}{(PY_t)^*} = \frac{(1 + i_t^f)(1 + \varepsilon_t)}{(1 + g_t)(1 + \pi_t)} \frac{D_{t-1}^f}{(P_{t-1}Y_{t-1})^*} - \frac{AB_t}{(PY_t)^*}$$

$\underbrace{\hspace{1.5cm}}_{d_t^f} \qquad \qquad \underbrace{\hspace{1.5cm}}_{d_{t-1}^f} \qquad \qquad \underbrace{\hspace{1.5cm}}_{ab_t}$

Debt Law-of-Motion: the Debt-to-GDP Ratio

It is easy to show that

$$\frac{(1+i_t^f)(1+\varepsilon_t)}{(1+\pi_t)} = (1+r_t^f)(1+\varepsilon_t^*)$$

where

$$(1+r_t^f) = \frac{(1+i_t^f)}{(1+\pi^*)} \qquad (1+\varepsilon_t^*) = \frac{(1+\varepsilon)(1+\pi^*)}{(1+\pi)}$$

π^* = foreign inflation rate

r_t^f = real interest rate on foreign debt

ε^* = real exchange rate depreciation

Debt Law-of-Motion: Analytical Representation

Evolution of the debt-to-GDP ratio

$$d_t^f = \underbrace{\frac{(1+r_t^f)(1+\varepsilon_t^*)}{(1+g_t)}}_{\phi_t} d_{t-1}^f - ab_t$$

For $ab_t = 0$ and $d_{t-1} > 0$:

If $\phi_t < 1$, debt converges to zero

If $\phi_t > 1$, debt explodes

Automatic Debt Dynamics

✓ Deducting past debt from both sides and simplifying:

$$d_t^f - d_{t-1}^f = \frac{(1 + r_t^f)(1 + \varepsilon_t^*)}{(1 + g_t)} d_{t-1}^f - d_{t-1}^f - ab_t$$

automatic debt dynamics

$$d_t^f - d_{t-1}^f = \frac{r_t^f - g_t + \varepsilon_t^*(1 + r_t^f)}{(1 + g_t)} d_{t-1}^f - ab_t$$

ϕ_{t-1}

Debt-Stabilizing Adjusted Balance

- ✓ What level of ab keeps debt constant? To find the answer, simply set $d_t = d_{t-1}$ in the previous expression (denote the constant debt level by d^*)

$$ab^* = \frac{r_t^f - g_t + \varepsilon_t^* (1 + r_t^f)}{(1 + g_t)} d^*$$

- ✓ ab^* is the debt-stabilizing primary surplus. Note that it equals the automatic debt dynamics.
- ✓ If $ab > ab^*$ debt falls continuously; if $ab < ab^*$, debt explodes and is therefore unsustainable

Key Comparative Statics

- ✓ *Debt dynamics are affected by:*
 - 📌 Real interest rate
 - 📌 Growth rate of the economy
 - 📌 Current level of indebtedness
 - 📌 Net exports
 - 📌 Long-term level of other flows
 - 📌 Real exchange rate changes

Illustration

| | Country X | Country Y | Country Z |
|--|-----------|-----------|-----------|
|--|-----------|-----------|-----------|

(% change)

| | | | |
|---------------|---|---|----|
| r^f | 5 | 5 | 5 |
| g | 4 | 4 | 4 |
| ε | 0 | 0 | -2 |

(% GDP)

| | | | |
|-------|-----|----|-----|
| d^f | 100 | 20 | 100 |
|-------|-----|----|-----|

ab*

Illustration

- ✓ We can calculate ab^* by applying the formula, while being careful to divide the parameters by 100:

$$ab^* = \frac{r_t^f - g_t + \varepsilon_t^* (1 + r_t^f)}{(1 + g_t)} d^*$$

- ✓ For country Z for example:

$$ab^* = \frac{0.05 - 0.04 - 0.02(1 + 0.05)}{(1 + 0.04)} \bullet 1 = -0.0106 = -1.06\%$$

Summary

Key Takeaways for External Debt

Key Equations

Debt law-of-motion

$$D_t^f = (1 + i_t^f) D_{t-1}^f - AB_t$$

Adjusted balance

$$AB_t = (CA_t + I_t) + (\Delta E_t - \Delta A_t)$$

Debt law-of-motion (%GDP)

$$d_t^f - d_{t-1}^f = \frac{r_t^f - g_t + \varepsilon_t * (1 + r_t^f)}{(1 + g_t)} d_{t-1}^f - ab_t$$

Debt dynamics

- ✓ *Debt dynamics are affected by:*
 - 📌 Real interest rate
 - 📌 Growth rate of the economy
 - 📌 Current level of indebtedness
 - 📌 Net exports
 - 📌 Long-term level of other flows
 - 📌 Real exchange rate changes