Two new TIMES features in action

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Feature 1: Freezing solution

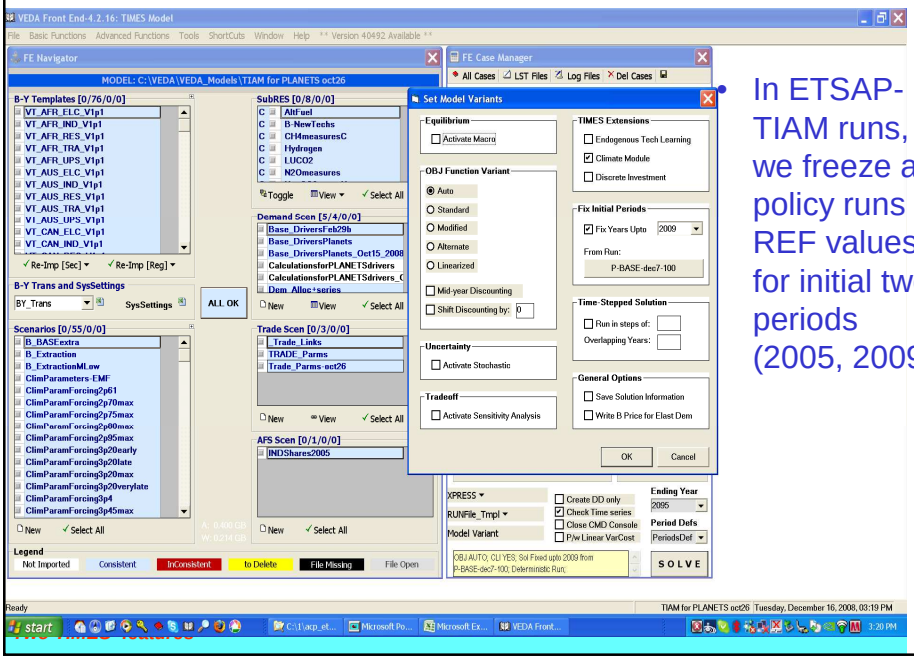
- Description:
  - Run 1 ☒ Solution 1
  - Freeze solution values for some initial periods, some regions
  - Run 2 with solution frozen as above ☒ Solution 2
- 3 Applications

A. Freeze all regions at REF values for periods that are past (say 2005 to 2008)

B. Freeze selected regions/periods to REF values, to simulate some policy (e.g. late entrants into emission reduction etc.)

C. Freeze solution to some heuristic policy when facing uncertainty

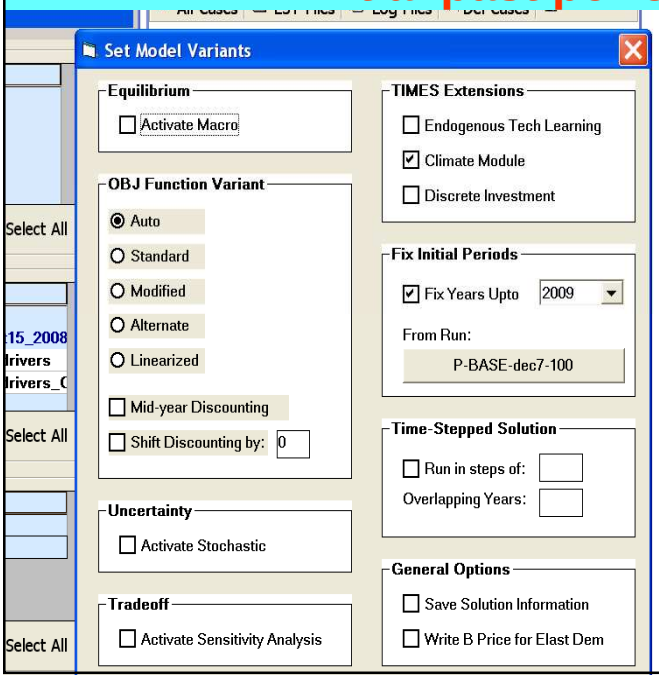
A. Initial past periods



- In ETSAP-TIAM runs, we freeze all policy runs at REF values for initial two periods (2005, 2009)

3

A. Initial past periods



- In ETSAP-TIAM runs, we freeze all policy runs at REF values for initial two periods (2005, 2009)

B. Policy Simulations

- Create a scenario file to define the region/period combinations

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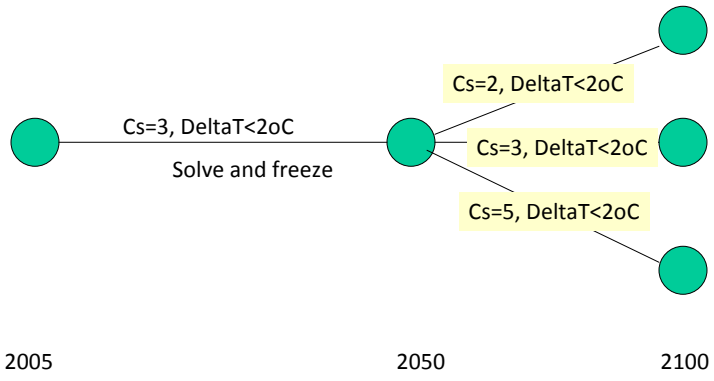
TirLit	Attribute	Year	AFR	AUS	CAN	CHI	CSA	EEU	FSU	GBL	IND	JPN	MEA	MEX	ODA	SKO	USA	WEU
	REG_FIXT		2016	2016	2016	2016	2016	2009	2016		2016	2016	2016	2016	2016	2016	2016	2009

This VEDA_FE scenario file says that EU region is frozen until 2009 (actually 2012), and other regions until 2016 (actually 2020)

C. Heuristic decisions in uncertain environments

- Suppose Climate sensitivity Cs is random with three possible values Cs=2 , Cs=3, and Cs=5
- The true value of Cs will be known in year 2050
- Suppose I want the global temperature to remain below 2oC at all times, and I want to implement the heuristic strategy that "assumes" Cs=3 (I do not want to use Stochastic Programming)
- Procedure:
  - fix Cs=3 and impose constraint DeltaT<3 in TIAM model
  - Solve problem get solution 1
  - Freeze all variables until 2050
  - Re-run three times, with above freeze, each time using the corresponding value of Cs

C. Heuristic decisions in uncertain environments



Feature 2: Multiple objectives (sensitivity analysis, parametric programming)

- **Description**: define more than 1 objective function (e.g. cost and risk index)

  Min (***Cost + a*Risk***), & ***a*** varies over a selected range

- Other (equivalent) formulation

  Min ***Cost*** s.t. ***Risk < R**** & vary ***R**** over a selected range

- Other formulation (2 steps)

  Min ***Cost*** $\Rightarrow$ ***Co***

  then

  Min **Risk** s.t. ***Cost < (1+b)*Co,*** & ***b*** varies over a range

Equivalence of formulations