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# **Empirical Estimation of GDP-at-Risk Models**

## CCBS Course for Central Bank of Egypt

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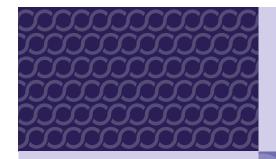
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# Plan for today

#### 1. An introduction to data and code to construct GDP-at-Risk model

Practical walk-through in MATLAB

## 2. Discussion of modelling Egyptian GDP-at-Risk

- What countries are most relevant to Egyptian macro-financial stability?
- What are the most relevant risk factors to focus on?
- Over what time span is data available for?
- Which results to focus on?

#### **GDP-at-Risk Code: Overview**

 The code is written in MATLAB and estimates a local-projection quantile regression model:

- The code produces:
  - 1. Impulse Response Functions (IRFs) at 5<sup>th</sup>, 50<sup>th</sup>, 95<sup>th</sup> perc (& mean)
  - 2. Quantile Response Functions (QRFs)
  - 3. Historical Decomposition of GDP@R

#### **GDP-at-Risk Code: Structure**

- The code folder contains a "MASTER\_GAR" file which is the only code that needs to be run to load the data, estimate the QR and obtain results
- Sub-codes are labelled "GO\_\*" and are also contained in "mfunctions" folder
- The "MASTER\_GAR" file is structured as follows:
  - Preliminaries
  - Section 1: Load in data from Excel
  - Section 2: Transform data and set-up "X" and "y" matrices for the regression
  - Section 3: Estimate quantile-regression local projection save coefficient estimates, standard errors and fitted values
  - Section 4: Produce charts to analyse results
  - Section 5: Save estimation

## **GDP-at-Risk Code: User Inputs**

- User inputs (% \*\*\*) in order to run MASTER\_GAR:
- Line 19: set user working directory where codes / subfolders are saved
- Lines 24-25: select whether to save results
- Lines 32-34: set Excel s/s names to read in data (for first run only)
- Line 48: select model to run (defined in "GO3\_Switches")
- Lines 106 / 117 / 124-130: select which results you want to focus on

- User inputs in GO3\_Switches
- Lines 10-16: define sample period and countries for estimation
- Lines 18-26: set LHS variable
- Lines 28-58 set RHS variables
- Lines 60-65: set bootstrap options for calculation of standard errors
- Lines 68-69: set quantiles and horizons to estimate and Ed Manuel

# **GDP-at-Risk Practicalities: Step 1**

- Construct database and load in data
  - Data saved in Excel files and loaded into MATLAB in GO1\_LoadData
  - Should include GDP data, macro-financial data, linkages data (e.g. trade/financial weights)

## TODAY:

Macro-financial dataset for advanced economies from Aikman et al. (2018) (extended by Lloyd et al. (2021)): covers data on circa. 20 variables for 22 countries (AEs and EMEs) 1972-2018

## **GDP-at-Risk Practicalities: Step 2**

- Define specification to run sample period and choice of covariates will depend on:
  - Data availability / degrees of freedom
  - Theory / previous studies
  - Country-specific knowledge (which variables matter most for GDP-at-Risk)

## **TODAY**:

- 1980-2018 quarterly data for 11 advanced economies
- Domestic variables: Volatility, 3y change in Credit-to-GDP, GDP growth
- Global variables: None (for now)

# **GDP-at-Risk Practicalities: Step 3**

- Estimate QR and interpret results:
- Are the results in line with hypothesis?
- Do we see different effects across horizons and quantiles?

#### TODAY:

- Increase fin market vol. -> fall in GDP@R (increased tail risk) in near-term
- Increase debt-to-GDP -> fall in GDP@R (increased tail risk) in medium-term
- For credit, -ve effect at  $5^{th}$  perc = **2** x effect at median
- Hist Decomp: at policy-relevant horizons, debt-to-GDP explains most of fluctuations in UK GDP@R

#### Discussion: Features of a CBE GDP-at-Risk model

## Data availability:

- Length of time series
- Panel vs. country-specific (is panel assumption reasonable?)

#### Which risk factors?

- Domestic financial conditions and credit growth
- Domestic macroeconomic controls
- Global factors?

#### Results to focus on:

- Impulse responses
- Historical decomposition

# **Resources for Estimating GDP-at-Risk**

## Range of tools available:

- <u>IMF</u> (Excel / Python)
- CEMLA (R)
- BoE (MATLAB)