SPECIALISTS IN EMPIRICAL ECONOMIC RESEARCH

XBUILD - EXTENDED G7 REGRESSION TRANSLATOR SOFTWARE

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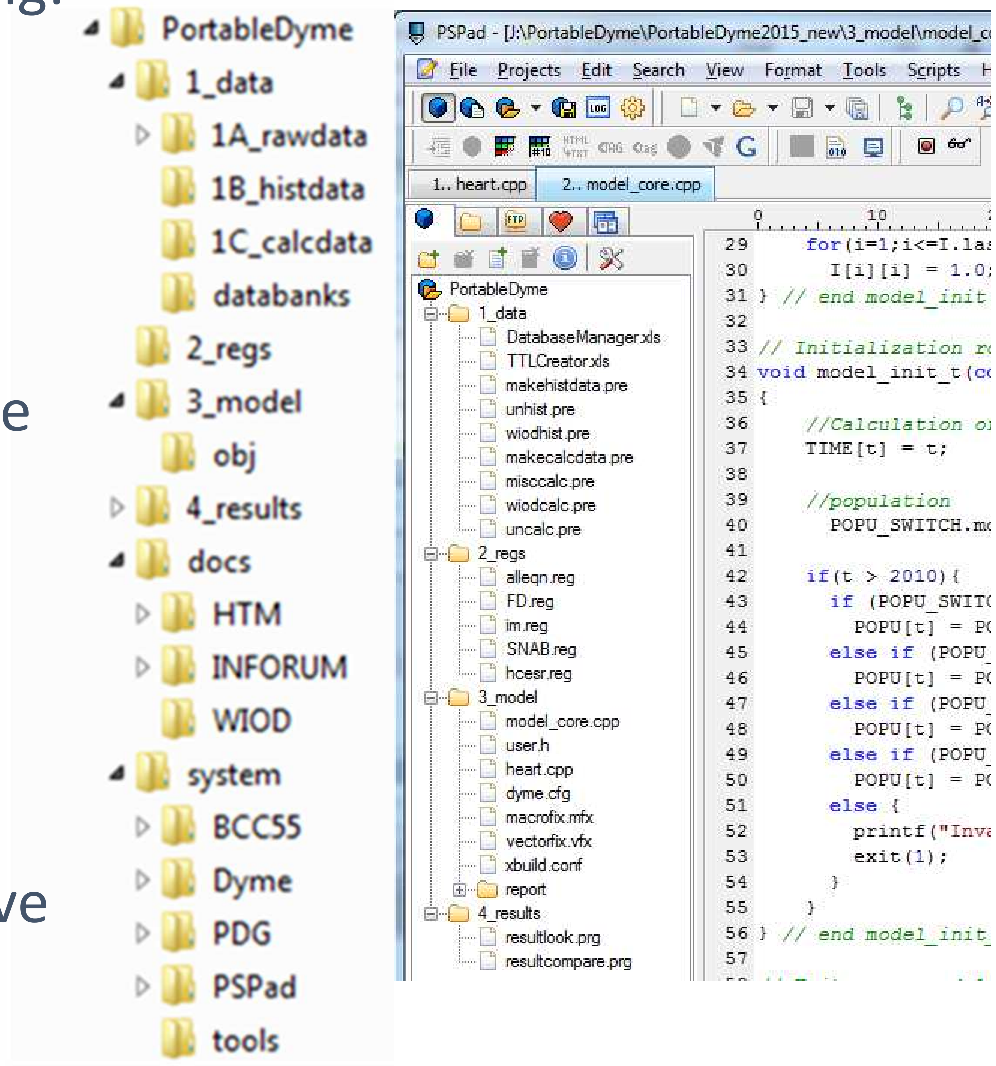
PortableDyme Model Building Framework

- Complete model building framework (software + basic model)
- Mainly INFORUM software (esp. G7, Dyme) plus add-ons, e.g.
  - PSPad (professional multi-file editor)
  - Excel VBA tools (data management, scenario evaluation)
  - Various scripts (batch, G7)
- Portable: Preconfigured to run from any storage media (i.e. USB devices) without installation
- Two versions of PortableDyme
  - „Plain Vanilla“: Software only; no model, no data
  - Basic IO model with SNAB based on WIOD data
    - May be easily adopted to 40 WIOD countries
    - Has to be customized to become a sophisticated model

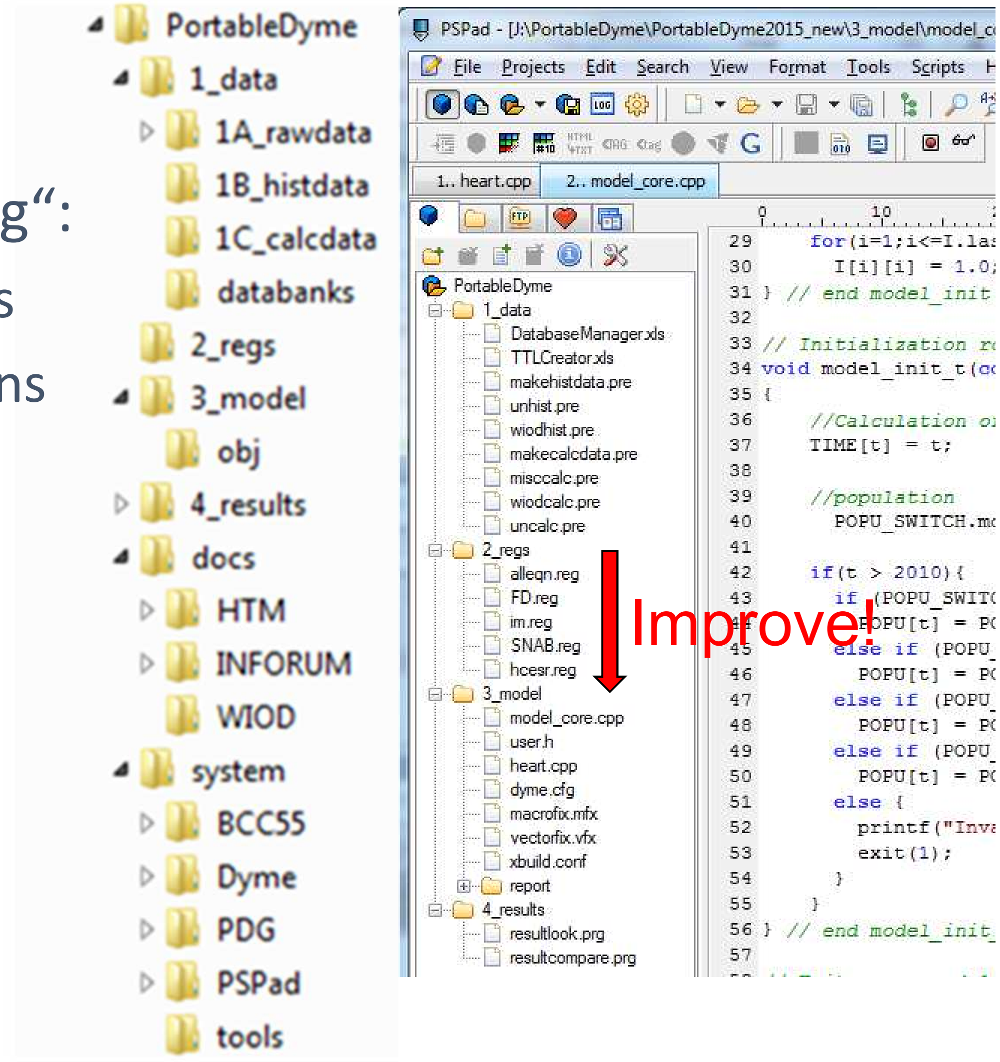
PortableDyme Model Building Framework (cont.)

- Main steps of model building:
  1. Building the historical database
  2. Performing regressions
  3. Writing model code
  4. Performing impact analysis and evaluation
- PortableDyme reflects these steps both on disk and in the project editor
- Each step contains preconfigured scripts and instructions
- Model building is an iterative process!



PortableDyme Model Building Framework (cont.)

- One important „to do“: Smoother transition from step 2 „regressions“ to step 3 „model programming“:
  - ⇨ Simplify vector regressions
  - ⇨ Enable „log-log“ regressions
  - ⇨ Improve error handling
  - ⇨ Provide runtime checks



Regressions and Definitions (Step 2)

- Needed Software: G7
- Data banks need to be loaded first (either in g.cfg) or by commands:

```
bank calcdata
vam calcdata b
dvam b
```

- Definitions are written using the „id“ command, e.g. for net domestic product B1NT

```
id  B1NT = B1GT – K1UT
```

- Appropriate limits have to be given for each regression, e.g.

```
lim 1996  2008
```

- The „r“ command performs a regression, e.g.

Macro: `r  P1RT = !OUT`

Vector: `r  im01 = !out01` („!“ omits the constant term)

Regressions and Definitions (Step 2) (cont.)

- Results are saved using the „save“ command, e.g.

  ```
  save snab.sav
  ```

- Sample output

  Macro: r P1RT = !OUT becomes

  ```
  r P1RT =     1.011268*OUT
  d
  ```

  Vector: r im01 = !out01 becomes

  ```
  r im01 =     0.387989*out01
  d
  ```

Model Programming (Step 3)

- Needed software: idbuild, C++ compiler
- Important task: Integrate regression results into the model
  - ⇨ idbuild translates .sav files into C++ code (i.e. heart.cpp)
  - ⇨ Regression functions need to be called in the C++ model code
  - ⇨ Compiler generates executable from C++ files
- idbuild translates list of files given in „master“ file by iadd commands, e.g.

```
iadd  SNAB.sav
```

- What about „rho“-adjustment and fixes?
  - ⇨ rho-adjustment: difference between historical and calculated value in the last historical year („error term“)
  - ⇨ fixes: overriding calculated values by given values, i.e. necessary for scenario analysis

Model Programming (Step 3) (cont.)

- For macro regressions, translation is straightforward:

```
r  P1RT = 1.011268*OUT  d                becomes
/* P1RT */ depend = coef[2][0]*OUT[t];
P1RT.modify(depend);
```

TO DO: write out coefficient value(s)

⇨ „modify“ handles both rho-ajustment and fixes

- For vector regressions, vector names need to be given with „isvector“ command, e.g.

```
isvector  im
isvector out
iadd  im.sav
```

- Example of vector regression translation:

```
r im01 =   0.387989*out01 d               becomes
depend = im[1];
im[1] = coef[22][0]* out[1];
```

⇨ rho-ajustment and fixes are missing

Model Programming (Step 3) (cont.)

- Options for dealing with missing rho-adjustment and fixes
  1. Detached coefficient mechanism (Almon: The Craft Vol.3, pp. 68):
     - „punch“ coefficients into .eqn files
     - Create vector regression handlers in C++
     - ➢ For advanced users only
  2. By hand in .reg files (current PortableDyme approach)
     Example of a log-log regression:

```
r @log(hcesr01)  = @log(B6GT / PHCES), @log(phces01/PHCES)
```

     has to be written as

```
f lhcesr = @log(hcesr01)
r lhcesr = @log(B6GT/PHCES),@log(phces01/PHCES)
cc hcesr[1] = hcesrEQN.rhoadj(exp(depend), hcesr[1], 1);
cc hcesr.fix(t, 1);
```

TODOs:

- Handle log-log regressions automatically
- Include rho-adjustment and fixes in translation

Model Programming (Step 3) (cont.)

- ► Problem: Why does the model behave erroneous although regression results looked fine?
  - ⇨ Missing statements/equations for RHS variables
  - ⇨ Missing/weired values in the database
  - ⇨ Erroneous statements cause problems while model iterates
  - ⇨ Math errors like log(0), division by zero, over-/underflows, etc.
  - ⇨ …

  High degree of interdependency is a problem per se!

- ► Standard C function „assert" helps to detect errors:
  - ⇨ void assert(*boolean expression*); //defined in assert.h
  - ⇨ If *expression* evaluates to *false*, program terminates giving the module name and line number causing the problem

Model Programming (Step 3) (cont.)

- Example for a „secured“ regression:

  ```
  r lhcesr = @log(B6GT / PHCES), @log(phces01 / PHCES)
  ```

  requires the following asserts in the model:

  ```
  assert(PHCES[t] != 0);                // check division by zero
  assert(B6GT[t] / PHCES[t] > 0);       // check log()
  assert(phces[1] / PHCES[t] > 0);      // check log()
  ```

- TODO: Automatically insert „assert“ statements to detect math errors
- Model builder should use „assert“ statements to secure other parts of the model

Xbuild Features

- xbuild addresses the aformentioned TODOs
  - ⇨ Improve readability of equations by including coefficient values
  - ⇨ Fully translate log-log regressions
  - ⇨ Include rho-adjustment and „fix“-statements
  - ⇨ Provide runtime checks („assert“)
  - ⇨ [Provide static checks (e.g. index errors) !?]

Demonstration: xbuild in action…

Xbuild Configuration

- Xbuild uses a configuration file in .ini format:

[xbuild] asserts=1 lineBreaks=0 include=//user includes\n	General settings (just some examples)
[banks] vam=dyme.vam bnk=dyme.bnk	Banks to use
[files] SNAB.sav FD.sav im.sav hcesr.sav	Files to translate

- Processing starts by giving the .ini file as a parameter:

```
xbuild  xbuild.conf
```

- Integrates nicely into PortableDyme‘s *idmodel.bat*

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Thank you for your attention

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