The Current Debt Management Strategy and the Cost and Risk of the Existing Debt

MTDS: Step 2
Step 2

• Objective
  – Identify the current debt management strategy
  – Identify the outstanding debt and its composition
  – Calculate basic cost and market risk indicators

• Outcome
  – Description of existing debt management strategy
  – Description of outstanding debt and debt servicing profile
  – Identification and description of main portfolio risks
Agenda

• The current strategy
• What is cost and risk on a public debt portfolio?
• Indicators of cost and risk
• Market risk indicators
  – Refinancing risk
  – Interest rate risk
  – Foreign exchange risk
  – Existing debt – deriving cash flows
• Country example
• Summary
The current debt management strategy (1)

- Why is a starting point for the MTDS the current strategy?
  - Describe current practices, and therefore, preferred cost-risk tradeoff
  - Provides a basis for analyzing alternative strategies

- If a formal strategy is in place
  - It may not be comprehensive
  - It may not have been updated recently
  - It may provide broad guidelines, but is not based on thorough analysis

⇒ Identify the strategy document
The current debt management strategy (2)

• If a formal strategy is not in place
  – Even without a formal debt management strategy, decisions are taken regarding interest, currency etc. on a regular basis
  – Identify and describe current practices, i.e. how are choices between domestic vs. foreign, fixed vs. variable etc., made?

➤ Describe current borrowing practices
Cost and Risk (1)

Decision-makers need information on

- **Cost**: Annual interest payments + the impact of changes in exchange rates
  - Local currency as numeraire?

- **Risk**: Changes in future cost and the impact on the budget

- How cost and risk may interact for different portfolios and under different market scenarios
  - Scenario analysis
  - Stochastic modeling
Cost and Risk (2)

- Since debt management objectives are expressed in terms of cost and risk, these concepts should have concrete interpretations in order to design debt management strategies that meet such objectives
  - Clear definitions of cost and risk is a first step of developing an MTDS

- Choice of time horizon and unit for cost measurement should be consistent with characteristics of the assets
  - Future stream of primary surpluses will normally be denominated in local currency
  - Medium to long term time horizon
Some definitions: Interest cost

\[ I_t^* = \sum_{j=1}^{m} e_{jt} I_{jt}^{FX} + I_t^{DX} \]

where \( I_t^* \) = total interest payments expressed in local currency at time \( t \), \( e_{jt} \) = \( jth \) exchange rate between the domestic currency and foreign currency \( j \), \( I_{jt}^{FX} \) = interest payments denominated in foreign currency \( j \), and \( I_t^{DX} \) = local currency interest payments.
Cost adjusted for unrealized capital gains/losses on indexed debt

\[ C_t^* = I_t^* + \sum_{j=1}^{m} (FX_t^j \Delta e_t^j) \]

where \( C_t^* = \) adjusted nominal interest cost,
\[ \sum_{j=1}^{m} (FX_t^j \Delta e_t^j) = \] the capital gains/loss arising from the change in the exchange rates associated with outstanding FX debt, and \( I_t^* \) is as defined previously.
Adjusted cost

• Recognizes that the structure of the instrument might affect the assessment of its true economic cost

• Ex-post cost of indexed debt will include the capital gains/losses that will be realized when debt is repaid
  – Proceeds to be paid on maturity may far outstrip those received on issue
  – Does represent a significant absorption of resources that could and should be incorporated into any assessment of the cost of debt

• This revaluation of the principal reflects an element of cost not captured in the profile of interest payments
  – Ensures that the cost associated with such gains / losses will be attributed (or accrued) in the period in which they are incurred
What is risk on a public debt portfolio?

• Market risk, operational risk, liquidity risk etc.
  – Our focus here is on market risk

• Market risk is function of
  – The volatility of the underlying factors, the risk factors or sources of risk, e.g. Interest rate volatility, exchange rate volatility
  – The portfolio exposure or the degree of sensitivity to the risk factors, e.g. duration, currency mismatch between assets and liabilities

• Risk is associated with the potential for the cost to deviate from its expected outcome on the budget and in the government’s balance sheet
Market risk: Potential variation in cost

\[ \text{risk}_t^k = I_t^{k,s} - I_t^{k,b} \]

\[ \text{risk}_t^k = C_t^{k,s} - C_t^{k,b} \]

\[ k = *, P, Y \text{ or } T \]

where \( I_t^{k,s} \) and \( C_t^{k,s} \) are respectively the costs under the scenario with an expected shock and \( I_t^{k,b} \) and \( C_t^{k,b} \) are the costs under a baseline scenario.
Refinancing risk

• Captures the exposure of the debt portfolio to higher interest rates at the point at which debt is being refinanced/rolled over

• Typical measures
  – Reviewing the redemption profile of the outstanding debt stock
  – The amount of debt that is falling due in a given period
  – Average Time to Maturity
Refinancing risk – the shape of the redemption profile

- Highlights specific points of vulnerability
  - Risk associated with realization of capital gains/losses
  - Highlights risk that is potentially masked by focusing on average measures such as average term to maturity
Refinancing risk: Average Time to Maturity (1)

\[ ATM_t = \sum_{t=1}^{T} (A_t \cdot t) \]

- Where \( A_t \) = \( t^{th} \) period principal payment in the portfolio.
- ATM shows how long it takes on average to roll over or refinance the debt portfolio.
- A low value indicates that a high share of the debt will be rolled over in the near future, i.e. exposure to risk.
Refinancing risk: Average Time to Maturity (2)

- A stylized example of calculating ATM

<table>
<thead>
<tr>
<th>Year</th>
<th>t</th>
<th>Fixed Rt fixed B</th>
<th>Floating Rt float C</th>
<th>Flow Rt D=B+C</th>
<th>Cashflow weight E=D/4000</th>
<th>Contribution ATM F=A*E</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>0.5</td>
<td>1,500</td>
<td>150</td>
<td>1,650</td>
<td>0.41</td>
<td>0.21</td>
</tr>
<tr>
<td>2008</td>
<td>1.5</td>
<td>500</td>
<td>150</td>
<td>650</td>
<td>0.16</td>
<td>0.24</td>
</tr>
<tr>
<td>2009</td>
<td>2.5</td>
<td>250</td>
<td>150</td>
<td>400</td>
<td>0.10</td>
<td>0.25</td>
</tr>
<tr>
<td>2010</td>
<td>3.5</td>
<td>250</td>
<td>150</td>
<td>400</td>
<td>0.10</td>
<td>0.35</td>
</tr>
<tr>
<td>2011</td>
<td>4.5</td>
<td>250</td>
<td>400</td>
<td>650</td>
<td>0.16</td>
<td>0.73</td>
</tr>
<tr>
<td>2012</td>
<td>5.5</td>
<td>250</td>
<td>-</td>
<td>250</td>
<td>0.06</td>
<td>0.34</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3,000</td>
<td>1,000</td>
<td>4,000</td>
<td>1.00</td>
<td>2.13</td>
</tr>
</tbody>
</table>
Interest rate risk

- Captures the exposure of the portfolio to changes in market interest rates
- Examples of interest rate indicators
  - Fixed-Floating ratio
    - Floating rate debt as a percentage of total debt
  - Debt exposed to interest rate re-fixing within a specific time period
    - Maturing fixed rate debt to be rolled over
    - Variable rate debt (include interest rate swaps)
  - Average Time to Re-fixing
Interest rate re-fixing risk

• Debt exposed to interest rate re-fixing within a specific time period
  – Maturing fixed rate debt to be rolled over
  – Variable rate debt (include interest rate swaps)
• Captures vulnerability of the debt portfolio, and its cost, to higher market interest rates at the point at which the interest rate on variable rate is being reset or fixed rate debt is being refinanced
Re-fixing risk: An illustration
Interest rate risk: Average Time to Re-fixing (1)

\[
ATR_t = \frac{\omega^f \sum_{t=1}^{T} (A_t^f \cdot t) + \omega^v \sum_{s=1}^{S} (D_{t,s}^v \cdot s)}{D_t}
\]

- Where \( D_t^v \) is the share of outstanding debt with variable interest rate, \( D_t \) is the total outstanding debt, \( A_t^f \) is amortization payments of fixed rate debt, \( s \) is the time to the next interest rate reset for the variable rate debt, \( \omega^j \), \( j = v \) and \( f \), are the respective shares of the variable rate debt outstanding and fixed rate principal falling due
- ATR shows how long it takes on average to re-fix the interest rate on the debt portfolio
- A low value indicates that a high share of the debt will be re-fixed in the near future, i.e. exposure to risk
Interest rate risk: Average Time to Re-fixing (2)

- A stylized example of calculating ATM

<table>
<thead>
<tr>
<th>Time</th>
<th>Cashflow Fixed</th>
<th>Cashflow Floating</th>
<th>Weight</th>
<th>ATR Fixed</th>
</tr>
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<tbody>
<tr>
<td>2007</td>
<td>0.5 1,500</td>
<td>1,000</td>
<td>0.63</td>
<td>0.31</td>
</tr>
<tr>
<td>2008</td>
<td>1.5 500</td>
<td></td>
<td>0.13</td>
<td>0.19</td>
</tr>
<tr>
<td>2009</td>
<td>2.5 250</td>
<td></td>
<td>0.06</td>
<td>0.16</td>
</tr>
<tr>
<td>2010</td>
<td>3.5 250</td>
<td></td>
<td>0.06</td>
<td>0.22</td>
</tr>
<tr>
<td>2011</td>
<td>4.5 250</td>
<td></td>
<td>0.06</td>
<td>0.28</td>
</tr>
<tr>
<td>2012</td>
<td>5.5 250</td>
<td></td>
<td>0.06</td>
<td>0.34</td>
</tr>
</tbody>
</table>

D = (B + C) / 4,000
E = A * D

Average time to refixing

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>1,500</td>
<td>1,000</td>
<td>0.63</td>
<td>0.31</td>
</tr>
<tr>
<td>1.5</td>
<td>500</td>
<td></td>
<td>0.13</td>
<td>0.19</td>
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<td>2.5</td>
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<td></td>
<td>0.06</td>
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<td>5.5</td>
<td>250</td>
<td></td>
<td>0.06</td>
<td>0.34</td>
</tr>
</tbody>
</table>

Average

3,000 1,000 1.00 1.50
Foreign Exchange Risk

- Share of external debt in total debt
- Currency composition
- Degree of currency mismatch
  - ALM considerations
    - Government inflows in foreign currency
    - Currency composition of central bank reserves
    - Degree of synchrony with a hard-currency economy
Exchange rate risk

\[ d_{t}^{fx} = \frac{D_{t}^{fx}}{D_{t}} = \frac{FX_{t}}{DX_{t} + FX_{t}} = \frac{\sum_{j=1}^{m} e_{jt}FX_{jt}}{DX_{t} + \sum_{j=1}^{m} e_{jt}FX_{jt}} \]

where \( d_{t}^{fx} = \frac{D_{t}^{fx}}{D_{t}} \) is the share of foreign currency debt in the debt portfolio.

- Captures the vulnerability of the debt portfolio and the government’s debt cost to a depreciation/devaluation in the external value of the domestic currency.
Market risk: Some observations

• Fixed rate, domestic currency debt will minimize potential volatility in costs, i.e. is low risk
  – Generally costly
  – Absence of domestic market

• Amortizing structures and actively smoothing the redemption profile reduce refinancing risk
  – May not match creditor/investor needs

• Often, the trade-off for developing countries is between short term/variable domestic debt and long term/fixed rate foreign currency debt
Why calculate risk indicators?

- Control and communicate risks on the government’s debt – reporting
- Describe the debt management strategy being applied
- Risk indicators are calculated using debt cash flows, debt stock, and macroeconomic variables such as the GDP, government revenues, etc.
- As risk has different dimensions, debt managers normally use a set of risk indicators rather than relying on a single one
Data requirements

• Risk indicators are calculated on the basis of cash flows

• The source for data: Debt recording system(s)
  – Every type of loan can be turned into a future cash flow – sometimes assumptions about future market rates are needed
  – When many currencies, cash flows can be bundled according to currency, i.e. focus only on the main currencies
Risk Indicators – Country Example
## Outstanding debt as of End 2007

<table>
<thead>
<tr>
<th></th>
<th>USD Bn</th>
<th>MYK Bn</th>
<th>% of GPD</th>
<th>Avg. Int.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>External Debt</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Debt</td>
<td>1.047</td>
<td>443.9</td>
<td>4%</td>
<td>1.78%</td>
</tr>
<tr>
<td>Bilateral</td>
<td>0.507</td>
<td>214.9</td>
<td>2%</td>
<td>2.19%</td>
</tr>
<tr>
<td>Multilateral</td>
<td>0.540</td>
<td>229.0</td>
<td>2%</td>
<td>1.40%</td>
</tr>
<tr>
<td><strong>Domestic</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Debt</td>
<td>1.618</td>
<td>686.0</td>
<td>7%</td>
<td>1.10%</td>
</tr>
<tr>
<td><strong>Total Debt</strong></td>
<td>2.665</td>
<td>1,129.9</td>
<td>11%</td>
<td>1.37%</td>
</tr>
</tbody>
</table>

- Share of multilateral debt = 52% of external debt
- Share of fixed rate debt = 96% of external debt
Market risk

• Interest rate risk
  – Refers to an increase in debt servicing cost due to unexpected changes in market interest rates
    • Short-term or variable interest rate debt is considered more risky than long-term or fixed rate debt

• Refinancing risk
  – Refers to the risk of not being able to obtain new financing as debt matures, or only at an unusually high cost
    • Short term debt is considered more risky than long term debt

• Foreign exchange risk
  – Refers to an increase in debt servicing cost due to unexpected foreign exchange rate movements
    • Debt denominated in or indexed to foreign currencies is considered more risky than debt denominated in domestic currency
Interest rate risk (1)

- Debt exposed to interest rate re-fixing within a specific time period
  - Maturing fixed rate debt to be rolled over
  - Variable rate debt

- Re-fixing within 1 year = 9% of outstanding external debt
  - Fixed rate debt maturing in 2008 = USD 52.6 M
  - Total variable rate debt = USD 46.3 M

- Re-fixing within 1 year for total debt = 24% of total debt
  - Domestic debt: 33%
Interest rate risk (2)

- Average Time to Re-fixing (ATR)

<table>
<thead>
<tr>
<th>Year</th>
<th>Time</th>
<th>Fixed</th>
<th>Var</th>
<th>ATR</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>0.5</td>
<td>25</td>
<td>100</td>
<td>0.31</td>
</tr>
<tr>
<td>2009</td>
<td>1.5</td>
<td>25</td>
<td></td>
<td>0.19</td>
</tr>
<tr>
<td>2010</td>
<td>2.5</td>
<td>25</td>
<td></td>
<td>0.31</td>
</tr>
<tr>
<td>2011</td>
<td>3.5</td>
<td>25</td>
<td></td>
<td>0.44</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th>100</th>
<th>1.25</th>
</tr>
</thead>
</table>

- ATR external debt = 10.8 years
- ATR domestic debt = 2.7 years
- ATR total debt = 5.9 years
Refinancing risk (1) – total debt

USD million

Domestic
Multilateral
Bilateral
Refinancing risk (2) – external debt

USD million

- Multilateral
- Bilateral
Refinancing risk (3)

• Debt refinancing/rollover
  – Maturing fixed and variable rate debt to be rolled over

• Refinancing within 1 year = 22% of outstanding debt (including domestic debt)
  – \(\frac{(60.4+530.7)}{2,665} = 22\% \text{ of outstanding debt}\)

  – External debt, refinancing within 1 year = 9%
    • Debt maturing in 2008 = USD 60.4 M

  – Domestic debt, refinancing within 1 year = 33%
    • Debt maturing in 2008 = MYK 225 Bn
Refinancing risk (4)

- Average Time to Maturity (ATM)

<table>
<thead>
<tr>
<th>Year</th>
<th>Time</th>
<th>Princ</th>
<th>ATR</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>0.5</td>
<td>50</td>
<td>0.13</td>
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<tr>
<td>2009</td>
<td>1.5</td>
<td>50</td>
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</tr>
<tr>
<td>2010</td>
<td>2.5</td>
<td>50</td>
<td>0.63</td>
</tr>
<tr>
<td>2011</td>
<td>3.5</td>
<td>50</td>
<td>0.88</td>
</tr>
</tbody>
</table>

- ATM external debt = 10.9 years
- ATM domestic debt = 2.7 years
- ATM total debt = 5.9 years
Foreign exchange risk

• Currency composition

- EUR, 60%
- USD, 21%
- JPY, 4%
- KWD, 3%
- CNY, 4%
- Other, 9%
Some conclusions regarding the risks on the government debt

• Debt level relatively low
• Mostly fixed, and low interest rates
• External debt
  – Low exposure to changes in interest rates
  – Low rollover risk
  – Low budget exposure to changes in exchange rates, however, potentially substantial impact on stock
• Domestic debt
  – High exposure to interest rate changes if debt is rolled over – lack of domestic market!
Summary

• Market risk on a public debt portfolio refers to the effect on costs, and therefore the government’s budget, from changes in the underlying market rates, interest rates and exchange rates

• Risk is a function of exposure and the volatility of the underlying risk factors

• Risk indicators are calculated on the basis of cash flows

• Output from Step 2
  • Description of existing debt management strategy
  • Outstanding debt and debt servicing profile
  • Main portfolio risks