Training Course in Revenue Forecasting

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Client *Tax Committee under the Government of Tajikistan, Contract TJTARP/CQS/-01*

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Revenue Forecasting - Day Three - Overview

- Taxation and the Economy
- Tax Elasticity and Tax Buoyancy
- Revenue Forecasting using Macroeconomic Data

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Revenue Forecasting – Session 1

Taxation and the Economy

- Stylized flow of funds within the macro-economy
- Macro-economic identities
- Tax revenue bases related to the flows of funds
- Economic bases for forecasting the main taxes

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Taxation and the Economy

Stylized flow of funds within the macro-economy - 1

- The economic activity of any country can be represented by the flow of funds within that country's macro-economy.
- It is convenient to represent the domestic economy as comprising three sectors: Households, Government and Businesses (sometimes called the Market sector).
- Imports take funds out the economy and Exports and Remittances introduce funds into the economy.
- Businesses pay wages to employees and distribute profits to business owners, either foreigners or in the Household sector.
- Households can spend their current income on Consumption or add to or subtract from their Savings.
- Businesses require Investment from domestic or foreign sources.

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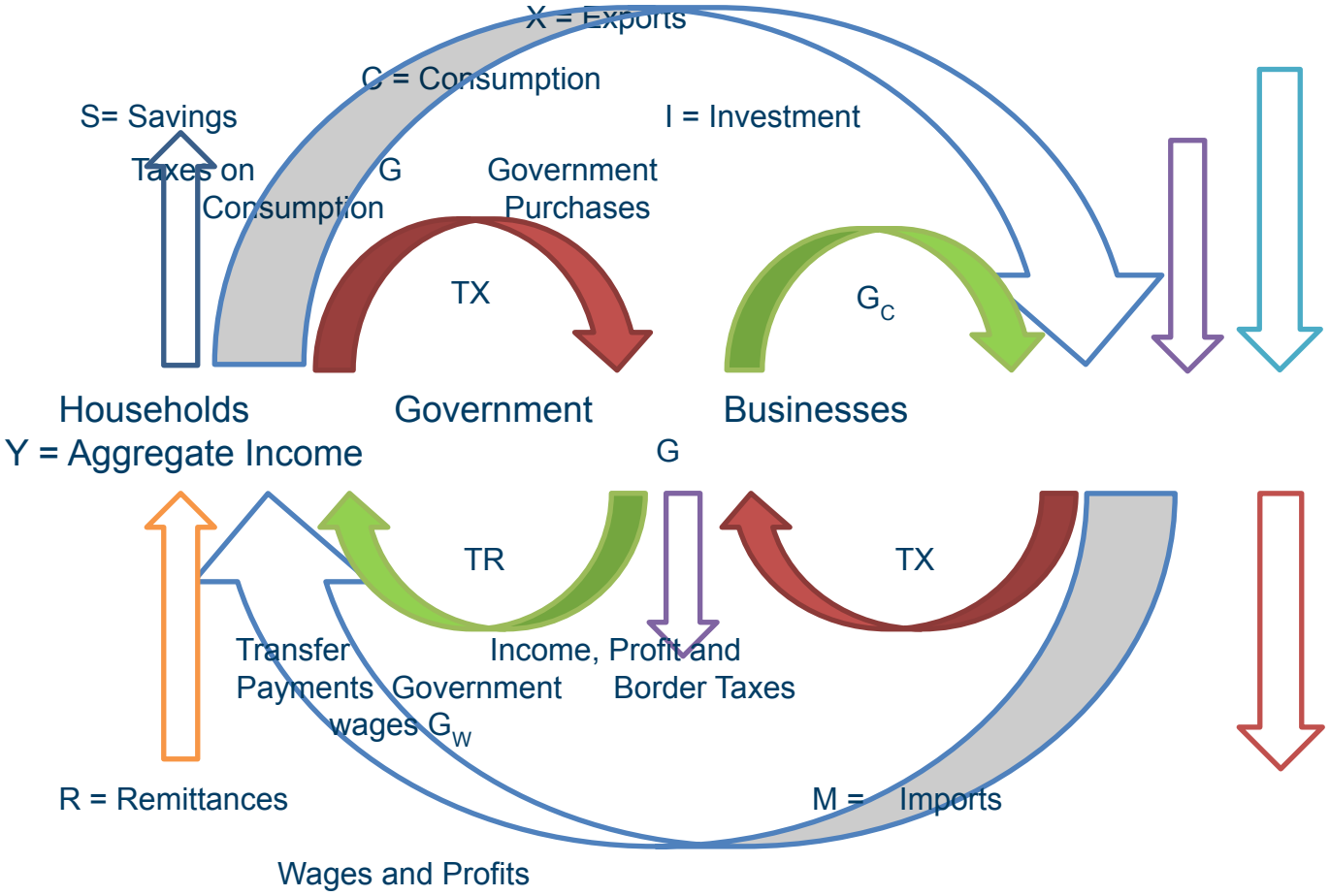
Taxation and the Economy

Stylized flows of funds within the macro-economy



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Taxation and the Economy

Stylized flow of funds within the macro-economy - 3

- In a closed economy, business investment needs, I, must be funded by Savings (or by Government grants and subsidies). However, the economy is not closed, and some investment funds may come from foreign sources.
- The Government is an agent within the economy, purchasing goods and services, G_C, assumed from the business sector, and paying wages, G_W, nominally to the household sector.
- In addition, the government collects taxes, TX, and makes transfer payments (pensions and social payments) TR to households.
- The government may also pay subsidies and make grants to the business sector. These can be included in the definition of TR.

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Taxation and the Economy

Macro-economic identities - 1

The circular flows of funding shown within the diagram are represented mathematically in a series of equations, known as identities.

The first and most important is the economy-wide balance:

$$Y - S = C + I + G + X - M \qquad (6.1)$$

where:

- Y is the aggregate income in the economy, accruing to households and business owners (including remittances);
- S is the net addition to savings of households and business owners;

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Taxation and the Economy

Macro-economic identities - 2

- C is the aggregate consumption of goods and services within the economy, measured as the amount spent (by households, government and businesses) to acquire those goods and services;
- I is the amount required for new investment by the producers of goods and services (market sector);
- G is the net expenditure of the government (government expenditure less government revenue);
- X is the revenue obtained from the export of goods and services by the domestic economy; and
- M is the aggregated cost of imports of goods and services by the domestic economy.

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Taxation and the Economy

Macro-economic identities - 3

The government spends money on purchases of goods and services G_C and pays wages G_W to its employees.

This expenditure is funded by its income from taxes TX, less its spending on transfers TR.

Hence we can write:

$$G = G_C + G_W - (TX - TR) \qquad (6.2)$$

where G is the net Government expenditure.

Note that if G is positive the Government Budget is in deficit.

Government debt and other financing flows are not included in this analysis of the real economy.

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Taxation and the Economy

Tax revenue bases related to the flows of funds - 1

The main flows of funds that have the potential to produce tax revenues are:

- gross income, including salaries and wages of government and private sector employees and business profits; and
- the spending by households and business on goods and services (in some countries, Government spending on goods and services is also taxed).

As all consumption goods and services are either produced domestically or imported, it is important not to count their value twice in determining the revenue base for estimating consumption taxes.

In addition, Customs duties and excises are levied on the value or the amount of the dutiable and excisable goods imported or produced.

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Taxation and the Economy

Tax revenue bases related to the flows of funds - 2

Major streams not taxed are:

- remittances (which form part of household income, and feed into household consumption), and
- savings and investment, although interest earned on aggregate savings and dividends from the application of the funds invested in business operations do yield tax revenue.

These latter two tax bases depend upon the stock of savings and investment, rather than the flow of funds.

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Taxation and the Economy

Economic bases for forecasting the main taxes - 1

Consumption and other indirect taxes

Value Added Tax	Private final consumption (household and small businesses)
Excises	Value or quantity of excisable goods produced or imported

Trade taxes

Import duties and levies	Value of goods imported – ideally by tariff classification
Export duties and levies	Value of dutiable goods exported - ideally by tariff classification

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Taxation and the Economy

Economic bases for forecasting the main taxes - 2

Income and other direct taxes

Corporate income tax (profits tax)	Operating surplus of incorporated entities
Personal income tax	Aggregate salaries, wages, interest and untaxed profits of entrepreneurs
Payroll tax	Aggregate salaries and wages
Social tax	Aggregate salaries, wages and entrepreneurial income

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Revenue Forecasting – Session 2

Tax Elasticity and Tax Buoyancy

- Definitions of tax buoyancy and tax elasticity
- Differences between tax buoyancy and tax elasticity
- Tax buoyancy calculation
- Tax elasticity calculation
- Expected relativity between the measures
- Expected elasticity and buoyancy of specific revenues

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Tax Elasticity and Tax Buoyancy

Definitions - 1

Tax Buoyancy

- Tax buoyancy measures the total response of tax revenues to changes in national income as commonly measured by GDP (or of tax revenue components to changes in components of GDP).
- This total response takes into account both increases or decreases in income relative to the chosen base measure over time and the effect of discretionary changes (for example, to tax rates and bases) in the tax system made by the authorities.
- Tax buoyancy also includes the effects of changes over time in the efficiency of the tax authorities in revenue collection.

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Tax Elasticity and Tax Buoyancy

Definitions - 2

Tax Elasticity

- Tax elasticity measures the pure response of tax revenues to changes in the national income as commonly measured by GDP (or of tax revenue components to changes in components of GDP).
- Tax elasticity reflects only the built-in responsiveness of tax revenue to changes in the chosen base measure over time intervals. The tax elasticity calculation excludes the impact of changes in tax rates and tax bases, as well as changes in effectiveness of revenue collection.
- Tax elasticity considers only the effects due to changes in levels of the underlying reference series, regardless of whether or not changes were made in the tax structure during that time period.

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Tax Elasticity and Tax Buoyancy

Differences between tax buoyancy and tax elasticity

- Tax buoyancy is the most appropriate measure when assessing the impact of tax policy and tax administration changes on tax revenue.
- Tax buoyancy relative to economic measures can be calculated directly using the observed historical tax revenue series (after data reconciliation and cleansing as previously described).
- Tax elasticity, on the other hand, measures only the response of tax revenues to changes in the underlying economic measure.
- In order to calculate tax elasticity, it is necessary to know the history of changes to the tax system (or the relevant parts of the tax system) over the period of analysis, and to adjust the observed tax revenue data to generate a new revenue data series in which the effects of the policy changes have been stripped out.

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Tax Elasticity and Tax Buoyancy

Tax buoyancy calculation

Tax buoyancy can be expressed as follows:

$$E^b_Y = (\Delta T^b / \Delta Y) * (Y / T^b) \qquad (7.1)$$

where

E^b_Y = buoyancy of tax revenue to national income
T^b = total tax revenue
ΔT^b = (annual) change in total tax revenue
Y = Aggregate national income
ΔY = (annual) change in national income

Tax buoyancy may be calculated for total tax revenue, or for individual taxes or groups of related taxes.

Total tax buoyancy can be also be expressed as the weighted sum of buoyancy contributions from the individual taxes.

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Tax Elasticity and Tax Buoyancy

Tax elasticity calculation - 1

Tax elasticities are simpler to calculate than tax buoyancies, but they require the tax revenue series to be adjusted to remove the effects of tax policy changes and tax administration changes.

Tax elasticity can then be expressed as follows:

$$E_Y = (\Delta T / T) / (\Delta Y / Y)$$

where:

E_Y = Elasticity of tax revenue relative to income (GDP);

and

$\Delta T / T$ = observed proportional change in tax revenue; and

$\Delta Y / Y$ = given proportional change in aggregate income (GDP).

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Tax Elasticity and Tax Buoyancy

Tax elasticity calculation - 2

An alternative way of writing this expression is:

$$E_Y = (\%\Delta T / \%\Delta Y)$$

where:

E_Y = Elasticity of tax revenue relative to income (GDP);
$\%\Delta T$ = observed percentage change in tax revenue; and
$\%\Delta Y$ = given percentage change in aggregate income (GDP).

Tax elasticity may be calculated for total tax revenue, or for individual taxes or groups of related taxes.

As for buoyancy, total tax elasticity can also be expressed as the weighted sum of elasticity contributions from the individual taxes.

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Tax Elasticity and Tax Buoyancy

Expected relativity between the measures - 1

- Each of the measures, Buoyancy and Elasticity, may have values less than unity, equal to unity, or greater than unity, when different taxes are compared to relevant economic variables (or other specific tax bases).

- Where there have been no policy changes, then tax buoyancy is expected to be equal to tax elasticity.

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Tax Elasticity and Tax Buoyancy

Expected relativity between the measures - 2

- When tax policy changes have increased effective tax rates, such as an increase in the rate of corporate profit tax, then the buoyancy of that tax will be greater than its elasticity, when both are measured relative to the same economic series (operating surplus of corporates) or other revenue base (corporate profits).

- When tax policy changes have decreased effective tax rates, such as an increase in capital allowances (through increased depreciation rates or allowing the immediate deduction of a class of assets), then the buoyancy will be less than the elasticity, when both are measured relative to the same revenue base.

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Tax Elasticity and Tax Buoyancy

Elasticity and buoyancy for specific revenues - 1

Firstly, in terms of ***elasticity of taxes*** relative to GDP or its relevant main components, the general expectation is as follows:

- Personal Income Taxes (PIT) tend to have E > 1, owing to the progressive tax rate structure (tax rates increasing with income), with values of E up to1.35 being observed in some western economies during periods of higher annual wage growth, and values nearer to.1.20 when wages are growing more slowly.

- For corporate income or profit taxes, the value of E may be above or below unity, depending upon the economic or revenue base chosen, and the dynamics of the business investment cycle.

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Tax Elasticity and Tax Buoyancy

Elasticity and buoyancy for specific revenues - 2

- In periods of higher investment, the capital allowances reduce taxable income growth relative to the growth of most economic base series, so the value of E tends to fall.
- In economic downturns, when investment spending is often cut back, the value of E measured relative to broad based profit series (operating surplus) is likely to rise.
- However, if the rate of growth in corporate profits falls relative to that of GDP, the value of E measured against GDP may fall at the same time.
- Corporate incomes and profit taxes are among the most difficult series to forecast, even during periods of relatively steady economic growth.

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Tax Elasticity and Tax Buoyancy

Elasticity and buoyancy for specific revenues - 3

- Value Added Taxes (VAT) tend to have E ~ 1.0, relative to GDP as a whole and relative to domestic private final consumption, provided that excess VAT paid by registered payers is refundable within a realistic period, and the VAT is applied to imports and exported goods qualify for VAT refunds.

- If basic goods (such as food) are exempted from VAT, then the value of E for VAT is expected to be slightly greater than 1.0, measured against consumption or against GDP.

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Tax Elasticity and Tax Buoyancy

Elasticity and buoyancy for specific revenues - 4

- Excise Taxes (and Customs Duties) fall into two categories, with different elasticity expectations.
- For excise taxes levied at specific rates – fixed amounts of excise for unit of the excisable good – the value of E will be significantly less than 1, when the growth in excise is measured against the growth in value of excisable goods.
- Relative to broader base economic measures, such as domestic private consumption or GDP, the value of E for revenue raised through specific excises will be closer to but still less than1.
- Similar arguments apply for fixed-rate Customs Duties on imported goods.

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Tax Elasticity and Tax Buoyancy

Elasticity and buoyancy for specific revenues - 5

The second category includes the following

- For excisable goods subject to ad valorem excises (a percentage of the value of the excisable goods) the value of E will be close to 1 when measured against the value of excisable goods, and may be above or below 1 when measured against broader measures such as domestic consumption or GDP, depending upon whether there is a tendency for households to consume a higher proportion of excisable goods as their incomes increase.
- These same arguments apply to ad valorem Customs Duties

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Tax Elasticity and Tax Buoyancy

Elasticity and buoyancy for specific revenues - 6

For all taxes, excises and duties, individually and collectively, the buoyancy will be higher than the elasticity when there are policy changes that effectively increase the rates of taxes or reduce the impact of deductible expenses over time, and lower than the elasticity when there are tax policy changes that reduce the rates of taxes or increase the impact of deductible expenses over time.

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Revenue Forecasting – Session 3

Revenue Forecasting using Macroeconomic Data

- General approach to forecasting revenues using forecasts of macroeconomic variables
- Example of estimation of total revenue and total tax revenue buoyancies relative to GDP
- Practical exercises

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Revenue Forecasting using Macroeconomic Data

Forecasting revenues using forecasts of macroeconomic variables - 1

- This methodology requires the use of a consistent set of macro-economic forecasts covering the period over which revenues are to be forecast. It also requires at least three years of historical data for the macro-economic variables as well as for the revenues to be forecasted.
- The latter are required to determine the relationship between the rate of growth of the revenues to be forecasted and the rate of growth of the corresponding macro-economic variables.
- In other words, sufficient historical data is required to be able to calculate the buoyancies of the revenue series to be forecast, relative to the macro-economic data series.

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Revenue Forecasting using Macroeconomic Data

Forecasting revenues using forecasts of macroeconomic variables - 2

The data treatment and calculation steps include:

a. Review and adjust revenue series for the impact of historical revenue policy changes.

b. Review and adjust revenue and economic series for the impact of historical changes in economic policy.

c. Review historical inflation and price changes and construct deflated real historical data for revenues and macroeconomic series of interest (this step may sometimes be omitted)

d. Determine revenue elasticities from the growth in adjusted and deflated revenues compare to adjusted and deflated GDP (or components of GDP)

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Revenue Forecasting using Macroeconomic Data

Forecasting revenues using forecasts of macroeconomic variables - 3

The remaining data treatment and calculation steps include:

e. Use these elasticities to forecast real revenues using forecasts of real macroeconomic variables.

f. Convert forecasts into nominal values using expected inflation factors for revenues and macroeconomic data series.

g. Adjust forecasts of revenues for anticipated changes in revenue policies and in economic policies that are expected to affect revenues.

h. Adopt the completed revenue forecasts.

Nominal values can be used if the deflators for the tax and economic variables are identical (or one is seen as the best proxy for the other).

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Revenue Forecasting using Macroeconomic Data

Example of estimation of total revenue buoyancy and total tax revenue buoyancy relative to GDP - 1

- Using data from the Implementation of the State Budget, 2000-2014, it is possible to calculate the buoyancies for Total revenue and for Total Tax Revenue measured against GDP.
- The results of this exercise are shown graphically in a series of slides and a copy of the worksheet is available on your computer.

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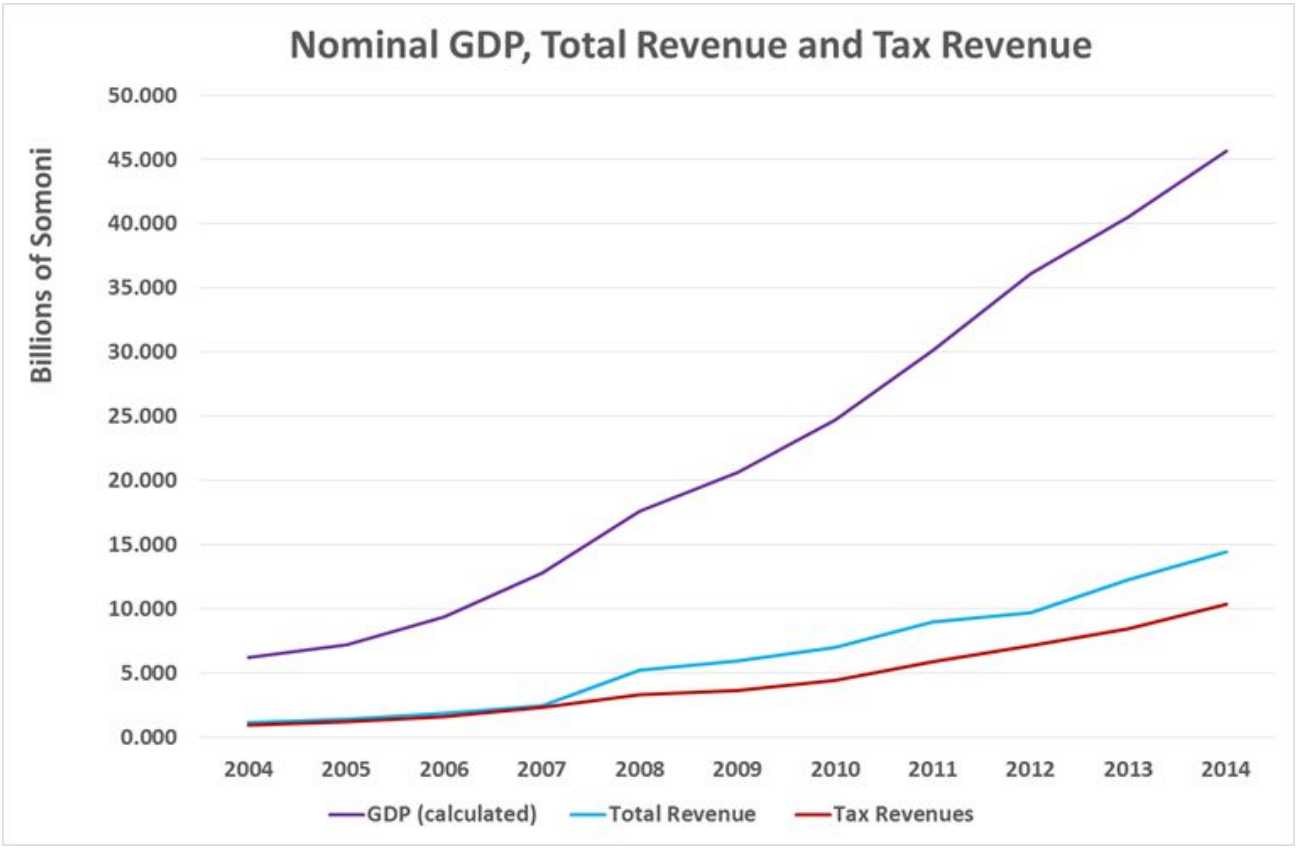
Revenue Forecasting using Macroeconomic Data

Example of estimation of total revenue buoyancy and total tax revenue buoyancy relative to GDP - 2



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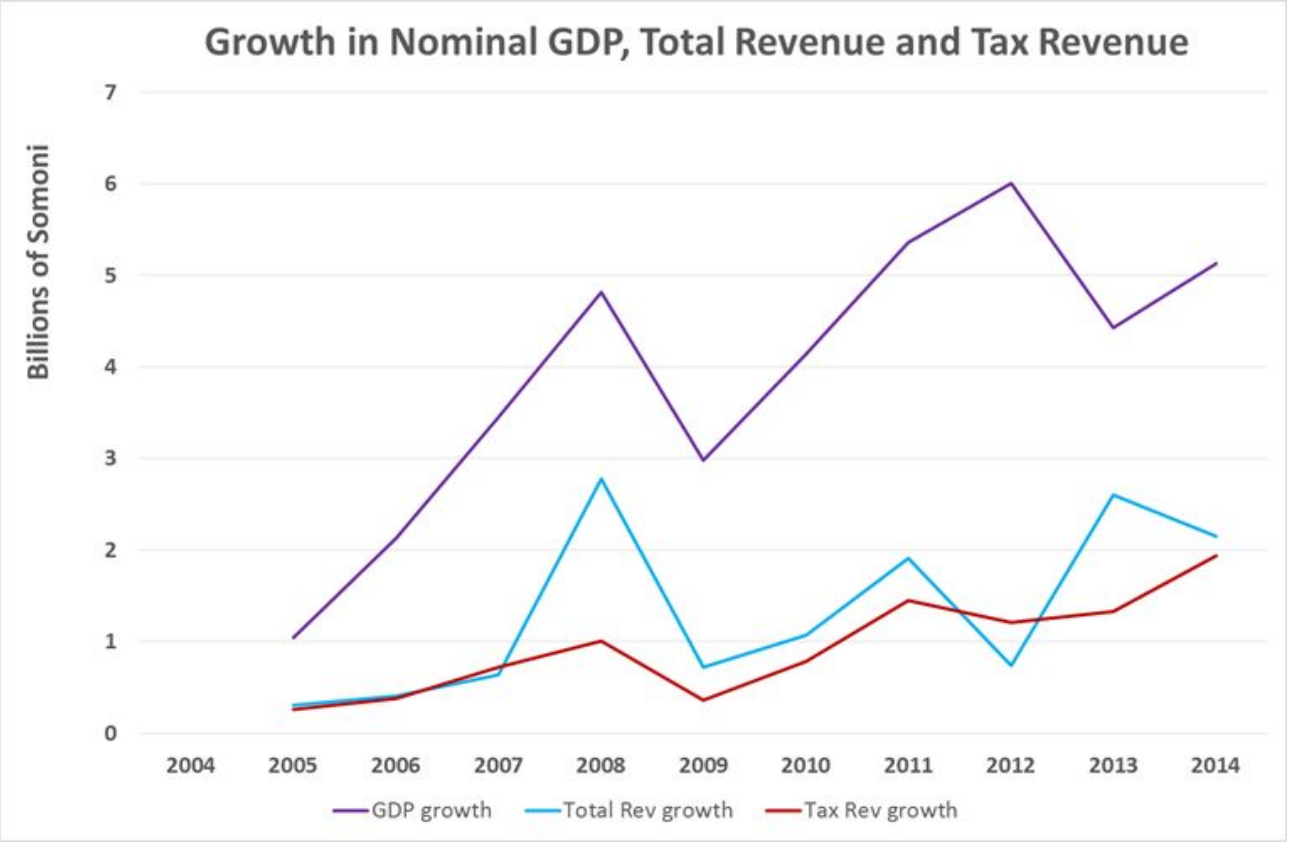
Revenue Forecasting using Macroeconomic Data

Example of estimation of total revenue buoyancy and total tax revenue buoyancy relative to GDP - 3



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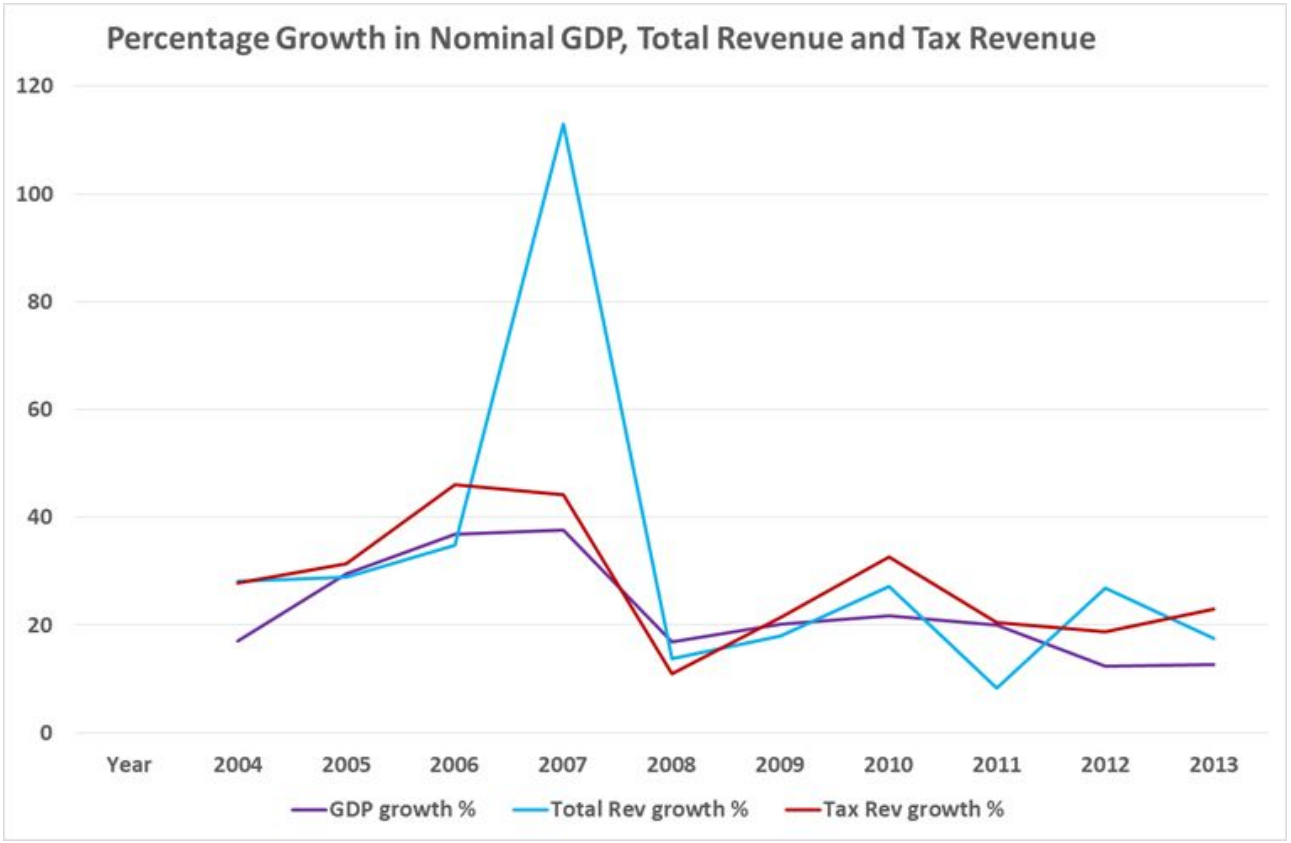
Revenue Forecasting using Macroeconomic Data

Example of estimation of total revenue buoyancy and total tax revenue buoyancy relative to GDP - 4



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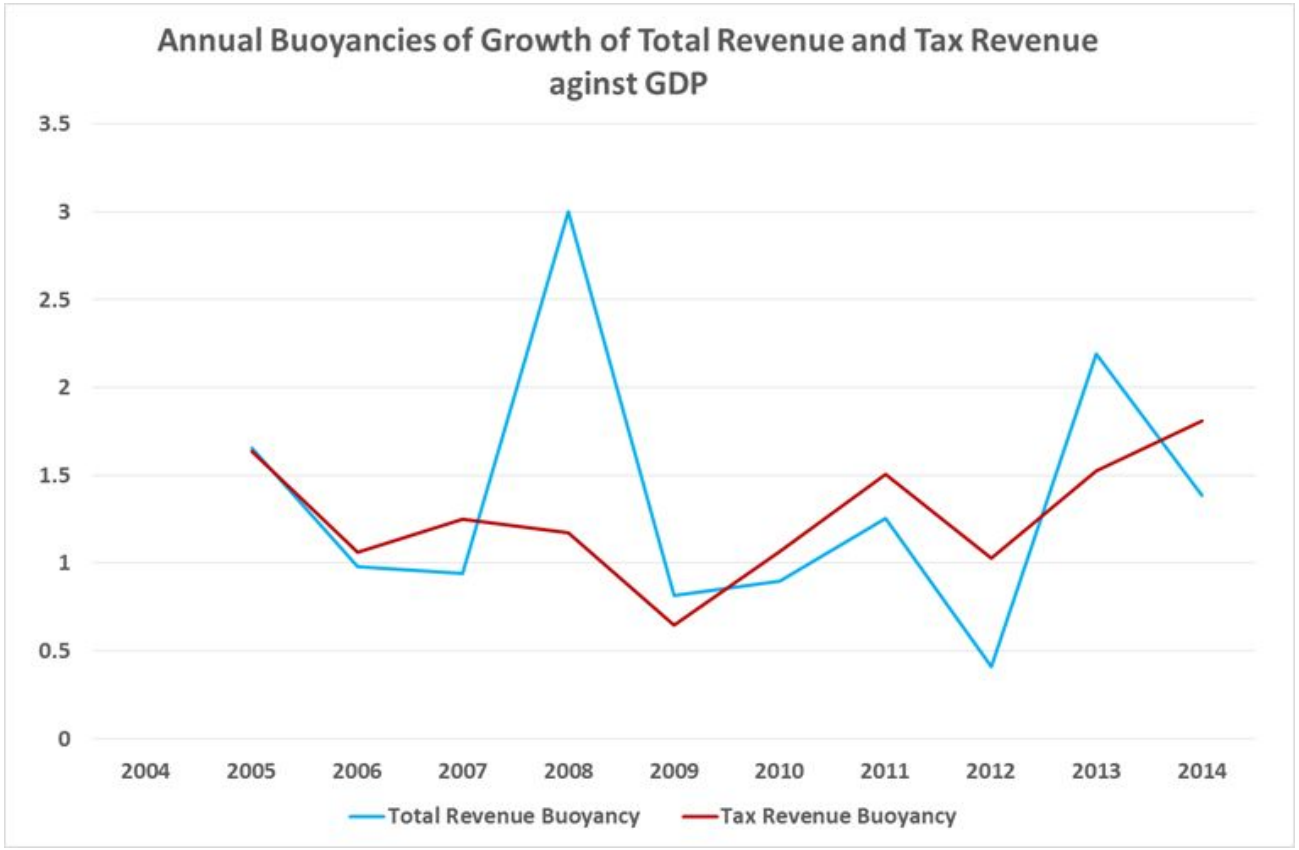
Revenue Forecasting using Macroeconomic Data

Example of estimation of total revenue buoyancy and total tax revenue buoyancy relative to GDP - 5



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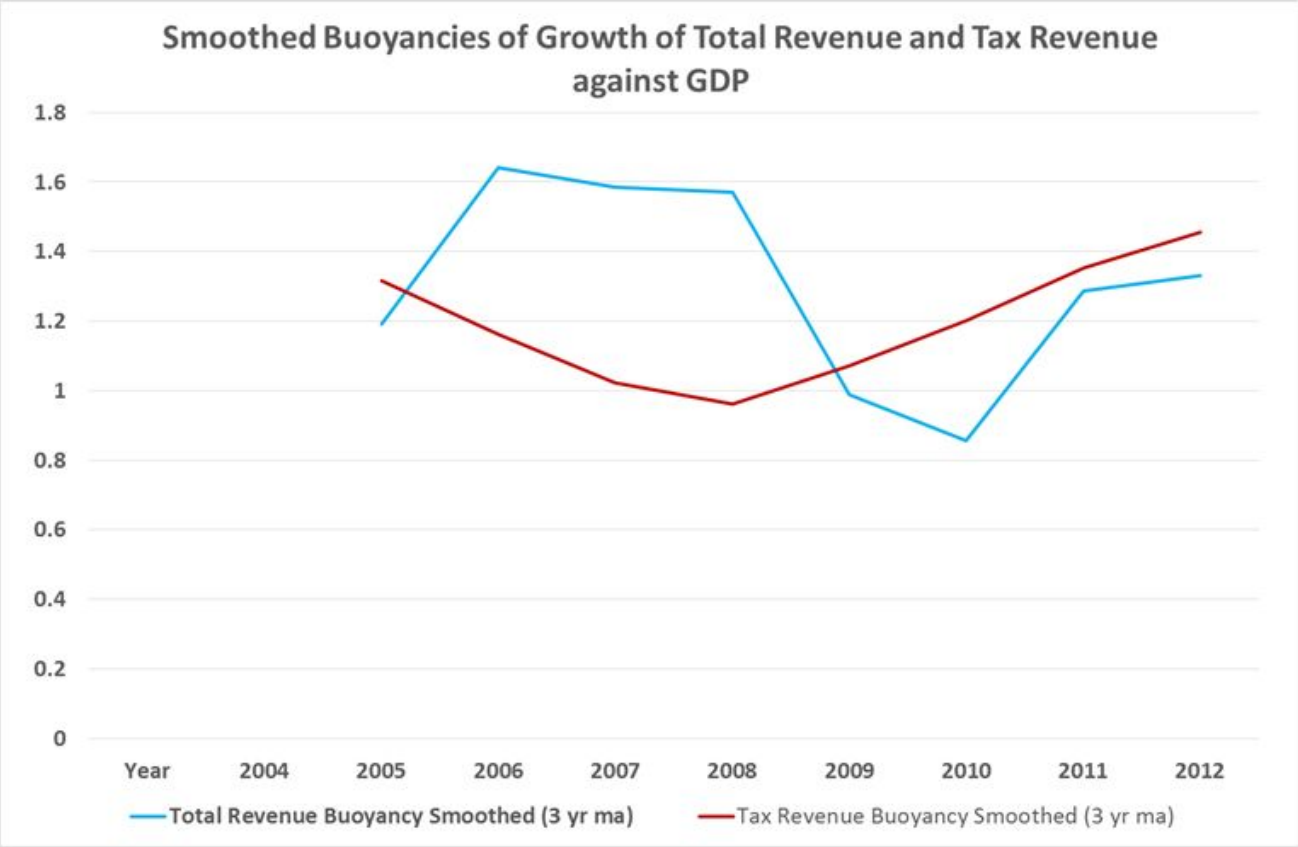
Revenue Forecasting using Macroeconomic Data

Example of estimation of total revenue buoyancy and total tax revenue buoyancy relative to GDP - 6



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Revenue Forecasting using Macroeconomic Data

Example of estimation of total revenue buoyancy and total tax revenue buoyancy relative to GDP - 7

- Because there is no policy related information available about the historical revenues, we can calculate only revenue buoyancies for use in forecasting future total revenue and tax revenue.
- Owing to the somewhat erratic variations in buoyancies from year to year, for both total revenue and tax revenue, even in the most recent three years (2011-2014), the data have been smoothed through averaging over successive three year periods in the final chart.
- Fortunately, the smoothed buoyancies for both total revenue and tax revenue relative to GDP show much more stability over the last two years of the evaluation period. The values chosen are averages of the smoothed values for each of these two years.

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Revenue Forecasting using Macroeconomic Data

Example of estimation of total revenue buoyancy and total tax revenue buoyancy relative to GDP - 8

- The calculated results are E^b (total revenue to GDP) = 1.31 and E^b (tax revenue to GDP) = 1.40. Both of these figures are significantly greater than unity, implying strong growth in revenues relative to GDP.
- The revenue system of Tajikistan has been relatively buoyant over this period, more so than in many other countries.
- Note that the averages over the entire period for the unsmoothed buoyancies are 1.35 for total revenue and 1.27 for tax revenue. But given the extreme variations in the earlier part of the series, these averages are unreliable for forecasting forward from 2014.

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Revenue Forecasting using Macroeconomic Data

Example of estimation of total revenue buoyancy and total tax revenue buoyancy relative to GDP - 9

- In summary, we expect total revenue in 2015 (and subsequently) to grow by 1.31 times the rate of growth of nominal GDP, and tax revenue in 2015 and in later years) to grow by 1.40 times the rate of growth of nominal GDP.

- Given forecasts of nominal GDP, both total revenue and tax revenue can also be forecast for several years ahead.

- Ideally, the causes of the erratic growth in revenues in the early part of the period should be determined. Further, the revenue impact of all policy and administrative changes over the historical period should be determined, and adjusted tax and total revenue series used to calculate revenue elasticities for use in forecasts.

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Revenue Forecasting using Macroeconomic Data

Practical examples

Examples of actual revenue forecasts using this methodology require the current forecasts of macroeconomic variables.

If these are made available within the next few days, we will be able to test this forecasting approach using data for Tajikistan.

Alternatively, we can develop and compare forecasts using data from other countries.

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