DGE–CRED Practical Session 1: Model comparison

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Task 1: Create the ModelSimulationandCalibration3Sectorsand1Region.xlsx File

- Use the CreateRawExcelInputFileRobust.m in the function folder under Miscellaneous to create the Excel file
- Sectors and subsectors are: Agriculture, forestry and fishing; Industry; Services
- Region: Vietnam
- Climate variables regional: surface temperature (tas)
- Climate variables national: sea level (SL)
- Note: For MacOs user change all \ in path to /

Task 2: Calibrate the value-added shares of the model

- Use the Vietnam IO Table.xlsx to compute value-added shares for different sectors in Vietnam.
- For agriculture, forestry and fishery, use the value added stated in the IO Table row 57 for agriculture, forestry plus fishing and aquaculture.
- For industry, use all sectors from Mining and Quarrying (column E) to Construction (column AA)
- For services, use all sectors after construction (column AB) to the last column with value added (column AU).
- Check whether the sum is equal to one.

Task 3: Calibrate the employment shares

- Use the Employment.xlsx file to compute employment shares for different sectors in Vietnam.
- For industry, use all sectors from Mining and Quarrying to Construction all divided by total
- For services, use the remaining ones.
- Check whether the sum is one.

Task 4: Calibrate labour cost shares

- Use the LabourShare.xlsx file to calibrate labour costs relative to value-added.
- For agriculture, forestry and fishery, use row 10.
- For industry use row 74 and row 44 and weight them with the value added share of each sector.

$$\left[\frac{va_{construction}}{va_{industry}+va_{construction}} \times Labor share_{construction}\right] + \left[\left[1 - \frac{va_{construction}}{va_{industry}+va_{construction}}\right] \times Labor share_{construction}\right]$$

- For services, use row 75.
- Divide the values by 100.

Task 5: Calibrate export shares

- Use the Vietnam IO Table.xlsx to compute export shares relative to the output of the respective sectors.
- Divide the individual cells in column BC by sum of output in row 58.
- Sectors and subsectors are: Agriculture, forestry and fishing; Industry; Services.

Task 6: Calibrate import shares

- Use the Vietnam IO Table.xlsx to compute import shares relative to total imports for each sector.
- Use the values in column BD.
- Sectors and subsectors are: Agriculture, forestry and fishing; Industry; Services.

Task 7: Calibrate intermediate input shares.

- Use the Vietnam IO Table.xlsx to compute intermediate input shares relative to the total output of each sector.
- Use the values in rows 56 and 58.
- Sectors and subsectors are: Agriculture, forestry and fishing; Industry; Services.

Task 8: Calibrate initial population, GDP, import share, housing to population ratio and investments in residential buildings.

- Enter value in Column Q.
- Set initial population to 0.937 which computed from $\frac{97{,}340{,}000}{100{,}000{,}000}$.
- Initial GDP or initial added value (Y0) is 1.
- Import share is the absolute value of the sum of the range BD9 to BD55 in VietnamIOTable.xlsx divided by total sum of output of each sector.
- Housing to population ratio is 23.
- Investments in residential buildings is 0.01.

Task 9: Run UpdateDataExcelFileRobust.m

- Modify line with inbsubsectors_p and inbregions_p such that you have 3 sectors and 1 region.
- Pleas make sure that all cells with enter value at the beginning have a numeric value or “ enter value here ” as entry.
- Otherwise MATLAB will return error message “ Error in UpdateDataExcelRobust (line 69) if ~isequal(caValueWrite, {’enter value here’}) && ~ismissing(caValueWrite{:}) ”

Task 10: Create the Baseline scenario for simulation.

- In the Baseline worksheet, define growth paths (gY_1) for value-added and employment for the different sectors (gN_1).
- For agriculture, forestry and fishery use an annual growth rate of 2.8 percent for value-added and -5.2 percent for employment.
- For industry, use an annual growth rate of 7.4 percent for value-added and 5.7 percent for employment.
- For services use an annual growth rate of 8.3 percent for value-added and 2.7 percent for employment.
- Assume a factor of decay of 0.95 ($x_t = 0.95\, x_{t-1}$)

Task 11: Run the Baseline scenario.

- Open RunsImulation.m file in Matlab.
- Check whether you add the right dynare version.
- Check whether you have the correct number of sectors and subsectors specified (1,2,3).
- Check whether you have the correct number of regions specified (1).
- Run the script.
- The solution will be save in ResultsScenarios3Sectorsand1Regions.xlsx

Task 12: Create the SSP 585 scenario.

- Copy the Scenario sheet in the ModelSimulationandCalibration3Sectorsand1Region.xlsx file and name the copy SSP585.
- Please open the Temperature.xlsx file.
- Select the model MIROC6, copy the change in temperature and paste values in column C (exo_tas_1) in scenario sheet SSP585
- Delete all empty rows after row 81.
- Assume that a 1℃ leads to a decline in TFP by 3.6 percent, fill in damage on TFP (exo_D_k) all sectors in column K to M
- Run the SSP 585 scenario in RunsImulation.m file in Matlab

Task 13: Create a Figure to illustrate the impact of climate change on GDP and its components.

- Use the Data/Figures.xlsx file to illustrate the differences between GDP, consumption, investment and net exports in the Baseline and the SSP 585 scenario.
- Make sure the ResultsScenarios3Sectorsand1Regions.xlsx file is open.
- Change the cell value A4 in sheet Var to ResultsScenarios3Sectorsand1Regions.
- Further adapt the names of the variables you want to illustrate for GDP (Y), consumption (C), investment (I), government expenditure (G), Net exports (NX) and Housing Expenditures.
- Interpret the results.

Task 14: Add Damages to labour productivity, crop yields and mortality (I)

- Assume that labour productivity declines with 1 ℃ by 2.7 percent, fill in damage on labor productivity (exo_D_N_k) all sectors in column N to P.
- Crop yields decline by 6.9 percent for 1 ℃, fill in damage on Crop yields (exo_D_k) . **Note** that this damage is added in the same column as damage on TFP in sector 1.
- Assume that the mortality rate in Vietnam is 0.6 percent, and for each 1 ℃ increase, the mortality rate increases by 4 percent.

$$\eta_t^{Pop,SSP} = Pop_t^{SSP} - Pop_t^{Baseline} + Pop_t^{Baseline} - Pop_0$$

$$\eta_t^{Pop,SSP} = -0.006 \star 0.04 \star Temp_t^{SSP} + Pop_{t-1}^{SSP} - Pop_{t-1}^{Baseline} + \eta^{Pop,Baseline}$$

  - $\eta_t^{Pop,SSP}$ is change in population in period t for the scenario SSP or Baseline scenario.
  - Pop_t^{SSP} is population in period t for scenario SSP or Baseline.
  - $Temp_t^{SSP}$ is temperature in period t for scenario SSP or Baseline.

Task 14: Add Damages to labour productivity, crop yields and mortality (II)

- Include the damages into the SSP 585 scenario and rerun the simulation.
- Take a look at the impact of climate change on GDP and its components and compare to the figure in Task 13.

Task 15: Create scenarios to compare the impact of the different damage types.

- Create SSP585TFP, SSP585Lab, SSP585Mort, SSP585Crop.
- SSP585TFP, only TFP shocks are turned on (only fill in damage in column K to M, without damage on crops in column K).
- SSP585Lab only labour productivity shocks are turned on.
- SSP585Mort only mortality shocks are turned on.
- SSP585Crop only crop yield shocks are turned on (only fill in damage in column K, without damage on TFP).
- Run Runsimulation.m with 4 new scenarios.

Task 16: Create a figure to illustrate which impact channel matters the most for GDP.

- Use the figure for GDP components from Task 14 as a basis.
- Modify the figure, change the GDP components to the damage type such that you can see the GDP effect for SSP585TFP, SSP585Lab, SSP585Mort, SSP585Crop as a stacked bar and all damage types simultaneously as a point.
- What impact channel is the most severe one?

Task 17: Create scenarios SSP119 and 245 for the MIROC6 model and compare GDP effects with SSP585.

- Copy the sheet SSP 585 two times.
- Rename the copied sheets into SSP119 and SSP245.
- Copy the change in temperature from Temperature.xlsx into the respective sheets.
- Run simulation on SSP219 and SSP 245.
- Plot the range of results for GDP effects compared to SSP585 for the different climate models (SSP119 and SSP245).

Task 18: Sensitivity Analysis SSP 585 effect for three different climate models.

- Create the following scenarios: SSP585FGOALSg3, SSP585CanESM5, SSP585MIROCES2L
- Each scenario is the SSP 585 scenario from a different climate model (FGOALS-g3, CanESM5, MIROC-ES2L).
- Note: Delete special characters from the scenario names when type in Runsimulation.m.
- Plot the range of results for GDP effects compared to SSP585 for three different climate models.

Task 19: Sensitivity Analysis SSP 585 effect for export price elasticity.

- Analyse the role of η^X for the simulation results. $X_{s,t} = D_s^X \left(\frac{P_{s,t}^D}{P_{s,t}^M} \right)^{-\eta^X}$
- What do you think will be the impact of an increase in η^X or decrease in η^X?
- Copy the ModelSimulationandCalibration3Sectorsand1Regions.xlsx file two times.
- Rename the copies into ModelSimulationandCalibration3Sectorsand1Regions_etaXhigh.xlsx and ModelSimulationandCalibration3Sectorsand1Regions_etaXlow.xlsx
- Change the value of etaX_p to 1.5 and 0.3 for high and low, respectively. The parameter is listed in the StructuralParameters sheet (row 11 column B).
- Execute the RunSimulation.m file. You need to change the sSensitivity in line 21 to _etaXhigh and _etaXlow. Further, you need to first run the Baseline scenario.

Task 20: Create GDP component plots to identify the sensitivity of GDP effects on etaX_p.

- Illustrate the differences between GDP, consumption, investment and net exports in the Baseline and the SSP 585 scenario with high and low supply price elasticity of exports (etaX_p).
- Are net exports higher or lower with an increase in etaX_p?