Oprogramowanie Naukowo-Techniczne sp. z o.o. sp. k.

Dystrybutor oprogramowania MathWorks, Inc. w Polsce

MathWorks

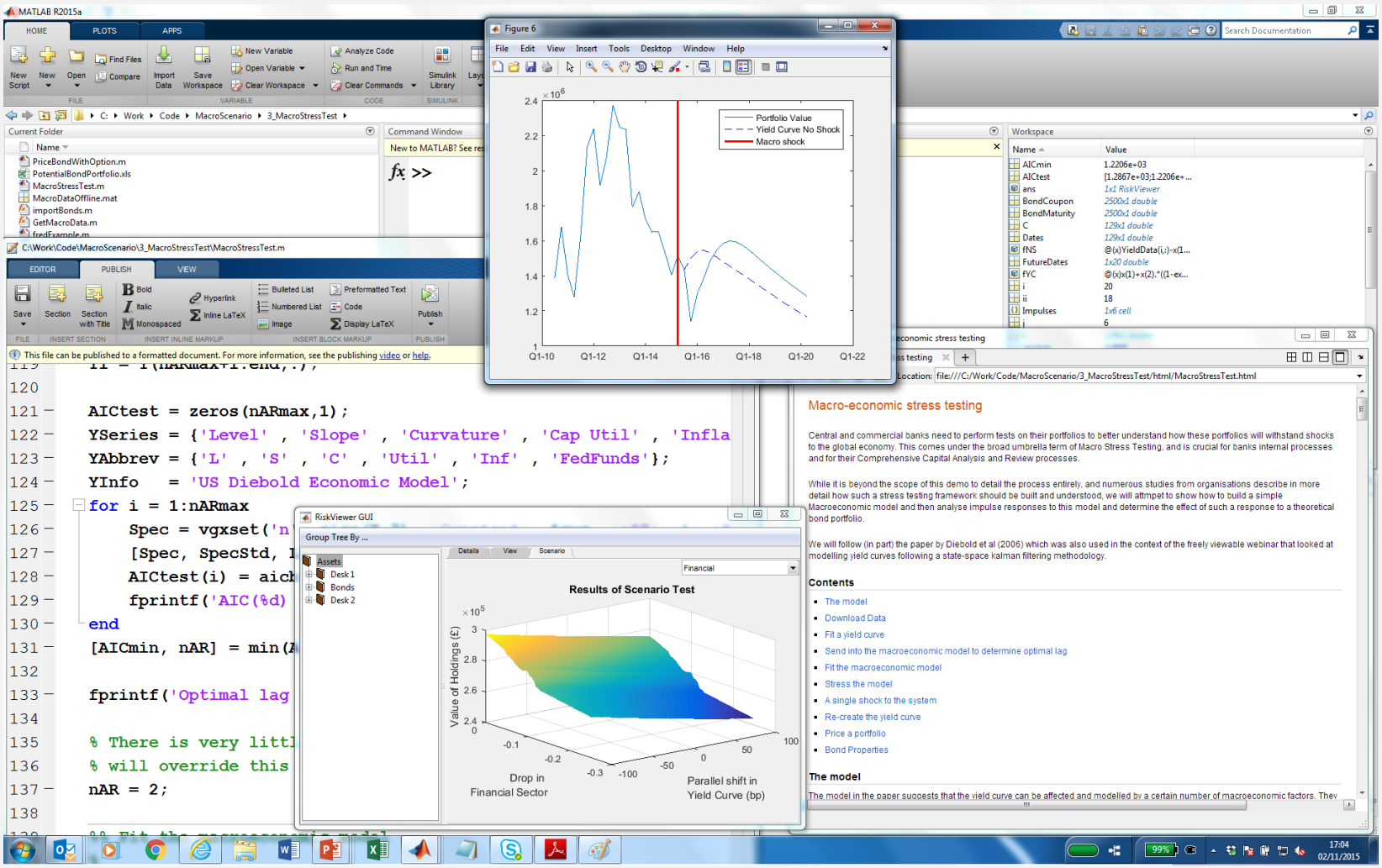
MATLAB

Accelerating Model Development in Finance

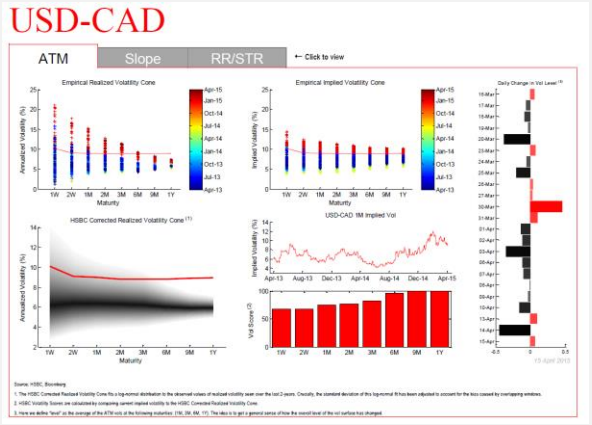
Remigiusz Lipiec

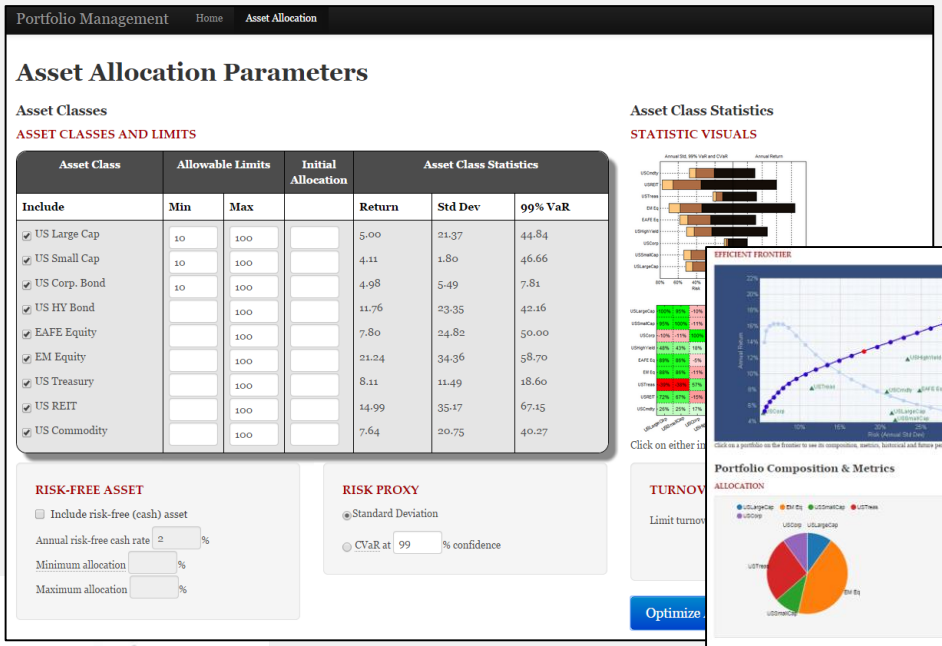
15.09.2017 ERFIN Workshop Warszawa

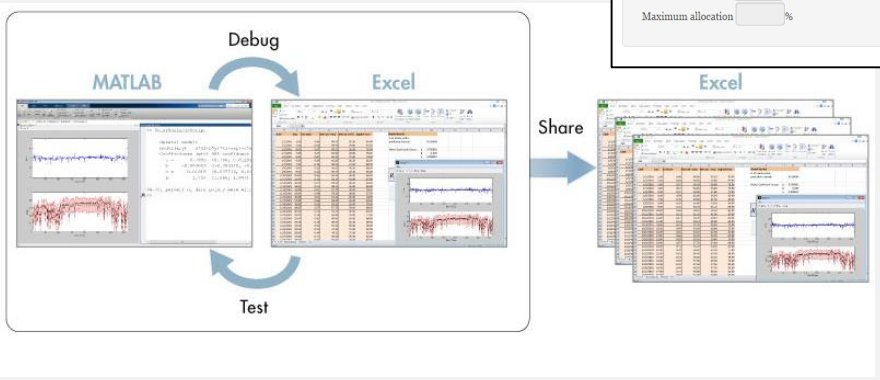
What is MATLAB ?: Rapid, Assured Model Development



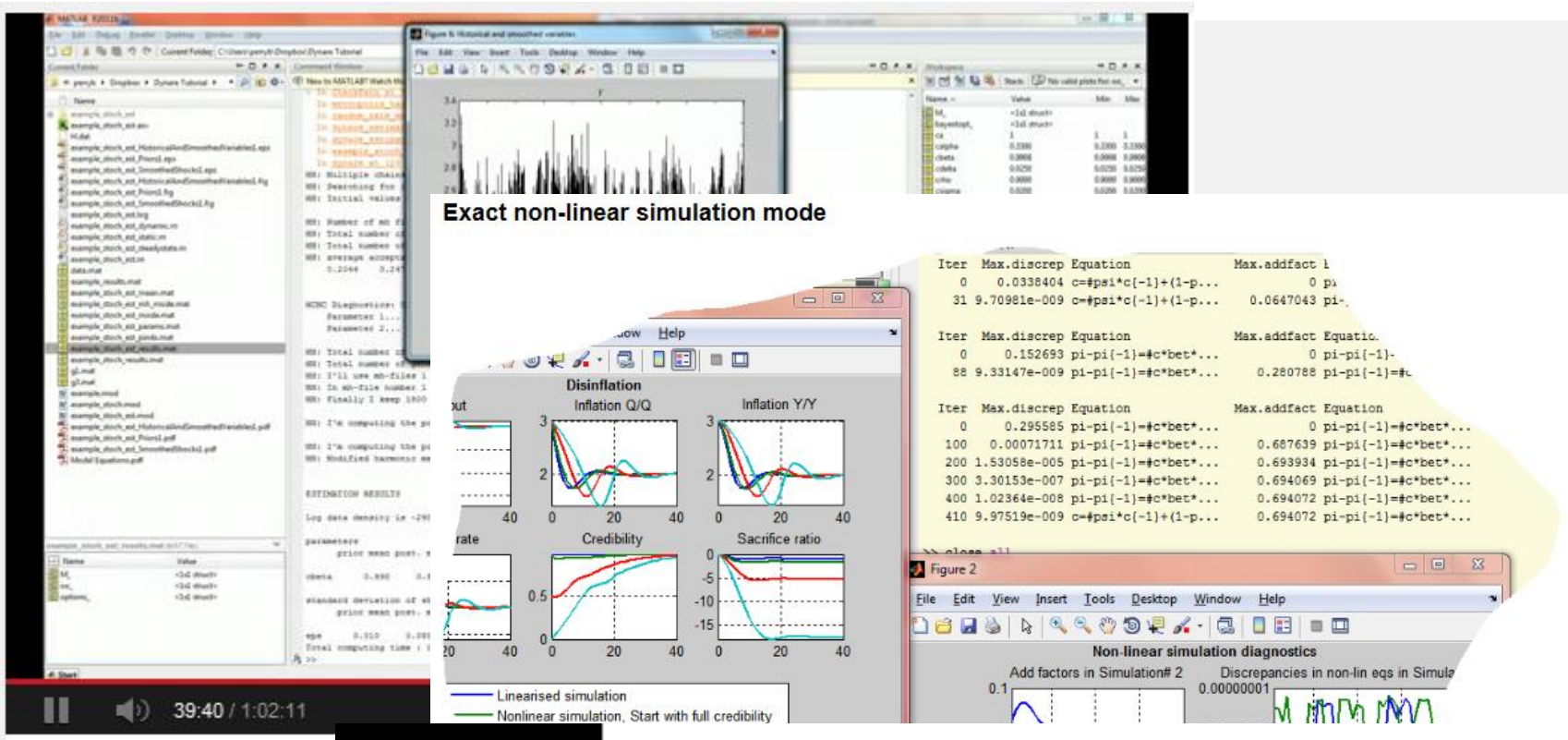
What is MATLAB ?: Easy to Implement and Scale







MATLAB Use Across Central Banks



Dynare 3

YADA

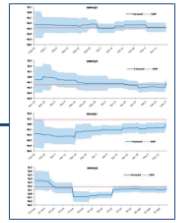
YADA is program for conducting Bayesian estimation and evaluation of Dynamic Stochastic General Equilibrium (DSGE) and Vector AutoRegressive (VAR) models. It is developed by the New Area-Wide Model (NAWM) team at the Monetary Policy Research Division (formerly the Econometric Modelling Division) within the Directorate General Research of the European Central Bank (ECB). Unlike other DSGE estimation applications, such as Dynare, YADA is a GUI-based program.

YADA is distributed with **six examples** that allow you to start playing with DSGE models directly. The examples are given by the models studied by:

1. An, S. and Schorfheide, F. (2007), "Bayesian Analysis of DSGE Models", Econometric Reviews, 26, 113-172.

MATLAB Use Across Central Banks

Forecasting GDP with a Dynamic Factor Model



MATLAB plot showing temporal aggregation of the common factor (red) and GDP (blue) from 1990 to 2010.

Challenge

Estimate and forecast GDP in the very short term

Solution

Use MATLAB to build a dynamic factor model that estimates a common factor underlying 31 economic indicators

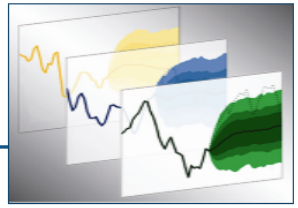
Results

- Virtually real-time forecasting enabled
- Updates and recalculations completed in minutes
- Business-cyclical turning points for a 20-year period accurately identified

"MATLAB was a natural choice for this work because much of the processing requires matrix operations."

Enrique M. Quilis
Spanish Ministry of Economy and Finance

Macroeconomic Modeling and Inflation Rate Forecasting at the Reserve Bank of New Zealand



Sample fancharts produced by RBNZ's macroeconomic model.

Challenge

Support New Zealand monetary policy with a theoretically well-founded model

Solution

Use MATLAB to analyze and forecast macroeconomic variables, and communicate results to stakeholders

Results

- Entire workflow completed in a single environment
- Code shared with other central banks and financial institutions
- Technical rigor of macroeconomic forecasting increased

"With all RBNZ models now implemented in MATLAB, the RBNZ has a common platform for evaluating the economy and making informed decisions."

Parallel Sequential Monte Carlo for Efficient Density Combination: The DeCo Matlab toolbox

Roberto Casarin
University of Venice

Stefano Grassi
CREATES

Francesco Ravazzolo
Norges Bank and BI

Herman K. van Dijk
Erasmus University Rotterdam
VU University Amsterdam and TI

Esobe, Norges Bank, August 2013

MATLAB Use Across Central Banks

BANK OF ENGLAND

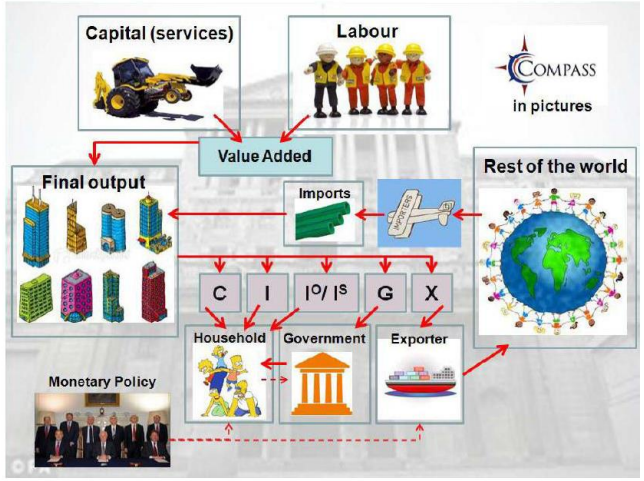
The Bank of England's forecasting platform

Matt Waldron

24 June 2014

Macroeconomic forecasting at Bank of England

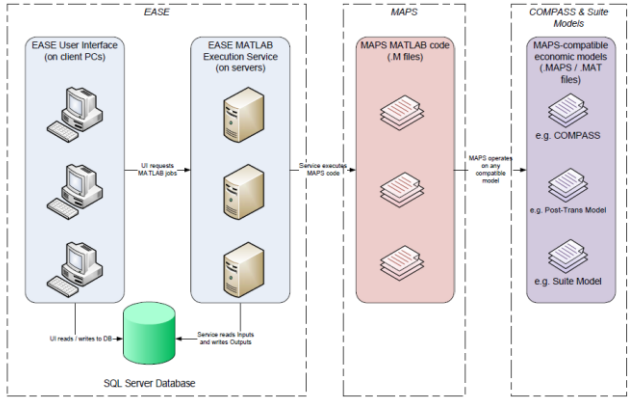
COMPASS in pictures



BANK OF ENGLAND

Matt Waldron, Model Development Team

MAPS/EASE architecture



Bank of England

Macroeconomic forecasting at Bank of England

Why MATLAB?

- MATLAB is the leading software used by economists in universities
- Core level of MATLAB proficiency in the Bank
  - Lowers maintenance cost/risk
- A lot of the functionality is based around linear matrix algebra
- Developing new code is fast
  - Policymakers often want results very quickly
- Toolboxes are generally of a high quality
- Flexibility in mixing procedural and object-oriented design

BANK OF ENGLAND

Matt Waldron, Model Development Team

ECB

EUROPEAN CENTRAL BANK
EUROSYSTEM

The State Space M
in Matlab version 2

Estimating and Simulating yield
the Dynamic Nelson-Siegel fran

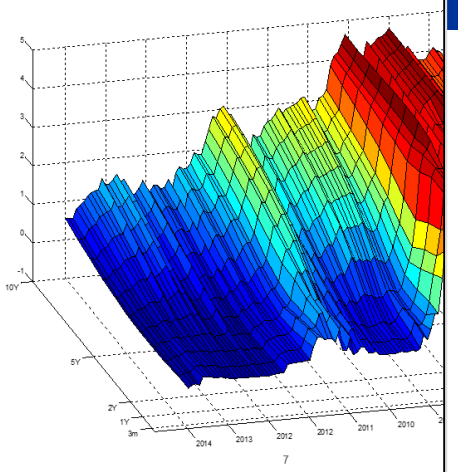
Ken Nyholm
CMT

Outline

1. The State-Space Module in the Econometric Toolbox
2. Dynamic Nelson-Siegel characterisation of the yield curve
3. Including exogenous variables, constants and breaks in parameters
4. Estimation and Results
5. Generate simulated yield curve surfaces

Dynamic Nelson-Siegel characterisation of the yield curve

- The state space description of the Nelson-Siegel model include dynamics for the underlying factors and yield curves observed at time time-interval (t)
- Consequently, the model can describe the yield curve surface as shown below



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Including exogenous variables, constants and breaks in parameters

- The ssm modules requires four matrices to be specified (A,B,C,D)
- So,
  - How do we integrate exogenous variables in the dynamic evolution of the yield curve?
  - What about a constant in the evolution of the yield curve factors?
  - What if we want VARMA dynamics for the factors?

Observation equation: $y_t = C_t \cdot x_t + D_t \cdot e_t$ $\quad y_t(\tau) = H \cdot \beta_t + e_t$

State equation: $x_t = A_t \cdot x_{t-1} + B_t \cdot u_t$ $\quad \beta_t = m + F \cdot \gamma_{t-1} + Q \cdot M_t + W \cdot z_{t-1} + z_t$

EUROPEAN CENTRAL BANK
EUROSYSTEM

Stephane DEES
Output and Demand Division
Directorate Economic Developments

with input from L.V. Smith (University of York)

The GVAR Toolbox

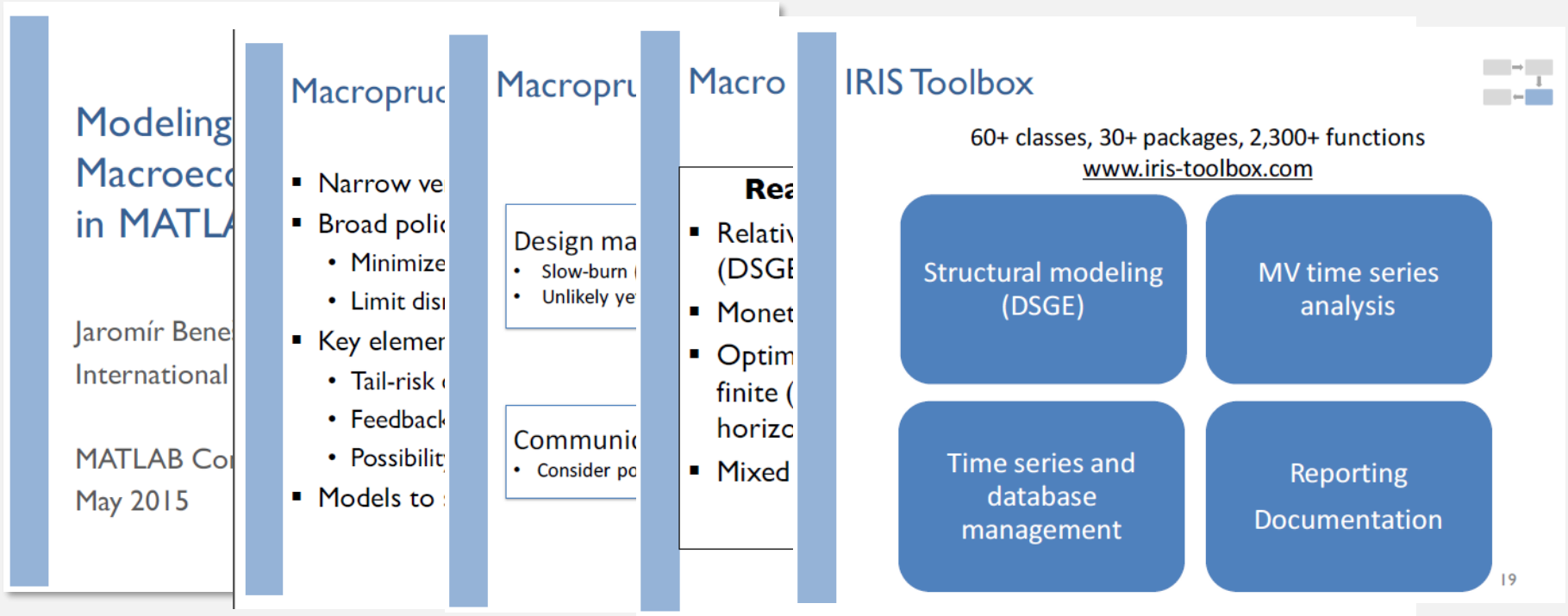
MATLABDAY@ECB2014
29 October 2014

What is a GVAR model?

- The GVAR approach developed in Pesaran et al. (2003) has been extended to study the international linkages of the euro area in Dees et al. (2007).
- A GVAR model combines country level models into a global system, where all variables are all endogenous and directly linked to one another
- The individual blocks can be any type of units, such as regional housing markets.
- The GVAR is a suitable tool for policy analysis, as it provides a framework for the quantitative analysis of the relative importance of different shocks and channels of transmission mechanisms.

International Monetary Fund

- Recent presentation at MathWorks [New York Conference]



Thank You

Remigiusz Lipiec

Sales Account Manager

kom.: +48 606 127 308

e-mail: remigiusz.lipiec@ont.com.pl

Oprogramowanie Naukowo-Techniczne sp. z o. o. sp. k.

Dystrybutor oprogramowania MATLAB i Simulink w Polsce

ul. Pod Fortem 19

31-302 Kraków