**Training Manual for Revenue Forecasting and Gap Analysis Using R**

Islamabad, Pakistan

Wednesday 28 September - Sunday 2 October, 2022

**Day 1: Wed 28 September 2022**

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| **10.00-11.00:** | Introductions and welcome remarks |
|  | *30 minute Coffee Break* |
| **11.30-13.30:** | Session 1: Introduction to Revenue Forecasting |
|  | *45 minute Lunch Break* |
| **14.15-16.00:** | Session 2: Understanding the use of ‘R’ for analysis |

**Session 1: Introduction to Revenue Forecasting**

Revenue forecasting plays a fundamental role for public authorities. Reliable forecasts are critical inputs to the budget making process. They help governments design sound policies that support fiscal sustainability. To be reliable, revenue forecasts need to result from the application of predefined processes and methodologies. Forecasts should not be systematically optimistic or pessimistic. Revenue forecasts that are excessively optimistic may force governments to conduct unplanned and uncoordinated budget cuts throughout the fiscal year. In contrast, revenue forecasts that are overly pessimistic may unnecessarily constrain crucial public spending in education, health care, or infrastructure. This could also lead the government to borrow more than it should, thereby incurring superfluous debt interest payments. Throughout this training, you will be asked to put yourself in the shoes of an analyst responsible for undertaking revenue forecasting and analysis. Practical hands-on exercises will assist you in consolidating what you have learned and help familiarize yourself with data manipulations that will become increasingly challenging as the course progresses. There will also be various assessments aimed at ensuring that you have acquired the knowledge and skills needed for you to move forward.

An important thing to be remembered by tax authorities is that tax revenues and tax ratios tend to increase with level of development (so, same holds true for the sales tax on services as well). Some of the factors that can contribute to increasing tax revenues include institutional factors, such as tax policy design, effectiveness of tax administrations, and the soundness of governance structures. Structural economic factors, like income distribution, and the presence of large hard-to-tax sectors may also explain these patterns.

However, tax revenue is a measure that is constructed from the aggregation of revenues collected from a variety of taxes. When investigating tax revenue performance, we gain insight by examining the composition of tax revenue, or the so-called tax mix. This simply involves analyzing the relative contribution of each tax (or group of taxes) to aggregate tax revenue. Main types of taxes collected by governments are listed as follows:

* Personal Income Tax
* Corporate Income Tax
* Domestic Consumption Taxes
* Taxes on international trade

The domestic consumption tax is both, on goods and services. In our case, KPRA being a provincial revenue authority is mandated to collect the domestic consumption tax or sales tax on services. This is mainly the value added tax (VAT). Sales tax on services is important source of tax revenue for all economies with the growing size of services sector in any economy.

We can compare the tax revenues of world economies by determining tax ratios. It is the contribution tax revenue in comparison to the size of the economy:

Tax Ratio = Tax Revenue / GDP

And for policy perspective we compute the relative contribution (in percentage) of each of the aforementioned taxes to total tax revenue to check the overtime contribution and increases/decreases.

Let’s do a small activity to understand the contribution of various tax categories in the total tax mix for KPRA.

**Activity 1.1 – Calculating Tax Mix**

Sample sheet attached – participant will be provided the sheet after omitting the calculations in it

What is the Tax Mix of KPRA in 2021?

* Sales Tax on Services Revenue (80.4%)
* Infrastructure Development Cess (5.8%)
* Other Taxes (13.8%)

We may add Tax Mix for another province to the activity.

Let’s move forward with slides.

We are confronted with taxes on regular basis, however, it is important to understand the three defining characteristics of taxes:

* They are required by law and are thus **compulsory** in nature
* They involve **payment to a government**, be it a national or subnational government
* They are **unrequited** in the sense that the taxes paid by an individual are not directly linked to receiving specific services or benefits from the government

Let’s now discuss the two underlying components of tax revenue. These are:

* Tax rate and
* Tax base

When thinking about mobilizing additional tax revenues, it is of crucial importance to consider both the tax rate and the tax base. Too often we have seen analyses focusing exclusively on the comparisons of tax rates, when tax bases are just as important. Additional tax revenue may indeed be obtained not only by increasing the rate, but also by increasing the base.

For example, if we consider the case of taxes on income earned by businesses, then increasing the tax base would mean increasing the total amount of taxable income. One of the ways in which this can be achieved is to rationalize or eliminate tax preferences, such as tax exemptions. In the tax jargon, this is often referred to as base broadening, a term that you hear quite often. Keep in mind that tax revenues are not a linear function of the tax rate.

In other words, doubling the tax rate is unlikely to double tax revenues. This is because the tax rate and the tax base are not independent of one another. Recall the tax base refers to the underlying economic activity being taxed. This activity will fluctuate based on the level of the tax rate. Increasing the tax rate, for example, will likely affect the tax base by discouraging the underlying economic activity that is being taxed. We thus tend to observe an inverse relationship between the tax rate and the tax base.

The non-linear relationship between tax revenue and tax rates was perhaps best illustrated by American economist Arthur Laffer. The so-called Laffer Curve shows governments can only go so far in increasing the tax rate, shown here on the x-axis, until it reaches a revenue maximizing point, shown on the y-axis. Past this point, further increases in the tax rate have a disproportionately large effect in reducing the base, and could thus reduce, as opposed to increase, revenues.

Figure to be inserted

Despite substantial uncertainty over the estimation of revenue maximizing tax rates, the Laffer Curve illustrates a simple yet important message i.e. the relationship between tax revenues and tax rates cannot meaningfully be analyzed without also considering the tax base. Another point to note is that tax revenue may vary, even in a situation where the legislated tax rates and tax bases remain unchanged. This could happen during an economic boom, which leads to an increase in taxable activity. The reverse is also true in the case of economic recessions.

In summary, tax revenue is the product of the tax rate and the tax base. However, tax revenue should not be expected to be a linear function of the tax rate, as the tax base itself can fluctuate with the tax rate. Therefore, when analyzing tax revenue, both components and their interdependence should be taken into account.

Governments generally tax multiple economic activities, as it allows them to diversify their revenue sources, pursue multiple policy objectives, and lessen income fluctuations over time. We will now consider a conceptual framework that illustrates potential tax bases and their underlying relationships.

We, the individuals, earn income. This income can essentially be used for one of two purposes.

* Either it will be used for immediate consumption, like buying food and paying rent
* Or it can be saved for future consumption, such as the money that is left aside in a savings account or put into a retirement plan

We can conceptualize this idea by stating that under certain conditions, income equals consumption plus savings. In the absence of bequests and inheritances, both of which imply transfers from one individual to another, the lifetime income earned by an individual will therefore equal his lifetime consumption. This is true because as you will recall, savings is undertaken for the purpose of future consumption.

So over one's lifetime, income may exceed consumption during working years, as individuals save some of their income for retirement. Then later on, consumption will exceed income, as individuals make use of savings to fund retirement expenses. If lifetime income does equal lifetime consumption, and if we abstract from the time value of money, then taxing either income or consumption should provide equivalent outcomes over one's lifetime, both in terms of taxes paid by the individual and in terms of revenues collected by the government. Both income and consumption can, and indeed commonly do, serve as a reasonable basis for taxation.

Income taxes are referred to as direct taxes, because individuals, through their personal income tax, or firms, through the corporate income tax, directly pay a share of their revenue or profits to the government. In contrast, consumption taxes are considered indirect taxes, because such taxes are levied and remitted to the government by an intermediary, typically a wholesaler, a manufacturer, or a retailer, instead of the consumer himself.

In practice, it will often prove practical for countries to tax both income and consumption, as it reduces compliance risks by diversifying the government's revenue base. However, this may be viewed by some as double taxation, since the income used for consumption has already been subjected to taxation. The equivalency between income, consumption, and saving can be extended and considered from an aggregate macroeconomic perspective by looking at the expenditure approach to calculating GDP.

Y = C + I + G + (X-M)

In this equation, Y is the country's total income, or its GDP. C is total consumption, I is investment by businesses, G is government expenditures, X are exports, and M are imports. In addition to income and consumption, imports and, although to a lesser extent, exports, also serve as common bases for taxation. As we know that trade taxes, such as import duties, remain a substantial source of revenue for many developing countries.

This relationship between different tax basis and country's national accounts has an important implication, which is especially relevant in the context of this course on revenue forecasting and analysis. If the aggregate tax base is broadly diversified, tax revenues tend to be correlated with national income, as measured by the GDP. That is, GDP and its underlying components are key predictors in forecasting tax revenue.

In summary, breaking down national income into its main components can provide a broad illustration of some of the different tax bases that governments use. To diversify their sources of revenue, most governments levy taxes on a combination of economic activities. And as a result, GDP is typically a key predictor of tax revenue.

In case of KPRA being mandated to collect the sales tax on services, the services sector’s contribution to the GDP can play an important role in predicting the sales tax revenue to be collected from the services sector.

So, the KPRA analyst must properly account for the interaction between the tax base and tax rate to produce robust projections, where a good predictor for tax base is the size of the services sector or its contribution to the GDP.

While on one hand tax rates are changed and tax base is broadened by government to raise sufficient funds, however, it is also important to promote society’s overall welfare. So, it is important for a good tax to fulfill the following criteria:

* Efficiency
* Fairness
* Simplicity
* Flexibility
* Transparency
* Effectiveness

We can go into the details of each of these criteria while making robust projections during our future advanced courses on revenue forecasting and gap analysis.

We will also under Budget Cycle later which is important to under the Revenue Forecasting during our future sessions. For today, we will proceed with understanding the use of ‘R’ after the lunch

**Session 2: Understanding the use of ‘R’ for analysis**

Content and activities for this section to be added

A spreadsheet with dummy data for this session to be added

**Day 2: Thur 29 September 2022**

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| **09.30-11:00:** | Session 3: Data Diagnostics |
|  | *30 minute Coffee Break* |
| **11.30-13.30:** | **Practice Exercises** |
|  | *45 minute Lunch Break* |
| **14.15-16.00:** | Session 4: Understanding Tax Data |

**Session 3: Data Diagnostics**

Content and activities for this section to be added

A spreadsheet with dummy data for this session to be added

**Session 4: Understanding Tax Data**

Content and activities for this section to be added

A spreadsheet with dummy data for this session to be added

**Day 3: Fri 30 September 2022**

|  |  |
| --- | --- |
| **09.30-11:00:** | **Practice Exercises** |
|  | *30 minute Coffee Break* |
| **11.30-13.30:** | Session 5: Forecasting Techniques |
|  | *45 minute Lunch Break* |
| **14.15-16.00:** | **Practice Exercises** |

**Session 5: Forecasting Techniques**

Content and activities for this section to be added

A spreadsheet with dummy data for this session to be added

**Day 4: Sat 01 October 2022**

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| **09.30-11:00:** | **Practice Exercises** |
|  | *30 minute Coffee Break* |
| **11.30-13.30:** | Session 6: Scenario building for Tax Forecasting |
|  | *45 minute Lunch Break* |
| **14.15-16.00:** | **Practice Exercises** |

**Session 6: Scenario building for Tax Forecasting**

Content and activities for this section to be added

A spreadsheet with dummy data for this session to be added

**Day 5: Sun 02 October 2022**

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| **09.30-11:00:** | Session 7: Basics of Gap Analysis |
|  | *30 minute Coffee Break* |
| **11.30-13.30:** | **Practice Exercises** |
|  | *45 minute Lunch Break* |
| **14.15-15.00:** | Summing Up: Your Future in Forecasting |
| **15.00-16.00:** | Certificate Distribution |

**Session 7: Basics of Gap Analysis**

Content and activities for this section to be added

A spreadsheet with dummy data for this session to be added