Module 2

Macroeconomic Forecasting: UN/DESA's World Economic Forecasting Model (WEFM)

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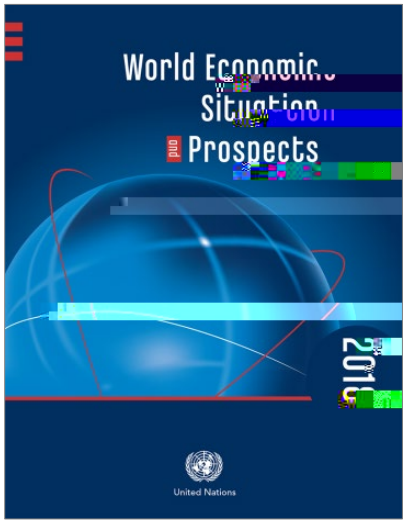
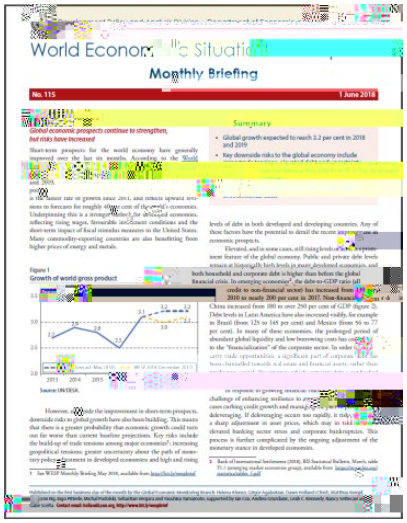
Global Economic Monitoring Branch What do we do?

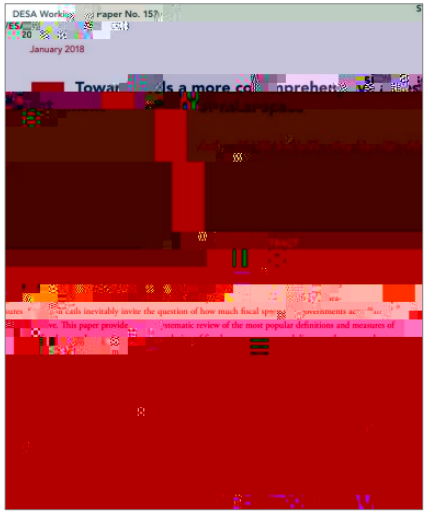
- Monitor global economic developments and prospects from the country level (179 countries)
- Assess policy options from a sustainable development perspective, including social and environmental dimensions

Global Economic Monitoring Branch
What do we do?

- Our macroeconomic forecasts and analyses are reflected in several UN publications







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- A set of interacting equations that describes key elements of the complex interactions between major macroeconomic actors and variables
- Even complex models are inevitably a gross oversimplification of reality
- Models will only deliver a pre-programmed response

Creating a model-based forecast

- Four key components:

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  - Latest data

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  - Latest data
    - Including high frequency data where available
  - Policy environment or assumptions
    - Tax/spending changes, Monetary policy, external assumptions

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  - Policy environment or assumptions
    - Tax/spending changes, Monetary policy, external assumptions
  - Model
    -

What makes a good forecast?

- Good data
- Good model
- Good judgement

- **How would you rank their importance?**

Good data

- What sources are available?
  - Often trade-off between data quality and data timeliness
- Models should be constructed using the highest quality data available
- Forecasts should make use of most recent data available
- Frequencies may need reconciliation

Good model

- What is the question?
- Short-term forecasting of a single indicator often best with simple data-based model (nowcasting)
- Medium-term projections benefit from theoretical underpinning
- Scenario studies rely on theoretical underpinning

Imposing judgement on a model

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The UN/DESA forecasting model

- What does UN/DESA want from a model?
  - To produce a globally consistent plausible baseline forecast for 176 countries for several years
  - Simple, efficient tool that can give insight into GDP, inflation, unemployment, current account, fiscal balance etc. under different scenarios
  - Adaptable to address specific questions as needed
  - Able to link to other sustainable development indicators via satellite models
- Structural econometric model adopted (runs in EViews)

Structural econometric models

- Cons
  - Lack theoretical elegance of DSGE models
    - ¾ Based on macro rather than micro foundations
    - ¾

UN’s World Economic Forecasting Model (WEFM)

- Common theoretical structure
  -

WEFM Model Overview (see paper)

- 176 individual country models
- Global linkages reconcile export and import volumes and prices
- Models have roughly 60 equations with 15-20 key behavioural relationships.
- Simple framework that nonetheless captures country-specific behaviour
- Designed for both forecasting and scenario studies
- Theoretical structure with econometrically estimated parameters and dynamics
- Short-term behaviour linked to ROW demand, oil price sensitivity, exchange rate sensitivity, policy, etc.
- Medium term: GDP approaches ‘capacity’; inflation may approach a ‘target’; productivity approaches ‘trend’; current account, gov’t

Modelling GDP

- GDP is driven by demand in the short-term
  - Sum of consumption, investment, net trade

$$YER = PCR + GCR + ITR + SCR + XTR - MTR$$

- Driven by supply in the long-term

$$YFT_t \quad f \; K_t, L_t, T_t$$

Aggregate Supply

- Underlying generic ‘production function’ describes the capacity of the economy
  - **Steady-state assumption**: Capacity evolves with potential labour input (labour force) and trend productivity (technology)
  - To allow for market imperfections in external sector, explicit link to export growth

$$\Delta \log(YFT_t) = \alpha \log(LFN_t) + \log(YFIT_TREND) + \beta \Delta \log(XTR_t)$$

Aggregate Demand

- Government consumption
  -

Aggregate Demand

- Investment
  -

Modelling the labour market

- Current vintage of WEFM adopts an Okun-style relationship that links the unemployment rate to GDP growth, simplest labour market model

Supply-side labour market models

- Specify production function, and derive factor demands by setting marginal product equal to marginal cost (profit maximization)
  - With CES function this implies:
  -

Policy channels

- Fiscal policy channels
  - single source of tax revenue
  - 3 categories of expenditure
    - ¾ Government consumption (national accounts)
    - ¾ Government interest payments
    - ¾ Other public spending (residual)

- Monetary policy channels
  - Exchange rate is primary instrument
  - Interest rates can follow a ‘Taylor-type’ Central Bank policy rule, and exchange rate follows

How does tax impact the labour market?

- In WEFM
  1. Change in tax rate impacts real personal disposable income
  2.

How does tax impact spending?

- In WEFM
  1. No direct impact, unless potential output changes

- Missing channels: Solvency condition

Solvency condition

- Government deficit flows onto Debt
- Debt serviced through interest payments
- Without a ‘solvency’ condition, there is no penalty for running a large deficit
  - Sustainable borrowing today should entail higher taxes or lower spending in the future to repay debt
- Not imposed in models we’ll work with this afternoon

How do interest rates impact the labour market?

- In WEFM
  1. Interest rate change impacts exchange rate
  2. Exchange rate impacts net trade and inflation
  3. Net trade and inflation impact GDP
  4. GDP impacts unemployment, and second round effects….
- Missing channels: Direct impact of interest rate on investment. Pass through is very slow

How do interest rates impact the fiscal balance?

- In WEFM
  1. Interest rate change impacts debt service payments
  2. Fiscal deficit flows onto debt stock
  3. Without solvency condition, feedback stops here

- Missing channels: Solvency condition

Forecasting study and policy study

Steps to a model-based forecast

- Collect most recent data
  - Basic data provided
- Estimate model as needed
  - Model provided
- Use high-frequency data for ‘nowcasting’
  - Annual database may be augmented by quarterly/monthly/even daily data to estimate key variables for 2017
  - MIDAS estimation example

Steps to a model-based forecast

- Set exogenous inputs
  - Policy assumptions
    - Government consumption
    - Tax rate
    - Interest rate/Exchange rate
  - Oil price
- Assess recent accuracy of model and set add factors on equations where necessary
- Produce forecast and fine tune settings

Steps to a model-based forecast

Stochastic forecasts

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Stochastic forecasts

- Assess the conditional forecast accuracy of the model
- Conditional on all the exogenous inputs into the model
- Uses historical errors from the model equations

Policy Study – Shock

- What is a shock?
- A shock is any deviation from the baseline projection for a variable **that is driven by factors exogenous to the model**
- Identifying the source of your shock is the first step to designing a scenario
  - This can sometimes be complex
- How would you design a shock to GDP?

Designing a shock to GDP

- Does it make sense to shock an identity directly?
- If not, what component of GDP is driving the shock?
- Say it comes from a shock to consumption
  - Is this because income has changed?
  - If not, we may have an exogenous shock to household behaviour, driven eg by a change in preferences or forthcoming tax on savings….
  - If so, is the income shock exogenous, or driven by inflation or a change to the tax rate?.... etc….

Policy Study – Fiscal response

- Increase government consumption spending
  - Government deficit deteriorates
  - GDP rises
    - ¾ Employment rises
    - ¾ Output gap closes and prices rise
      - Interest rates rise…
    - ¾ Government deficit improves…