COOKING WITH INTERDYME

INTERNATIONAL CUISINE

24th Inforum World Conference

Osnabrück

August 29, 2016









How Does It Work?

Operational proof … it's all theory until you see for yourself whether or not something works. - Julia Child

- ***Building Economic Models – A 'Craft', or a recipe?***
- ***How to plan a model?***
- ***What do we want from the model?***
- ***How to start from scratch?***
- ***How to 'taste' or evaluate a model? How to 'play'.***
- ***Displaying results beautifully.***
- ***Bossing the dough – constraints and optimization.***
- ***Model extensions and international linkage.***

What Do We Want to Cook?

You don't spring into good cooking naked. You have to have some training. You have to learn how to eat.

What do we want from the model? What problems should it solve? What questions should it answer?

Desirable qualities:

- *Industry detail – crucial for answering many questions, especially for relationships between industries.*
- *Dynamic – The future relates to the past, the model behaves reasonably over long periods.*
- *Macroeconomic – Consistent with industry detail, macroeconomic conditions also affect industry behavior.*
- *International linkage – Linkages of trade and finance are increasingly important. Many markets are world markets.*

Why Interdyme?

- *A common software framework.*
- *Handles vectors, matrices and macrovariables.*
- *Solves over time, in historical simulation or forecast.*
- *Easy to apply "fixes" which are flexible applications of assumptions on endogenous or exogenous variables.*

Interdyme consists of:

- *G7 – organizes data, estimates regressions, views data*
- *Interdyme C++ - implement Vectors, Matrices, macrovariables, equations, fixes, read for the eager chef!*
- *IdBuild – Cooks up C++ code for parts of the model.*
- *Fixer and Macfixer – for baking of scenarios*
- *Compare – for attractive display*

Choosing Ingredients

You don't have to cook fancy or complicated masterpieces - just good food from fresh ingredients.

- ***Level of sectoral detail – like salt, too little lacks taste, too much causes high blood pressure.***
- ***What to model? – How will the model be used? Who is the audience? What data are available?***
- ***Extensions – Like side dishes: Energy use and emissions; MFP; demogaphics; occupations and skills; health care, R&D.***
- ***Linkages – Interdyme makes it convenient to link models, either unidirectional or bi-directional: Bilateral Trade Model, Demographic Projections Model, Panta Rhei***

The Cookbook

Nothing is too much trouble if it turns out the way it should.

- ***Our cookbook describes a standard recipe, but the chef should feel free to experiment!***

1. ***Start simple: The Tiny model provides a good example.***
2. ***Build up final demand equations one by one, let other final demands and prices be exogenous. Incorporate the IO solution from the start.***
3. ***Productivity and employment set the stage for estimating wages and compensation. Estimate equations for other value added components. Incorporate the IO price solution.***
4. ***Develop macro equations in IdBuild as you go. Design and implement a simple 'Accountant', then add detail.***
5. ***Cook until done.***

Herbs, Spices and Special Sauces

In France, cooking is a serious art form and a national sport.

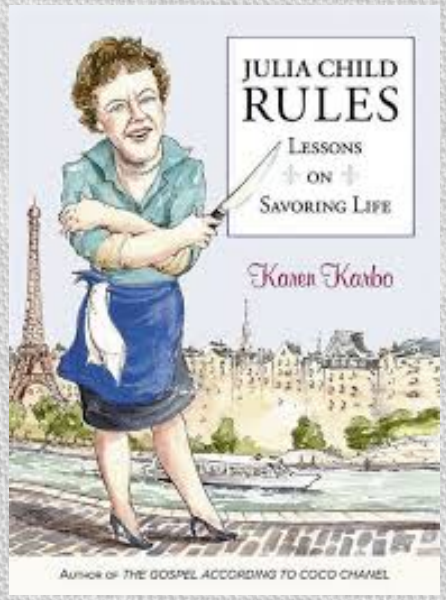
- ***National and regional cuisines are unique. So are people and economies.***
- ***There is a temptation to use a 'cookie-cutter' approach. -> easy to build; easy to link***
- ***We have followed the approach of giving the cooks freedom to differ:***
  - *Sectoring classifications*
  - *Approach to modeling each equation*
  - *General modeling philosophy*
  - *Model complexity*

Kitchen Techniques

Once you have mastered a technique, you barely have to look at a recipe again.

- ***To learn cooking, it's best to cook with your mother.***
- ***Estimating good model equations is best learned by working side by side with an experienced model builder.***
- ***But mastering several simple rules (Craft-1, p.103) can help:***

1. ***Account for important influences.***
2. ***Economize on variables.***
3. ***Use appropriate dimensions.***
4. ***Mix trend and stationary variables with caution.***
5. ***Avoid "umbrella" variables.***
6. ***Allow for lags as necessary.***
7. ***Have plausible parameter values.***
8. ***Fit adequately.***
9. ***Aim for coefficient robustness and stability.***



Appearance is Everything

It's so beautifully arranged on the plate - you know someone's fingers have been all over it.

- ***Tasteful presentation is a crucial component of good cooking.***
- ***The art of tasteful and informative display of the model is extremely valuable.***
  1. *Provide 'Bird's eye' view of macro, with short canned G7 add files of attractive graphs.*
  2. *Drill down to industry or category detail using Compare tables or 'show' files in G7.*
  3. *Compare alternative scenarios to understand effects of different assumptions; Calculate multipliers.*
- ***Be ready for the unexpected!***

Kitchen Tools

Always start out with a larger pot than what you think you need

- ***G7 can be thought of as a 'toolbox', that includes or uses many useful tools for the model-building kitchen:***
  - ***Compiling, organizing and reconciling data in databanks.***
  - ***Organizing and revising IO data. Creating current and constant price IO time series and prices.***
  - ***Estimating and testing regressions for IdBuild or for 'detached coefficient' equations for vectors and matrices. Making tables of regression results.***
    - ***Regressions techniques: OLS, Non-linear regression, stacked equation systems, ARIMA, Hildreth-Lu.***
- ***Interdyme: a set of C++ classes and template code that gets you up to speed quickly. Not quite microwave cooking, more like a cake mix.***

Software: G7 and Interdyme

G7: databanking, econometrics and model building

- Historical and forecast macro, vector and matrix data
- Estimates model equations and writes C++ source code.
- Table making and graphical capabilities for comparing simulations.
- Spreadsheet view of vectors and matrices

Interdyme: Framework for developing models

- Incorporates C++ classes for Matrix, Vector, Tseries (macro variable), Equation and Databanks
- User-written code is a very small percentage of the total, and localized to a few files.
- Works closely with G7 and G7 databank files

Forcing the Issue

You are the boss of that dough.

Soft Constraint: **used to impose prior knowledge or theoretical requirements on regression coefficients**

1. **Allows for subjective tradeoff between satisfaction of constraints and goodness of fit.**
2. **Programmed by adding a certain number of artificial observations to a regression.**

Almon Lag: **Imposes a polynomial pattern on a set of distributed lag weights.**

1. **May be linear, quadratic, cubic, etc.**
2. **May result in much more reasonable lag pattern with little loss in fit.**
3. **Helps with problem of alternating positive and negative lag weights often encountered when estimating distributed lags.**

Soft Constraint Example: Consumption of Food

$$ln\,cfood = \beta_0 + \beta_1\, ln\,pfood + \beta_2\, ln\,Y$$

where

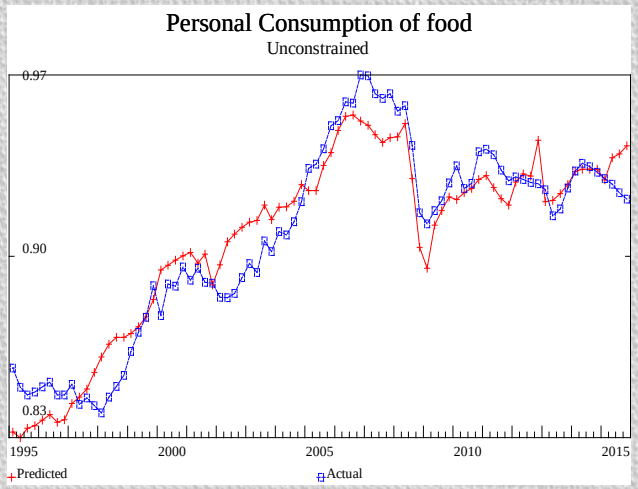
cfood is real per-capita consumption of food

pfood is the relative price of food to the aggregate consumption deflator

Y is real income per capita

Estimation of this equation on U.S. quarterly data from 1995 to 2015 yields the following equation and plot:

$$ln\,cfood = -.98 - .81\, ln\,pfood + .53\, ln\,Y\,,\quad R^2 = .898$$

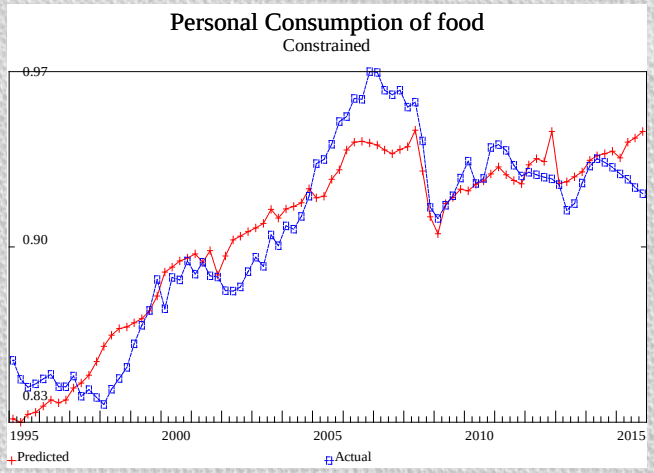


Soft Constraint Example: Consumption of Food

Experiment with soft constraint on price elasticity to -0.5.

Results:

$$ln\,cfood = -.74 - .50\,ln\,pfood + .46\,ln\,Y,\quad R^2 = .882$$



R-squared goes down, and income elasticity goes down. In general, a constraint on one parameter will cause all other parameters to adjust.

Optimization

Goal: Improve or optimize an entire model over some objective function.

Steps:

Objective Function: Code the objective function as an equation in the model.

Choose Parameters to Vary: Regression coefficients in key equations will be modified to do the optimization.

'Spin' the Model: The model is run many times, moving through the parameter space, until it finds an optimum.

Examples: **1. Improving historical simulation, with the goal of better forecasting; 2. Maximizing a policy objective; 3. Achieving a desired relationship in a forecast projection.**

Icing on the Cake

A party without cake is just a meeting.

If you have appetite for it, many extensions are possible:

- ***Satellite models:*** *Arts and cultural, Health care, Research and development, Travel and tourism, and Transportation – hook to IO or macro data, good tool for IdBuild.*
- ***Energy and environmental:*** *Energy and environmental accounts are often developed independently of IO/macro, but can be linked.*
- ***Multifactor Productivity:*** *Uses IO current and constant price framework, to model using KLEMS or more detailed inputs.*

International Cuisine

If you're in a good profession, it's hard to get bored, because you're never finished -- there will always be work you haven't yet done..

BTM Version 3.0! Rossella and Leonardo will present their latest results at this conference:

- *Updated Trade data*
- *More Countries and Regions*
- *Improved BTM programs*

What's Next?

- *Improve the procedure for adding new countries.*
- *Add partner models; Build more models for countries not covered.*
- *Discuss cooperative projects.*

After Dinner Drinks

Everything in moderation…including moderation.

Where are we going with our work?

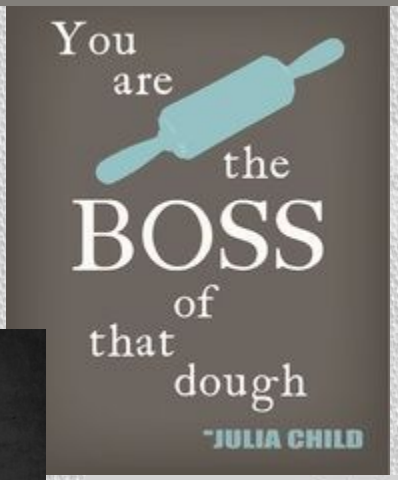
What can we do together in the future?

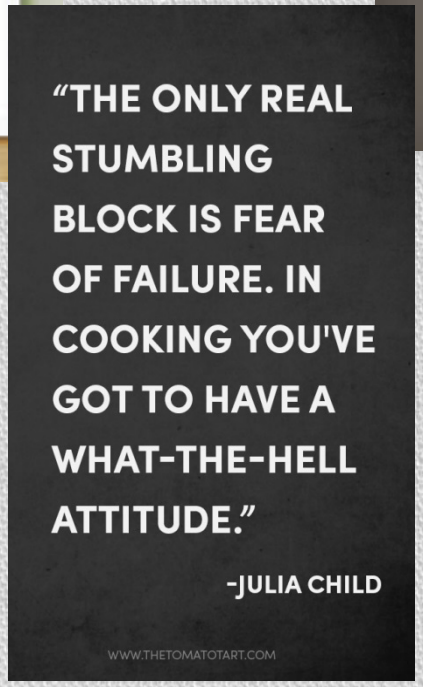
How can we make a bigger impact?

Research Interests: Productivity, Technological Change, Energy and Emissions, Health Care, Demographics, Infrastructure, Water, International Trade, Labor Force and Education.

За здоровье!

“The more you know, the more you can create. There’s no end to imagination in the kitchen.”
— Julia Child,





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A RECIPE HAS NO SOUL. YOU AS THE COOK MUST BRING SOUL TO THE RECIPE

-THOMAS KELLER