



**Australian Government**  
**Productivity Commission**

# MoDEM 2.0

## Documentation

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October 2008

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# Contents

<b>Acknowledgments</b>	<b>V</b>
<b>Disclaimer</b>	<b>VI</b>
<b>Abbreviations</b>	<b>VIII</b>
<b>1 Introduction to MoDEM 2.0</b>	<b>1</b>
1.1 MoDEM modes	2
1.2 Basic MoDEM modules	2
1.3 Additional MoDEM modules	2
<b>2 Getting started with MoDEM 2.0</b>	<b>5</b>
2.1 Opening MoDEM	5
2.2 Navigating around MoDEM	5
2.3 Getting help in MoDEM	8
<b>3 Detailed Projection module</b>	<b>9</b>
3.1 MoDEM Validate tool	9
3.2 Scenario Summary screen	10
3.3 Graphs in the Detailed Projection module	10
3.4 Instructions for using the Detailed Projection module	11
<b>4 Results module</b>	<b>31</b>
4.1 Using the results screens	32
<b>5 Using the Projection Wizard</b>	<b>35</b>
5.1 Using the Projection Wizard	35
<b>6 Export/Import module</b>	<b>37</b>
<b>7 Update module</b>	<b>39</b>
7.1 Update Year and Database	40
7.2 All other update screens	41
<b>8 Labour supply shocks module</b>	<b>43</b>
8.1 Sub Shocks	43

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<b>9</b>	<b>Using MoDEM in Expert Mode</b>	<b>47</b>
9.1	Some tips for expert users	47
<b>Appendices</b>		
<b>A</b>	<b>MoDEM Error Testing</b>	<b>51</b>
<b>B</b>	<b>Terminology</b>	<b>53</b>
B.1	Demographic Terms	53
B.2	Economic terms	54
<b>C</b>	<b>MoDEM default ('Medium') scenario</b>	<b>57</b>
C.1	Fertility	57
C.2	Migration	58
C.3	Survival	58
C.4	Productivity and the discount rate	58
C.5	Labour supply	59
<b>D</b>	<b>MoDEM worksheets</b>	<b>61</b>
<b>Tables</b>		
1.1	Worksheets visible in MoDEM Interface Mode	61
1.2	Additional worksheets visible in MoDEM Expert Mode	63
<b>References</b>		<b>71</b>

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# Abbreviations

ABS	Australian Bureau of Statistics
ASFR	Age Specific Fertility Rate
CBR	Crude Birth Rate
CDR	Crude Death Rate
CSV	comma-separated value
ERP	Estimated resident population
GDP	Gross Domestic Product
GIF	Graphics Interchange Format
GRR	Gross Reproduction Rate
MoDEM	Modified Demographic and Economic Model
NOM	net overseas migration
PC	Productivity Commission
TFR	Total Fertility Rate
VBA	Visual Basic for Applications

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# 1 Introduction to MoDEM 2.0

The Modified Demographic and Economic Model (MoDEM) 2.0 is used to calculate population, labour market and Gross Domestic Product (GDP) projections under different demographic and labour assumptions. Key model outputs include population size, dependency ratios, labour force participation rates, GDP and GDP per capita. The model allows two sets of projections to be compared to evaluate the effects of a change in assumptions.

MoDEM 2.0 has its origins in a model created for the Productivity Commission (PC) report on *Economic Implications of an Ageing Australia* (PC 2005). That model was subsequently modified for the report on *Potential Benefits of the National Reform Agenda* (PC 2007). This became MoDEM 1.0, released in late 2007. MoDEM has now been upgraded to include a user-friendly interface and the ability to update the input data and change the base year of projections, among other features. The base year has been updated to 2007 and the labour parameters have been re-estimated.

MoDEM's flexibility and ease of use makes it suitable for a wide range of users and applications. For example:

- Demographers can use the model to manage multiple demographic projections at once, and to incorporate the labour market implications of demographic changes;
- Government departments and agencies can use the model to assess the effects of medium- and long-term policies on population and labour supply, as well as to explore the interaction of demography and labour market outcomes;
- Academics, researchers and others can use MoDEM to investigate research questions related to demography, labour market outcomes and economic growth.

MoDEM accommodates users with different levels of experience and different requirements. Users can select from two modes of use (Interface Mode and Expert Mode) and can choose to use the basic modules (Detailed Projection module and Results module) or additional modules (Projection Wizard, Export/Import, Update module, and Labour Supply Shocks).

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## 1.1 MoDEM modes

The two modes of use are Interface Mode and Expert Mode. Interface Mode is suitable for new and less experienced users, and for those who do not need to access to the underlying formulas and databases in the model. This mode features a graphical interface, step-by-step instructions, navigation buttons and drop-down menus. Expert Mode enables more experienced users to view and make changes to the full databases, Excel formulas and Visual Basic for Applications (VBA) code in MoDEM 2.0. This mode restores the full Excel Toolbar, Formula bar, row and column headers and Excel worksheet tabs.

## 1.2 Basic MoDEM modules

The basic MoDEM modules are the Detailed Projection module and Results module. These are suitable for both new and experienced users who wish to create scenarios and view projected outputs. The Detailed Projection module takes users through a series of steps to create a scenario from preset options or by entering their own data. The Results module allows users to view the demographic and economic projections resulting from the active scenario.

An invaluable feature that complements the basic modules is the Scenario Summary sheet. This provides a complete summary of the settings in the active scenario, and allows users to save or modify the scenario, restore the default or imported scenario, or view the projection results (Results module).

## 1.3 Additional MoDEM modules

In addition to the basic MoDEM modules, users can access four additional modules: the Projection Wizard, Export/Import module, Update module, and Labour Supply Shocks module.

The Projection Wizard is suitable for the experienced user who is familiar with the steps involved in creating a MoDEM scenario, requires minimal instruction in doing so, and does not need to view the underlying data for each parameter. It allows the user to quickly enter the necessary assumptions to create a scenario.

An Export/Import module is suitable for both new and experienced users who wish to save scenarios to access at a later stage or to share with other users. A simple-to-use feature, it allows users to save the active scenario as a separate file and to load other pre-saved scenarios.

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Update module is best suited to more experienced users who wish to change the base year for projections or update the model with new data.

The Labour Supply Shocks module is best suited to more experienced users who wish to assess the effect of policy changes that ‘shock’ labour force participation, unemployment, hours worked and productivity. Users enter the labour supply shocks after creating a scenario using the Detailed Projection module (or using the Projection Wizard, or importing a scenario using Export/Import).

This manual contains detailed instructions for using MoDEM 2.0:

- Chapter 2 describes how to get started using MoDEM, including opening and navigating around the model.
- Chapters 3 to 8 explain how to use the basic MoDEM modules to create a scenario and view projection results, and how to use the additional MoDEM modules.
- Chapter 9 describes how to use MoDEM in Expert Mode, and provides some tips for expert users.
- Appendices A to D contain miscellaneous information about MoDEM 2.0. Appendix A discusses error testing; Appendix B defines key demographic and economic terminology; Appendix C describes the assumptions underpinning the default (‘Medium’) MoDEM scenario; and Appendix D describes the functions of and relationships between all the Excel worksheets in MoDEM.



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## 2 Getting started with MoDEM 2.0

MoDEM 2.0 is an excel module written using Excel's built-in functions and with Visual Basic for Applications (VBA). The interface has been designed to

- increase the ease of use of MoDEM
- add flexibility in the choice of selected parameters
- enable MoDEM to be easily updated with new base data (changing the base year) or by updating any of the selected parameters.

### 2.1 Opening MoDEM

MoDEM is opened by double clicking on the icon, or choosing File → Open from the Excel toolbar. To allow MoDEM to load, Macros must be enabled. Due to the size of the file (approximately 70Mb) and the launch of interface macros, the program will take a few seconds to load.

The objects, fonts and graphics in MoDEM have been set to a standard size. Users can change the screen resolution to aid readability, if desired, by clicking on View → Zoom and choosing an appropriate screen magnification.

### 2.2 Navigating around MoDEM

By default, MoDEM 2.0 will open in Interface Mode. (Chapter 9 provides information on switching to and using Expert Mode.) All Excel worksheet tabs, as well as toolbars and the formula bar, are hidden in Interface Mode. As a consequence, users must navigate around MoDEM in one of two ways: using screen-based menus and buttons (beginning with the MoDEM Main Menu) and using the MoDEM Menu Bar.

#### *The MoDEM Main Menu*

Navigation using buttons in the Main Menu and subsequent screens is ideal for new or inexperienced MoDEM 2.0 users, as each menu and sub-menu offers instructions on choosing from the options listed.

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With this navigation method, users begin by selecting one of the modules or features listed in the MoDEM Main Menu screen, clicking the ‘Launch’ button next to the selected feature. This takes the user either directly to the selected option, or to a sub-menu.

From the MoDEM Main Menu, the following options are available:

- Projections
  - **Detailed Projection**
    - ... Leads directly to step 1 of the 16-step Detailed Projection module, which guides users through creating a scenario.
  - **Labour Supply Shocks**
    - ... Leads to the Labour Supply Shocks sub-menu, from which the user can navigate to one of up to three shock scenarios, as well as choose from a range of related options in this module.
  - **Scenario Summary**
    - ... Leads directly to a summary of all settings in the active scenario.
  - **Results**
    - ... Leads to the Results sub-menu, from which the user can navigate to a range of demographic and economic projection results, in tables and graphs.
- Database
  - **MoDEM Update**
    - ... Leads to the Update sub-menu, from which the user can navigate to a range of sub-modules that update different parameters (such as the base year, fertility and mortality data, and so on).
- Exporting, Importing and Expert Options
  - **Export/Import Scenario**
    - ... Leads to the Export/Import sub-menu, from which the user can choose to export (save) the active scenario, or import (open) a previously saved MoDEM scenario.
  - **MoDEM Expert Mode**
    - ... Switches MoDEM to Expert Mode, showing all Excel toolbars, the formula bar, worksheet tabs, and row and column headers.

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- **Projection Wizard**

- ... Leads directly to step 1 of the Projection Wizard, which allows users to quickly select options for the Detailed Projection module without viewing the details of each parameter.

- **MoDEM Close**

- ... Exits MoDEM 2.0. Users are prompted to save the MoDEM workbook before closing Excel. However, this process does not create separate export files for any scenarios.

### *The MoDEM Menu Bar*

Alternatively, the MoDEM Menu Bar allows users to directly access a desired screen. For example, users can navigate directly from the ‘Survival’ screen in the Detailed Projection module to the ‘Resident Population’ screen in the Results module.

The MoDEM Menu Bar loads automatically when MoDEM opens. In Excel 2003, the MoDEM Menu Bar is found directly on the toolbar, next to the Excel Window Menu. In Excel 2007, the Menu Bar is on the ‘Quick Access Toolbar’ under Menu Commands.

Of course, users can navigate around MoDEM with a combination of the Menu Bar and Main Menu (button) methods.

As well as the options listed in the Main Menu, the MoDEM Menu Bar offers the following additional options:

- About
  - This form lists basic information about MoDEM, the user interface and the individuals involved in its development.
- Terms and Conditions
  - Although MoDEM is considered shareware, users are bound by a set of conditions. This form details the disclaimer of liability and conditions of use.
- Set as Baseline
  - This sets the active scenario as the ‘baseline’ scenario. Users can then create a new scenario and compare this with the baseline scenario.
  - Note: this option is also available in Main Menu navigation, when users reach the last step of the Detailed Projection module or of the Projection Wizard.

- 
- Help
    - This launches a form showing an index of help topics. Choosing a help topic opens the MoDEM Manual (this document) at the selected topic.

### *Restoring Toolbars*

When MoDEM loads in interface mode, the default Excel toolbars are deleted to keep the interface as simple and uncluttered as possible. However, the toolbars are restored once the user closes MoDEM. Toolbars can be reactivated in MoDEM in two ways. First, the user can enter Expert Mode (see chapter 9), which will restore the toolbars, as well as the formula bar and any hidden sheets. Second, the user can manually add toolbars by using the View → Toolbars option on the Excel Toolbar. To manually restore the formula bar, select Tools → Options and tick the ‘Formula Bar’ option.

## **2.3 Getting help in MoDEM**

The MoDEM Manual (this document) is the main source of help and instructions for MoDEM 2.0. As it is contained in a separate pdf document, the user can keep the manual open and toggle between it and the model as they follow instructions.

The MoDEM Manual can be accessed in one of three ways:

1. Opening the pdf file directly, using Acrobat Reader.
2. Clicking on Help → Index of Help Topics in the MoDEM Menu Bar. This brings up an index of topics from which the user can select the desired help topic. Clicking on a topic opens the MoDEM Manual at the section relevant to that topic.
3. Clicking on the black ‘Instructions’ button at the top of most screens visible in Interface Mode. This opens the MoDEM Manual at the help topic relevant to the current screen.

Please ensure that the MoDEM Manual is stored in the same directory as the MoDEM 2.0 file, and that the manual file is named manual.pdf. This ensures that the manual can be successfully accessed by methods 2 and 3 above.

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## 3 Detailed Projection module

The Detailed Projection module consists of 16 separate screens that guide the user through the selection of demographic and economic parameters. This module is used to enter all of the assumptions to create a scenario, compare two scenarios, and save a scenario to later test the effect of labour supply shocks (using the Labour Supply Shocks module, discussed in chapter 8).

The user can choose to set all parameters to the default ('Medium') settings, in order to limit the amount of user input required (or to restore the default scenario after creating a user scenario). A description of the assumptions underpinning the default ('Medium') scenario is given in Appendix C.

The steps required for each input screen in the detailed projection are listed below. On each screen, users are able to:

- Click on the 'INSTRUCTIONS' button to access the MoDEM Manual and view instructions for that step of the Detailed Projection module.
- Select preset parameter values, imported parameter values (imported through MoDEM Export/Import module, see chapter 6) or input user data in the grey cells.
- Validate selected parameters to ensure that they are sensible assumptions.

The last of these features — the MoDEM Validate tool — is discussed below. Also discussed below is a feature accessible from steps 1, 5 and 16 of the Detailed Projection module, the Scenario Summary screen.

### 3.1 MoDEM Validate tool

The MoDEM Validate tool allows users to check the values they have entered for a given parameter against some indicators of what might be 'reasonable' values. When the user clicks 'Validate', MoDEM compares the user input data with inbuilt values that might be considered 'high' and 'low' for that parameter.

For example, suppose the user has entered labour force participation rates. MoDEM checks these participation rates against preset 'high' and 'low' boundaries for each age-sex group. For males aged 60 to 64, for instance, it is assumed that a

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participation rate below 35% is probably ‘low’ and a rate above 65% is probably ‘high’. So, if the user has entered a rate of 80% for this age group, the Validate tool will indicate that this value is unusually ‘high’.

It is important to note that this judgment is based purely on ‘eyeballing’ the last few decades of data for each variable, and does not need to be taken as definitive. The Validate tool is intended only to indicate where user input values might be outside ‘reasonable’ boundaries. It does not force the user to revise the values, as the scenario might have been deliberately intended to calculate projections for an extreme case! Rather, the tool is designed to be an extra check on the data to pick up where an error might have been made that would dramatically affect projection results.

## **3.2 Scenario Summary screen**

The Scenario Summary screen shows all active settings for the current scenario, including demographic and labour parameters as well as labour supply shocks. This screen is designed to provide an ‘at a glance’ summary of the active scenario. For more detailed information on the settings for each parameter, users should view the step-by-step screens in the Detailed Projection module.

From the Scenario Summary screen, users are able to modify any of the settings by clicking on the ‘Modify’ button next to the selected group of parameters. Users can also re-active the imported scenario (that is, make the imported scenario the active scenario — see also chapter 6 on the Export/Import module), restore the default (‘Medium’) scenario settings, save the current scenario, or view projection results.

## **3.3 Graphs in the Detailed Projection module**

Each screen in the Detailed Projection module contains one or more graphs illustrating the settings for a given parameter(s). Changing the selection in the pull-down menus will change the values used for the graphs. However, some graphs will refresh automatically to incorporate these changes, and others need to be manually refreshed using the ‘Refresh’ button located next to the graph.

The following is a list of the graphs that must be manually refreshed after changing parameter settings:

- Civilian Population Ratios graph (in step 1 of the Detailed Projection module)
- Fertility Pattern and Fertility Level graphs (in step 2)

- 
- Emigration and Immigration Age Pattern graphs (in step 3)
  - Migration Level graph (in step 4)
  - The **upper** graph in each of the labour supply parameters (steps 6 to 15)
  - Relative Productivity graph (in step 16)

### **3.4 Instructions for using the Detailed Projection module**

This section gives step-by-step instructions to creating a scenario using the Detailed Projection module in MoDEM 2.0.

To begin the process, the user should click ‘Launch’ next to the Detailed Projection item on the MoDEM Main Menu screen, or select Detailed Projection → Base Population from the MoDEM Menu Bar.

The left and right arrows at the top of each screen can be used to navigate through the module. Alternatively, users can ‘jump’ directly to the desired screen using the Menu Bar.

Note that if columns are too narrow to view user data properly, they can be widened in Expert Mode (see chapter 9). This applies to all worksheets visible in Interface Mode.

1. Enter Expert Mode by choosing Expert User → Expert Mode from the MoDEM Menu Bar.
2. Select Tools → Protection → Unprotect Sheet from the Excel menu bar. This allows the user to modify the worksheet, including adjusting column widths.

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## Step 1 — Base Population

1. Civilian Population Ratios:
  - (a) Choose the male (M) and female (F) scenarios from the pull-down menus. The civilian population ratios are defined as civilian population divided by total population, where total population comprises the civilian population and defence personnel.<sup>1</sup> MoDEM uses these base year ratios throughout the projection period to convert projections of total population into civilian population.
  - (b) To enter user data, enter the desired values in the grey cells, set the pull-down menus to 'User' and click the 'Validate' button to ensure your scenario is sensible.
2. Ensure that your desired scenario is shown in the outlined box next to each pull-down menu. These boxes show the scenarios that are active in MoDEM.
3. Base Year: If you would like to use a different (later) base year from that shown in the outlined box, click on the 'MoDEM Update' button. This will take you to the Update menu, from which you can change the base year and enter new estimated resident population data.
4. Base Scenario: To set all parameters to the MoDEM default ('Medium') settings, thus creating the MoDEM default ('Medium') scenario, click the 'MoDEM Medium' button. This allows the user to quickly create a scenario with minimal input, or to restore the original settings after trying different parameter values.
5. Graphs: View your assumptions about the civilian population ratio and estimated resident population in the graphs. If you have changed the civilian population ratios, click the 'Refresh' button to update the civilian population ratio graph. (The Estimated resident population (ERP) chart on the right updates automatically.)
6. Scenario Summary: To view all active settings in the current scenario, click on the 'Scenario Summary' button.
7. At the top of the screen, click the forward arrow to go to the next screen, or the back arrow to return to the main menu.

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<sup>1</sup> These ratios should normally be close to, but less than or equal to, one. However, in the base scenario there are several ratios greater than one. This is the result of the data for total population (derived from the census) being based at June 30, whereas civilian population (derived from the Labour Force Survey for consistency with the labour parameters) is based at Dec 31. In calculating the civilian population ratios for the base year, MoDEM uses a two year moving average of total population to put it in the same timeframe as civilian population.

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## Step 2 — Fertility Pattern and Level

### 1. Fertility Age Pattern:

- (a) For the base year, choose an age pattern scenario for fertility from the pull-down menu. The yellow cells show the age pattern for the active scenario as shares. The white cells represent the pattern as (indicative) levels. (The base year for the fertility pattern assumption is the same as the MoDEM base year.)
- (b) To enter user data, enter the desired values in the grey cells, set the pull-down menus to 'User' and click the 'Validate' button to ensure your scenario is sensible.

### 2. Intermediate Year:

- (a) Click the 'Intermediate Year' button to specify an intermediate year for the age pattern scenario for fertility. The intermediate year must be within the projection period. MoDEM will linearly interpolate between the patterns for the base and intermediate years. The intermediate pattern is used for all subsequent years.
- (b) For the intermediate year, choose a fertility pattern scenario from the pull-down menu. The yellow cells show the age pattern for the active scenario as shares. The white cells represent the pattern as (indicative) levels. To enter user data, enter the desired values in the grey cells, set the pull-down menus to 'User' and click the 'Validate' button to ensure your scenario is sensible.

### 3. Ensure that your desired scenario is shown in the outlined box next to each pull-down menu. These boxes show the assumptions that are active in MoDEM.

### 4. Fertility Level:

- (a) Choose the scenario for the fertility level (Total Fertility Rate, or TFR) from the pull-down menu. To enter user data, enter the desired values in the grey cells and then set the pull-down menu to 'User'. If user data are entered, click the 'Validate' button to ensure that your assumptions are reasonable.
- (b) Ensure your scenario is shown in the outlined box below the pull-down menu. This box shows the assumptions that are active in MoDEM.

### 5. Graphs: View your assumptions about fertility in the graphs. If you have changed the years, fertility patterns or levels in the previous steps, click the 'refresh' buttons to update each graph. The comparison pull-down menu below each graph allows the user to view alternative scenarios against the active scenario. After selecting a comparison scenario, click the 'refresh' button to update the graph.

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6. At the top of the screen, click the forward arrow to go to the next screen, or the back arrow to return to the Base Population screen.

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### *Step 3 — Migration: Age Pattern*

1. Emigration Age Pattern:
  - (a) Choose the male (M) and female (F) emigration pattern scenarios from the pull-down menus.
  - (b) To enter user data, enter the desired values in the grey cells, set the pull-down menus to 'User' and click the 'Validate' button to ensure your scenario is sensible.
2. Ensure that your desired scenario is shown in the outlined box next to each pull-down menu. These boxes show the scenarios that are active in MoDEM.
3. Immigration Age Pattern:
  - (a) Choose the male (M) and female (F) immigration pattern scenarios from the pull-down menus.
  - (b) To enter user data, enter the desired values in the grey cells, set the pull-down menus to 'User' and click the 'Validate' button to ensure your scenario is sensible.
4. Ensure that your desired scenario is shown in the outlined box next to each pull-down menu. These boxes show the scenarios that are active in MoDEM.
5. Graphs: View your assumptions about migration in the two graphs. The comparison pull-down menus below each graph allow the user to select two scenarios to view. The first scenario is plotted in green, the second is in red. After selecting the scenarios to compare, click the 'Refresh' button to update each graph.
6. At the top of the screen, click the forward arrow to go to the next screen, or the back arrow to return to the Fertility screen.

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#### *Step 4 — Net Migration: Level*

3. Emigration:
  - (a) Select the desired Emigration level scenario from the pull-down menu.
  - (b) To enter user data, enter the desired values in the grey cells, set the pull-down menus to 'User' and click the 'Validate' button to ensure your scenario is sensible.
4. Ensure that your desired scenario is shown in the outlined box next to the pull down menu. This box shows the scenario that is active in MoDEM.
5. Immigration:
  - (a) Select the desired Immigration level scenario from the pull-down menu.
  - (b) To enter user data, enter the desired values in the grey cells, set the pull-down menus to 'User' and click the 'Validate' button to ensure your scenario is sensible.
6. Ensure that your desired scenario is shown in the outlined box next to the pull down menu. This box shows the scenario that is active in MoDEM.
7. Net Migration: Check net migration levels implied by the chosen immigration and emigration scenarios. In MoDEM 2.0, Net Migration is automatically calculated from immigration and emigration and cannot be changed directly.
8. Graph: View the current assumptions about net migration and its components in the graph. The Emigration and Immigration Comparison pull-down menus below the graph allow the user to select additional migration scenarios to view. After selecting the scenarios to compare, click the 'Refresh' button to update the graph.
9. At the top of the screen, click the forward arrow to go to the next screen, or the back arrow to return to the Migration Age Pattern screen.

---

## Step 5 — Survival: Pattern and Trend

### 1. Male Age Pattern:

- (a) Choose a scenario for the age pattern of survival for males from the pull down menu. There are several survival patterns to choose from for males and females. These patterns are the same as those in PC (2005), but with a base year of 2007. Further details of these series and comparisons of life expectancy under each scenario are given in section 2.3 of PC (2005) and table 1.1 of Technical Paper 1 from PC (2005).
- (b) User data for the survival pattern is **not** directly available as an option here. However, user data could be entered through the MoDEM update process and stored to one of the empty scenarios. That scenario could then be selected and used here.

2. Ensure that your desired scenario is shown in the outlined box next to the pull down menu. This box shows the scenario that is active in MoDEM.

### 3. Female Age Pattern:

- (c) Choose a scenario for the age pattern of survival for females from the pull down menu.
- (d) User data for the survival pattern is **not** directly available as an option here. However, user data could be entered through the MoDEM update process and stored to one of the empty scenarios. That scenario could then be selected and used here.

4. Ensure that your desired scenario is shown in the outlined box next to the pull down menu. This box shows the scenario that is active in MoDEM.

### 5. Life expectancy:

- (a) Select the desired life expectancy scenario using the M (Male) and F (Female) pull down menus.<sup>2</sup> Ensure your scenarios are shown in the outlined boxes next to the pull down menus. These boxes show the scenarios that are active in MoDEM. Numbers in the first column of the table show, for the current scenario, the life expectancy for males and females in the 46th year of the projection period (the year displayed in the black cell).
- (b) To enter user defined life expectancy for males and females, select ‘User’ from the pull down menus and enter the desired life expectancy in the grey cells below the USER label in the second column of the table. Click the

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<sup>2</sup> The preset high, medium and low life expectancy scenarios are designed to match the various age pattern scenarios for mortality indicated as high, medium or low. However, users can mix these options as desired — MoDEM will then adjust the age specific mortality rates to achieve the selected life expectancy while preserving the shape of the mortality curve.

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‘Set User’ button and wait for MoDEM as it adjusts mortality rates to achieve the desired life expectancy while preserving the shape of the mortality curve across the age groups.

6. **Graphs:** View your assumptions about age patterns in mortality for males and females in the graphs. To see how the patterns change over the projection period, users can select three years to compare in each graph. Use the pull-down menus below each graph to select the years to display. After selecting the years to compare, use the ‘Zoom Out’ button to view the full scale for mortality rates across all age groups. To identify any projected differences between the years for males and females aged under 50, the ‘Zoom In’ button allows users to magnify the lower region of the mortality rate axis.
7. **Labour Supply Shocks Exit:** If you have already specified labour supply scenarios and shocks and have just completed changes to demographic parameters as part of your shock scenario (see chapter 8), click the ‘Back to Shock’ button to return to the labour supply shocks module. Your new assumptions about civilian population ratios, fertility, migration and mortality have been updated in MoDEM. If you have not specified any labour supply scenarios, click the forward arrow at the top of the screen to go to the next screen, or the back arrow to return to the Net Migration Level screen.
8. **Scenario Summary:** To view all active settings in the current scenario, click on the ‘Scenario Summary’ button.

---

## Step 6 — Labour Force Participation: Males

1. Male scenario:
  - (a) Choose a scenario for male participation from the pull-down menu. Note: the ‘PC (2005)’ scenario for male participation rates uses parameters from PC (2005) (also used in the MoDEM 1.0 baseline). The ‘PC (2008)’ scenario uses a new set of parameter values, re-estimated using data up to 2007 and the same methodology as the ‘PC (2005)’ scenario. The ‘Constant 2007’ scenario uses parameters set at 2007 levels for all years of the projection.
  - (b) To enter user data, enter the desired values in the grey cells for the six years shown, set the pull down menu to ‘User’ and click the ‘Validate’ button to ensure your scenario is sensible. The user scenario only requires data for six years during the projection period. MoDEM uses linear interpolation to calculate participation rates for the intervening years. If you prefer to specify participation rates for all years, use the MoDEM Update module to input the data and store as a new scenario that can then be accessed from the pull-down menu on this screen.
2. Ensure that your desired scenario is shown in the outlined box next to the pull-down menu. This box shows the scenario that is active in MoDEM.
3. Graphs: View your assumptions about male labour force participation in the two graphs.
  - (a) Use the first graph to compare age groups and see how participation rates in the current scenario change between three selected years during the projection period. Users can select different years using the pull-down menus next to the graph. Click the ‘Refresh’ button to update this graph.
  - (b) Use the second graph to compare changes over time between two scenarios for a particular age group. Users can select the age group and scenarios to display using the pull-down menus next to the graph. This graph updates automatically.
4. At the top of the screen, click the forward arrow to go to the next screen, or the back arrow to return to the Survival screen.

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## Step 7 — Labour Force Participation: Females

1. Female scenario:
  - (a) Choose a scenario for female participation from the pull-down menu. Note: the ‘PC (2005)’ scenario for female participation rates uses parameters from PC (2005) (also used in the MoDEM 1.0 baseline). The ‘PC (2008)’ scenario uses a new set of parameter values, re-estimated using data up to 2007 and the same methodology as the ‘PC (2005)’ scenario. The ‘Constant 2007’ scenario uses parameters set at 2007 levels for all years of the projection.
  - (b) To enter user data, enter the desired values in the grey cells for the six years shown, set the pull down menu to ‘User’ and click the ‘Validate’ button to ensure your scenario is sensible. The user scenario only requires data for six years during the projection period. MoDEM uses linear interpolation to calculate participation rates for the intervening years. If you prefer to specify participation rates for all years, use the MoDEM Update module to input the data and store as a new scenario that can then be accessed from the pull-down menu on this screen.
2. Ensure that your desired scenario is shown in the outlined box next to the pull-down menu. This box shows the scenario that is active in MoDEM.
3. Converge: MoDEM includes an option to force projected participation rates for females in the three oldest age groups to converge to those for males in those age groups. To specify the number of years by which this convergence occurs, click on the ‘SET’ button and a sex convergence box will appear. Use the up and down arrows in the box to select the assumed number of years until convergence. The convergence time must be within the projection period. To disable the convergence option (implying female participation rates are not forced to converge to those of males), select ‘0’ in the convergence box.
4. Graphs: View your assumptions about female labour force participation in the two graphs.
  - (a) Use the first graph to compare age groups and see how participation rates in the current scenario change between three selected years during the projection period. Users can select different years using the pull-down menus next to the graph. Click the ‘Refresh’ button to update this graph.
  - (a) Use the second graph to compare changes over time between two scenarios for a particular age group. Users can select the age group and scenarios to display using the pull-down menus next to the graph. This graph updates automatically.

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5. At the top of the screen, click the forward arrow to go to the next screen, or the back arrow to return to the Male Labour Force Participation screen.

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## Step 8 — Unemployment: Males

1. Male scenario:
  - (a) Choose a scenario for male unemployment from the pull-down menu. Note: the ‘PC (2005)’ scenario for male unemployment rates uses parameters from PC (2005) (also used in the MoDEM 1.0 baseline). The ‘PC (2008)’ scenario uses a new set of parameter values, re-estimated using data up to 2007 and the same methodology as the ‘PC (2005)’ scenario. The ‘Constant 2007’ scenario uses parameters set at 2007 levels for all years of the projection.
  - (b) To enter user data, enter the desired values in the grey cells for the six years shown, set the pull down menu to ‘User’ and click the ‘Validate’ button to ensure your scenario is sensible. The user scenario only requires data for six years during the projection period. MoDEM uses linear interpolation to calculate unemployment rates for the intervening years. If you prefer to specify unemployment rates for all years, use the MoDEM Update module to input the data and store as a new scenario that can then be accessed from the pull-down menu on this screen.
2. Ensure that your desired scenario is shown in the outlined box next to the pull-down menu. This box shows the scenario that is active in MoDEM.
3. Graphs: View your assumptions about male unemployment in the two graphs.
  - (a) Use the first graph to compare age groups and see how unemployment rates in the current scenario change between three selected years during the projection period. Users can select different years using the pull-down menus next to the graph. Click the ‘Refresh’ button to update this graph.
  - (b) Use the second graph to compare changes over time between two scenarios for a particular age group. Users can select the age group and scenarios to display using the pull-down menus next to the graph. This graph updates automatically.
4. At the top of the screen, click the forward arrow to go to the next screen, or the back arrow to return to the Female Labour Force Participation screen.

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## Step 9 — Unemployment: Females

1. Female scenario:
  - (a) Choose a scenario for female unemployment from the pull-down menu. Note: the ‘PC (2005)’ scenario for female unemployment rates uses parameters from PC (2005) (also used in the MoDEM 1.0 baseline). The ‘PC (2008)’ scenario uses a new set of parameter values, re-estimated using data up to 2007 and the same methodology as the ‘PC (2005)’ scenario. The ‘Constant 2007’ scenario uses parameters set at 2007 levels for all years of the projection.
  - (b) To enter user data, enter the desired values in the grey cells for the six years shown, set the pull down menu to ‘User’ and click the ‘Validate’ button to ensure your scenario is sensible. The user scenario only requires data for six years during the projection period. MoDEM uses linear interpolation to calculate unemployment rates for the intervening years. If you prefer to specify unemployment rates for all years, use the MoDEM Update module to input the data and store as a new scenario that can then be accessed from the pull down menu on this screen.
2. Ensure that your desired scenario is shown in the outlined box next to the pull-down menu. This box shows the scenario that is active in MoDEM.
3. Graphs: View your assumptions about female unemployment in the two graphs.
  - (a) Use the first graph to compare age groups and see how unemployment rates in the current scenario change between three selected years during the projection period. Users can select different years using the pull down menus next to the graph. Click the ‘Refresh’ button to update this graph.
  - (b) Use the second graph to compare changes over time between two scenarios for a particular age group. Users can select the age group and scenarios to display using the pull down menus next to the graph. This graph updates automatically.
4. At the top of the screen, click the forward arrow to go to the next screen, or the back arrow to return to the Male Unemployment screen.

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## Step 10 — Part-Time Work Share: Males

1. Male scenario:
  - (a) Choose a scenario for the split between part-time and full-time work for males from the pull down menu. Note: the ‘PC (2005)’ scenario for the part-time work share for males uses parameters from PC (2005) (also used in the MoDEM 1.0 baseline). The ‘PC (2008)’ scenario uses a new set of parameter values, re-estimated using data up to 2007 and the same methodology as the ‘PC (2005)’ scenario. The ‘Constant 2007’ scenario uses parameters set at 2007 levels for all years of the projection.
  - (b) To enter user data, enter the desired values in the grey cells for the six years shown, set the pull-down menu to ‘User’ and click the ‘Validate’ button to ensure your scenario is sensible. The user scenario only requires data for six years during the projection period. MoDEM uses linear interpolation to calculate part-time work shares for the intervening years. If you prefer to specify part-time work shares for all years, use the MoDEM Update module to input the data and store as a new scenario that can then be accessed from the pull-down menu on this screen.
2. Ensure that your desired scenario is shown in the outlined box next to the pull-down menu. This box shows the scenario that is active in MoDEM.
3. Graphs: View your assumptions about the split between part-time and full-time work for males in the two graphs.
  - (a) Use the first graph to compare age groups and see how part-time work shares in the current scenario change between three selected years during the projection period. Users can select different years using the pull-down menus next to the graph. Click the ‘Refresh’ button to update this graph.
  - (b) Use the second graph to compare changes over time between two scenarios for a particular age group. Users can select the age group and scenarios to display using the pull-down menus next to the graph. This graph updates automatically.
4. At the top of the screen, click the forward arrow to go to the next screen, or the back arrow to return to the Female Unemployment screen.

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## Step 11 — Part-Time Work Share: Females

1. Female scenario:
  - (a) Choose a scenario for the split between part-time and full-time work for females from the pull-down menu. Note: the ‘PC (2005)’ scenario for the part-time work share for females uses parameters from PC (2005) (also used in the MoDEM 1.0 baseline). The ‘PC (2008)’ scenario uses a new set of parameter values, re-estimated using data up to 2007 and the same methodology as the ‘PC (2005)’ scenario. The ‘Constant 2007’ scenario uses parameters set at 2007 levels for all years of the projection.
  - (b) To enter user data, enter the desired values in the grey cells for the six years shown, set the pull down menu to ‘User’ and click the ‘Validate’ button to ensure your scenario is sensible. The user scenario only requires data for six years during the projection period. MoDEM uses linear interpolation to calculate part-time work shares for the intervening years. If you prefer to specify part-time work shares for all years, use the MoDEM Update module to input the data and store as a new scenario that can then be accessed from the pull-down menu on this screen.
2. Ensure that your desired scenario is shown in the outlined box next to the pull-down menu. This box shows the scenario that is active in MoDEM.
3. Graphs: View your assumptions about the split between part-time and full-time work for females in the two graphs.
  - (a) Use the first graph to compare age groups and see how part-time work shares in the current scenario change between three selected years during the projection period. Users can select different years using the pull-down menus next to the graph. Click the ‘Refresh’ button to update this graph.
  - (b) Use the second graph to compare changes over time between two scenarios for a particular age group. Users can select the age group and scenarios to display using the pull down menus next to the graph. This graph updates automatically.
4. At the top of the screen, click the forward arrow to go to the next screen, or the back arrow to return to the Male Part-Time Work Share screen.

---

## Step 12 — Full-Time Average Hours: Males

1. Male scenario:
  - (a) Choose a scenario for average full-time hours worked by males from the pull down menu. Note: the ‘PC (2005)’ scenario for average full-time hours worked by males uses parameters from PC (2005) (also used in the MoDEM 1.0 baseline). The ‘PC (2008)’ scenario uses a new set of parameter values, re-estimated using data up to 2007 and the same methodology as the ‘PC (2005)’ scenario. The ‘Constant 2007’ scenario uses parameters set at 2007 levels for all years of the projection.
  - (b) To enter user data, enter the desired values in the grey cells for the six years shown, set the pull down menu to ‘User’ and click the ‘Validate’ button to ensure your scenario is sensible. The user scenario only requires data for six years during the projection period. MoDEM uses linear interpolation to calculate average full-time hours worked for the intervening years. If you prefer to specify average full-time hours worked for all years, use the MoDEM Update module to input the data and store as a new scenario that can then be accessed from the pull down menu on this screen.
2. Ensure that your desired scenario is shown in the outlined box next to the pull-down menu. This box shows the scenario that is active in MoDEM.
3. Graphs: View your assumptions about average full-time hours worked by males in the two graphs.
  - (a) Use the first graph to compare age groups and see how average full-time hours worked in the current scenario change between three selected years during the projection period. Users can select different years using the pull down menus next to the graph. Click the ‘Refresh’ button to update this graph.
  - (b) Use the second graph to compare changes over time between two scenarios for a particular age group. Users can select the age group and scenarios to display using the pull-down menus next to the graph. This graph updates automatically.
4. At the top of the screen, click the forward arrow to go to the next screen, or the back arrow to return to the Female Part-Time Work Share screen.

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### Step 13 — Full-Time Average Hours: Females

1. Female scenario:
  - (a) Choose a scenario for average full-time hours worked by females from the pull-down menu. Note: the ‘PC (2005)’ scenario for average full-time hours worked by females uses parameters from PC (2005) (also used in the MoDEM 1.0 baseline). The ‘PC (2008)’ scenario uses a new set of parameter values, re-estimated using data up to 2007 and the same methodology as the ‘PC (2005)’ scenario. The ‘Constant 2007’ scenario uses parameters set at 2007 levels for all years of the projection.
  - (b) To enter user data, enter the desired values in the grey cells for the six years shown, set the pull down menu to ‘User’ and click the ‘Validate’ button to ensure your scenario is sensible. The user scenario only requires data for six years during the projection period. MoDEM uses linear interpolation to calculate average full-time hours worked for the intervening years. If you prefer to specify average full-time hours worked for all years, use the MoDEM Update module to input the data and store as a new scenario that can then be accessed from the pull-down menu on this screen.
2. Ensure that your desired scenario is shown in the outlined box next to the pull-down menu. This box shows the scenario that is active in MoDEM.
3. Graphs: View your assumptions about average full-time hours worked by females in the two graphs.
  - (a) Use the first graph to compare age groups and see how average full-time hours worked in the current scenario change between three selected years during the projection period. Users can select different years using the pull down menus next to the graph. Click the ‘Refresh’ button to update this graph.
  - (b) Use the second graph to compare changes over time between two scenarios for a particular age group. Users can select the age group and scenarios to display using the pull-down menus next to the graph. This graph updates automatically.
4. At the top of the screen, click the forward arrow to go to the next screen, or the back arrow to return to the Male Full-Time Hours screen.

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## Step 14 — Part-Time Average Hours: Males

1. Male scenario:
  - (a) Choose a scenario for average part-time hours worked by males from the pull down menu. Note: the ‘PC (2005)’ scenario for average part-time hours worked by males uses parameters from PC (2005) (also used in the MoDEM 1.0 baseline). The ‘PC (2008)’ scenario uses a new set of parameter values, re-estimated using data up to 2007 and the same methodology as the ‘PC (2005)’ scenario. The ‘Constant 2007’ scenario uses parameters set at 2007 levels for all years of the projection.
  - (b) To enter user data, enter the desired values in the grey cells for the six years shown, set the pull-down menu to ‘User’ and click the ‘Validate’ button to ensure your scenario is sensible. The user scenario only requires data for six years during the projection period. MoDEM uses linear interpolation to calculate average part-time hours worked for the intervening years. If you prefer to specify average part-time hours worked for all years, use the MoDEM Update module to input the data and store as a new scenario that can then be accessed from the pull-down menu on this screen.
2. Ensure that your desired scenario is shown in the outlined box next to the pull down menu. This box shows the scenario that is active in MoDEM.
3. Graphs: View your assumptions about average part-time hours worked by males in the two graphs.
  - (a) Use the first graph to compare age groups and see how average part-time hours worked in the current scenario change between three selected years during the projection period. Users can select different years using the pull-down menus next to the graph. Click the ‘Refresh’ button to update this graph.
  - (b) Use the second graph to compare changes over time between two scenarios for a particular age group. Users can select the age group and scenarios to display using the pull-down menus next to the graph. This graph updates automatically.
4. At the top of the screen, click the forward arrow to go to the next screen, or the back arrow to return to the Female Full-Time Hours screen.

---

## Step 15 — Part-Time Average Hours: Females

1. Female scenario:
  - (a) Choose a scenario for average part-time hours worked by females from the pull down menu. Note: the ‘PC (2005)’ scenario for average part-time hours worked by females uses parameters from PC (2005) (also used in the MoDEM 1.0 baseline). The ‘PC (2008)’ scenario uses a new set of parameter values, re-estimated using data up to 2007 and the same methodology as the ‘PC (2005)’ scenario. The ‘Constant 2007’ scenario uses parameters set at 2007 levels for all years of the projection.
  - (b) To enter user data, enter the desired values in the grey cells for the six years shown, set the pull down menu to ‘User’ and click the ‘Validate’ button to ensure your scenario is sensible. The user scenario only requires data for six years during the projection period. MoDEM uses linear interpolation to calculate average part-time hours worked for the intervening years. If you prefer to specify average part-time hours worked for all years, use the MoDEM Update module to input the data and store as a new scenario that can then be accessed from the pull-down menu on this screen.
2. Ensure that your desired scenario is shown in the outlined box next to the pull-down menu. This box shows the scenario that is active in MoDEM.
3. Graphs: View your assumptions about average part-time hours worked by females in the two graphs.
  - (a) Use the first graph to compare age groups and see how average part-time hours worked in the current scenario change between three selected years during the projection period. Users can select different years using the pull down menus next to the graph. Click the ‘Refresh’ button to update the first graph.
  - (b) Use the second graph to compare changes over time between two scenarios for a particular age group. Users can select the age group and scenarios to display using the pull-down menus next to the graph. This graph updates automatically.
4. At the top of the screen, click the forward arrow to go to the next screen, or the back arrow to return to the Male Part-Time Hours screen.

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## Step 16 — Productivity Options

1. Relative Productivity:
  - (a) Choose the male (M) and female (F) relative productivity scenario from the pull-down menus. These scenarios determine whether and by how much productivity varies between age groups.
  - (b) To enter user data, enter the desired values in the grey cells, set the pull down menus to 'User' and click the 'Validate' button to ensure your scenario is sensible.
2. Ensure that your desired scenario is shown in the outlined box next to each pull down menu. These boxes show the scenarios that are active in MoDEM.
3. Graph: Click the 'Refresh' button to update the graph and view your assumptions about relative productivity for each age group.
4. Aggregate Productivity Rate:
  - (a) Choose the aggregate productivity rate scenario from the pull down menu.
  - (b) To enter user data, enter the desired rate in the grey cell and set the pull down menu to 'User'. Ensure that your desired scenario is shown in the outlined box next to the pull down menu.
  - (c) The rate next to the scenario is assumed to apply in the same way each year. If the relative productivity scenario allows age-varying productivity, the rate implied by relative productivity in the outlined box may differ slightly from the assumed rate if the age profile for hours worked changes.
5. View Scenario Summary: Click the 'Scenario summary' button to view a summary of the active settings for this scenario.
6. Set or View Results:
  - (a) If you wish to compare scenarios or use the labour supply shocks module, click the 'Set as Baseline' button to save the current assumptions and results as the baseline scenario (and then wait while MoDEM reloads).
  - (b) To navigate directly to the projection results for the scenario, click on the 'Results' button.
7. At the top of the screen, click the forward arrow (or click on the 'Results' button) to go to the next screen, or the back arrow to return to the Female Part-Time Hours screen.

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## 4 Results module

The Results module allows users to examine demographic and economic projections from the scenarios.

Projection results are presented in two groups, demographic results and economic results. For each group, users can access

- a **Summary Table** of key parameters and their values at an aggregate level over the projection period
- **Static Graphs** of all parameters in the summary table
- **Animated Graphs** showing how selected parameters, split by age, sex and projection year, evolve over the projection period
- **Detailed tables** of selected parameters

For the demographic parameters, there are detailed results tables by age, sex and projection year for the following:

1. Resident Population
2. Civilian Population
3. Emigrants
4. Immigrants
5. Deaths
6. Survivors
7. Births

For the economic parameters, there are detailed tables of results by age, sex and projection year for the following:

1. Total Labour Inputs
2. Efficiency Units of Labour
3. Workers
4. Labour Force

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Users can also navigate directly to the static and animated graphs from the detailed results tables.

## 4.1 Using the results screens

To access the Results module, the user should click on the ‘Launch’ button next to the Results item on the MoDEM Main Menu. Alternatively, users can select Menus → Results from the MoDEM Menu Bar, or navigate directly to the desired results screen using the Results sub-menu on the Menu Bar.

From the Results menu, users can also view a summary of the active settings for the current scenario by clicking on the ‘Summary’ button, or return to the MoDEM Main Menu screen by selecting ‘Exit’.

### *Summary tables and detailed results tables*

1. Select the desired scenario from the pull-down menu. Users can view results as a single scenario or as deviations between two scenarios. Single scenarios show results from the Detailed Projection module (baseline or current scenario), or from the Detailed Projection and Labour Supply Shocks modules combined (shock scenario). The (total) deviation scenario shows the difference between the shock scenario and the baseline. For economic results, users can view two extra deviation scenarios that split the total deviation (shock – baseline) into a ‘labour supply deviation’ (shock – current) scenario and a ‘demographic deviation’ (current – baseline) scenario. The demographic deviation scenario allows users to view the effects on economic variables of changing the population demography only (see *Change Demography* in chapter 8).
2. To save results as a CSV (comma-separated value) file for further analysis, click the ‘Save \*.csv’ button. The user will be prompted with a form to enter a filename and directory for the file to be saved. The CSV file can then be opened in any standard spreadsheet or statistical package. These CSV files may require the user to manually include additional information (like scenario names) outside MoDEM.
3. To view a graph of the results, click ‘Graph’ for static graphs (where applicable), or ‘Animate’ for animated graphs (where applicable), and select the relevant scenario and variable.
4. At the top of the screen, click the back arrow to return to the Results menu.

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### *Static graphs*

1. Select a scenario from the pull-down menu for each graph. Users can choose from the baseline scenario, the current scenario and the shock scenario.
2. Select the variable to graph from the 'Variable' pull-down menu.
3. To save results as a Graphics Interchange Format (GIF) file, click the 'Save Chart as \*.gif' button. The user will be prompted with a form to enter a filename and directory for the file to be saved. The file can then be opened in any word processor or graphics package. These GIF files only include the information displayed on the chart, and require users to manually include additional information (scenarios and variables) outside MoDEM.
4. At the top of the screen, click the back arrow to return to the results menu.

### *Animated graphs*

1. Select a scenario for both graphs from the 'Scenario' pull-down menu. Users can choose from the baseline scenario, the current scenario and the shock scenario.
2. Select the variable to graph from the pull-down menu.
3. Choose years for each graph using the up and down arrows. The current year will be displayed next to the 'Year 1' and 'Year 2' labels.
4. To rescale the axis of the graph at any time, click 'Rescale'.
5. To save results as a GIF file, click the 'Save Chart as \*.gif' button. The user will be prompted with a form to enter a filename and directory for the file to be saved. The file can then be opened in any word processor or graphics package. These GIF files only include the information displayed on the chart, and require users to manually include additional information (like scenarios and variables) outside MoDEM.
6. At the top of the screen, click the back arrow to return to the results menu.



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## 5 Using the Projection Wizard

The Projection Wizard is designed for experienced users to quickly enter assumptions for parameters without viewing the underlying data. It can be thought of as an express alternative to the Detailed Projection module, for users who are familiar with MoDEM 2.0.

The Projection Wizard consists of eight steps:

1. Base Civilian Population Ratio
2. Fertility Assumptions
3. Migration Assumptions
4. Survival Assumptions
5. Male Labour Supply Assumptions
6. Female Labour Supply Assumptions
7. Productivity Assumptions
8. Setting Results for Further Analysis

### 5.1 Using the Projection Wizard

To begin using the Projection Wizard, users should click on the ‘Launch’ button next to the Wizard item on the MoDEM Main Menu. Alternatively, users can select Expert User → Projection Wizard from the MoDEM Menu Bar.

For each parameter, choose a scenario using the list boxes. Users can navigate between the steps of the wizard using the ‘Back’ and ‘Next’ buttons.

In step 8, users can choose to navigate directly to the Results module by clicking the ‘Next’ button. Active settings can be viewed from links to the scenario summary sheet on the results menu. Alternatively, users can set the active scenario as the baseline scenario by clicking the ‘Set Baseline’ button at this step. This allows the current settings to be stored as the baseline scenario, so that the user can apply labour supply shocks or compare the current scenario with another scenario.



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## 6 Export/Import module

The MoDEM Export/Import module enables both new and more experienced MoDEM users to save scenarios in a compact, tabulated format and to distribute these scenarios to other MoDEM users.

To access the Export/Import module, users should click on the ‘Launch’ button next to the Export/Import Scenario item on the MoDEM Main Menu. Alternatively, users can select MoDEM Export/Import and then either Export or Import from the MoDEM Menu Bar to bypass the menus.

On the Export/Import menu screen, users can choose to

1. Export the current scenario:
  - (a) Click on the ‘Launch’ button under the Export Menu heading.
  - (b) Enter a name for the current scenario and enter a user name and any comments, if desired.
  - (c) Click ‘OK’. This brings up a prompt to name the resulting \*.csv (comma-separated value) file and save it in a chosen directory. The file is approximately 365 Kb unzipped, allowing users to easily email or archive it.
2. Import a previously saved (exported) scenario:
  - (a) Click on the ‘Launch’ button under the Import Menu heading.
  - (b) Select the desired saved scenario (a \*.csv file), and be patient while MoDEM imports the scenario. Depending on the speed of the computer, this step may take 15–30 seconds.
  - (c) The Import Menu then updates to display the scenario name, date, time, username and comments for the scenario that was imported.
3. View a summary of all currently active settings, by clicking ‘Launch’ next to the Scenario Summary item.
4. View projection results, by clicking ‘Launch’ next to the Results item.
5. Return to the MoDEM Main Menu screen, by selecting ‘Exit’.

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When importing a scenario, please note:

- Imported scenarios must have the same base year as the MoDEM base year.
  - The MoDEM base year is listed on the scenario summary sheet.
  - The MoDEM base year can be changed to a later year using the Update module, discussed in chapter 7.
- Importing a scenario automatically makes it the active scenario, and it is stored as the ‘Imported’ scenario in pull-down menus. After changing any selections, the imported scenario can be fully reinstated as the active scenario by navigating to the Scenario Summary sheet and clicking on the ‘Launch’ button next to the item ‘Re-activate the imported scenario’.
- To import a scenario with labour supply shocks (discussed in chapter 8) as well as a baseline scenario, two csv files are needed to ensure the correct comparison with, and decomposition against, the baseline scenario.
  - First, the user must import a csv file containing the appropriate baseline scenario. Once loaded, select ‘Set as Baseline’ from the MoDEM Menu Bar.
  - Then, the user must import a second csv file containing the labour supply shock scenario. This will overwrite the previous scenario settings in the imported scenario. Failure to complete the first import will result in erroneous decompositions, particularly for the deviation results.

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## 7 Update module

The Update module allows users to add their own custom scenarios to MoDEM's preset scenarios, by uploading their own data into the MoDEM database.

The module consists of eight update screens:

1. Update Year and Database
2. Population, Productivity and Fertility Update
3. Migration and Survival Update
4. Participation Update
5. Unemployment Update
6. Part-Time Work Share Update
7. Full-Time Hours Update
8. Part-Time Hours Update

To access the Update module, users should click on the 'Launch' button next to the MoDEM Update item on the Main Menu screen. Alternatively, users can select Menus → MoDEM Update from the MoDEM Menu Bar for the Update menu screen, or navigate directly to the desired update screen using the Update sub-menu on the Menu Bar.

Instructions on using the update screens are given below.

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## 7.1 Update Year and Database

This screen enables users to update the MoDEM base year by choosing a new base year and entering estimated resident population (ERP) data for the new base year. To use this screen:

1. From the Update Menu, click ‘Update Year and Database’.
2. Enter the new base year for the projection in the grey box labelled ‘New’.
3. Enter the new base year ERP, measured at June 30. MoDEM requires ERP data for each sex by single year of age from 0 to 100+. ERP data for Australia are available from the Australian Bureau of Statistics website ([www.abs.gov.au](http://www.abs.gov.au)).
4. Click on the ‘Validate’ button to check whether your assumptions are realistic.
5. Enter the ERP for one year prior to the new base year (also measured at June 30).<sup>1</sup> MoDEM requires ERP data for each sex by single year of age from 0 to 100+. ERP data for Australia are available from the Australian Bureau of Statistics website ([www.abs.gov.au](http://www.abs.gov.au)).
6. Click on the ‘Validate’ button to check whether your assumptions are realistic.
7. Click on the ‘Activate’ button to load your new ERP data into MoDEM and to recalibrate the databases. The initial value of real GDP (in \$2006-07) will be updated for the new base year using a projection of real GDP from the corresponding year in the baseline scenario. Wait while MoDEM recalculates.  
**Note:** see Warning, below.

### *Warning:*

Failure to complete the three key steps (entering the new base year, entering the new base year ERP, and entering the ERP for the year prior to the new base year) will result in severe errors in MoDEM.

- At a minimum, MoDEM requires the new base year to be entered, and it must be within 10 years of the current base year. For example, using the 2007 base year, users can only move the base year as far as 2017 in one update.
- Failure to include the correct base year ERP will result in errors throughout the results.
- Failure to include the correct one year lagged ERP will result in incorrect estimates of the projected civilian population and labour supply.

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<sup>1</sup> MoDEM uses ERP at (base year – 1) to construct a moving average of total population, from which civilian population (and therefore labour market) projections are generated.

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**Important note:** The ‘Activate’ button is the final step in the Update Year and Database screen. This button should only be clicked after correctly entering the new base year and the appropriate sets of ERP data. A change in the MoDEM base year **cannot** be reversed except by closing MoDEM 2.0 without saving any changes.

## 7.2 All other update screens

To use any of the other update screens (besides the Update Year and Database screen):

1. Enter the required data in the grey cells.
2. Enter a label for the new scenario in the grey ‘Label’ boxes.
3. Use pull-down menus to choose a storage space for your new assumptions, either by selecting an ‘Empty’ space in the database, or by overwriting previous user-defined scenarios. Note that the update process does not overwrite inbuilt MoDEM assumptions.
4. Click ‘Validate’ to check whether your assumptions are realistic.
5. Click ‘Update’ (or, where separate, use Male and Female buttons) to load your new data into MoDEM. Wait while MoDEM recalculates.

*Warning:*

Failure to complete all steps will result in severe errors in MoDEM. In particular,

- failure to validate the data before updating may result in spurious projections
- failure to enter a label for the scenario will result in a ‘blank’ named scenario which may not be visible from the detailed projection screens.



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## 8 Labour supply shocks module

The labour supply shocks module allows users to implement policy scenarios that shock: participation, unemployment, hours worked (including part-time share) and productivity.

Demographic parameters in a scenario can also be changed, although this involves entering new values in the demographic screens of the Detailed Projection module rather than just entering incremental shocks.

Before using the labour supply shocks module, the user must have:

- Successfully created a scenario using the Detailed Projection module or Projection Wizard, or have imported a previously saved scenario using the Export/Import module, and
- Saved this scenario as the baseline scenario, either by clicking ‘Set as Baseline’ in Step 16 of the Detailed Projection module, clicking ‘Set as Baseline’ in the last step of the Projection Wizard, or choosing ‘Set as Baseline’ from the MoDEM Menu Bar after importing a scenario using Export/Import.

### 8.1 Sub Shocks

MoDEM enables the user to implement up to three separate policy sub shocks for labour supply, named Sub 1 – Sub 3, in the Labour Supply Shocks module.

1. Labour Supply Shock Menu: For each sub shock, turn the shocks for participation, unemployment, hours worked and productivity all on or all off using the ‘On/Off’ buttons. Alternatively, use the ‘Toggle’ buttons to create sets of shocks with some parameters turned on and others turned off. The only restriction on combinations of sub shocks is that hours cannot be shocked unless shocks to part-time work share are turned on using the ‘On/Off’ button on the corresponding sub shock sheet for part-time work share.
2. To begin entering shocks, click the ‘Launch’ button next to Sub 1 to go to the participation (Sub 1) sheet.
3. Sub shocks: Enter the required shocks in the grey cells for males and females respectively. Scroll down the screen to view cells for the last part of the

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projection period. When entering shocks, ensure that the outlined box next to the 'On/Off' button on the sub shock sheet is turned on. This button is linked to the corresponding 'Toggle' button on the Labour Supply Shock Menu and shows whether the shocks are active.

4. At the top of the screen, click the forward arrow to go to the next step, or the back arrow to go back one step. At any stage, the user can return directly to the labour supply shocks menu using the MoDEM menu on the toolbar.
5. Repeat steps 3 and 4 to enter shocks for other labour supply components: unemployment, part-time share, full-time hours, part-time hours and productivity.
6. Repeat steps 1–5 for Sub 2 and Sub 3 if additional sub shocks are desired.

Data types required:

1. Sub shocks for participation, unemployment and part-time shares are in percentage points.
2. Sub shocks for full-time and part-time hours are in hours.
3. Productivity shifters are in percentage points.

Note: Each of the three sub shocks can be turned on or off from the main Labour Supply Shocks Menu if desired. However, the user must enter the sub shock sheets to record the direction and size of the shocks.

### *Consolidation Factor*

If more than one set of sub shocks is used, once the complete set of sub shocks is entered, return to the Labour Supply Shocks Menu and click the 'Launch' button next to Consolidation Options to choose the method and weighting factor for consolidating the parameters.

1. Enter a weight for the consolidation in the text box. The number next to the text box shows the weight that is currently active in MoDEM.
2. Choose your consolidation method using the list box. MoDEM supports the following methods: Sum, Average, Max, and Max – Min.
3. Click 'OK' to load your new consolidation options, or 'Cancel' to continue with the previous options.
4. Ensure that your choice of weight and method are shown in the outlined boxes on the labour supply shocks menu.

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### *Outsider Discounts*

When simulating a scenario that increases labour force participation, an important consideration is the use of Outsider Discounts. MoDEM offers four types of discounts: (1) Productivity Ratio for Incremental Labour, (2) Incremental Labour Relative Propensity for Employment, (3) Average Hours Worked Ratio for Incremental Labour and (4) Incremental Labour Relative Propensity for Full-Time Work.

1. Click the 'Launch' button next to Outsider Discounts to choose the types and amounts of discounts.
2. Click the tick box in the top left-hand corner to turn on the discounts.
3. Enter new values for each of the four discount parameters in the boxes. The numbers under the MoDEM heading indicate the discounts currently active.
4. Click 'OK' to load new discount values in MoDEM or 'Cancel' to continue with the previous discounts.

### *Validate Labour Parameters*

To validate the consolidated parameters, click the 'Launch' button next to Validate Labour parameters. The sheet displays indicators of whether each post-shock labour supply parameter is 'LOW', 'HIGH' or 'OK'. As mentioned in chapter 3, the validation tool is only intended to be a data check, indicating parameter values that might be considered unusually high or low.

### *Change Demography*

As part of a policy shock, users may also need to change the underlying demography. This is done by changing the detailed projections for the demographic variables.

1. Click the 'Launch' button next to Change Demography to return to the detailed projection module.
2. Step through and adjust the scenarios in each of the first 5 demography screens.
3. After changing the survival scenario (STEP 5 of 16), click the 'Back to Shock' button to return to the labour supply shocks module.



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## 9 Using MoDEM in Expert Mode

MoDEM Expert Mode enables experienced MoDEM users to view and make changes to the underlying formulas, databases and to edit or add VBA code. Expert Mode also restores the full Excel Toolbar, Formula Bar, row and column headers and Excel worksheet tabs. Expert Mode can be accessed from the MoDEM Main Menu screen (by clicking ‘Launch’ next to MoDEM Expert Mode) or from the MoDEM Menu Bar (MoDEM → Expert User → Expert Mode). To return to interface mode at any time, select MoDEM → Expert User → Interface Mode on the MoDEM Menu Bar.

To minimise the risk of debug errors, users should not insert or delete rows or columns or move cells, as VBA does not update these references. Moreover, changing sheet names will cause errors in the VBA code. Expert users may, however, edit the cell locations in the Visual Basic for Applications (VBA) modules.

### 9.1 Some tips for expert users

- To change the size of rows and columns in MoDEM to aid visual clarity or to fit large numbers:
  - First, unprotect the worksheet. In Expert Mode, select Tools → Protection → Unprotect Sheet from the Excel Menu Bar.
  - Then click and drag to change the width of rows or columns using the Excel row and column headers.
  - Protection can be restored by selecting Tools → Protection → Protect Sheet from the Excel Menu Bar and using the selected options for the sheet.
- Every so often, Excel will automatically save the MoDEM workbook in case the file needs to be recovered. This can take up to a few minutes and so may pose an interruption to users. The interval between Autosaves can be lengthened, or the feature can be turned off completely. Please note that this will increase the risk of data loss in the event of Excel crashing.
  - To change how often Excel ‘Autosaves’ the MoDEM workbook: Select Tools → Options and choose the ‘Save’ tab. Enter the desired interval

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between Autosaves in minutes. Or, to disable AutoSave completely, click 'Disable Autorecover'.

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# APPENDICES



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# A MoDEM Error Testing

The efficient and accurate operation of MoDEM is totally dependent upon the quality of the input data. In most cases, users should use the validate buttons to ensure the plausibility of the parameters entered into the model. All grey input boxes have also have data validation procedures to ensure the input data is of the correct data type.

Apart from these pre-processing error checks, error handling procedures have been written in VBA for MoDEM. In the event of an error, meaningful error messages have been written to provide advice to users. To minimise the risk of debug errors, users should not change cells, rows or sheet names, as VBA does not update these references. Expert users can make changes to the VBA code using the Visual Basic Editor accessed from Tools → Macro → Visual Basic Editor, or by pressing Alt + F11.



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# B Terminology

## B.1 Demographic Terms

**Age Specific Fertility Rate (ASFR):** A measure of fertility for a specific age group, calculated as the number of live births in each age group divided by the female population (in thousands) in that age group. While the TFR is a measure of the average number of children per woman across the population, the ASFR is specific to a given age group.

**ASFR Peak:** This is the highest ASFR across all age groups. It is a measure of the age at which a female of reproductive age is most likely to give birth.

**Civilian population:** the total population, excluding members of the armed forces.

**Crude Birth Rate (CBR):** An average measure of the number of births in a given year. It is calculated by dividing the number of survived births in a year by the mid-year population, all multiplied by 1000.

**Crude Death Rate (CDR):** An average measure of the number of deaths in a given year. It is calculated by dividing the number of deaths in a year by the mid-year population, all multiplied by 1000.

**Gross Reproduction Rate (GRR):** A measure of fertility limited to the female population. It measures the number of daughters (female births) per woman of reproductive age.

**Life expectancy at birth:** A measure of the average number of years of life remaining, at age zero.

**Life Table Dependency:** This dependency measure, although similar to the population based dependency rates, differs in that it uses 'years lived' (calculated from lifetables) as a measure of age.

**Old Age Dependency:** A crude measure of economic dependency in a population. It is calculated as the number of persons aged 65 and over, divided by the number of persons of working age (15–64).

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**Population (moving average):** a measure of population at 31 December, calculated as a two-year moving average of total population at June 30. Used to convert timings of population measurements to match those for labour data (fiscal year averages).

**Total Dependency:** A crude measure of economic dependency in a population. It is the old age dependency rate plus the young age dependency rate.

**Total Fertility Rate (TFR):** A synthetic cohort measure of fertility. The TFR of a population is the average number of children women would bear during their lifetimes if they were to experience the exact age-specific fertility rates (ASFRs) that apply in a given year at each age of their reproductive lives. The TFR is the sum of the ASFRs at a given point in time (see also ASFR).

**Young Age Dependency:** A crude measure of economic dependency in a population. It is calculated as the number of persons aged less than 15, divided by the number of persons of working age (15–64).

## B.2 Economic terms

**Aggregate productivity (assumed):** an index measuring the annual growth rate of productivity, based on a single growth rate applied to all workers. It does not include the effects of age-varying productivity.

**Aggregate productivity (implied):** an index representing average annual productivity growth across all workers, based on the aggregate productivity rate and age-specific relative productivity. If the uniform relative productivity option is selected for males and females, implied and assumed aggregate productivity will be the same.

**Discounted per capita GDP:** the present value of projected per capita GDP, based on a discount rate of 5 per cent.

**Efficiency units per capita:** a measure of labour supply (hours) per head of population, where hours are weighted by a productivity index that can vary by age.

**Gross Domestic Product (GDP):** a measure of the output produced by workers. In MoDEM, changes in GDP result from changes in the size and composition of the (employed) workforce — the number of workers, average hours per worker and worker productivity.

**Hours dependency rate:** potential working hours not worked divided by hours worked, where the measure of potential working hours (worked and not worked)

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assumes all employed people could potentially work 40 hours per week. Potential working hours not worked is the difference between a potential 40-hour working week and the projected ‘average hours’ working week.

**Labour force:** The number of people in the civilian population, aged 15 years and over, who are either employed or unemployed (available for and actively seeking employment).

**Labour force dependency ratio:** A crude measure of economic dependency in a population. It is calculated as the number of persons who are not working divided by the number of workers.

**Labour inputs:** hours worked, excluding any productivity effects.

**Labour inputs (per capita):** hours worked per head of population.

**Non-workers:** number of people in the civilian population (aged 15 and over) who are unemployed or not in the labour force.

**Participation rate (aggregate):** The labour force expressed as a percentage of the civilian population aged 15 years and over.

**Participation rate (no ageing):** An aggregate participation rate based on each age–sex group maintaining a constant share in the civilian population. That is, each year the projected participation rates for the age–sex groups are combined using shares from 2007.

**Productivity:** an index of the relationship between an hour of time worked (input) and what is produced during that hour of work (output). Workers with high productivity produce more output in an hour than workers with low productivity.

**Workers:** number of employed people (aged 15 and over).



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## C MoDEM default ('Medium') scenario

Users can choose to reset all parameters to the default ('Medium') scenario in step 1 of the Detailed Projection module or from the Scenario Summary Sheet. Users may wish to do this in order to:

- create a scenario with minimal user input
- restore MoDEM to the original 'Medium' settings after trying different parameter values.

The following is a brief description of the 'Medium' settings and assumptions. Full details of all parameter values for this default scenario, or any active or preset scenario, can be found in the database sheets accessible in Expert Mode (see tables 1.1 and 1.2 in Appendix D, which list the sheets visible in Interface and Expert Mode and their contents).

### C.1 Fertility

Under the default scenario, the Total Fertility Rate (TFR) is set at a constant rate of 1.7 from 2018 to the end of the projection period. This is consistent with the Australian Bureau of Statistics' (ABS) assumption for the long-term 'medium' TFR (ABS 2006).<sup>1</sup> The TFR is set at 1.8 in 2007 (based on actual data for 2006 (ABS 2007a)) and linear interpolation is used to project TFR figures for the period between 2007 and 2018.

The default ('Medium') Age-Specific Fertility Rates (ASFRs) for 2007 are taken from ABS data for 2006 and are consistent with a TFR of 1.8 (ABS 2007a). The default ASFRs for the intermediate year, 2020, are set to be equal to those for 2007 (as described above, these are equal to actual ASFRs for 2006). That is, the default assumption is that the age profile of fertility will not change over the period 2007 to 2020. Users can vary this assumption by selecting the 'Older' or 'Younger' scenario for 2020, or by entering user data.

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<sup>1</sup> However, it is slightly lower than the long-term assumption of 1.8 used in the most recent population projections (ABS 2008b).

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## C.2 Migration

Under the default scenario, there is a constant net overseas migration (NOM) of 177,000 persons per year. This is the result of constant emigration and immigration levels, of 210,000 persons per year and 387,000 persons per year respectively. These figures are based on 2006-07 ABS migration data (ABS 2008a).

Age patterns of emigration and immigration are based on single-year age-sex profiles provided by the ABS for 2006-07 (ABS 2008a).

## C.3 Survival

Based on ABS data, the default scenario begins in 2007 with life expectancy at birth of 79.0 years for males and 83.8 years for females (ABS 2007b). During the projection period, mortality rates are assumed to gradually decline to achieve life expectancy at birth of 88.2 years (males) and 90.8 years (females) by 2053. These figures result from applying the methodology used by the ABS to generate life expectancy assumptions for its population projections (ABS 2006, 2008b).<sup>2</sup>

MoDEM's default scenario uses a life table provided by the ABS to create an age profile for mortality for each sex (ABS 2007b). This profile, also called a survival pattern or mortality shape, is rescaled (marginally) to be consistent with the figures for life expectancy at birth for males and females given above.

## C.4 Productivity and the discount rate

The default scenario assumes an aggregate productivity growth rate of 1.5 per cent per year over the projection period. It also assumes uniform relative productivity across age–sex groups.

A discount rate of 5 per cent is assumed, although this is only used to calculate discounted per capita GDP.

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<sup>2</sup> In the default scenario, the annual increase in life expectancy is initially in line with its long term trend and then slows. ABS deaths data from 1972 to 2006 show the average annual increase in life expectancy was 0.32 years for males and 0.26 years for females (ABS 2007b). By assumption, this trend continues until 2011 in the default scenario. Thereafter, the annual increase in life expectancy declines linearly to 0.06 years for males and 0.03 years for females in 2053. These increases for the final year are determined by the smallest annual increase observed between 1972 and 2006 for each sex.

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## C.5 Labour supply

The values of the labour supply parameters (participation rates, unemployment rates, part-time shares and average hours worked) used in the default scenario are the projections labelled 'PC (2008)'. These numbers are an update of those from the Commission's report on *Economic Implications of an Ageing Australia* (PC 2005). The same method has been used to generate the two sets of projections, however the later set includes the effects of more recent data.



## D MoDEM worksheets

Table 1.1 **Worksheets visible in MoDEM Interface Mode**

<i>Worksheet(s) name</i>	<i>Description</i>	<i>How worksheet(s) interact with other worksheet(s)</i>
<b>RootMenu</b>	MoDEM Main Menu	<p>Links to the following:</p> <ul style="list-style-type: none"> <li>• Detailed Projection (<b>DP1</b> and then to <b>DPx</b> sheets)</li> <li>• Labour Supply Shocks (<b>LMenu</b> and then to <b>Lx.x</b> sheets)</li> <li>• <b>Scenario Summary</b> (shows summary of active settings)</li> <li>• Results (<b>RMenu</b> and then to <b>Rx</b> sheets)</li> <li>• MoDEM Update (<b>UMenu</b> and then to <b>Ux</b> sheets)</li> <li>• Export/import scenario (<b>SMenu</b>)</li> <li>• Expert Mode (shows all sheets, restores toolbars, shows row and column headings and sheet names)</li> <li>• Projection Wizard (interactive forms that allows users to quickly enter assumptions for a Detailed Projection).</li> <li>• MoDEM Close (closes MoDEM)</li> </ul>
<b>Scenario Summary</b>	Summary of active settings	<p>Allows users to see a summary of the active settings for the model. Users can change settings or view more detail on each variable through the links to:</p> <ul style="list-style-type: none"> <li>• Detailed Projections (<b>DPx</b> sheets)</li> <li>• Labour Supply Shocks (<b>LMenu</b>)</li> <li>• Results (<b>RMenu</b>)</li> </ul> <p>Also allows users to re-activate the imported scenario, restore the default ('medium') scenario and save the current settings in an export file.</p>
<b>DP1–DP16 (DPx sheets)</b>	Detailed Projection sheets	<p>The <b>DPx</b> sheets together form a 16-step process for users to enter the input required for a detailed projection.</p> <p>The sheets contain drop-down boxes.</p> <ul style="list-style-type: none"> <li>• When users select a scenario from the drop-down boxes, this choice is reflected in an index contained in one of the Database sheets (<b>db_x</b> sheets).</li> <li>• The Database sheets then display the active scenario at the top, according to which scenario has been selected.</li> </ul> <p>Some of the <b>DPx</b> sheets also link to the validation (<b>Vx</b>) sheets, which check the numbers against those contained in the <b>Validation</b> sheet.</p> <p>All of the <b>DPx</b> sheets contain graphs. The graphs in sheets <b>DP2</b> to <b>DP15</b> are based on data contained in sheet <b>DPGData</b>, while graphs in sheets <b>DP1</b> and <b>DP16</b> use data on the same sheet.</p>
<b>Umenu</b>	MoDEM Update Menu	Links to modules to update the base year and other parameters, such as fertility, migration, participation (all the <b>Ux</b> sheets)

(Continued next page)

Table 1.1 (continued)

<i>Worksheet(s) name</i>	<i>Description</i>	<i>How worksheet(s) interact with other worksheet(s)</i>
<b>U1–U8</b> ( <b>Ux</b> sheets)	Update sheets	<p>Sheet <b>U1</b> updates the base year by allowing users to enter ERP data for a new base year. This data gets stored in sheet <b>db_Misc</b>. In turn, the first column of the population projection sheet (<b>Pop_estimate</b>) is set equal to the ERP figures in <b>db_Misc</b>.</p> <p>Sheets <b>U2–U8</b> allow users to enter new data and store the data in one of the ‘Empty’ scenarios. The data are then stored in the Database (<b>db_x</b>) sheets.</p> <p>The <b>Ux</b> sheets link to the validation (<b>Vx</b>) sheets, which check the numbers against those in the <b>Validation</b> sheet.</p>
<b>V1–V13</b> ( <b>Vx</b> sheets)	Validation sheets	Users access these sheets from the Detailed Projection ( <b>DPx</b> ) sheets or the Update ( <b>Ux</b> ) sheets. The validation sheets check user input against numbers in the <b>Validation</b> sheet.
<b>LMenu</b>	Menu for labour supply shocks	Links to the labour supply shock modules ( <b>Lx.x</b> sheets), allowing users to enter up to 3 sub-shock scenarios.
<b>L1.1–L1.6,</b> <b>L2.1–L2.6,</b> <b>L3.1–L3.6</b> ( <b>Lx.x</b> sheets)	Labour supply shock sheets	Each group of six sheets ( <b>Lx.1</b> to <b>Lx.6</b> ) represents a six-step process for users to input labour supply shocks. These shocks comprise changes to participation, unemployment, part-time share, and part-time and full-time average hours for males and females. The three groups ( <b>L1.x</b> , <b>L2.x</b> , <b>L3.x</b> ) represent the sub-shock scenarios (users can enter up to three such scenarios).
<b>RMenu</b>	MoDEM Results Menu	Links to the results ( <b>Rx</b> ) sheets for Demographic and Economic variables.
<b>R1–R13</b> ( <b>Rx</b> sheets)	Results sheets	<p>These sheets are accessed via the Results Menu (<b>RMenu</b>) and contain tables showing the projected values for Demographic and Economic variables. Users will generally access these sheets after completing a Detailed Projection, using the Projection Wizard, or adding labour supply shocks to an existing scenario.</p> <p>Some of the <b>Rx</b> sheets offer a graph or ‘Animate’ option, which links to one of the graph (<b>Gx</b>) sheets. The user is then able to select what to display from a range of options.</p>
<b>G1–G4</b> ( <b>Gx</b> sheets)	Graph sheets	<p>Sheets <b>G1</b> and <b>G2</b> show ‘Animated’ results for the Demographic and Economic variables respectively, while sheets <b>G3</b> and <b>G4</b> display line graphs for the Demographic and Economic variables. In each of the graph sheets, users can select the desired variable from a drop-down box.</p> <p>Data for the graphs in these sheets is drawn from sheet <b>GData</b>.</p>
<b>SMenu</b>	MoDEM Export/Import Menu	Allows users to export or import a MoDEM scenario. Also links to the Results menu ( <b>RMenu</b> ) so users are able to quickly access results from an imported scenario.

Table 1.2 **Additional worksheets visible in MoDEM Expert Mode**

<i>Worksheet name</i>	<i>Description</i>	<i>How worksheet(s) interact with other worksheet(s)</i>
<b>Validation</b>	Validation data sheet	Gives plausible ranges of values for different parameters, such as ERP, fertility, migration and so on. The validation ( <b>Vx</b> ) sheets use the figures in the <b>Validation</b> sheet to suggest whether or not user input figures are within a plausible range.
<b>Processed input</b>	Contains complete set of data input necessary to calculate projection results for the active scenario.	Data are organised into a series of tables on fertility, migration, mortality, labour force participation and so on.  Data are mostly taken from the <b>Raw input</b> sheet. The major exception is mortality data. Mortality rates, calculated by interpolation, are taken from the applied mortality sheet (titled <b>Mortality</b> ).
<b>Raw input</b>	Contains data input for the active scenario.	Takes data from the Database ( <b>db_x</b> ) sheets for fertility, mortality, migration and so on. Feeds into the <b>Processed input</b> sheet.  A complication is mortality data: <ul style="list-style-type: none"> <li>• A full set of mortality figures for the active scenario are taken from the <b>db_mortality</b> sheet and put into <b>Raw input</b> 'as is'.</li> <li>• The first column of data (i.e. data for the base year) only is pasted into the applied mortality sheet (titled <b>Mortality</b>). Mortality rates for years after the base year are calculated by a process of interpolation in the <b>Mortality</b> sheet.</li> <li>• The <b>Processed input</b> sheet draws mortality rates (calculated by interpolation) from the <b>Mortality</b> sheet.</li> </ul> The <b>Raw input</b> sheet also contains the productivity growth rate and discount rate.
<b>Imported input</b>	Contains complete set of data input (from an imported scenario) needed to calculate projection results	Figures are taken directly from <b>Imported raw</b> sheet.
<b>Imported raw</b>	Contains data input for an imported scenario	When the user runs the macro to import a previously saved MoDEM scenario, the data are pasted as values into this sheet.
<b>Pop_estimate</b>	Contains projected ERP for males and females in every age group from 0 to 100	Figures for the base year (i.e. the first column of figures) are taken from sheet <b>db_Misc</b> .  Figures for successive years are calculated by: <ul style="list-style-type: none"> <li>• For age group 0, taking the rounded sum of births and immigrants of age 0, less emigrants of age 0, from the sheets <b>Births</b>, <b>Immigrants</b> and <b>Emigrants</b>.</li> <li>• For other age groups, taking the rounded sum of survivors and immigrants, less emigrants, from the sheets <b>Survivors</b>, <b>Immigrants</b> and <b>Emigrants</b>.</li> </ul>

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Table 1.2 (continued)

<i>Worksheet name</i>	<i>Description</i>	<i>How worksheet(s) interact with other worksheet(s)</i>
<b>Deaths</b>	Contains the projected number of deaths by age and sex, from (baseyear + 1) onwards	Figures obtained by multiplying death rates from the <b>Mortality</b> sheet by projected ERP in the <b>Pop_estimate</b> sheet.
<b>Births</b>	Contains the projected number of births by age of mother, from (baseyear + 1) onwards.	Total births are divided into male and female births based on a ratio at the top of the sheet.  Number of births by age of mother is obtained by multiplying fertility rates from the <b>Fertility</b> sheet by projected female population in a given age bracket from the <b>Pop_estimate</b> sheet.  This sheet also calculates the number of surviving births (male and female) by multiplying the total number of births (male and female) by (1 – infant mortality rate) from the <b>Mortality</b> sheet.
<b>Survivors</b>	Contains the projected number of resident persons surviving in each year from (baseyear + 1) onwards, by age and sex	Figures obtained by multiplying (1 – death rate) from the <b>Mortality</b> sheet by projected ERP in the <b>Pop_estimate</b> sheet.
<b>Immigrants</b>	Contains the projected number of immigrants by age and sex, from (baseyear + 1) onwards.	Figures are taken from <b>Processed input</b> sheet.
<b>Emigrants</b>	Contains the projected number of emigrants by age and sex, from (baseyear + 1) onwards.	Figures are taken from <b>Processed input</b> sheet.
<b>Sum formula</b>	Consolidates the active user-defined shocks by taking the sum	Sums up the active shocks as entered in the <b>Raw input</b> sheet.
<b>Max formula</b>	Consolidates the active user-defined shocks by taking the maximum or range	Takes the maximum (or their range, if the Max – Min consolidation option has been selected) of the active shocks as entered in the <b>Raw input</b> sheet.
<b>Average formula</b>	Consolidates the active user-defined shocks by taking the average	Takes the average of the active shocks as entered in the <b>Raw input</b> sheet.

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Table 1.2 (continued)

<i>Worksheet name</i>	<i>Description</i>	<i>How worksheet(s) interact with other worksheet(s)</i>
<b>Total UDS increments</b>	Shows the selected form of consolidation of user-defined shocks (UDS).	Figures are taken from the <b>Sum formula</b> , <b>Max formula</b> or <b>Average formula</b> sheets according to which method of consolidation of shocks is selected. The selected method is represented by an index in the <b>Total UDS increments</b> sheet, which is linked to the selection stored in <b>db_Misc</b> .
<b>Mortality</b>	Contains mortality rates by age and sex, for the base year onwards.	Figures for the base year are taken directly from the <b>Raw input</b> sheet. Figures for subsequent years are calculated by a process of interpolation.
<b>Mortality shape</b>	Describes the pattern of mortality across the projection period.	Shows mortality rates for the base year and the 'final year' (46 years after the base year, after which mortality rates are static), and calculates the natural logarithm of the ratio of final year to base year rates.
<b>Fertility</b>	Contains figures on the age pattern of fertility and on the total fertility rate.	Shows the age-specific fertility rate (ASFR) and total fertility rate (TFR). <ul style="list-style-type: none"> <li>• The ASFR represents the number of births occurring in a calendar year divided by the female population (in thousands) in each age group.</li> <li>• The TFR, which is known as the 'Fertility Level' in the MoDEM interface (sheet <b>DP2</b>), represents the average number of births per woman over a lifetime.</li> </ul> <p>In this model, the projected TFR figures are taken directly from the <b>Processed input</b> sheet (where they are derived from the preset fertility scenario selected by the user, or the fertility level entered by the user). The projected ASFR figures are then calculated and adjusted to be consistent with the TFR figures.</p>
<b>Female convergence</b>	Shows the changes in the over-60 female participation rate needed to achieve convergence with participation rates among males of the same age.	The parameter <i>sex_converge</i> applies to the oldest age groups in the labour market: 60–64, 65–69 and 70+. When active (non-zero), this parameter represents the number of years over which female participation rates are made to converge to those of males. The participation increments shown in this sheet are calculated by combining the value of <i>sex_converge</i> with participation rates for males and females in the over-60 age groups from the <b>Raw input</b> sheet.
<b>Intermediate</b>	Shows additional participants, workers and hours worked resulting from user-defined shocks.	Translates shocks to participation rates, unemployment rates, part-time shares, full-time and part-time average hours into incremental participants, workers and hours. These calculations are explained in Appendix B of the User's Guide to MoDEM.
<b>GDP-baseline</b>	Contains projections for economic and demographic parameters for the baseline scenario.	Figures on this sheet are copied from the <b>GDP</b> sheet when the user chooses to set the active scenario as the baseline scenario. Any changes to the active scenario have no effect on the <b>GDP-baseline</b> sheet until the scenario is set as a baseline.

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Table 1.2 (continued)

<i>Worksheet name</i>	<i>Description</i>	<i>How worksheet(s) interact with other worksheet(s)</i>
<b>GDP</b>	Contains projections for economic and demographic parameters for the active scenario.	The input data on this sheet are mainly taken from the <b>Processed input</b> and <b>Pop_estimate</b> sheets. These data are used to calculate the economic and demographic projections shown in this sheet, such as GDP, labour force size, and aggregate productivity.
<b>GDP-UDS</b>	Contains projections for economic and demographic parameters for the active scenario, after taking into account the effects of user-defined shocks.	Input data on this sheet are taken from the from the <b>Processed input</b> , <b>Pop_estimate</b> and <b>Intermediate</b> sheets to calculate the economic and demographic projections shown in this sheet. These projections include the effects of user-defined shocks.
<b>Deviations_GDP_Base</b>	Shows the difference in economic projections between the baseline and the active scenario.	Figures are calculated by taking the difference between the equivalent value in the <b>GDP</b> sheet and that in the <b>GDP-baseline</b> sheet.  These deviations are displayed in the results ( <b>Rx</b> ) sheets when the 'Demographic Deviation' option is selected from the drop-down menus in sheets <b>R9–R13</b> . This allows the user to easily view the effect on key outputs of changing from the baseline scenario to the active scenario.
<b>Deviations_GDPUDS_Base</b>	Shows the difference in economic projections between the baseline and the active scenario with user-defined shocks.	Figures are calculated by taking the difference between the equivalent value in the <b>GDP-UDS</b> sheet and that in the <b>GDP-baseline</b> sheet.  These deviations are displayed in the results ( <b>Rx</b> ) sheets when the 'Total Deviation' option is selected from the drop-down menus in sheets <b>R9–R13</b> . This allows the user to easily view the effect on key outputs of changing from the baseline scenario to the active scenario (including the effects of user-defined shocks).
<b>Deviations_GDPUDS_GDP</b>	Shows the difference in economic projections for the active scenario with and without the user-defined shocks.	Figures are calculated by taking the difference between the equivalent value in the <b>GDP-UDS</b> sheet and that in the <b>GDP</b> sheet.  These deviations are displayed in the results ( <b>Rx</b> ) sheets when the 'Labour Supply Deviation' option is selected from the drop-down menus in sheets <b>R9–R13</b> . This allows the user to easily view the effect on key outputs of user-defined shocks within the active scenario.
<b>Deviations_Dem</b>	Shows the difference in demographic projections between the baseline and the active scenario.	Figures are calculated by taking the difference between the equivalent value in the <b>GDP</b> sheet and that in the <b>GDP-baseline</b> sheet.  These deviations are displayed in the results ( <b>Rx</b> ) sheets when the 'Deviation' option is selected from the drop-down menus in sheets <b>R1–R8</b> . This allows the user to easily view the effect on key demographic projections of changing from the baseline scenario to the active scenario.

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Table 1.2 (continued)

<i>Worksheet name</i>	<i>Description</i>	<i>How worksheet(s) interact with other worksheet(s)</i>
<b>Gdata</b>	Contains input data for the graphs in MoDEM Results module.	Data in this sheet are used as input for the graphs linked to the results menu ( <b>RMenu</b> ) and tables ( <b>Rx</b> ) sheets.
<b>DPGData</b>	Contains input data for the graphs in the Detailed Projection module.	Data in this sheet are used as input for the graphs in sheets <b>DP2</b> to <b>DP15</b> (inclusive) in the Detailed Projection module.
<b>MenuSheet</b>	Contains items for the MoDEM Menu.	Contains a list of commands included in the MoDEM Menu, as well as macro-launching buttons to create or delete the MoDEM Menu.
<b>db_Misc</b>	Stores miscellaneous information.	<p>The information in this sheet is organised into 30 small 'tables', and is drawn from a number of sheets in MoDEM. It mainly consists of indices representing selections made by users (via drop-down boxes, forms, and so on). For example, the sheet includes toggle indicators showing which user-defined shocks are currently active, and what method of consolidation is selected.</p> <p>This sheet stores the ERP data for the base year and (base year – 1), which are required to define the initial population for the base year. It also contains the initial value of GDP for the base year.</p>
<b>db_mortality</b>	Stores mortality rates for the active scenario as well as other preset and user-defined scenarios.	<p>The sheet is organised as follows:</p> <ul style="list-style-type: none"> <li>• The top section shows the list of possible scenarios from which the user may select, and displays the scenario that is currently selected (the active scenario)</li> <li>• The next sections, 'MoDEM Males' and 'MoDEM Females', show mortality data for the active scenario.</li> <li>• The rest of the sheet shows data for all possible scenarios, as listed at the top of the <b>db_mortality</b> sheet.</li> </ul> <p>The data in this sheet, as with the other Database (<b>db_x</b>) sheets, feeds into the <b>Raw input</b> sheet.</p>
<b>db_avhourspart</b>	Stores average part-time hours for the active scenario as well as other preset and user-defined scenarios.	The sheet is organised in the same way as the <b>db_mortality</b> sheet, and also feeds into the <b>Raw input</b> sheet.
<b>db_avhoursfull</b>	Stores average full-time hours for the active scenario as well as other preset and user-defined scenarios.	The sheet is organised in the same way as the <b>db_mortality</b> sheet, and also feeds into the <b>Raw input</b> sheet.

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Table 1.2 (continued)

<i>Worksheet name</i>	<i>Description</i>	<i>How worksheet(s) interact with other worksheet(s)</i>
<b>db_parttimeshare</b>	Stores the part-time work share for the active scenario as well as other preset and user-defined scenarios.	The sheet is organised in the same way as the <b>db_mortality</b> sheet, and also feeds into the <b>Raw input</b> sheet.
<b>db_participation</b>	Stores participation rates for the active scenario as well as other preset and user-defined scenarios.	The sheet is organised in the same way as the <b>db_mortality</b> sheet, and also feeds into the <b>Raw input</b> sheet.
<b>db_unemploy</b>	Stores unemployment rates for the active scenario as well as other preset and user-defined scenarios.	The sheet is organised in the same way as the <b>db_mortality</b> sheet, and also feeds into the <b>Raw input</b> sheet.
<b>db_civil</b>	Stores civilian population ratios (ratio of civilians to total population in each age–sex group) for the active scenario as well as other preset and user-defined scenarios.	The sheet is organised in the same way as the <b>db_mortality</b> sheet, and also feeds into the <b>Raw input</b> sheet.
<b>db_ageprod</b>	Stores age-specific productivity ratios (relative productivity of workers in each age bracket) for the active scenario as well as other preset and user-defined scenarios.	The sheet is organised in the same way as the <b>db_mortality</b> sheet, and also feeds into the <b>Raw input</b> sheet.
<b>db_Emigl</b>	Stores emigration level (number of emigrants per year) for the active scenario as well as other preset and user-defined scenarios.	The sheet is organised in the same way as the <b>db_mortality</b> sheet, and also feeds into the <b>Raw input</b> sheet.
<b>db_Immigl</b>	Stores immigration level (number of immigrants per year) for the active scenario as well as other preset and user-defined scenarios.	The sheet is organised in the same way as the <b>db_mortality</b> sheet, and also feeds into the <b>Raw input</b> sheet.

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Table 1.2 (continued)

<i>Worksheet name</i>	<i>Description</i>	<i>How worksheet(s) interact with other worksheet(s)</i>
<b>db_Fertl</b>	Stores fertility level for the active scenario as well as other preset and user-defined scenarios.	Fertility level (also known as total fertility rate (TFR) in MoDEM) measures the average number of births per woman over a lifetime.  The sheet is organised in the same way as the <b>db_mortality</b> sheet, and also feeds into the <b>Raw input</b> sheet.
<b>db_Fertp</b>	Stores age-specific fertility rates for the active scenario as well as other preset and user-defined scenarios.	Age-specific fertility rates (ASFR) represent the number of births occurring in a calendar year divided by the female population (in thousands) in each age group. MoDEM uses births throughout a calendar year to represent the fertility pattern at June 30.  The sheet is organised in the same way as the <b>db_mortality</b> sheet, and also feeds into the <b>Raw input</b> sheet.
<b>db_Immip</b>	Stores immigration age pattern (for males and females) for the active scenario as well as other preset and user-defined scenarios.	The sheet is organised in the same way as the <b>db_mortality</b> sheet, and also feeds into the <b>Raw input</b> sheet.
<b>db_Emip</b>	Stores emigration age pattern (for males and females) for the active scenario as well as other preset and user-defined scenarios.	The sheet is organised in the same way as the <b>db_mortality</b> sheet, and also feeds into the <b>Raw input</b> sheet.
<b>TBSheet</b>	Displays a list of toolbars that are hidden in Interface Mode and visible in Expert Mode.	This sheet is referred to in the macros that switch the user between Interface Mode and Expert Mode. For example, when moving from Interface to Expert Mode, the relevant macro will proceed to 'show' the toolbars listed in <b>TBSheet</b> .



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## References

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