



# International Monetary Fund - IMF Regional Technical Assistance Center

Building macroeconomic capacity in East Africa



## Building sustainable macroeconomic forecasting frameworks

Workshop on strengthening Macro-Fiscal Units

**Bryn Battersby, Eric Lautier, and Yalenga Nyirenda**  
Dar es Salaam, January 9, 2018



Ministry of Foreign Affairs of the  
Netherlands



Schweizerische Eidgenossenschaft  
Confederaziun Svizra  
Confederaziun Svizra  
Unia Confederală  
Federal Department of Economic Affairs,  
Education and Research (EAER)  
State Secretariat for Economic Affairs (SECO)



G20 GERMANY 2017

# Outline of the presentation



Defining the forecasting framework



Desirable characteristics of a forecasting framework



Considerations in building a forecasting framework

# Outline of the presentation



Defining the forecasting framework



Desirable characteristics of a forecasting framework



Considerations in building a forecasting framework

# What is a forecasting framework?



Communication  
products

Quarterly reports, daily emails,  
monthly forecast note,  
demonstrating consistency

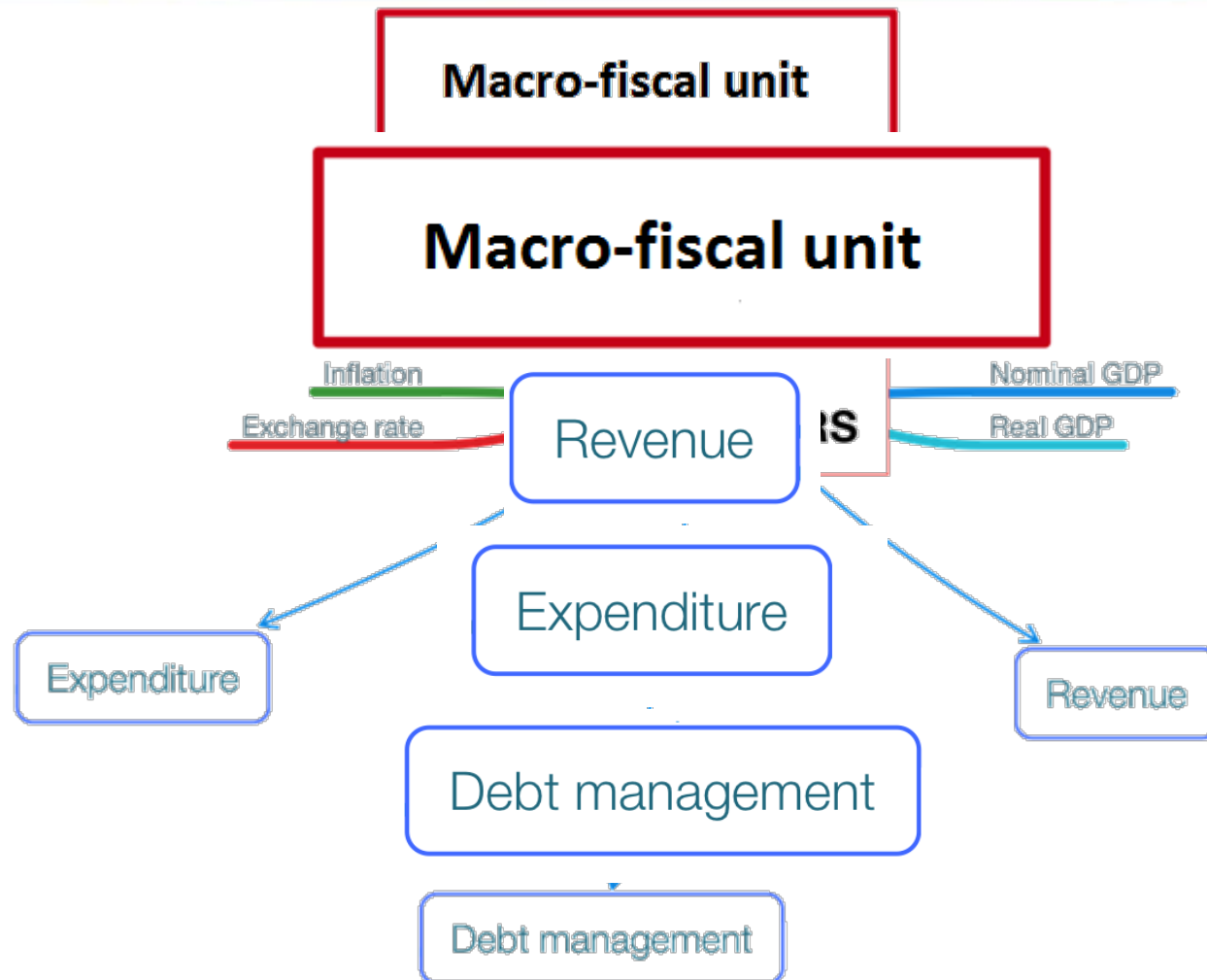
Processes

Forecast updates, checking,  
approvals, links with other  
ministries, supporting consistency

Technology

Spreadsheets, daily email  
templates, forecasting equations,  
all internally consistent

# Outputs of the macroeconomic forecasting framework



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# Desirable features of a forecasting framework



Useful

Useable

Accurate

Sustainable

# Desirable features of a forecasting framework



## Useful

- Informs the budget process
- Provides analysis and advice useful to the Minister and senior staff
- Responsive to ministry needs

## Useable

## Accurate

## Sustainable

# Desirable features of a forecasting framework



Useful

Useable

- Easy for staff to use
- Straightforward to learn
- Easy to follow and understand results

Accurate

Sustainable

# Desirable features of a forecasting framework



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- Accuracy improves budget credibility
- Builds trust in the framework
- But manage expectations

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- Use;
- Fix; and
- Develop the framework without external assistance

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# Complexity in the framework



Complexity in a forecasting framework increases (often non-linearly) with the number of:

- variables
- links
- business processes
- equations
- users
- relationships

Increased complexity can make the framework **more useful** and **more accurate** by considering more determinants and more flexibly responding to policy scenarios.

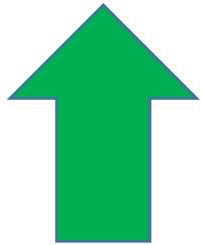
But complexity can make the framework more **difficult to use** and **less sustainable**, more prone to error, and less easy to understand.



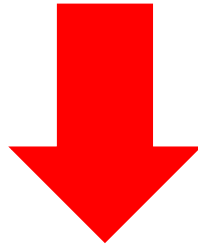
# The effect of complexity on the framework



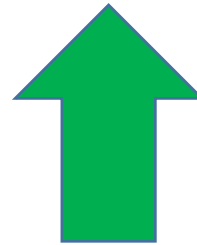
Useful



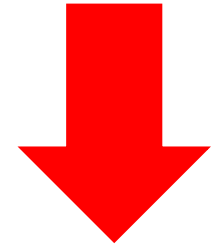
Useable



Accurate



Sustainable



Does the increase in complexity improve usefulness and accuracy more than it reduces usability and sustainability?

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# Considerations in developing a framework



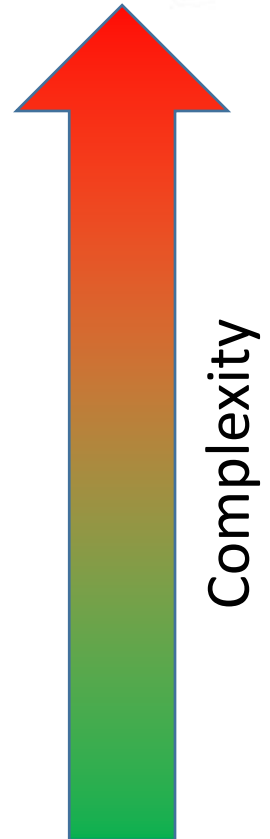
- Objective and outputs of the framework
- Business processes to connect the framework with the broader work program of the ministry
- Number of staff, training, turnover, and recruitment
- What types of data are available?
- What does the IT environment look like?
- How do you want to work with external support?
- Is knowledge managed? How?

How complex does the framework need to be?  
What level of complexity can the institution support?

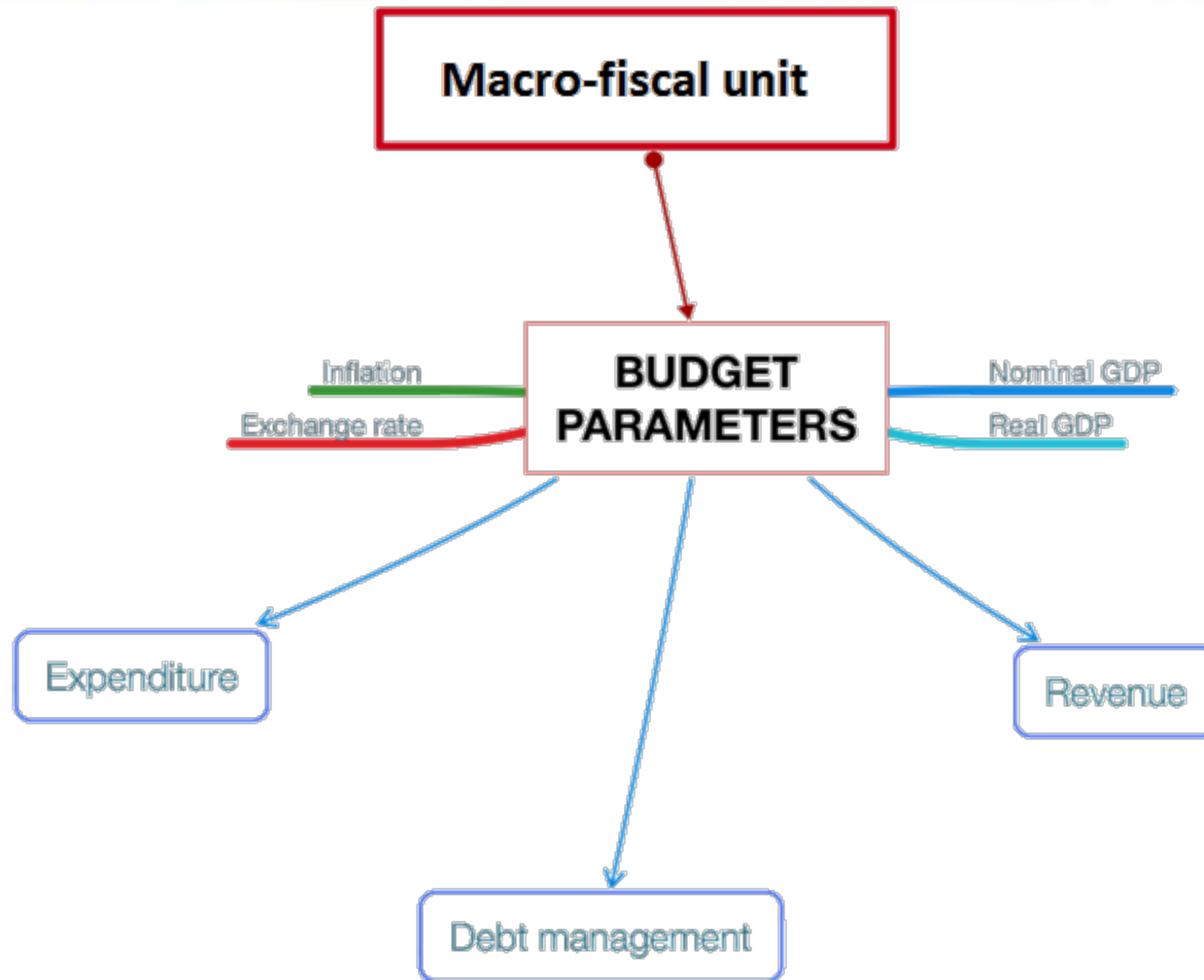
# Some examples of objective and outputs



- Economic scenario analysis
- Tax policy scenario analysis
- Provide multi-year macroeconomic forecasts for medium term fiscal framework
- Revenue forecasts
- Charts and regular analytical notes for circulation and inclusion in documentation
- Provide a simple set of macroeconomic forecasts for one-year ahead budgeting



# Create processes for the distribution and use of forecasts – who are the users?



# Synchronising the forecasting system with the MTEF and budget calendar



- Who are the principle users of the forecasts?
- When do they require the forecasts?
  - Often this will not fit well with data release schedules...
- Who else can benefit from the forecasts and analysis?



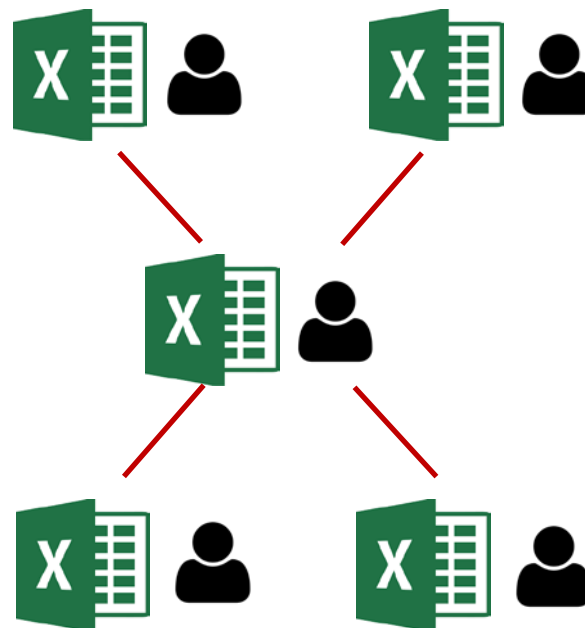
# Staff and the framework



## One option:



## Another option:



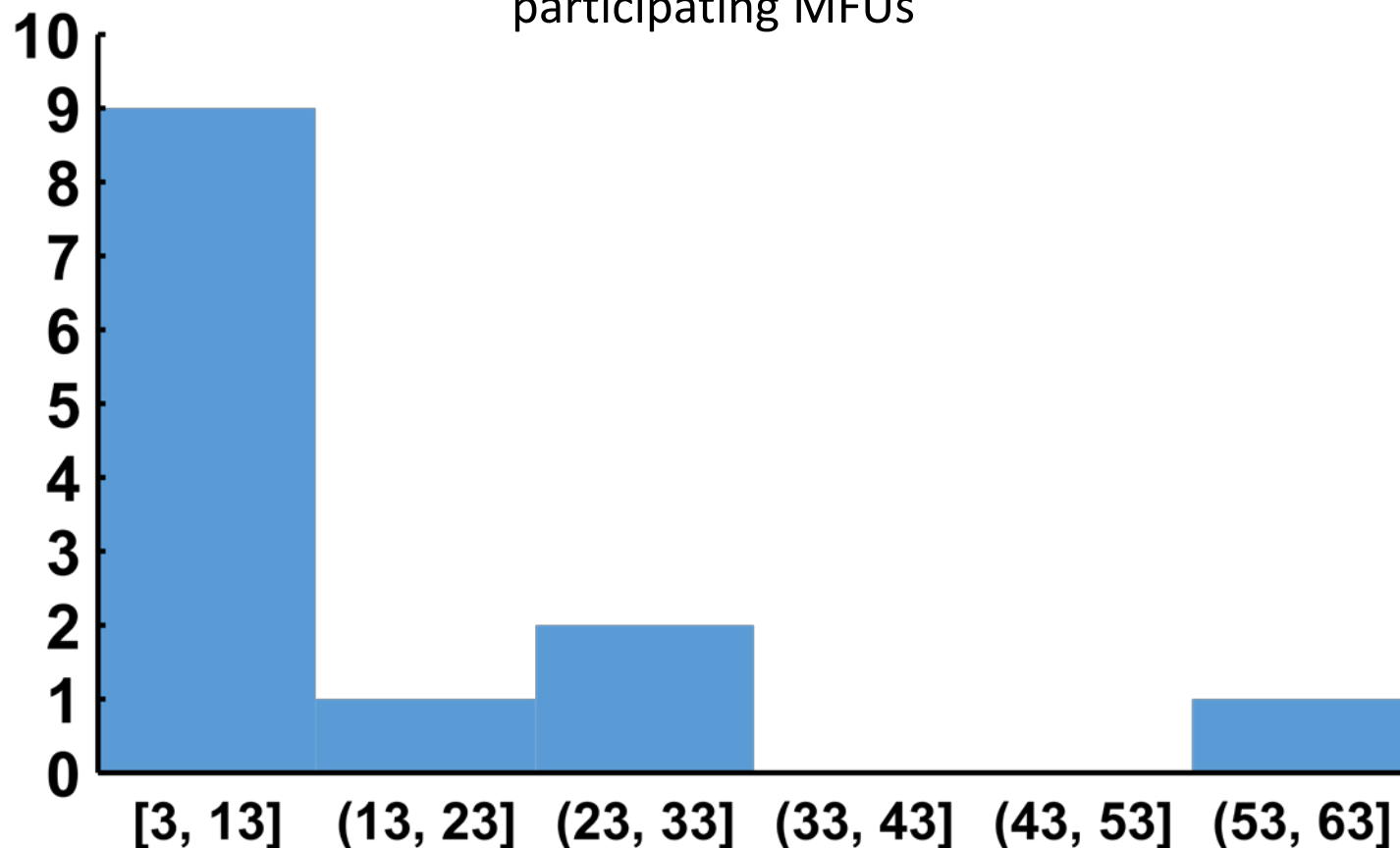


	High turnover	Low turnover
Small team	Simple system, few parts	Complex system, few parts
Large team	Simple system, many parts	Complex system, many parts

# Staff and the framework



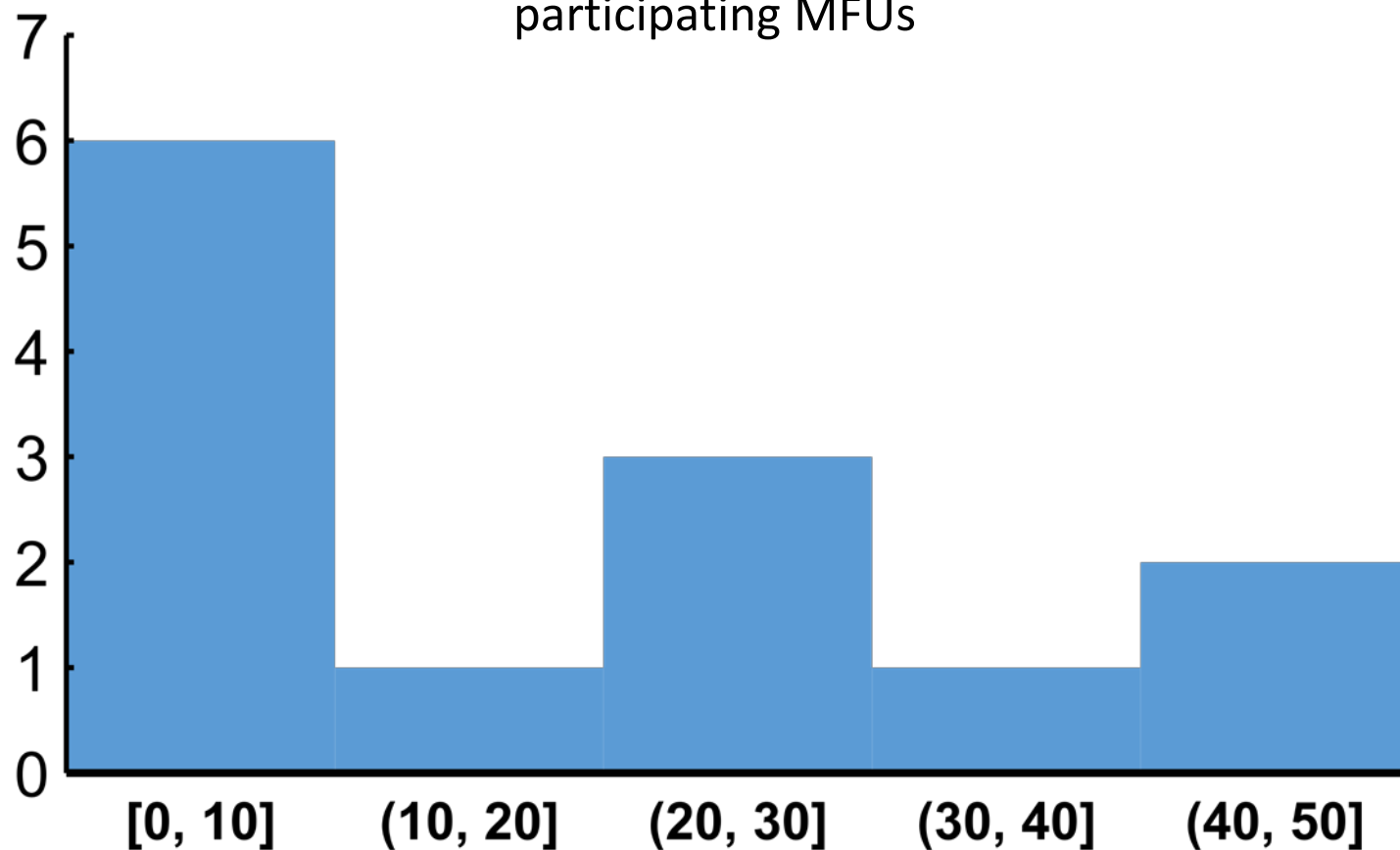
Histogram of the number of professional staff in participating MFUs



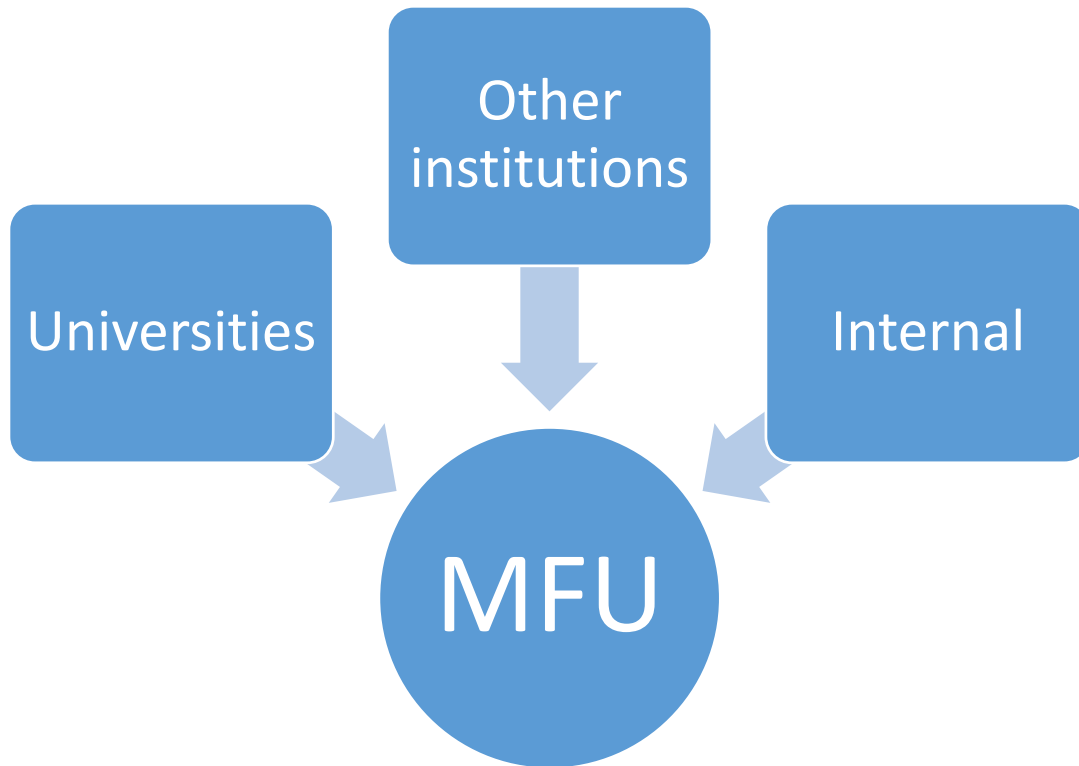
# Staff and the framework



Histogram of the rate of staff turnover across participating MFUs



# Recruitment stream



**What skills do new recruits come equipped with and how compatible are these with the framework?**

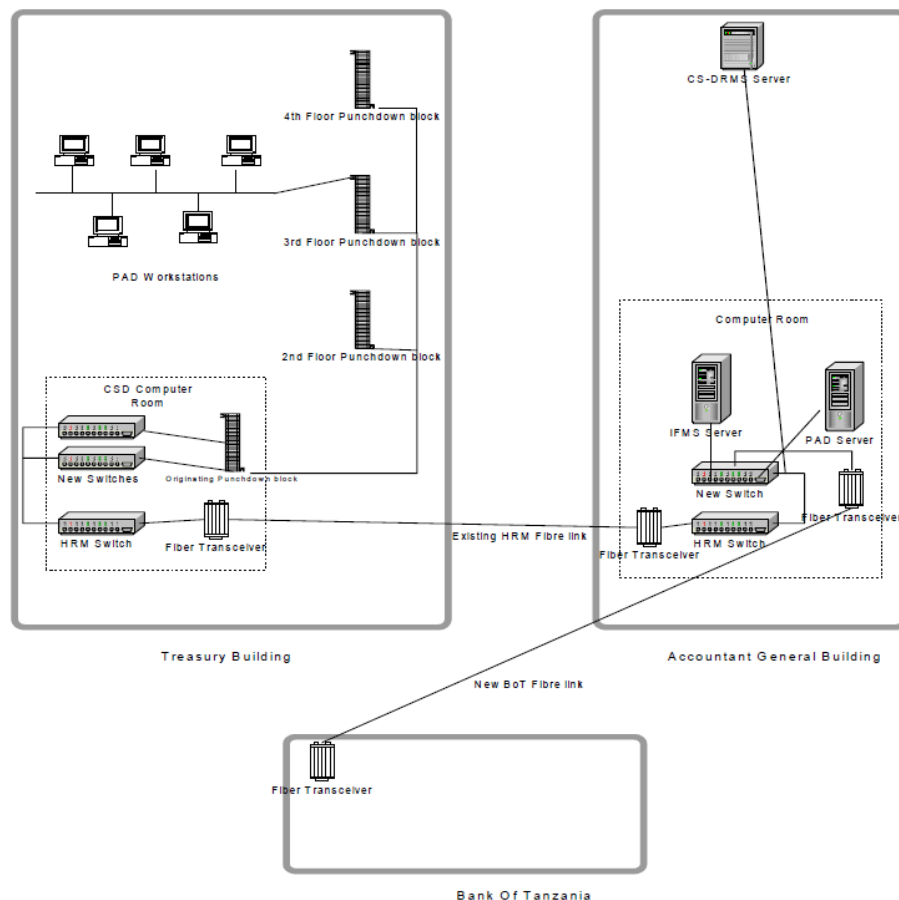
**How much supplementary training will be needed to keep the framework operating smoothly?**

# Data availability and timeliness



- Data limitations can constrain the scope of the framework, but other sources of data can provide useful proxies and interesting insights.
- What type of standard data are available?
  - Annual and quarterly national accounts?
    - Which accounts? Current and constant prices?
  - Monthly or quarterly consumer price indices?
  - Exchange rates?
- What other non-standard data are also available?
  - Business liaison programs
  - High frequency indicators
  - Industry data

# IT environment



**What IT infrastructure is available and what is needed?**

Servers

Workstations

Internet

Uninterruptable power supply

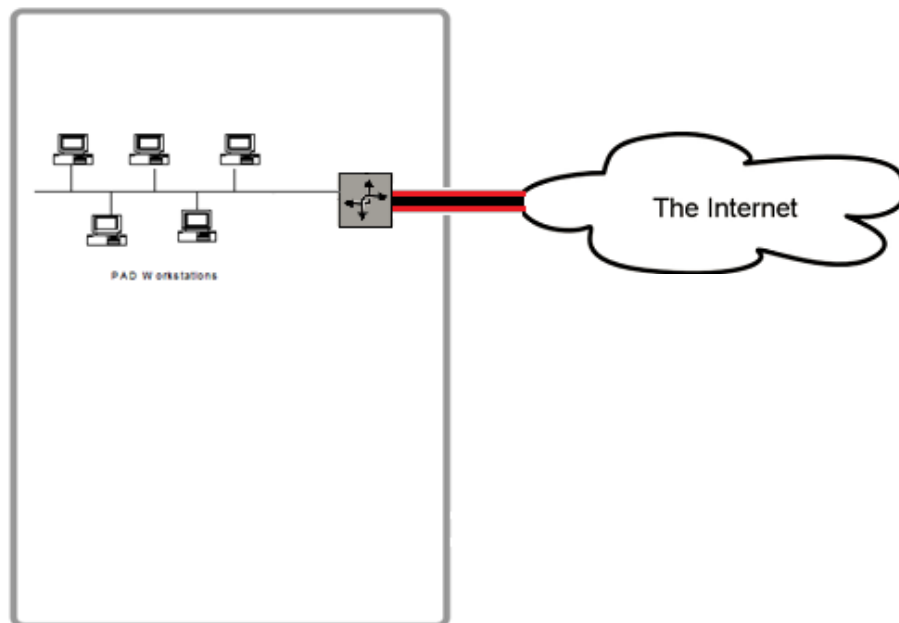
Local area networking

Printers

*2000 network schematic: Tanzania MoF scoping for new macro dept.*



# IT environment



**What IT infrastructure is available and what is needed?**

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# Version control



Version control is a logical way to organize and control revisions of the framework.

Some form of version control is **absolutely essential** for the development and maintenance of a forecasting framework.

Version control ensures:

- The correct version for budget processes can be identified
- Errors can be traced back to their source
- Users are able to access and easily identify current and historical versions of the file
- Version control could be as simple as establishing dated filename conventions for spreadsheets and setting up an archive directory.

# Version control



Even simple version control for a forecasting framework requires:

- A server (either cloud or local)
- Storage space
- A filename convention
- A revision log convention
- User account management

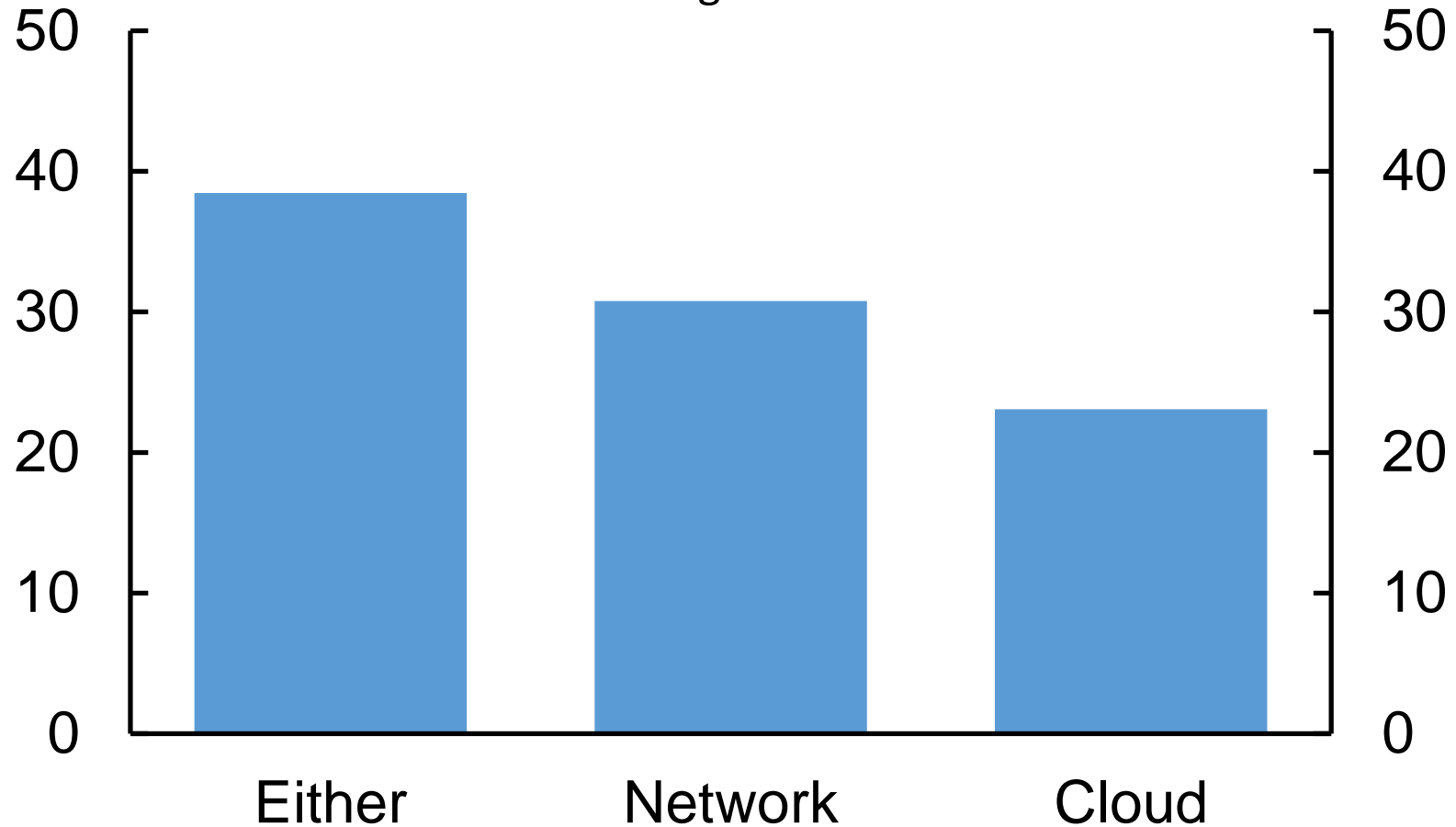
More complex version control could include merging rules, baseline conventions, or even version control software.

**Email and USB sticks are not a good way to manage version control**

# IT environment



Percentage of participating MFUs with server arrangements



# IT environment - software

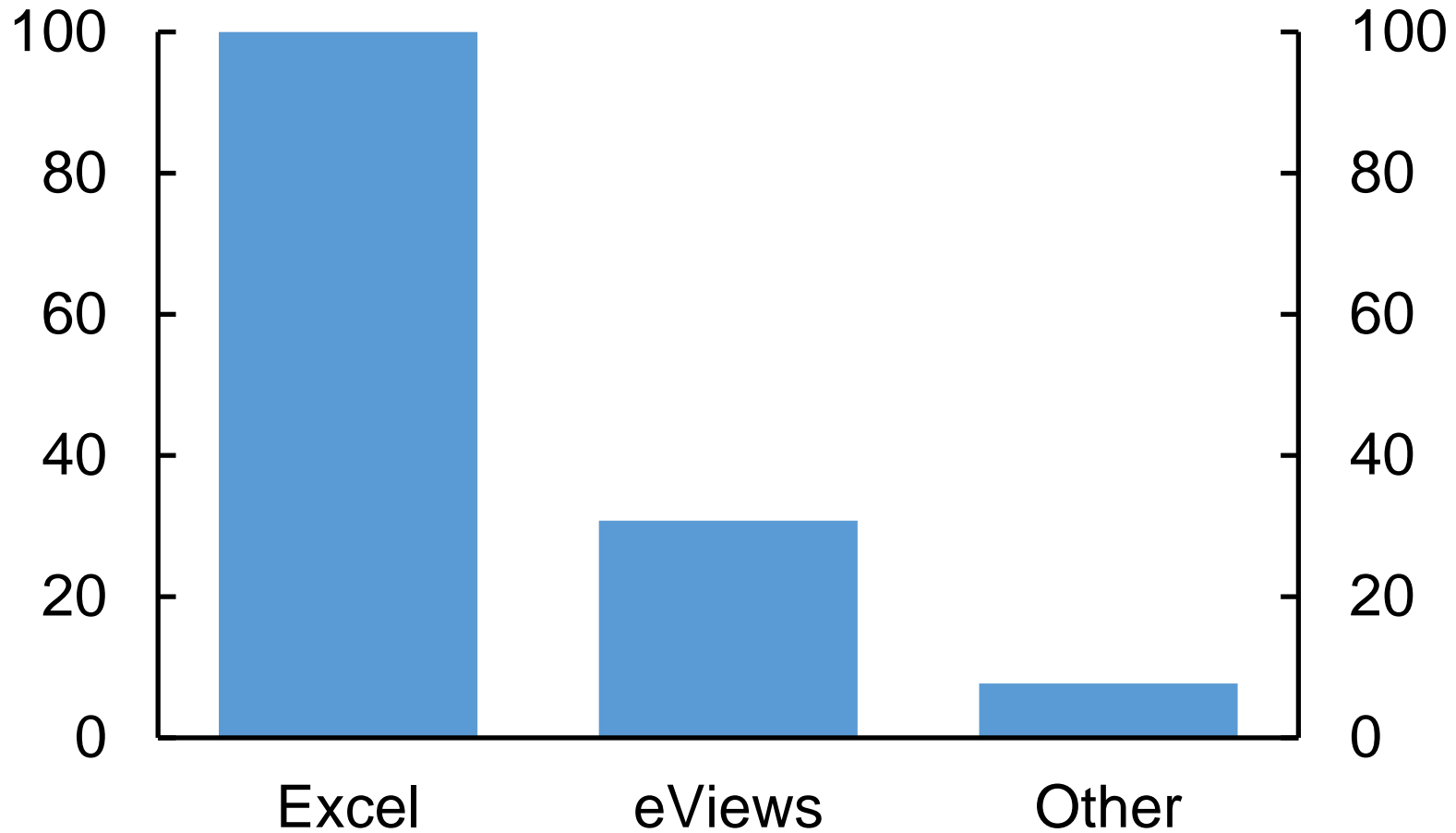


- What is needed to produce the desired outputs?
- What software licenses does the Ministry have?
- What type of computers are needed to run the software, and are they available?
- What software do analysts currently use for their work, and what have they been trained in?
- What do new recruits have training in?
- What is the cost of new and ongoing software licensing?
- Bespoke software solutions can be problematic

# Software usage



Software used by participating MFUs



# External assistance



- External assistance can often be provided by:
  - Donors
  - Contracted consultants
  - Universities
  - Other institutions (like the central bank)

Assistance can speed up development, but can hinder sustainability.

The assistance should be guided to help produce a framework that is useful, useable, accurate, and sustainable in the context of the ministry of finance.

The assistance should not build itself into the framework (unless the assistance is permanently ongoing).



# Knowledge management



Knowledge management is how we create, store and manage the knowledge of the MFU.

- Manuals
- Wikis
- Workflow systems
- Videos
- Working papers
- Technical notes

The knowledge management system should be compatible with the business processes and IT environment of the MFU

# Checklist before development



Objective and output

--

Summary of complexity of proposed framework  
(broad design, including business processes)

--

***Assessment of current environment and new needs for the objective and level of complexity:***

Relationships and business processes

--

Computer hardware, server and storage

--

Computer software, version control system

--

No of staff, and framework structure for team

--

Recruitment and training systems

--

New and ongoing training requirements (and cost)

--

Data availability

--

External assistance

--

Knowledge management

--

Summary of anticipated new and ongoing costs

--

# Malawi Case Study



- **Context**

- FPP Spreadsheet in place but produced limited outputs
- Responsibility for housing and maintaining the framework had not been established, and not been documented
- Parameters not produced in time to be used by the debt and revenue forecasting teams

# Malawi Case Study



## Objective:

**Use forecasts from the framework to improve macroeconomic consistency in the budget process**

**What is the desired output of the system, how will it be used, and how will it integrate with the business processes of the ministry?**

Consulted the Revenue and Debt and Aid Departments on the different output needed (GDP, CPI, Exchange rate, Imports, Exports Consumption, Compensation of Govt employee etc..)

A summary tables of economic indicators like the IMF's Table 1 Selected Indicators of Economic Activity.

A CPI forecast note and a CPI outcome note to help build macroeconomic awareness and build reputation of MFU unit

Charts and Other Summary Tables for reports

## Business Processes Integration

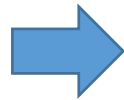
Created a calendar of upcoming data releases and related work to Integrate Forecast early in the budget calendar

# Malawi Case Study



**Is self-sustainability an objective, or will the ministry always look to draw on external experts to assist?**

Self Sustainability Goal



Make the Spreadsheet Useable

**What data are available?**

Data mostly available although few aggregations and compilation errors.

Previous work focused on solving inter account inconsistency issues and improve the SGO database. More work would be required to close the framework

**What does the IT environment look like?**

Framework not stored on a common drive.



Reliable IT Structure Not available



Use of Cloud driver (Box)

**How many staff will use the framework, and what is the rate of staff turnover?**

High Staff Turnover



Simple Spreadsheet and model



Implement a knowledge management system

# Malawi Case Study



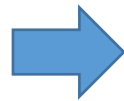
## What training have the staff received on different software?

Good knowledge of the economic concepts underpinning the framework

Intermediate training in Excel would provide some of the skills needed to build analytical spreadsheets

## Is there a knowledge management system, and how does it work?

In Malawi a knowledge management system was absent to address this

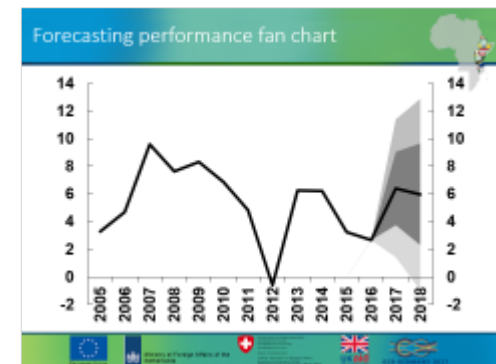


A series of guides on updating the framework were produced, and stored on the *Box* drive

# Malawi Case Study



- Is it useful?
  - Generating charts and analytical notes
  - Producing some forecasts
- Is it usable?
  - All in excel – most formulae are simple
  - But updating still difficult – business processes linking to users and suppliers are difficult to maintain
- Is it accurate?
  - Added a forecast performance
- Is it sustainable?
  - Using, fixing and developing it further



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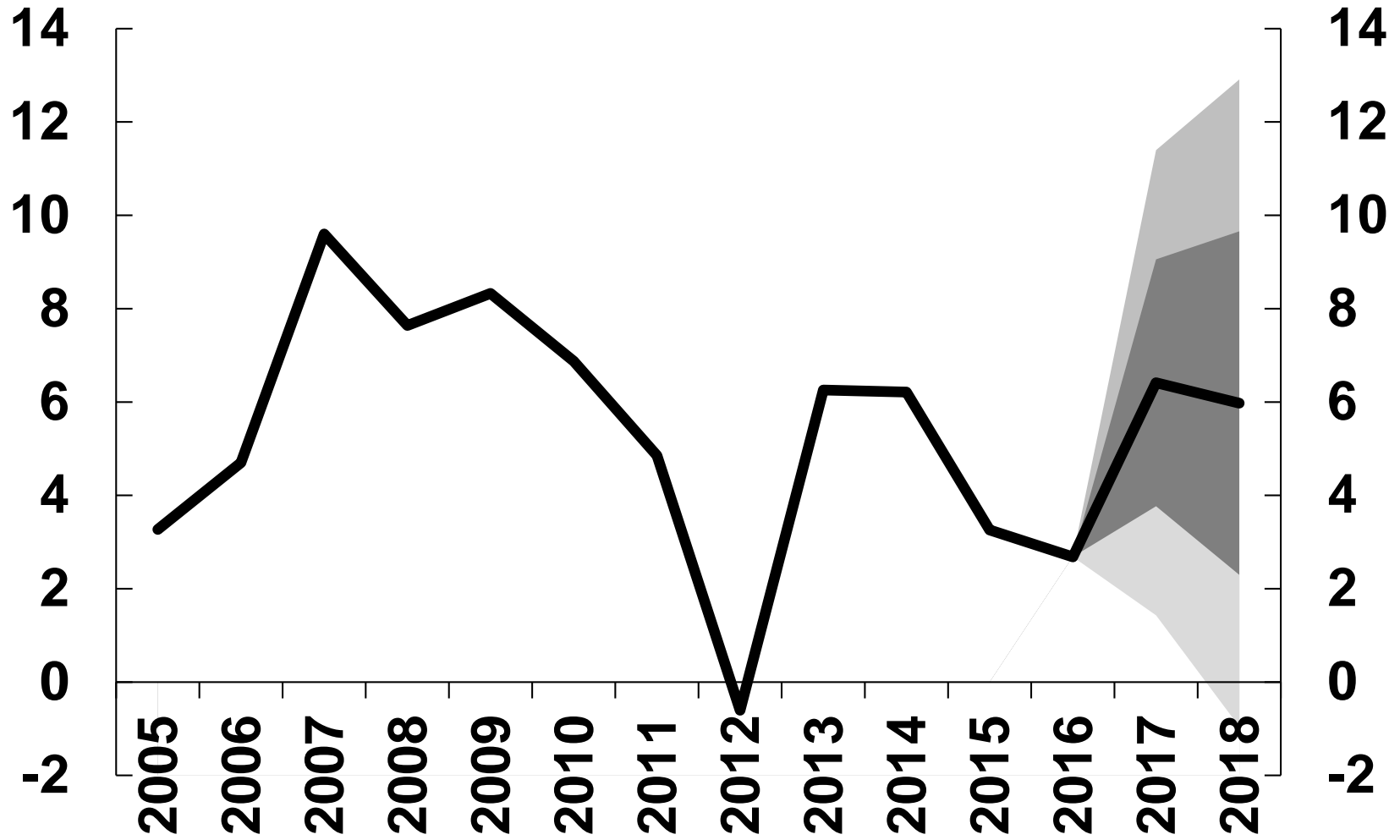


Considerations in building a forecasting framework



East AFRITAC Facebook page  
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# Forecasting performance fan chart





# International Monetary Fund - IMF Regional Technical Assistance Center

Building macroeconomic capacity in East Africa



## Building and Maintaining Macro-Fiscal Frameworks/Units

Sami Yläoutinen

Strengthening the Role of Macro-Fiscal Units (MFUs) in Ministries of Finance

JANUARY 11, DAR ES SALAAM, TANZANIA



Ministry of Foreign Affairs of the  
Netherlands



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Itens Confederaziun  
Federal Department of Economic Affairs,  
Education and Research (SAE)  
State Secretariat for Economic Affairs SECO



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# Building and Maintaining MFUs

## Outline of Presentation



- I. Demonstrating the benefits of MFUs
  - Within the MoF: What are/should be the key deliverables
  - To stakeholders: The importance of transparency
- II. Interaction
  - Within the budget process
  - Within MoF: The importance of consistency
  - With outside stakeholders
- III. Skills
  - What skills are needed
  - How to build and maintain required skills
- IV. Conclusions

# I. Demonstrating the Benefits



- Crucial to be able to demonstrate why MFU is needed
  - Within the MoF (Minister, other departments)
    - What are the key deliverables
  - To outside stakeholders
    - Transparency (publications, addressing bias, forecast errors etc.)

# I. Demonstrating the Benefits

## What the Minister can expect: Macro



Output	Content	Timing	When
<b>Medium-term macroeconomic forecast</b>	Document providing assumptions, results, key driving forces as well as main risks, sensitivity analysis and changes with respect to previous forecast.	Bi-annually	In connection of the MTBF and budget



# I. Demonstrating the Benefits

## What the Minister can expect: Fiscal



Output	Content	Timing	When
<b>In-year fiscal reports</b>	Basic information and explanations of revenue, expenditure and balance outturns.	Quarterly	
<b>Final Budget Outturn report</b>	More detailed information on revenue, expenditure and balance outturns plus reconciliation with below the line activity.	Annual	6/9/12 mo after the end of fin year
<b>Medium-Term Fiscal Forecasts</b>	Document, providing fiscal forecasts and explanation for policy makers. Should provide an explanation of how forecasts have evolved relative to the previous round.	Bi-annually	In connection of the MTBF and budget
<b>Pre-budget report</b>	Fiscal write-up, applying the fiscal rule/strategy to the fiscal forecasts, to provide an estimate of fiscal space, and proposed policy actions.	Annual	September



# I. Demonstrating the Benefits

## What the Minister can expect (e.g.): Policy



Output	Content	Timing	When
<b>Fiscal Strategy Options Paper</b>	Options for an implicit or explicit fiscal rule/strategy that will guide fiscal policy formulation. Include simulations and implications	One-off	
<b>Estimate of fiscal multipliers</b>	Estimates for fiscal multipliers for various categories of expenditure	One-off	
<b>Long-term Economic Growth Report</b>	Internal document, explaining the basis and supply-side assumptions underlying the long-term growth projection.	One-off	
<b>Ad hoc research reports</b>	Responses to the Minister's requests		

# I. Demonstrating the Benefits Stakeholders



- Transparency of the forecasts (publications)
- IMF Fiscal Transparency Code:
  - "The budget projections are based on comprehensive macroeconomic forecasts, which are disclosed and explained"
  - "Budget documentation and any subsequent updates explain any material changes to the government's previous fiscal forecasts, distinguishing the fiscal impact of new policy measures from the baseline"

# I. Demonstrating the Benefits

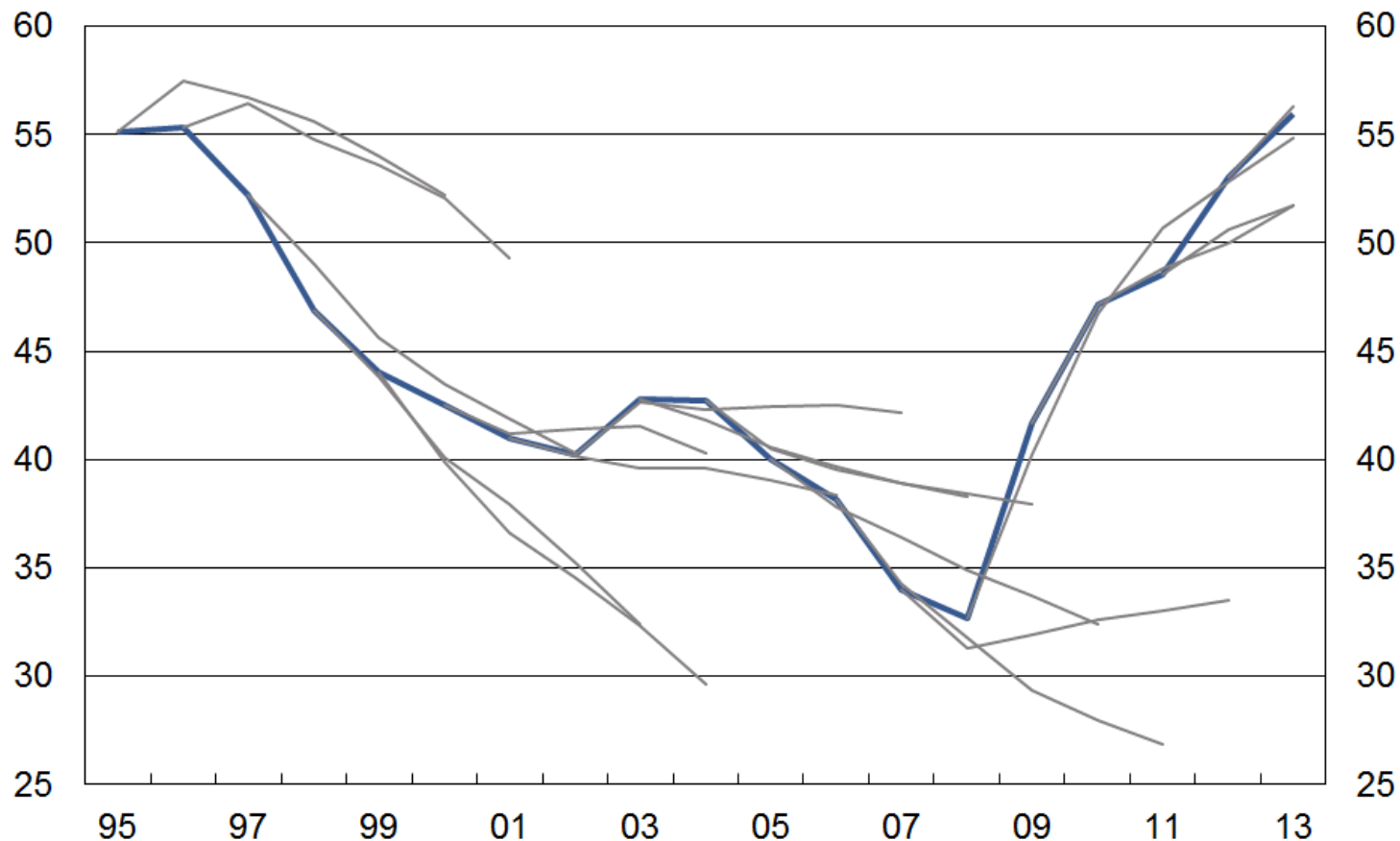
## Forecast errors and bias



- Why there are forecast errors?
  - Unforeseen economic developments
- ... and when forecast errors are linked to bias
  - Overestimation (optimistic forecasts)
    - E.g. elections, strenght of fiscal institutions
  - Underestimation (pessimistis forecasts)
    - E.g. intentional bias (want to limit the risk of an unexpected deficit)
- Are consequences symmetric?

# Example: Finland

## GG Debt to GDP forecasts and outturn



Source: Statistics Finland, Ministry of Finance

# I. Demonstrating the Benefits

## Addressing Bias



- Explicit prudence factor in GDP-projection
- Prudence in revenue projections
- Independent input
- Forecasting competition
- Transparency, evaluation and accountability

	GDP-forecast	Other economic assumptions	Independent forecasts
Australia	Central assumptions	Conservative bias in forward estimates of 0.5-1.5% of spending	None
Canada	Average of indep. assumptions	Ministry of Finance adds 0.5 to 1% to interest rates and runs through model	Private sector forecasts
Netherlands	Budget based on cautious economic scenario in which GDP 0.5 to 1% below outturn	Central assumptions	Central Planning Bureau
UK (before 2010)	Ministry of Finance uses GDP forecast 0.25% below trend	7 other economic assumptions explicitly 'cautious'	HM Treasury (MoF)
UK (after 2010)	Central assumptions	Central assumptions	Office for Budget Responsibility
Sweden	Central assumptions	Central assumptions	National Institute of Economic Research, Fiscal Policy Council

# I. Demonstrating the Benefits

## Forecast errors and transparency

Figure 1. GDP percentage growth forecast deviations, %

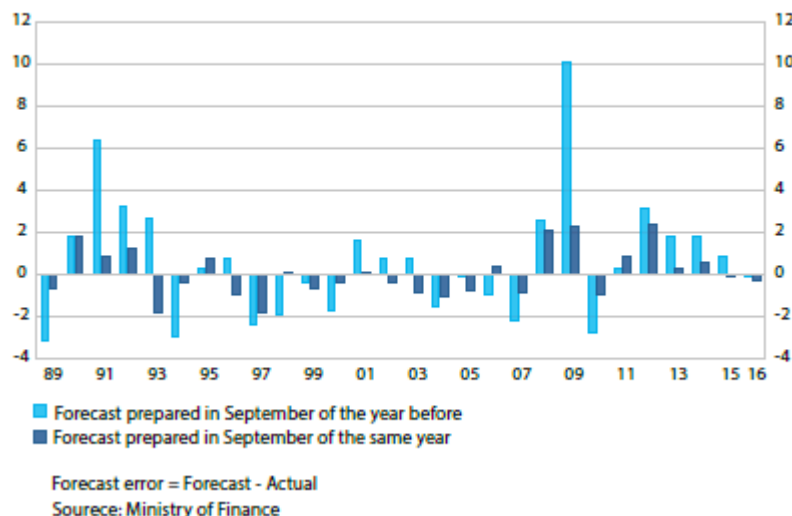


Figure 2. More detailed macro forecasts for development in 2016, %

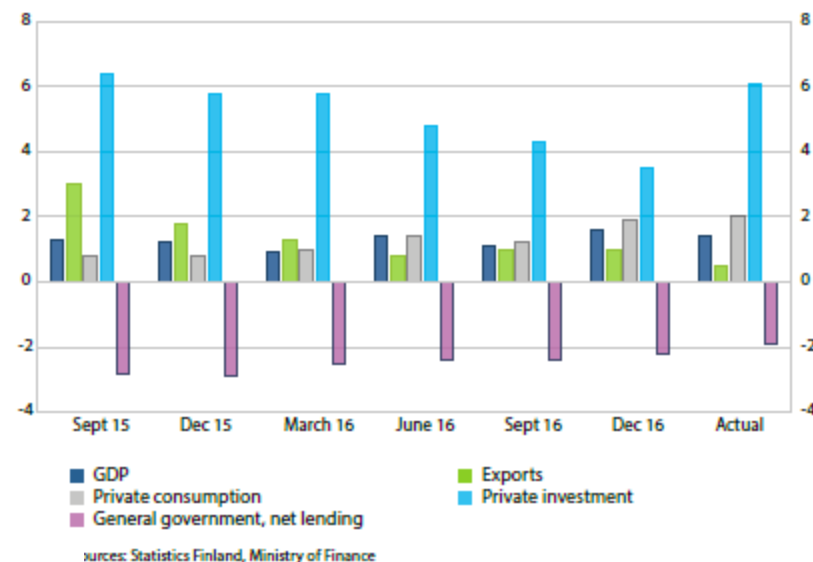


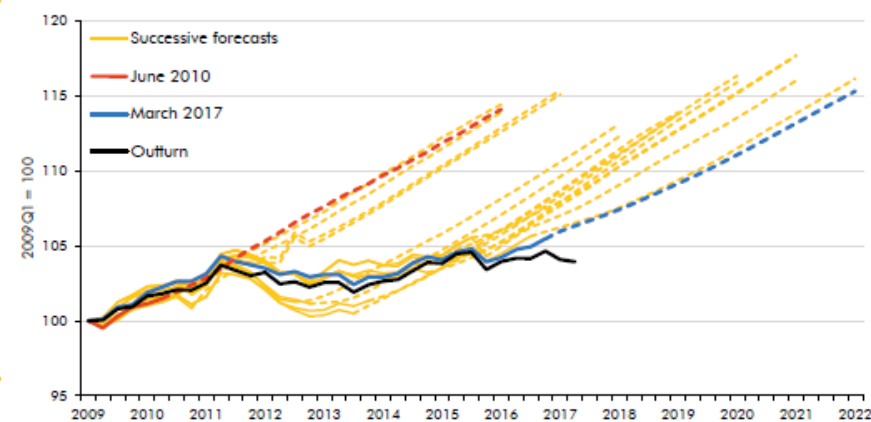
Table 3.1: 2016-17 receipts, spending and net borrowing forecasts

	Forecast <sup>1</sup>	Outturn	Difference	£ billion				Memo: like-for-like difference <sup>2</sup>
				of which:				
				Classification changes	Policy changes	Economic factors	Fiscal forecasting difference	
Borrowing (PSNB)								
March 2015	42.7	45.0	2.4	-8.5	12.1	-1.5	0.3	10.9
March 2016	55.9	45.0	-10.9	-8.1	0.9	-0.5	-3.2	-2.8
Receipts (PSCR)								
March 2015	708.6	726.2	17.6	5.6	5.5	-0.5	7.1	12.0
March 2016	717.3	726.2	8.9	4.3	0.0	1.9	2.7	4.6
Spending (TME)								
March 2015	751.3	771.3	20.0	-2.9	17.6	-2.0	7.4	22.9
March 2016	773.3	771.3	-2.0	-3.8	0.9	1.4	-0.5	1.8

<sup>1</sup> Forecasts have been restated to reflect the reclassification of housing associations to the public sector.

<sup>2</sup> Excludes the effect of classification changes.

Chart 1.1: Successive OBR productivity forecasts (output per hour)



## II. Interaction



- The MFU needs to coordinate with a wide range of institutions, inside and outside the MoF
- The full benefits of the macro-fiscal work can only be reaped through regular inter-agency consultation and cooperation, in which there are exchanges of views on
  - forecasts,
  - fiscal policy options, and
  - their quantitative impact



## II. Interaction

### Within the Budget Process



**Table 2. Forecast Stages and Budget Calendar: an Illustration**

Update 1: Establishing baseline (March)	<p><b>Input:</b> updated macro-projections.</p> <p><b>Purpose:</b> used to produce a no-policy-change assessment is made to obtain the base-line for expenditures.</p>
Update 2: Macro-update and projections of proposed policies (July-August)	<p><b>Input:</b> based on comprehensive policy proposal (both existing and new policies) and latest macroeconomic data</p> <p><b>Purpose:</b> ensure that the evaluation of policy proposals is based on the best possible macroeconomic assessment, basis for detailed budget preparation.</p>
Update 3: Budget update (September/October)	<p><b>Input:</b> all policies proposed in the Draft Budget and latest macroeconomic information</p> <p><b>Purpose:</b> fine tuning costings in the Draft Budget and ensure consistency with the macro-forecast</p>



# II. Interaction

## Within MoF



- Strong coordination between the MFU and the Budget Directorate is crucial.
- MFU
  - Typically strategic issues of macroeconomic and fiscal importance
- Budget Directorate
  - Annual budget issues and detailed spending projections
  - In collaboration with spending ministries and agencies, often coordinates the preparation of annual and multi-annual spending projections (by program or by sector)

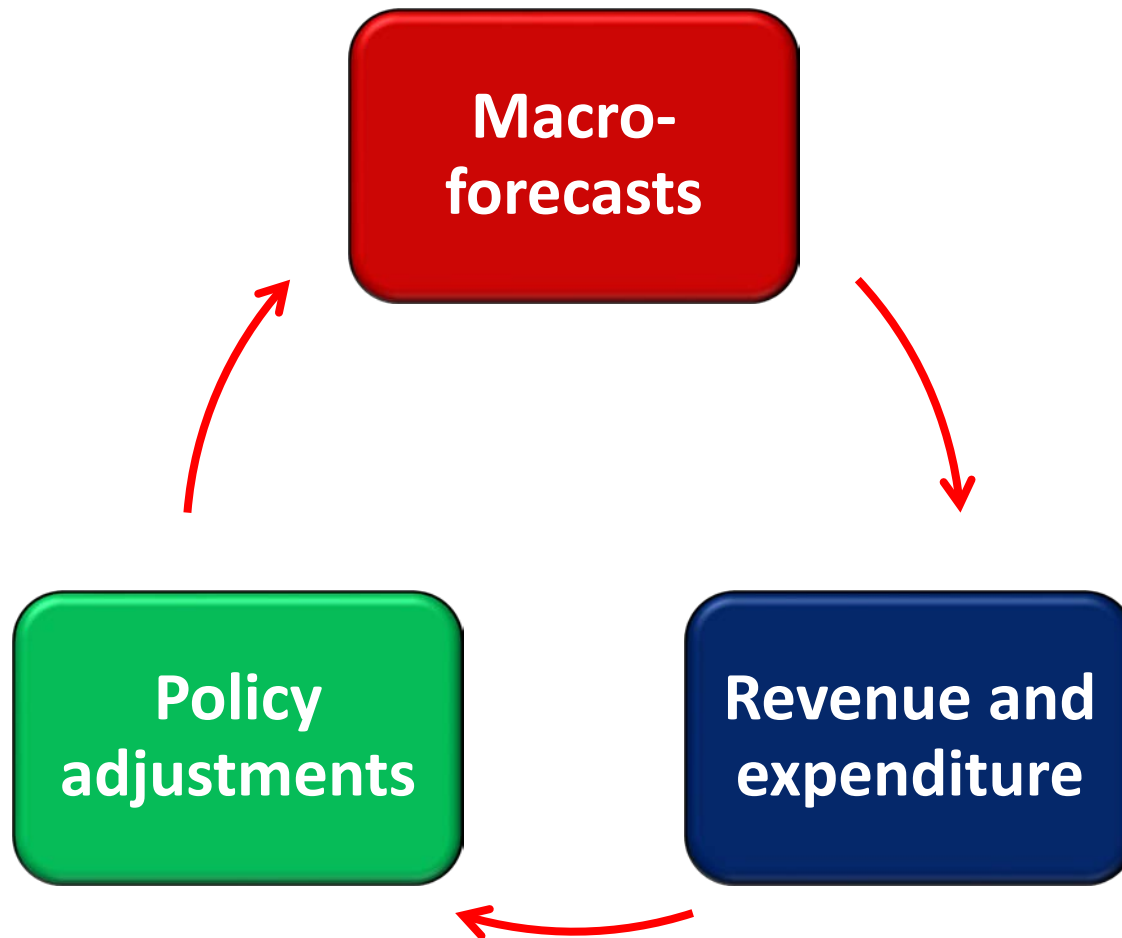
## II. Interaction Within MoF



- Close contact with the Revenue, Treasury, Debt (and/or Aid) Directorates of the MoF
- Debt Sustainability Analysis projections in coordination with the Debt Directorate or DMO
- Some outputs of other MoF directorates (e.g., if a debt management strategy paper is prepared by the DMO) need to be reviewed carefully by the MFU

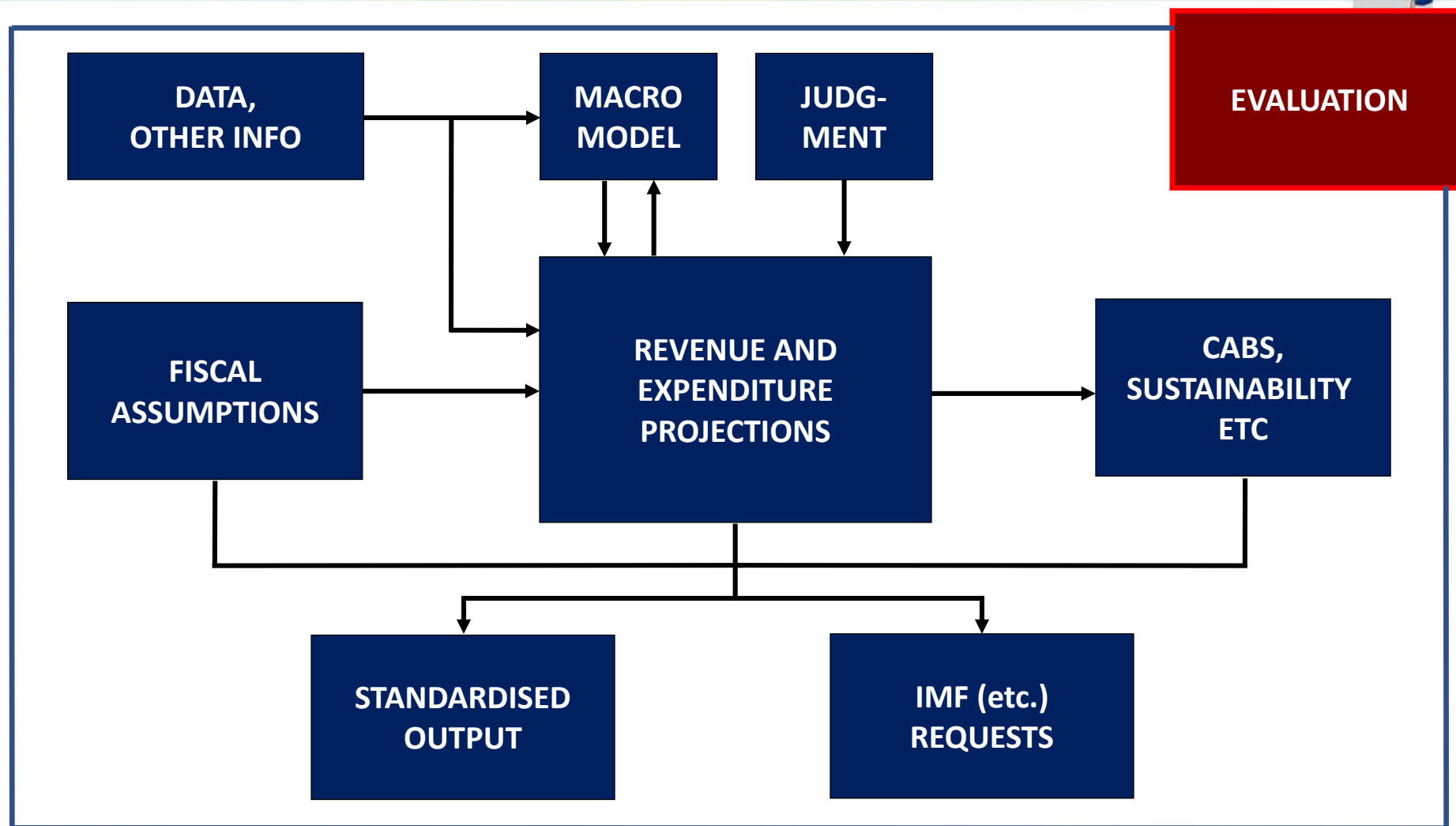
## II. Interaction

### Within MoF: Consistency



# II. Interaction

## Within MoF: Consistency



## II. Interaction



### MINISTRY OF FINANCE

**Minister of Finance**  
Mr Petteri Orpo

**Minister of Local Government and Public Reforms**  
Ms Anu Vehviläinen

**Permanent Secretary**  
Mr Martti Hetemäki

**Economic Policy Coordinator,  
Director General**  
Mr Sami Yläoutinen

**Permanent  
Under-Secretary**  
Mr Tuomas Saarenheimo

**Permanent  
Under-Secretary**  
Mr Tuomas Pöysti

**Budget Department**  
Mr Hannu Mäkinen, Director General

**Economics Department**  
Mr Mikko Spolander, Director General

**Tax Department**  
Ms Terhi Järvikare, Director General

**Government Financial Controller's Function**  
Mr Esko Mustonen  
Deputy Government Controller-General

**Financial Markets Department**  
Ms Leena Mörttinen, Director General

**International Financial Affairs Unit**  
Mr Pekka Morén, Director

**Secretariat for EU Affairs**  
Ms Marketta Henriksson, Director

**Media and Communications Unit**  
Ms Liinu Lehto, Director

**Public Governance Department**  
Mr Juha Sarkio, Director General

**Public Sector ICT Department**  
Ms Anna-Maija Karjalainen, Director General

**Department for Local Government and  
Regional Administration**  
Mr Jani Pitkäniemi, Director General

**Administrative Governance and Development**  
Ms Helena Tarkka, Director General

# II. Interaction

## Within MoF: Finnish Example



- Revenue forecasts are prepared in the Ministry of Finance as a cooperative effort of
  - Economics Department
  - Budget Department
  - Tax Department
- Coordinating body:
  - Revenue Working Group includes above mentioned (+ Tax Administration)

## II. Interaction

### Within MoF: Finnish Example



- The working group compiles the central government and general government revenue forecasts and estimates required in:
  - Economic outlook forecasts
  - Budget preparations
  - Medium-term scenario calculations
  - Etc.
- Reliability ("peer review", common macroeconomic forecast as basis, also ex-post evaluation, sensitivity and risk assessment of revenue estimates)
- Transparency, understanding and cooperation (regular meetings)



## II. Interaction

### Within MoF: Finnish Example



- Forecasts based on:
  - Actual tax revenue
  - Forecast of the tax base change
  - Tax criteria changes relating to the following year
  - Behavioral responses (elasticities)
  - Macro forecast
- The macroeconomic forecast prepared by the Economics Department:
  - Important basis for the preparation of revenue forecasts
  - No tax revenue category or tax base is forecast solely on the basis of the macroeconomic
  - Role varies according to the tax category and the situation.



## II. Interaction With Stakeholders



- Close coordination is needed with
  - Planning Ministry or agency (medium-term and long-term Plans for socio-economic development/investment budget.
  - To support investment plans, the planning ministry may prepare macroeconomic projections.
    - Consistency with the medium-term fiscal strategy developed by the MFU of the MOF!

## II. Interaction With Stakeholders



- National statistics office and other non-MoF agencies
  - The statistics office's historical National Accounts and fiscal data should be identical to the MFU's data used in its macroeconomic and fiscal projections.
- Other relevant actors in the public and private sectors to gather information and compare projections
- Central bank

# III. Skills



- The availability of skilled staff depends on adequate recruitment, promotion and retention policies
- If human resource incentives are weak, the ability of the MFU to perform its functions may be limited
- Competition from private sector: salaries

# III. Skills

## Macro



- A strong understanding of macroeconomics is essential
- An ability to collect and analyze data, incl. graphical and quantitative analysis
- Database management and information technology (IT) skills.
  - If time series software packages such as Eviews are not currently used, may require training

# III. Skills

## Fiscal



- A good understanding of how the budget is organized, and what determines expenditures and revenues.
- Quantitative experience in the revenue and budget departments
- Does not necessarily require advanced econometric and modeling skills, but familiarity with quantitative work and Excel spreadsheets important

# III. Skills Policy



- Depending on tasks, stronger academic background may be needed
- Largely analytical, research and report writing; strong economic research background
- May involve undertaking more complicated econometric analysis, which can then be fed into the work of the other two sections

# III. Skills

## Capacity Building



- Capacity building often takes time
- Expertise can be built up
  - Regular contacts with local and international counterparts,
  - More frequent contacts with the IMF Article IV team to exchange ideas on policy and technical issues.
  - Training: The IMF Institute provides a number of courses for government officials in Washington, Kuwait City and Vienna.

# IV. Conclusion



1. Important to be able to demonstrate the benefits of having MFU
2. MFU outputs should be well planned and of high quality
3. Forecasting updates need to be coordinated with budget and statistics calendars
4. A macro-fiscal unit can spearhead the development of macro-fiscal capacity, but requires constructive cooperation with budget policy dep't and others.
5. Consistency between macro-forecasts and fiscal policy requires coordination and iteration.
6. Capacity building takes time but can be addressed