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Modernizing Debt Sustainability Analysis Framework for Better Policy Assessments: Notes from Turkish Experience

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□ Practice in Turkish Treasury

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 - Debt Indicators Module (DIM)
 - Turkish Debt Simulation Model (TDSM)
- Reporting and Publishing

□ Final Remarks

Debt Sustainability Analysis

Debt Sustainability Analysis

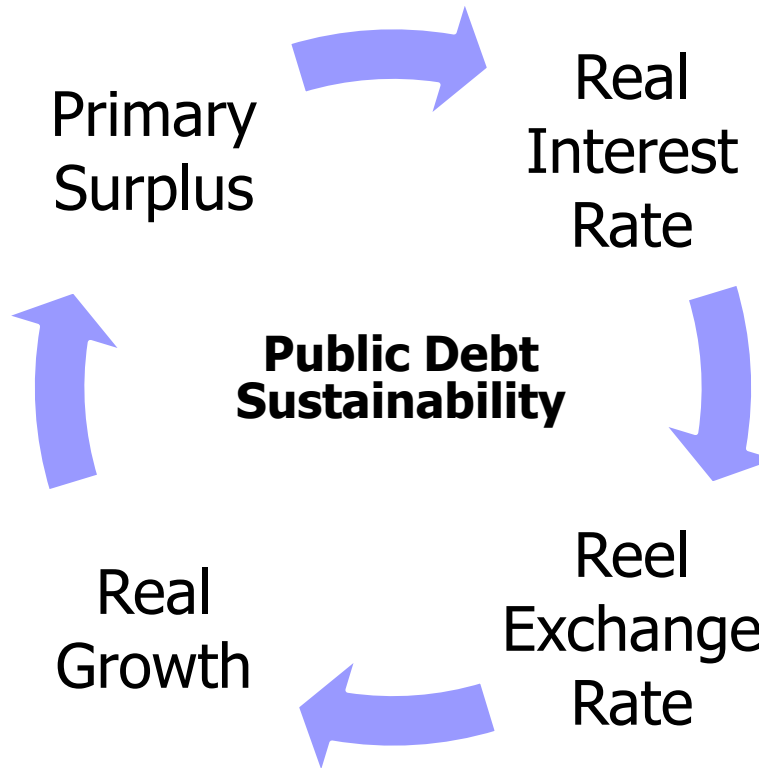
Purpose

- The primary goal of debt sustainability analysis (DSA) is
 - to estimate the future path of debt stock and
 - to test the course of debt level under adverse shock scenarios
- A country that looks solvent at present may not be so in the future -and vice versa-
- DSA outcomes are important for
 - fiscal policy makers
 - the financial market players

Debt Sustainability Analysis

Main Dynamics

Interrelation of public debt with exchange rates, interest rates, primary surplus, real growth and budget dynamics



Debt Sustainability Analysis

Main Dynamics

- A stress test framework for public debt management should ideally
 - consider possible risks arising from contingent liabilities
 - have a robust structure to cover tail risks and interdependence among shocks.
 - Include forward looking scenarios
- These features are traditionally important for EMs, after global financial crisis crucial for all countries

Debt Sustainability Analysis

Methodology

- In literature, there are different methods for conducting DSA, among which “Accounting Approach (AA)” is the most widely used
- AA concentrates on public debt to national income ratio and provides valuable information for assessing debt burden in an economy

Debt Sustainability Analysis

Methodology - Accounting Approach

- The equation presents the relationship between “Debt/GDP” ratio (b), primary surplus (ps), interest (r) expenditures and economic growth rate (g) and forms the basis for accounting approach

$$b_t = \frac{(1 + r_t)}{(1 + g_t)} b_{t-1} - ps_t$$

- If the primary surplus to GDP ratio equals to zero, the debt ratio will grow (or fall) at a rate equal to difference between the interest rate and the growth rate.

Debt Sustainability Analysis

Methodology - Accounting Approach

- AA is a useful method
 - easily-implemented and useful for showing the effect of medium-term budget policy
 - estimates primary surplus need for stabilizing debt ratio under given interest rate and the growth rate assumptions (Cuddington, 1997)
- However,
 - does not contain any information about maturity and interest rate structure of debt stock and inadequate in terms of determining sustainable debt strategy
 - cannot capture tail risks as the variables are handled in a deterministic process

Practice in Turkish Treasury

Practice in Turkish Treasury

Scenario analyses and stress tests are performed through

- Conventional Accounting Approach (CAA) on the debt accumulation
- Enhanced Models of DSA:
 - Debt Indicators Module (DIM): Spread sheet model that
 - relies on scenario analyses where
 - certain macro-economic or market scenarios are created
 - Base scenario(s)
 - Risk scenario(s)
 - by means of expert judgment, market analysis etc.
 - Turkish Debt Simulation Model (TDSM): Stochastic simulation model for tail risks

Practice in Turkish Treasury:

Conventional Accounting Approach (CAA)

- Simple equation of conventional accounting approach was converted into its below form

$$b_t = \left[\frac{(1 + r_t)}{(1 + g_t)} \right] b_{t-1}^d + \left[\frac{(1 + r_t^f)}{(1 + g_t)} \right] \Delta rer * b_{t-1}^f - ps_t - pri_t$$

- This new form of the equation
 - distinguishes the currency structure of debt by applying change in real exchange rate (Δrer) foreign currency interest rate (r) onto the estimation
 - Incorporates privatization revenues as a debt reducing item
- However, it does not contain any information about maturity and interest rate structure of debt stock

Practice in Turkish Treasury:

Sensitivity of Gross Public Debt to Shocks based on CAA

	2001	2012
Change in real exchange rate app/dep by 5 percentage points	+ / - 2.2 points	+ / - 0.5 points
Change in TRY interest rate by*		
10 percent	+ / - 2.0 points	+ / - 0.2 points
25 percent	+ / - 5.0 Points	+ / - 0.5 points
Change in GDP growth rate by 2 percentage points	+ / - 1.5 points	+ / - 0.7 points
Change in Primary Surplus/GDP ratio by 1 percentage point	+ / - 1.0 points	+ / - 1.0 points

(*) Reflects percent change in TRY interest rate in succeeding years.

Note: The effects of scenarios on “Gross Public Debt Stock/GDP” ratio (as defined by ESA standards) measured by deviations from baseline scenarios based on end-2001 and end-2012 stock realizations.

Source: Undersecretariat of Treasury

Practice in Turkish Treasury

- Although the new form of the equation is useful for testing the sensitivity of the current state of the debt stock, it has major shortcomings such that
 - Can not produce precise future estimations since it does not take current structure of debt into account
 - Would miss key risk sources for debt sustainability
- Composition of the debt stock plays critical roles not only for estimating the future path of debt, but also for measuring vulnerabilities properly
- Also, major impact of policy changes in a forward looking analysis needs to be analyzed in a comprehensive framework

Practice in Turkish Treasury:

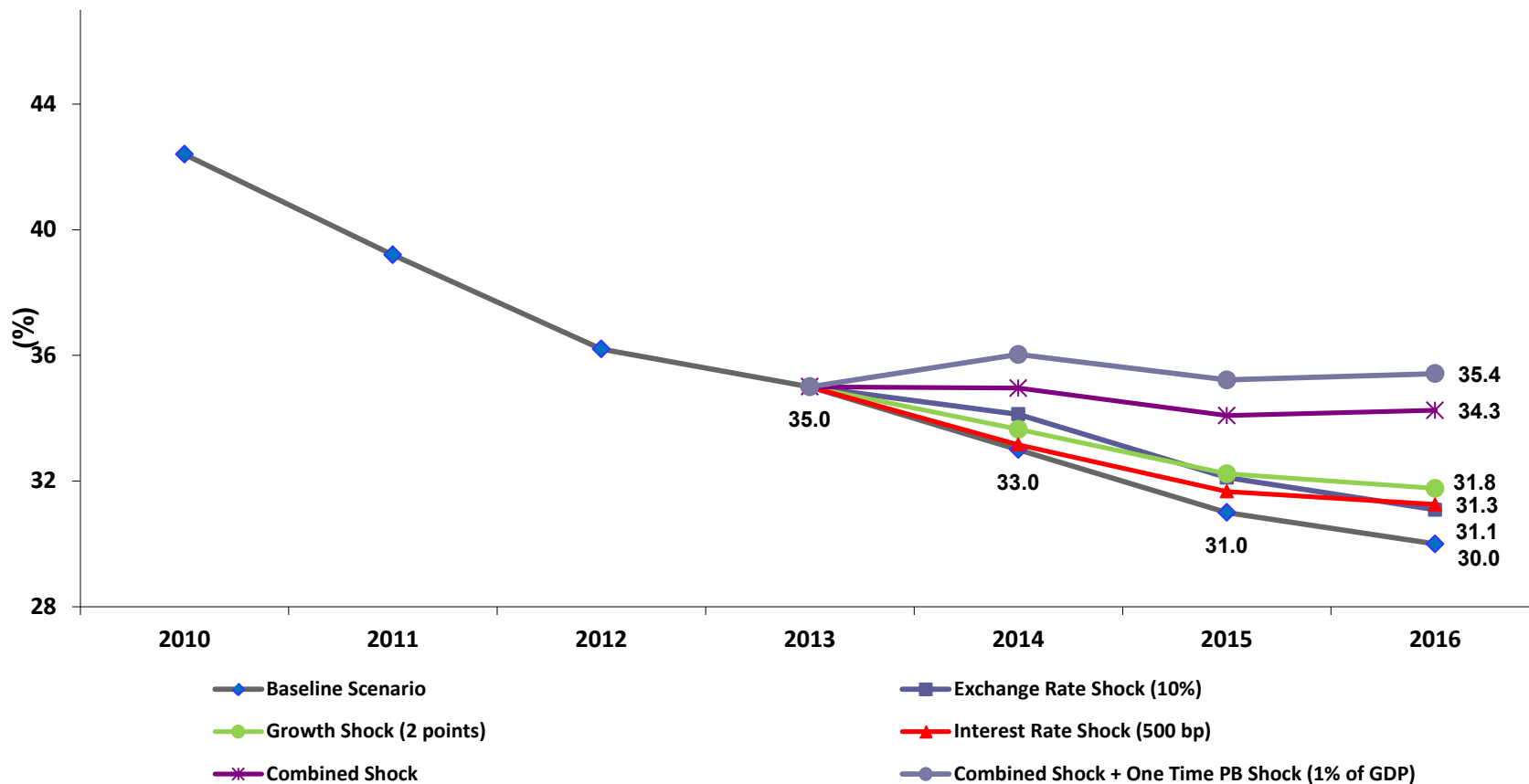
Debt Indicators Module (DIM)

- DIM is an Excel based tool which contains monthly data for “debt redemptions”, “non-borrowing sources” and “borrowing composition”
- Based on this comprehensive data set, DIM
 - ✓ recognizes interest, maturity and currency composition of current stock on monthly basis
 - ✓ produces debt stock projections for 5 years horizon period
 - ✓ calculates various debt and risk management indicators
 - ✓ enables us to distribute total financing requirement among instrument types

However, it does not take tail risks into account

Practice in Turkish Treasury:

Scenario Analyses based on DIM



Source: Undersecretariat of Treasury, PEP 2014-2016

Practice in Turkish Treasury:

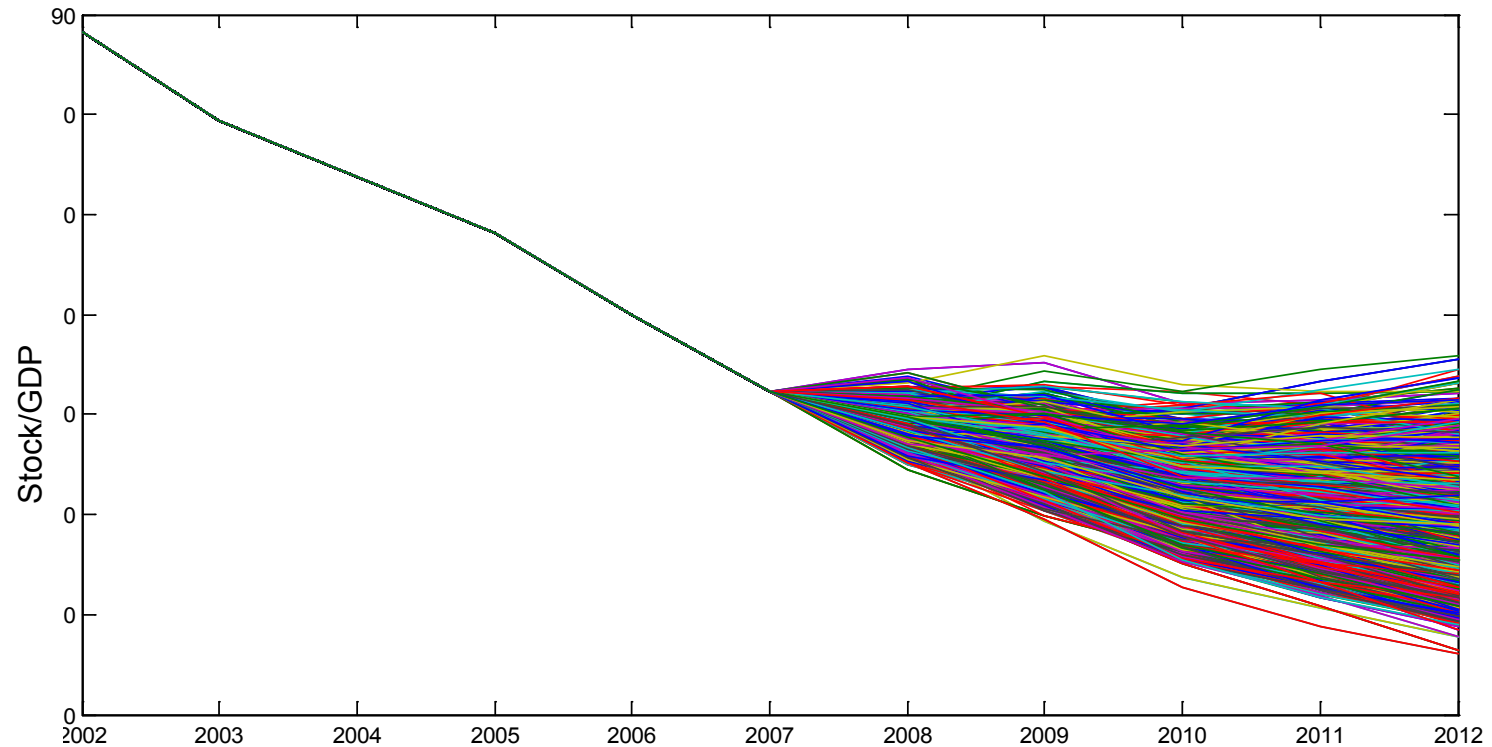
Turkish Debt Simulation Model (TDSM)

- We try to cover all potential uncertainty side of a financial time series
- In addition to normal distribution scenarios, stochastic environment is enriched with fat tails, asymmetric errors, yield curve shifting scenarios
- Forward-looking scenarios can be generated based on
 - Medium-Term Program (MTP) Targets
 - Central Bank Inflation Targets
 - Market expectations
 - Implied option volatilities
 - Forward rates

Practice in Turkish Treasury:

Assessment of Tail Risk based on TDSM

Distribution of Debt Stock Projections (Illustrative Result)



Practice in Turkish Treasury:

Reporting and Publishing

- Mid-office runs the DSA and Sensitivity analysis on a regular basis and report the results to the top management → *Monthly Risk Bulletins*
- Besides that, results are shared with the public through the Treasury's web site and publications
 - *Presentation on Debt Indicators*
 - *Public Debt Management Report*
 - *Medium Term Economic Program*

Final Remarks

Final Remarks

- Taking debt structure into account in a DSA framework makes a significant difference both in estimating future path of debt and analyzing vulnerability of debt stock
- Although CAA is simple tool providing important information especially about the direction of the debt burden, it has major shortcomings
- Enhanced tools like DIM and TDSM make it possible to estimate the future path of debt properly and test the baseline under various scenarios at the expense of collecting and analyzing composite data sets.

Final Remarks

- Better risk assessment of public debt requires improvement in DSA, specifically:
 - Interest rate, currency and maturity structure of debt stock
 - Risks arising not only from direct liabilities but also from contingent liabilities
 - Tail risks
 - Interdependence among shocksshould be taken into account.
- Sharing the methodology and the results of these analyses with public in accordance with the transparency principles could be another aspect to be focused



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