Derived Forecast (DF) Model

Reference manual

Version 1.0

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1. INTRODUCTION

1.1 Overview

The Derived Forecast (DF) model is a new development in the POPGROUP suite of demographic models. It incorporates in one model set up, one forecast routine and one output reporter all the previous features of LABGROUP and HOUSEGROUP. In addition, it has the flexibility to accommodate the methods of household projection from each of the four UK statistical agencies.

The DF allows data to be entered for any variable that is closely related to the age-sex structure of the population as forecast by POPGROUP or independently, including household structure, economic activity and disability, and to prepare projections from these data sources.

The DF provides a single 'set-up' procedure to define a model appropriate to the data available and their particular relationship to the age-sex structure of the population. It allows specification of different models, for example:

- One rate applied to the whole population for a standard set of five-year age-sex groups, as might be the case for some models of long-term limiting illness.
- Several rates adding to less than 100%, applied to a population modified by subtraction of those in institutions, and excluding child age groups, as is the case for the current government sub-national household projections in England and Scotland.
- Application of rates to a population that is sub-divided into age-sex-student status, as is allowed for in labour force projections.
- Several rates that add to exactly 100%, to compute the population in each household type, and further calculations involving household size to compute the number of households, as in the NISRA and WAG models.
- No disaggregation by sex, or no disaggregation by age or sex, as in a very simple model of household formation by household size.

The DF model avoids complicating the use of the software for the majority of users who will probably not use its optional flexibility, though each user may want a different subset of options. This is achieved through prepared standard model setups in which the options are pre-entered (but not hard-coded) for, e.g., 'WAG household projections', such that the user need only enter the Groups (usually areas) to be forecast before creating the skeleton input files. Variations on a standard setup would only involve changing the standard setup options.

1.2 Some general points about using DF

- The DF model is set up as a series of EXCEL workbooks.
- In Excel 2007 it is necessary to set workbooks to save as the type 97-2003 by default and enable macros and trust access to VBA (see Appendix 2 for instructions).
- When opening workbooks, enable macros.
- When running the DF model or setup program, do not attempt to use other 'instances of EXCEL on the same machine i.e. do not start up one or more copies of Excel.
- Extensive use is made of the EXCEL notes facility to provide guidance on the acceptable contents of data fields. Resting the cursor over a cell containing a red triangle at its top right corner shows its note.
- When the DF setup or model program is running, its progress is monitored in the centre of the screen.
- Widespread data validation is used on data entry.
- Numbers entered by the user on the skeleton workbooks are formatted blue in yellow shaded cells.
- Worksheets are protected, so that only cells where user input is expected will allow data entry. Worksheet protection should not be altered.
- <u>Worksheets</u> within DF files should not be renamed, deleted or re-ordered. DF file names are chosen by the user.
- The extent and format of data entry areas on DF workbooks must not be altered in any way.
- The 'named ranges' in model workbooks must not be changed.
- No cell content should be moved by dragging its box with the cursor, or by cutting and pasting cells should only be copied and pasted as values.
- For data entry on any DF files Ctrl-V can be used as a quick way to 'paste as values'.

1.3 Installation

The DF model has been developed in MS Excel VBA, specifically as a MS Excel 2003 application to run on a standard desktop PC. It is supported in Windows versions since XP, and in Excel versions 2003 and 2007.

For guidance on the correct configuration of security settings in MS Excel please refer to Appendix 2 of this document.

The DF model is installed from a CD. To install the system, copy the DF folder from the CD to your preferred location. Within the DF folder will be the DF 'Setup' file, *DFSetup.xls*, plus a sub-folder, DFSysFiles, which contains all the 'system' files required to run the model.

Once installed, the user will then be able to run the *DFSetup.xls* utility to select and configure a DF model. As part of the set-up process the user will be asked to provide an appropriate identifier (*ModelID*) for three sub-folders which will contain the skeleton files (_skel), input files (_inp) and output files (_out) required to run the DF in scenario mode. In addition the user will be asked to specify a location for these folders.

If, for example, the user chose to place the sub-folders below the main DF folder, the resulting folder structure would be as follows:



1.4 Technical Support

Software use is designed to be intuitive. This manual is designed to give detailed explanation when a user is in doubt. If a user still has problems, technical support is available from Edge Analytics using the following contact details.

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Edge Analytics Ltd Leeds Innovations Centre 103, Clarendon Road Leeds LS2 9DF

Tel: +44 (0) 113 384 6087

Email: popgroup@edgeanalytics.co.uk

In the unlikely event of a software crash, click 'debug' if this option is offered, copy the highlighted code to an email together with the name of the routine named above the code, and send to popgroup@edgeanalytics.co.uk together with details of what actions led to the problem.

1.5 Data Modules

At the time of writing, it is planned to produce Data Modules which will greatly aid setting up a DF model with data from standard UK projections, including those produced by CLG, GROS, and WAG. The manual does not refer to these Data Modules, which will be documented separately, in a supplement to this manual.

2. DF: MODEL METHODOLOGY

The DF model produces its forecasts as a multiplication of two indicators: a forecast population at risk (by age and sex) and a 'derived category' rate (by age and sex).

Derived categories could, for example, be households (defined by headship rates) or the disabled population (defined by disability rates).



Figure 1: Derived Forecast Model - methodology

Algebraically the model is defined as follows:

$$D_{a,s,u,y,d,g} = P_{a,s,u,y,g} * R_{a,s,u,y,d,g} / 100$$

Where:

ast

- P = Population 'at risk' Forecast
- R = Derived Category Rates

and

- a = age-group
- s = sex
- u = Sub-population
- y = year
- d = derived category
- g = group (usually an area, but can be an ethnic group or social group)

The population at risk would typically be derived from a population forecast, making any adjustments necessary (e.g. removing the population not in households) and subdividing into sub-populations where appropriate (e.g. student population).

The derived category forecast may be finally adjusted by 'factors (for example to divide a household population by household size).

The user controls the age-sex categories, the population adjustments and final adjustment, the number of derived categories, the number of groups (areas), and the labels used by the model.

3. DF: SUMMARY OF FUNCTIONALITY

The structure of the DF model is illustrated in Figure 2. On start-up, the user is presented with a number of mandatory and optional steps for 'model configuration'. A large number of the model configuration options will only be used if the user is establishing a new (user-defined) model type or if one of the standard model types (e.g. GROS 2006 household) is being modified in some way.



Figure 2: Derived Forecast Model - structure

Once the configuration options are complete the DF application will create a series of 'skeleton' files that reflect the chosen options. To run the DF model these skeleton files must be populated with appropriate data to create the user's own 'input' files.

Future development of the DF model will provide users with the ability to automatically populate these input files when, for example, a household projection from one of the four UK statistical agencies has been chosen. Until these standard datasets have been created or if a user-defined model is being configured, it is the responsibility of the user to populate the input files with the necessary data.

With a set of input files populated, the user runs the DF using a simple 'scenario' configuration process. A short run-time produces a series of 'output' files from which the user is able to examine data, charts and reports which summarise the chosen derived forecast. Different scenarios can be compared using the 'DFCompare' utility.

The DF user is able to add extensive notes to describe the data and assumptions used in each input file. This information is copied directly to output files to enable the most efficient scrutiny of results.

The following sections guide the user through the use of the DF model as follows:

4 DF configuration - basics

A guide to the standard DF configurations. A detailed guide to the full flexibility of DF configuration is provided in section 8.

5 **Preparing the Data**

The structure and content of each of the key data inputs, distinguishing between the essential and optional files.

6 Scenario configuration

A guide to the options and choices required to configure a model scenario and to run the DF application.

7 Model results

A guide to the output files produced from a model scenario.

8 DF configuration – advanced

A guide to the full set of configuration options available to an advanced user of the DF who is seeking to set-up a new, user-defined model type or is seeking to modify an existing (standard) model configuration.

9 Using DF with Popgroup

A guide to providing the implications for a Derived Forecast of a population forecast, and to constraining a population forecast to meet targets of derived units (for example, a dwellings-led forecast).

10 Help for old friends

A guide for those who have previously used HOUSEGROUP and LABGROUP.

Appendix 1

A summary of the 'sample' files bundled with the DF model providing the user with an introduction to the product.

Appendix 2

Information on how to enable macros in MS Excel.

Appendix 3

Information on the standard model setups for WAG 2006 household, GROS 2006 Household, GROS 2008 household, CLG 2006 household, and CLG 2008 household.

4. DF CONFIGURATION - THE BASICS

4.1 Mandatory configuration steps

As part of the Installation of the DF model the *DFSetup* workbook will have been created in the main DF folder. This workbook is used each time a new model is set up, which will occur the first time the DF is used and/or when the user chooses to configure an alternative DF.

Upon opening the *DFSetup* workbook the user will be presented with an initial form (Figure 3) which requires the following inputs:

- A file header which is to be used on all subsequent input and output sheets
- A label identifier for the skeleton, input and output folders that are to be created
- A selected location for these folders
- A 'model-type', selected from a drop-down list of options



Figure 3: DF mandatory set-up: step one

When all selections have been made, use the 'Next' button to progress to step two of the setup process (Figure 4). This requires the user to identify the 'groups' that are to be used by the model. Groups will most likely be a list of geographical areas, but may be ethnic or social groups.

A 'short-cut' option is available to complete this step, whereby the user can access all group label information from a previous POPGROUP *model_set-up* file, if it exists. Browsing to the correct location and then clicking on the 'Get Labels' button will populate the remainder of the form with the required information on the number of groups, the 'All' groups short and long labels and each individual group's short and long label.

Alternatively, the user must enter this information manually, using the following steps:

• Enter the number of required groups in the 'No. of Groups' box (this will then prompt the user to enter the required information for each group)

- Enter a short label and a long label for the 'All' category. So for example, if the groups consist of all local authority districts in the North West Government Office Region, the 'All ' group short label might be 'NW' and the long label might be North West.
- To short-cut... Browse to identify a POPGROUP model set-up file. Click on Get Labels to POPGROUP Derived Forecasts populate this form with the desired Group definition information. Use Labels from a C:_PGSOFTWAREOFExampleGROSPGNames.xls POPGROUP Model_Setup Get Labels Back No. of Groups Or... 3 Next Enter number of groups required abels for total of all Groups Enter short and long 'ALL' Group Short label Long label labels to describe the Scot Scotland 'all' group Labels for each Group The order given will be used on the input and output files, and printed reports Short label Long label No. Enter short and long AbCy Aberdeen City 1 labels for each group 2 Aber Aberdeenshire 3 Angus Angus
- Enter a short label and a long label for each group.

Figure 4: DF mandatory set-up: step two

This completes the 'mandatory' stages of the DF set-up process. The user may use the 'Back' button to return to step-one or, if they are satisfied with the details provided, use the 'Next' button to progress to the 'optional' stages of the set-up process and/or the creation of the skeleton files to the specification that has been defined.

4.2 Optional configuration steps

The DF model provides considerable flexibility in the set-up process to enable a user to create a bespoke model configuration (e.g. disability model) or to modify the configuration of an existing model (e.g. WAG 2006 households).

These options can be ignored if the user wishes to simply run a scenario using the configuration of an existing model.

Figures 5 and 6 provide an illustration of the options that are available to the user. <u>These are</u> <u>described in detail in section 8 of this manual</u>



Figure 5: DF optional set-up



Figure 6: DF optional set-up: Population Adjustment

To complete the set-up process without making further changes and to progress to the creation of the skeleton files the user should confirm that the selected model type and the 'Base Year' are correct and should then simply select 'Run Setup'.

Section 5 provides a summary of the structure and content of each of the skeleton files and describes the data that is required to transform each to an 'input' file that is required by a DF scenario. A distinction is again made between skeleton/input files that are mandatory and optional.

5. PREPARING THE DATA

5.1 Skeleton/input file summary

Figure 2 has provided an illustration of the skeleton/input files created by the DF set-up process. The skeleton files are to be found in the '*ModelID*_skel' folder. Once populated with data they are saved to the '*ModelID*_inp' folder. They are summarised as follows:

Mandatory	
DFPop.xls	Population forecast by age group and sex for each group (area) by year.
	Note that although this skeleton file is produced each time the model setup is run – it can be substituted at model run-time with a compatible POPGROUP Forecast file by single year of age. To be compatible the POPGROUP file must include data for the set of 'groups' (areas) being modelled.
DFRates.xls	Derived category rates by age group, sex, year – and optionally sub-population type.
Optional	
DFPopAdjust.xls	Population by age group and sex for each group (area) by year that is to be removed or added prior to the application of 'rates (e.g. institutional population when applying household headship rates).
DFSubPop.xls	Sub-populations – allowing age group and sex categories by year to be sub-divided – for example into 'student' and 'non-student' categories.
DFFactor.xls	Specifies a further 'size factor' which can be applied to the derived forecasts disaggregated by category and optionally group (area).
DFCons.xls	Allows the flexible application of constraints to the derived forecasts which can be disaggregated by combinations of age group, sex, sub-population and category or by total. For example, a model for small areas can be constrained to sum to an independent forecast for a larger region. The derived category rates are adjusted automatically to meet the constraint.
Scenario set-up	
DFScenario.xls	Scenario set-up file, to configure and start a DF model run.
Scenario comparison	
DFCompare.xls	A utility to enable users to compare results from different scenarios. This utility is held in the same folder as DFSetup.

It is usual practice to use input file names that extend their skeleton names, so that their content is clear. For example the skeleton DFPop.xls, once filled with data, is saved in the input folder as DFPopXXX, where XXX is the user's choice.

5.2 Data entry rules and validation

Each skeleton file is populated with appropriate data by the user. The 'save as' function is then used to save each file to the '*ModelID*_inp' folder, ready for use in a DF scenario.

For each skeleton file there are 'rules' which will need to be followed in order that data are entered consistently and correctly. To ensure that these rules have been followed there are a number of 'validation' routines. These routines are triggered in three ways:

- 1. Automatically, as the user is entering data
- 2. Manually, using the 'Validate' button on the 'Notes' sheet
- 3. At DF run-time

These validation checks are designed to ensure that:

- Individual data entry items are within acceptable and expected bounds
- Data entry is complete
- Data entry is consistent with the chosen DF configuration

The following sections provide a description of each of these files and the process by which skeleton files are populated with data to produce the input files to the DF. The necessary rules and validation checks are described for each. For illustration, examples are taken from the GRO Scotland 2006 household model.

5.3 Population Forecast - DFPOP.xls

Status: Mandatory - unless user decides to use an existing POPGROUP forecast

Data entry

A key input to the DF is a population forecast, disaggregated by age (and sex) to which a set of derived category rates can be applied. Population forecast data are required for each group (area) specified in the set-up process, with each group represented as a separate worksheet in the skeleton/input file. There is no default or 'All groups' sheet in the DFPop.xls file. Figure 6 provides an example from the GROS 2006 household model.



Figure 7: Example Model: DFPop.xls

The DFPop skeleton file may be populated with data directly from a previously created POPGROUP population forecast. The 'Notes' worksheet of the skeleton file provides the user with the option to locate an appropriate POPGROUP file and to populate the group worksheets with population forecast data (Figure 7). Simply locate the POPGROUP file using the browser, then select 'Load POPGROUP forecast'.



Figure 8: Loading a POPGROUP forecast to DFPop.xls, from the 'Notes' Worksheet

If existing population forecast data from POPGROUP are not available to the user, then data must be entered manually in the format specified in the individual group worksheets of DFPop.xls.

Once data entry is complete the skeleton DFPop.xls should be 'saved as' an input file in the designated '*ModelID*_inp' folder.

Rules & validation

The rules for data entry to DFPop.xls are as follows:

Rules

A population value is required in the base year for each age-sex combination, for each group

If data are provided for the base year only, then the DF will assume all subsequent years have the same data values

If additional data are provided for later (but not contiguous) years the DF will interpolate data for intervening years

If data are provided up to but not beyond some year, then the DF will assume that all subsequent years have the same data as the last year provided.

Data values must be greater than or equal to zero.

If the user attempts to enter invalid data into individual cells they will be prompted with an error message.

To complete a validation of the data entry, the user should select the 'Validate' option from the 'Notes' worksheet (see Figure 7). The validation routine will check each year (column) of each group worksheet. Any errors that are found will be listed in the 'Notes' sheet and included in an accompanying diagnostics table warnings may also be provided to the user (Figure 8 provides an example). The user will be expected to correct errors prior to a scenario run of the DF. The presence of warnings will not prevent the model from running but may affect the model outcome

	Data taken from	:				
	Error (Base					
Group Name	Year missing)	From Group	From Constant	From Interp		
AbCy	0	572	528	0	Aberdeen City	
Aber	0	572	528	0	Aberdeenshire	
List of errors and	warnings from valid	l ation Ip sheet <abcy:< th=""><th>>; values will be</th><th>held constant or</th><th>interpolated</th><th></th></abcy:<>	>; values will be	held constant or	interpolated	

Figure 9: Example of validation checks on DFPop.xls

To double-check, the validation process is repeated at run-time, although the checks will only be made on those years to be included in the forecast. A DF model run will terminate if validation checks fail. The user will again be expected to correct any errors prior to a subsequent scenario run of the DF.

5.4 Population adjustment - DFPopAdjust.xls

Status: Optional - required only if specified at model set-up

Data entry

DFPopAdjust.xls contains data on the population that is to be removed or added prior of the application of the derived rates (e.g. population in communal households). The workbook contains a worksheet for each group plus a 'default' worksheet.

The user must enter population adjustments for each age and sex category. The age categories will match exactly those in the DFPop.xls file but may be more detailed than those in the DFRates.xls file (see below). The DF scenario routine deals with this discrepancy as necessary.

Population adjustments may be actual values, percentage values or a mixture of both, and may be either added to or subtracted from the population forecast or a mixture of both. The user is able to define these options at model setup time, but may also change these choices for any age-sex category on DFPopAdjust.

Derived Forecast - User Defined Exar							nple l	Mode	el 👘														
Trend o	rend of population adjustments (Not in Households), from base year																						
Aberdee	n City																						
And or	Values	Reform	Turt																				
Subject	(II or %)			2001	2002	2005	2004	2005	2006	2007	2000	2000	2010	2017	2012	2013	2014	2015	2016	2017	2010	2019	2020
Carbonard.	N	629.W	0.14	- 72	32	35	- 72	25	25	25	72	72	25	25	32	32	25	25	25	25	35	- 72	- 72
Cabbook	N	Nate	75-75	843	845	843	845	843	843	843	843	843	843	843	843	843	845	845	843	843	845	845	843
Submary'	N	6245W	30.24	003	063	065	063	065	065	065	065	063	065	065	063	065	065	065	065	065	065	065	063
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Subtract!	N	601M	52.54	67	67	67		1	67	1	67		67	10	67	67	10	1	67	1	67	67	1
Subtract.	N	Nate	55-59	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34
Subtract	N	62434	60.64	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34
Sabback	N	Natur	65-65	59	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39
Add	54	6293e	70.74	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44
Add	%	Natur	75-73	88					87	80	89	<u>, 11</u>	/2		<u>78</u>	18	81	83	83	8	87	91	
Add	54	629.W	50.04	71	70	66	- 00	67	00		00	67	90	80	82	96	87	90	104	101	102	107	109
Add	%	Natur	801	152	152	152	152	184	182	155	202	211	248	230	229	247	256	288	2/6	228	304	310	322
Conference.	N	Convin	0.14	21	71	71	21	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71
Sabbaci	N	Pennik	75-75	527	527	527	5007	527	527	527	597	947	527	527	527	5927	527	527	527	527	527	5927	5927
Submary'	N	Cartain	30.24	712	762	762	712	712	712	712	762	712	762	712	762	762	712	712	712	712	762	712	712
Sabbrack Subbrack	<u>N</u>	Pennik:	25-29	187	187	18/		187	18/	187	187	187	18/	187	187	187	187	187	18/	187	18/	187	18/
Construction of the	- C	1 4 1 1 4	107.11		- 2	- 2	- 22	- 2			- 2	- 2	- 2		- 2	- 2		- 2		- 2	- 2	14	- 2
Cohimeri	- C -	Campio	42.44			·····																	
Statistics of	2	Acres 4	45-45	1.1		- 2	- 12		12					12			10	12	12		- 2	12	
Subtract	- N	Camila	50.54								33											30	
Satisfact	N	Const.	55-59	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
Subtract'	N	Carryle	60.64	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Subtract	N	Penak	65-69	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
7.66	56	Carryle	70.74	62	ø	ø	(Q	ø	62	62	ø	ø	ø	62	ø	ø	62	ø	62	62	ø	62	ø
Add	55	Pennik	75-79	166	164	162	150	155	155	152	148	148	148	143	145	148	148	148	146	144	143	144	148
144	56	Convin-	82.84	196	203	242	210	211	206	203	262	262	204	204	190	196	194	196	196	197	203	206	207

Figure 10: Example Model: DFPopAdjust.xls

Rules & validation

The rules for data entry to DFPopAdjust.xls are as follows:

Rules

A data value is required in the base year for each age-sex combination, either in each group worksheet or in the default worksheet.

If data are provided for the base year only, then the DF will assume all subsequent years have the same data values

If additional data are provided for later (but not contiguous) years the DF will interpolate

data for intervening years

If the group sheet has no value (after interpolation), but a value on the default sheet is present then it will be used for the group. A default % is used for each group not specified on its own sheet, while a default N is shared to each group in proportion to its projected population for this age-sex combination.

If data are provided up to but not beyond some year, then the DF will assume that all subsequent years have the same data as the last year provided.

In the 'Values (N or %)' column, the user may only choose to enter 'N' or '%'. '%' refers to a percentage of the group's (area's) population of this age-sex combination.

Changing the 'Values (N or %)' will require the user to select the 'Reformat' option to change the data entry formats in the worksheet.

If the user attempts to enter invalid data into individual cells they will be prompted with an error message.

To complete a validation of the data entry, the user should select the 'Validate' option from the 'Notes' worksheet. The validation routine will check each year (column) of each group worksheet and the default worksheet. Any errors that are found will be listed in the 'Notes' sheet and included in an accompanying diagnostics table.

To double-check, the validation process is repeated at run-time, although the checks will only be made on those years to be included in the forecast. However, an additional validation is performed, comparing the DFPOP.xls with the DFPopAdjust.xls to ensure that population adjustments do not create a population less than zero in any age-sex category.

A DF model run will terminate if validation checks fail. The user will again be expected to correct any errors prior to a subsequent scenario run of the DF.

5.5 Sub-populations - DFSubPop.xls

Status: Optional - required only if specified at model set-up

Data entry

DFSubPop.xls provides data on the population in the selected sub-population(s). It allows age group and sex categories by year to be sub-divided – for example into 'student' and 'non-student' categories, or into marital status categories.

The workbook contains a worksheet for each group plus a 'default' worksheet.

The user must enter a count or a percentage value for each age, sex and sub-population. It is possible to enter data either for all sub-populations as defined or all-but-one of them. This provides the user with the flexibility to define a single sub-population (e.g. students) and to then assume that the 'remainder' of the population constitutes the other sub-population.

The age categories match those of the DFRates.xls workbook.

Data must be entered as counts or percentage values, as specified in the first column of each worksheet.

Derived Forecast - User Defined				Labour Force												
Trend o	stion),	from	base j	year												
Aberdee	in City															
Values 2	Reform	nut														
$(0 \approx 2\phi)$				2001	2002	2003	2004	2005	2006	2007	2009	2009	2010	2011	2012	20/3
N	6043e	15 10	Students	3,290	3,293	3,293	3,293	3,293	3,290	3,293	3,293	3,293	3,299	3,293	3,293	
N	Nato	75-79	Non-Sinderia													
N	6043e	32.24	Children 15	4,015	4,015	4,015	4,015	4,015	4,015	4,015	4,015	4,015	4,015	4,015	4,015	
N	Male	20-24	Non-Electoria													
N	601M	25.25	Statents	850	353	860	353	850	850	850	a 50	850	850	860	353	
N	Male	25-23	Non-Stadents													
N	601A	32.34	Condents .	125	125	125	125	125	125	125	125	125	125	125	125	
N	Male	30-34	Non-Electoria													
N	Ada te	35.35	Condents.	0	9	9	9	9	٩	٩	0	9	٩	0	٩	
N	Male	25-22	Non-Clockets													
N	601W	42.44	Statents	9	9	9	9	0	٩	0	0	٩	a	9	9	

Figure 11: Example Model: DFSubPop.xls

Rules & validation

The rules for data entry to DFSubPop.xls are as follows:

Rules

A data value is required in the base year for each age, sex, sub-population combination, either in each group worksheet or in the default worksheet.

If data are provided for the base year only, then the DF will assume all subsequent years have the same data values.

If additional data are provided for later (but not contiguous) years the DF will interpolate data for intervening years.

If data are not provided for a later year (after interpolation) but a value is available on the default sheet (after interpolation) then the default value is used, as follows.

- If the value is a %, it is multiplied by the group's adjusted population at that age-sex.
 - If the value is N, it is shared to the group in proportion to its adjusted

population among all groups, at that age-sex.

If data are not provided for a later year on both the group sheet and the default sheet, the value on the group sheet will be held constant from the previous year.

If a subpopulation is named on the Notes sheet to be treated as a residual, then the above rules do not apply to this subpopulation. Its data will be calculated as the residual adjusted population, after deducting the other subpopulations from the total for the age-sex category. An error will occur if any data are provided for this subpopulation.

If the user attempts to enter invalid data into individual cells they will be prompted with an error message.

To complete a validation of the data entry, the user should select the 'Validate' option from the 'Notes' worksheet. The validation routine will check each year (column) of each group worksheet and the default worksheet. Any errors that are found will be listed in the 'Notes' sheet and included in an accompanying diagnostics table.

To double-check, the validation process is repeated at model run-time, although the checks will only be made on those years to be included in the forecast. However, an additional validation will take place which aligns the sub-populations with the population forecast on DFPOP to check for consistency. Any inconsistencies will be reported at run-time and the user is given the choice to continue or to abort the model run.

A DF model run will terminate if validation checks fail. The user will again be expected to correct any errors prior to a subsequent scenario run of the DF.

5.6 Derived category rates - DFRates.xls

Status: Mandatory

Data entry

DFRates.xls contains data on the 'rates' which are to be applied to the population forecasts to produce the derived category forecasts. The workbook contains a worksheet for each group plus a 'default' worksheet.

The user must enter rates for each age and sex, for each derived category and for any subpopulation that has been (optionally) defined. The age-sex categories are those defined in the model setup. They may be less detailed than the population adjustment. In the example in Figure 11, the categories are for persons from age 16, while the population adjustment was for males and females separately from age 0 (Figure 9).

Rates must be entered as percentage values. An optional 'annual increment' may be applied, either on a group worksheet or the default worksheet (with the group worksheet value taking precedence if found on both). This increment is applied to each year, either by addition or multiplication, as specified in the 'Notes' sheet of the DFRates workbook.



Figure 12: Example Model: DFRates.xls

Rules & validation

The rules for data entry to DFRates.xls are as follows:

Rules

A data value is required in the base year for each age, sex, derived category and (optionally) sub-population combination, either in each group worksheet or in the default worksheet.

For each year after the base year

- If there is a value on the group sheet this will be used.
- If additional data are provided for later (but not contiguous) years the DF will interpolate data for intervening years.
- If only the default sheet has a value then the group's previous year value will be incremented by applying the change from the previous year on the default sheet. This will be applied by addition or multiplication according to the choice on the notes sheet.
- If neither the group sheet nor the default sheet has a value (after interpolation), the value on the group sheet will be held constant from the previous year.

Addition or multiplication is set on the Notes sheet. The annual increment and the default rates are applied according to this setting, as follows:

- Annual increment, e.g. 1%. Either an addition of 1% each year, or a multiplication of 1.01 each year.
- Default sheet. Either an addition to the previous year's group value of (default value year y – default value year y-1), or multiplication of the previous year's group value by (default value year y) / (default value year y-1). The default sheet is often used to apply the trend of projected change in a reference area (national or regional) to a local area for which only a base year value has been provided.

If the annual increment or the application of default values results in a rate value that is outside the bounds set in the original 'set-up' process (e.g. from 0 to 1) then the rate is changed to the nearest valid value (0 or 1) and a warning provided after validation.

If the sum of rates is outside the bounds set in the original 'set-up' process (e.g. sum to 1), then the rates are scaled to meet the bounds and a warning provided after validation.

Any annual increment will be applied each year from the base year and will overwrite any values provided for later years. It is not used in combination with a trend.

If the user attempts to enter invalid data into individual cells they will be prompted with an error message.

To complete a validation of the data entry, the user should select the 'Validate' option from the 'Notes' worksheet. The validation routine will check each year (column) of each group worksheet and the default worksheet. Any warnings or errors that are found will be listed in the 'Notes' sheet and included in an accompanying diagnostics table.

To double-check, the validation process is repeated at run-time, although the checks will only be made on those years to be included in the forecast.

A DF model run will terminate if validation checks fail with erorrs. The user will again be expected to correct any errors prior to a subsequent scenario run of the DF.

5.7 Size Factors - DFFactor.xls

Status: Optional - required only if specified at model set-up

Data entry

DFFactor.xls contains a 'size factor' which can be applied to the derived forecasts disaggregated by category and optionally group (area). This would be applied, for example, to derive household numbers from household populations as is the case with the WAG 2006 household model.

The workbook contains a worksheet for each group plus a 'default' worksheet.

The user must enter size factors for each derived category, group and year. Rates must be entered as percentage values. An optional 'annual increment' may be applied, either on the group worksheet or the default worksheet (with the group worksheet value taking precedence if found on both). This increment is applied to each year, either by addition or multiplication, as specified in the 'Notes' sheet of the DFFactor workbook.

Derived Forecast - WAG Head of	Example Model															
Calculations on rates, from base year																
Aman																
Category	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
1 person	1.00															
2 person (no children)	2.00															
2 person (1 adult, 1 child)	2.00															
3 person (0 children)	3.00															
3 person (2 adults, 1 child)	3.00															
3 person (1 adult, 2 children)	3.00															
4 person (0 children)	4.00															
4 person (2 adults, 1+ children)	4.00															
4 person (1 adult, 3 children)	4.00															
5+ person (no children)	5.30															
5+ person (2+ adults, 1+children)	5.36															
5+ person (1 adult, 4+children)	5.37															

Figure 13: Example Model: DFFactor.xls

Rules & validation

The rules for data entry to DFFactor.xls are as follows:

Rules
A data value is required in the base year for each derived category, either in each group worksheet or in the default worksheet.
If data are provided for the base year only, then the DF will assume all subsequent years have the same data values.
If additional data are provided for later (but not contiguous) years the DF will interpolate data for intervening years.
If data are provided up to but not beyond some year, then the DF will assume that all subsequent years have the same data as the last year provided.

Values on the default sheet are only used if the group sheet has no value in the base year.

If the user attempts to enter invalid data into individual cells they will be prompted with an error message.

To complete a validation of the data entry, the user should select the 'Validate' option from the 'Notes' worksheet. The validation routine will check each year (column) of each group worksheet and the default worksheet. Any warnings or errors that are found will be listed in the 'Notes' sheet and included in an accompanying diagnostics table.

To double-check, the validation process is repeated at run-time, although the checks will only be made on those years to be included in the forecast. However, an additional validation will take place which aligns the sub-populations with the main population forecast to check for consistency.

A DF model run will terminate if validation checks fail. The user will again be expected to correct any errors prior to a subsequent scenario run of the DF.

5.8 Constraints - DFCons.xls

Status: Optional

Data entry

DFCons.xls allows users to enter data which will constrain the derived forecasts. For **any single year**, these constraints can either be:

- Total constraints
- Category constraints
- Gender-age-category constraints.
- Sub-population constraint if the data are available.

The purpose of the DF constraints file is to force the projection to agree with an independent projection that has already been made but which has less detail than the user's model. For example, a projection for smaller areas may be forced to sum to a previous projection for the larger area which contains them.

There will be a worksheet for each group and an 'All Groups' worksheet. It is possible to choose any constraint option on the 'All Groups' Worksheet or the group worksheet **but not on both**.

The user specifies which constraint options are required in each year. The worksheet will then prompt for data to be entered into the appropriate cells in the worksheet.



Figure 14: Example Model: DFCons.xls

The 'Options Wizard' button provides the user with a flexible way of quickly entering constraint selections into the relevant parts of the worksheet. Data must be entered when selections have been made. Alternatively, the user can simply 'double-click' on the relevant cell to select an option and to enter data appropriately.

The options wizard allows constraint options to be chosen for multiple areas at one time



Figure 15: Options Wizard in DFCons

To assist with editing, a number of 'Clear' functions are provided, allowing selections on a sheet or all sheets to be removed and to also remove both data and selections simultaneously.

Initial results for the derived units will be adjusted by scaling to the values given on this workbook. The user's forecast will be adjusted to agree in total or in detail with the constraints applied. The DF model will also rescale the derived unit rates to be consistent with the constrained forecast. The adjusted rates appear on the output file DFRatesOut.xls. Note that it is possible for this rescaling to result in rates that no longer adhere to the rules for derived unit rates specified on DFSetup.

Rules & validation

The rules for data entry to DFCons.xls are as follows:

Rules

In any year only one constraint option may be chosen on any sheet.

In any year a constraint may only be chosen on either the Group sheet or the 'All Groups' sheet - not both.

Where data are provided for each selected year for a particular constraint type, these will be used.

Non-contiguous values for the same type of constraint will be interpolated where no other constraint types are used in intervening years.

Values will be held constant where contiguous blank cells for a selected constraint type follow one or more defined values and where no other constraint types are used in intervening years.

If the user attempts to enter invalid data into individual cells they will be prompted with an error message.

When removing an option for which data has been provided, any data entry will remain but will be formatted grey and not used in a forecast. If the option is reinstated the data will become visible again.

To complete a validation of the data entry, the user should select the 'Validate' option from the 'Notes' worksheet. The validation routine will check each year (column) of each group worksheet and the default worksheet to ensure that data has been entered where required. Any errors that are found will be listed in the 'Notes' sheet and included in an accompanying diagnostics table.

To double-check, the validation process is repeated at run-time, although the checks will only be made on those years to be included in the forecast.

A DF model run will terminate if validation checks fail with errors. The user will again be expected to correct any errors prior to a subsequent scenario run of the DF.

6. SCENARIO CONFIGURATION

The DF is run from the DFScenario.xls workbook (Figure 15). It specifies the input files that are to be used.



Figure 16: Example Model: DFScenario.xls

There are a number of fields which need to be filled within the DFScenario.xls file. Guidance is as follows:

Input	Description and requirement
Scenario identifier	A unique name for the scenario, used as a suffix on all output files.
File header	A header to appear in each output file.
Other information	Optional additional information which will also appear in each output file.
Final year for the forecast	This must be at least one greater than the base year, and no greater than the maximum number of years of data validated on "DFRates", or the maximum number of years of population forecast available.
Default folder for input workbooks	If no explicit paths are provided in the separate entry of the input workbook names (see below), this folder will be used to search for them. This folder is also used to store DFScenario.xls after the forecast has been run, with the name chosen by the user in 'Scenario identifier' above.
Default folder for output workbooks	This folder will be used to store the output workbooks from the forecast routine.

Input workbook names	The user must enter the names of the input files to be used in the scenario. If a workbook is not in the folder specified above, its name must include its full path.
Names to be given to the three output workbooks.	If the workbooks are not to be stored in the default output folder, their names must include the full path. Automatic names for these three workbooks are provided, based on the scenario identifier.
Name by which DFScenario.xls will be saved	The DFScenario.xls workbook will be saved for reference purposes in the default input folder, under the name provided here.
Notes	Notes can be added to summarise the assumptions, for example. They will be reproduced in the main forecast output workbook.

The DF carries out the following checks before it produces the forecasts:

Check	Outcome of check
Is the final year chosen for the forecasts within allowable bounds?	IF NO, the program provides an on screen message and then terminates.
Do the default folders exist?	IF NO, the program provides an on screen message and then terminates.
Does each named workbook exist?	IF NO, the program provides an on screen message and then terminates.
Do any of the output workbooks already exist?	IF YES, the user is asked whether it is to be overwritten. If the answer is "no" the program terminates.
Are all files used in the scenario consistent with each other (have they all been configured using the same 'model setup'?	IF NO, the program provides an on screen message and then terminates.
All files are again validated for content, regardless of whether the user has validated previously.	IF any errors are detailed, the program provides an on screen message and then terminates.

If all the required workbooks are present, and contain no errors, the forecasts are generated and a series of output workbooks are created in the *ModelID_out* folder

The DFScenario workbook is saved with a name ending with the identifier supplied, allowing the user to run a forecast again, after amending the input workbooks, without repeating the required data entry process.

7. MODEL RESULTS

7.1 Output file summary

Figure 2 has provided an illustration of the output files created by the DF scenario model. The output files are to be found in the '*ModellD*_out' folder. Each file will have the scenario identifier (*ID*) suffix that was defined in the DFScenario.xls file. They are summarised as follows:

DFForecastDetail_ID.xls	Full detail Derived Forecast counts by group (area) and year – disaggregated by age group, sex, category and (optionally) sub-population.
DFForecastTotal_ <i>ID</i> .xls	Total Derived Forecasts by group (area) and year by category.
DFRatesOut_ <i>ID</i> .xls	Derived Category rates used in the forecast by group (area) and year – disaggregated by age group, sex, category and (optionally) sub-population.
DFRiskPop_ <i>ID</i> .xls	Population counts by group (area) and year by age group and gender and (optionally) sub-population.
DFReporter_ <i>ID</i> .xls	A utility for producing reports and charts from the scenario results, to user-specification
DFCompare.xls	A utility for comparing the results from two or more scenarios. Not produced from a scenario run but will be present in the same folder as the model setup file.

In addition, a utility on the DFReporter_*ID*.xls allows all the output to be written to a single Excel sheet. This 'dump file' is suitable for export to other software for further analysis.

The following sections provide a description of each of these files and their content. For illustration, examples are taken from the GRO Scotland 2006 household model.

7.2 Detailed Forecasts - DFForecastDetail_ID.xls

The most detailed output provides, for each group (area), a disaggregation of derived category counts by age and sex for each year of the forecast (Figure 16). If sub-populations have been defined, these will be included as an additional dimension to the output.

An 'all groups' worksheet is included, which is a summation of the individual group worksheets.



Figure 17: Example Model output: DFForecastDetail_ID.xls

7.3 Summary Forecasts - DFForecastTotal_/D.xls

A more aggregate version of the previous output is provided, presenting derived category counts for each year of the forecast, summed over all age-sex categories (Figure 16). Again, if sub-populations have been defined, these will be included as an additional dimension to the output.

An 'all groups' worksheet is included, which is a summation of the individual group worksheets.



Figure 18: Example Model output: DFForecastTotal_ID.xls

If the size factors have been used from a DFFactors input file, then the DFForecast_Total_ID contains the final derived units *after* application of the factors, and the factors themselves, while DFForecastDetail_ID contains the derived units by age and *before* application of the factors

Note that in some rare cases it may be impossible for the model to calculate the 'factor' values. This may occur on the <All Groups> sheet where a zero Derived Forecast would lead to a division by zero and therefore a factor value cannot be calculated – even though there may have been a value for each individual Group sheet. These instances are marked

in the output by an asterisk (*) accompanied by an explanatory note at the bottom of the data panel.



Figure 19: Asterisk where factor value cannot be calculated

7.4 Derived Category Rates - DFRatesOut_/D.xls

The derived category rates used by the DF are provided for each age, sex and derived category combination for each year of the forecast (Figure 19). If sub-populations have been defined, these will be included as an additional dimension to the output.

An 'all groups' worksheet is included. These data will differ from those in the original DFRates.xls 'default' worksheet as they will be a calculated average of the rates used for individual groups.

The 'final' set of rates that is presented in DFRatesOut_*ID*.xls will be consistent with the original data created in DFRates.xls unless the following changes have been made:

- Constraints have been applied to the scenario output in the DFCons.xls workbook
- An annual increment has been specified in the original DFRates.xls
- Infill and interpolation has been required to produce the complete set of rates specified in the original DFRates.xls

If any of these conditions are met, the DF recalculates derived category rates after scenario results have been derived.



Figure 20: Example Model output: DFRatesOut_ID.xls

Note that in some rare cases it may be impossible for the model to calculate the 'rates' values. This may occur on the <All Groups> sheet where a zero population would lead to a division by zero and therefore a rate value cannot be calculated – even though there may have been a value for each individual Group sheet. These instances are marked in the output by an asterisk (*) accompanied by an explanatory note at the bottom of the data panel.

	f echili, f child	2.03.	20%	2.0.97	20%	2.0.8	20%	2.035	20%	2.035	2056	2.035	20%	2.0.8	20%	2.035
	f peroto, ternete	2.036	20%	2.0%	20%	2.035	20%	2.035	20%	2.035	20%	2.035	20%	2.035	20%	2.036
	f person, male	2.035	2.0%	2.0%	20%	2.035	20%	2.035	20%	2.035	20%	2.035	20%	2.035	2.0%	2.035
	2 people, ell'echil	2.0%	20%	2.0%	20%	2.035	20%	2.035	20%	2.0%	20%	2.035	20%	2.036	20%	2.035
	2 Cartoli, 7 Christian	2.035	2.0%	2.0%	20%	2.035	20%	2.035	20%	2.035	20%	2.035	20%	2.035	2.0%	2.035
	3 (person, will widelf	2.035	20%	2.0%	20%	2.035	2.0%	2.035	20%	2.035	20%	2.035	20%	2.035	20%	2.035
Cleanna Rhi Shalenia	field, 2schilden							-								
	f echal, f child															
	f person, termete	-						-								
	f person, male															
	2 people, ell'echil															
	2 Cardoll, 1 Considered	-		-				-		-		-				
	3 (person, will widelf							-								
		<u> </u>														
		 Zero pri 	publica le	et lo a Div	secoldy as	no when I	ed-of-	faling Re	les lor «Sa	21						

Figure 21: Asterisk where rate value cannot be calculated

7.5 Population-at-Risk - DFRiskPop_ID.xls

This output file contains the adjusted population, disaggregated by age and sex and the adjustments made to reach the adjusted population (Figure 21). If sub-populations have been defined, these will be included as an additional dimension to the output.

An 'all groups' worksheet is included, which is a summation of the individual group worksheets.



Figure 22: Example Model output: DFRiskPop_ID.xls

7.6 Reports and Charts - DFReporter_ID.xls

The 'DFReporter' file provides the flexibility to produce reports and charts, with data aggregated across user-defined categories.

Reports

The **Reporter** worksheet presents the following options:

POPGROUP Derived Forecasts Report Generator - Example Area					
Report Level	Current Selection				
Gender Age	All Persons All Ages				
Population Groups Years Category types	Each Coup and Total Loch Year Each Category				
Change decomposition	No Decomposition				
	Change Report Options	Produce Report			
Results dump file	Orthearth Edge Analytic Alfragert ADHDH_patiela	Bang_Ngratan-Kebata			
		Produce durip life			

Figure 23: Report Generator

If the user wishes to accept the default selections, the 'Produce Report' option will prompt the user to give a label to the resulting report worksheet. A Summary Report will then be produced as follows:

Derived Forecasts	Summary Rep	ort		1	Migratio	n-led					
User Defined - All Pers	sons - All Ages										
Example Area											
Category type	7991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Couple	188,995	188,245	187,595	189,310	190,317	191,561	193,402	193,692	193,521	193,878	195,188
core parent	21,003	22,609	23,235	23,739	24,214	24,090	25,023	25,244	25,455	25,725	25,942
Other multi person	18,793	18,962	19,170	19,370	19,741	20,029	20,312	20,582	20,680	20,891	21,187
One person	00,505	90,278	81,811	83,281	95,705	98,100	89,001	100,604	101,609	103/3311	105,517
Concealed family	1,875	1,838	1,837	1,835	1,933	2,001	2,042	2,053	2,063	2,067	2,071
lolui	320,013	321,934	323,749	327,551	331,901	335,609	340,110	347,745	343,409	345,893	349,905

Figure 24: Summary Report

Important Note for those using Size Factors (e.g. average household size)

Note that depending on the selections made the reporting and charting routines will pick up data from different model output files. If the model setup included the use of 'Factors' (i.e. perhaps converting between 'household population' and 'households') this can mean that different units will be displayed in the outputs.

Where user choices are 'All genders', 'All ages' and 'All sub-populations' (where there are some) model output data will be retrieved from the *DFForecastTotal.xls* file otherwise data

will be retrieved from the *DFForecastDetail.xls* file. Where 'Factors' have been used this will result in different output units being used and displayed for different requests.

For example – where factors have been used to convert from 'household population' to 'households' a user selection involving 'All genders', 'All ages' and 'All sub-populations' will result in 'Household' output being displayed. Any more detailed selection – i.e. where perhaps individual age groups or genders have been selected – will, in this case, result in 'household population' data being displayed. Where factors have not been used, a request involving an age-sex group gives the households headed by that age-sex group.

The units being displayed will be indicated at the top of the report or chart.

Report Options

The format and content of the reports can be controlled using a series of options which are accessed from the 'Change Report Options' button. The following options may be selected:

(a) Gender and Age-groups

Beport Options	
Sender & Yor Equivisions Souge Vewn Calescales Deconnoction - Danka	
C. Rock was done	
E Republican data includes all age groups	OK Canol

The default selection is 'All persons' and 'All Ages.

Users have the option to choose 'all persons' or to select either male or female.

For the illustration of age-specific data, 'all ages' is the default or, if data are available, a single age-group can be selected or a user-defined age-range.

(b) Population groups

Report Options					
Gender & Age Population Groups Population Groups G Data Groups G Data Groups C Sen stal Groups Population Groups Population Populatio	Conception Decomposition C New Reages V. Form				
Population data inductor of age groups OK Convex					

By default each population group (area) and the total will be displayed in the report.

The user can choose to display just the sum of all groups, an individual group (choose below) or can create an aggregate as the summation of groups (see guidance on creation of aggregates below).

(c) Years

Report Options		_
Gender & Age Populations Groups	Tears Categories Decomposition	
	Start year Dury two year Selecter year 2006 2007 2008 2019 2019 2019 2019 2019 2019 2019 2019 2019 2019 2019 2010 2010 2011 2012 2013 2014 2012 2013 2012	
	Population data includes all age groups	OK Ower

(d) Derived categories



Each year is displayed by default but the user may chose to display just every five years, or selected years within the forecast period.

For 'Selected years', use the control and shift keys to select more than one year.

By default the report will display results for each Derived Category.

If 'Default Category Groups' have been specified during model set-up then the option to display these will be available.

Users may also create aggregates of categories (see guidance on creation of new groups below).

(e) Decomposition



Decomposition illustrates the relative impact of population change and change in the Derived Category rates upon the final household numbers.

The default setting is for no decomposition to be displayed.

If the user wishes to see decomposition statistics then a start and end year must be selected.

The 'Population effect' is the change in derived units if the Derived Category rates were to remain constant. The 'Rates effect' is the remainder of the projected change in derived units.



(f) Population per Derived Unit

A tick box 'Population per derived unit' is included on the main part of the form.

Where age groups used within the model sum to the 'total population' (i.e. includes child age groups) the reporter can produce an additional indicator which is 'total adjusted population' / 'derived units'. For example in household projections this indicator is the average household size.

(g) Dump file

The reporter provides the facility to produce a results 'dump file'. This takes output from each of the model files and writes it to a 'flat file' format where it may be easily imported into other applications for further analysis and/or processing.

Charts

The Charter worksheet presents the following options:

POPGROUP Derived Forecasts Chart Generator - Example Area				
	Elack and White Charts			
Chart Level	Current Selection			
Population Groups	Each Group and Total All Persons			
Category types	All Categories			
Chart type Derived Units or Rates	Each age group given year Derived units			
Change Chart Options	Produce Chart Save New Chart			
Quick Charts	Quick Charts for year. 2006			

Figure 26: Chart Generator

Again, the user may accept the default selections and select the 'Produce Chart' option. This will prompt the user to give a label to the resulting chart worksheet to generate the following type of output:



Figure 27: Summary Chart

The content of the charts can be controlled by the user using a series of options which are accessed from the 'Change Report Options' button. The following options may be selected:

(a) Chart type

Chart Options Chart Options Populations Graces Care Coart Type	алы -	
Contrace group given year Year 2001 2002 2003 2005 2006 2009 2009	C Den year given age group Genter Ø al passens C Hule C Hule C Hunde C Hunde	
Refer of Defued units	Ø Denved Units	
		UK Canal

(b) Population Groups

Chart Options	
Chart Options Populations Groups Categories	
Population Service Population Service Same of all Groups C Individual Groups	C New Groups
Area I - DTM Poenple Area 2 - DTM Example	
	OK Canal

The default selection for the Chart Type is to display a graph of the <u>'derived unit</u>' for <u>each age-group</u> in a <u>given year.</u>

The user can configure this to change the specific year and/or to choose to display <u>rates</u> rather than derived units.

In addition, the user can modify the chart type so that it displays a graph of the derived units (or rates) for a <u>selected age-group</u> across <u>each</u> <u>year</u>.

The default selection for the Population Groups is to display 'Each Group and Total'.

Additional options allow the user to display just the sum of all Groups, or just individual Groups.

In addition, there is an option to create Aggregates of Groups (see guidance on creation of aggregates below).

(c) Categories

Chart Options		х
Chart Options Populations Groups Calcigores		
Categories		
P Al Catagorea	C Catagory Group	
C Endendual Category	Debre	
Liperson Ziparson (na childran)		
2 person (Ladub, Lichts Sportson (Edulation)		
Sperson (2 adult, 2 child Sperson (2 adult, 2 child A server (2 del can)		
Approven (Cadula, 11 d Approven (Cadula, 2 d)		
Sit person (reichidren) Se person (2+ adulte, 1)		
Siliparson (Ladul, 11d		
1	l	
	OK Canad	

The default settings for the derived 'Categories' is to display 'All Categories'.

This can be modified to display an Individual Category or the user may create an 'Aggregate of Categories' (see guidance on creation of new groups below).

Figure 28: Chart options

(d) Quick Charts

A 'Quick Charts' option is also provided from the Charter worksheet. This produces a set of 'rate' graphs for a specified year for each of the Derived Categories as follows:



Figure 29: Quick Chart output

Creating aggregates of Groups or Categories

A number of the Reporter and Charter options enable the user to 'create an aggregate' (e.g. of two or more population groups or of two or more categories). The functionality for achieving this is identical for each option and guidance is provided in the illustration below:



Figure 30: Creating a new group in Report and Chart Options

7.7 Comparing Scenarios – DFCompare.xls

An additional 'Comparison' utility is provided to enable DF users to compare output from alternative scenarios. This utility can be found in the folder where the model setup file resides. The interface to this utility is illustrated below. The user must first specify the 'folder' location of the output files to compare. Data from each DFForecastTotal_*ID* file are used in the comparison.

Following the steps detailed on the worksheet:

- 1. The 'Refresh' option identifies all the output files available for comparison. Delete as appropriate.
- 2. The 'Get output workbooks' option reads each of the selected files and creates the data necessary to produce the comparison.
- 3. The 'Run Summaries' option produces the pivot tables and charts which compare scenario output.
- 4. The 'Change Default' option allows the user to specify which group (area) they wish to be the default in the chart illustrations.

POPGROUP Derived Forecasts Comparison of Forecasts Audue click to honses for andher folder Cutered folder to search Sep 1 March Deforecast folds_Social of - Supprison-led xis Deforecast		1. Select folder where	
PDPGROUP Derived Forecasts Comparison of Forecasts Cubel click to braves for another folder Cubel click to braves for another folder Cubel click to braves for another folder Der Fa Vertragen and braves for another folder Step 1 Vertragen and braves for another folder Step 1 Vertragen and braves for another folder Step 2 Step 3 Polace summay charts and data Produce summay charts and data Produce nummay charts and data Chart countert selections and deleter at		output files are located	1
POPGROUP Derived Forecasts Comparison of Forecasts Step 1 Use Televine for the answer of output folder to searcher Output folder to searcher Class of the answer of output to the name of output folder to searcher Step 1 Use Televine for the answer of output to the answer output to the answer of output to the answ			
Comparison of Forecasts	POPGROUP Derived Forecasts		
double click to browse for another folder Output folder to search: CutersNI Edge AnalyticsProjectsScolandDP_cot Step 1 Image: Click to Browse for another folder Durb Folder to search: Image: Click to Browse for another folder Step 1 Image: Click to Browse for another folder Durb Folder shares of output folder to search: Image: Click on the click to Browse for another folder Die ForecastTotal_Scotland - Migration-led xis Die ForecastTotal_Scotland - Migration-led xis Die Search and a data irom the workbooks: Click data from workbooks: Step 3 Click data from workbooks: Produce summary charts and data. Produce Step 3 Click Search and Search Produce summary charts and data. Click Search Click contrem selections and delee all summary sheets Click Search Default population group (click on dropdown to select a different proce allows the user to choose the default	Comparison of Forecasts		
Audbe click to browse for another folder Current scheder			
Output tolder to search: Evidence1 Edge AnalyticsProjectsSootlandDE_ox Step 1 Use The first hits busin to list and output lifeth, Edeler and use of tolder. Deferences Total_Scotland - Migration-led xis DFForecessTotal_Scotland - Diverbilings xis DFForecessTotal_Scotland - Diverbilings xis Diverbilings and adda form the volted data from th		double click to browse for another folder	
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Use Pariesh list button to list names of output lifes that begin with DFF orecast Total_Scotland - Migration-led x/s DFF orecastTotal_Scotland - Migration-led x/s DFF orecastTotal_Scotland - Divellings x/s DF orecastTotal_Scotland - Divellings x/s Default population group (click on dropdown to select a different group Clear current selections and delete all summary sheets Default population group (click on dropdown to select a different group Default population group (click on dropdown to select a different group Orepose the default	Sten 1	List of derived forecast files in the nominated output folder	
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Step 2 Dick/ Exer day to load data from the workbooks. Once loaded, define "aggregates of groups' if required. Step 3 Produce summary charts and data. Produce summary charts and data. Default population group (click on dropdown to select a different group. Default population group (click on dropdown to select a different group. 2. Drop down menu allows the user to choose the default	in the nominated output folder. Delete any	DFForecastTotal_Scotland - Dwellings.xls	
Step 2 Click 'Get data 'too load data from the workbook. Done loaded, define 'aggregates of groups' if required. Cet data from 'workbook. Done loaded, define 'aggregates of groups' if required. Step 3 Produce summary charts and data. Produce Summarie Clear current selections and delete all summary sheets Clear Selection Sites Steep 3 Default population group (click on dropdown to select a different group allows the user to choose the default) 2. Drop down menual allows the user to choose the default	you don't want to include.		
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*aggregates of groups' if required.	workbooks. Once loaded, define w orkbooks		
Step 3 Produce summary charts and data. Produce summaries Clear current selections and delete all summary sheets Clear Selection & Sheets Default population group (click on dropdown to select a different grour allows the user to choose the default 2. Drop down menu allows the user to choose the default	'aggregates of groups' if required.		
Step 3 Produce summary charts and data. Produce Summaries Clear current selections and delete all summary sheets Clear Selection & Sheets Default population group (click on dropdown to select a different group choose the default 2. Drop down menu allows the user to choose the default			
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Default population group (click on dropdown to select a different group ▲ 2. Drop down menu allows the user to choose the default			
allows the user to choose the default		Default population group (click on dropdown to select a different group	2. Drop down menu
choose the default			allows the user to
			choose the default

Figure 31: Example Model output: DFReporter_ID.xls

An additional option allows the user to specify alternative aggregations of the Derived Categories for the comparison worksheets. The simple method is illustrated below, with a four-step procedure. First select the number of aggregates required; second, give a name to the aggregates; and third, allocate each Derived Category to one of the aggregates. The user may also specify whether a total is required of the aggregates specified and if this is the case then the user may enter a name for the Total of Aggregates. If the aggregates do not

include all the categories, their total will not be the same as the overall total of categories. All selections will then appear as extra comparison sheets.



Figure 32: New group definition in DFCompare

Based on the options selected, DFCompare will compile a worksheet containing a Pivot Table of the data and will provide a series of charts which compare the results of the scenario results that have been identified in the header sheet:



Figure 33: DFCompare – comparison charts

8. DF CONFIGURATION – ADVANCED

8.1 Summary of options

The DF set-up process provides a range of options which are likely to appeal to more advanced users of the model. These options allow a user to modify the configuration of an existing model type (e.g. GROS 2006 household) or to create a new model type to a precise specification. A modified or new configuration will result in a set of skeleton files which the user will populate with appropriate data.

The options available to the user are contained within a single form (Figure 33) and may be roughly identified as those which modify the age-sex configuration (left hand portion of Figure 33) and those which modify the derived categories (right hand portion of Figure 33).

POPGROUP Derived Forecasts Model Selections	
VodelType Busic GROS 2005 Honsechold 2	Year Back Run Schup
Age / Sex groups	Derived Units Builty
Chose a set of Age/ Sex groups GR GS 2006 II outschold · Ven Eabert on Age/ Sex groups is GR05 2006 Illouischold	Choose type of Denved Unit rates GR 03: If and off I outwohild Var Later for Denved Unit rates rat. GR03: If and off I outwohild
Propublican Adjustment Make Population Adjustment	Chouse Derived Units If ourseholds Labert for Derived Units rat. If ourseholds If ourseholds
Adjustment applied using	Value of each rule C 0 or eve C from 0 (1) C No Linit Sam across categories C Samis 1 (C) Tor Leas C No Linit
Sub Populations	Calculations on Hensed Units C. Note: C. Notejay G. Nase
Illes Sub Reputations C. Yus. Stream	

Figure 34: DF configuration options

The remainder of this section provides a summary of the functionality that is available from each of the advanced options.

8.2 Modification of age-sex groups

The first of the advanced options available in the DF set-up process is the ability to specify which age groups are required for both the Derived Units and/or for the Population Adjustment (they may be different). Select the 'Modify' button to edit existing categories.

As shown below in Figure 34, for both (1) Age Groups in Derived Units and (2) Age Groups in Pop Adjustment, there must be either female or male, or persons age categories with the necessary requirement that the final age, such as 85, must end with a plus sign.

The user has a number of options to 'clone' data from one selection to another to simplify the configuration process.

In order to verify if the age categories are correct there is the option to 'View', which allows the user to ensure the age categories are the ones desired.

Skeleton files will be configured accordingly and data will be expected for the specified agegroup configuration.



Figure 35: Modification of age-sex groups

8.3 Sub-populations

The Sub-Populations option allows a specific focus on one of the population age and sex groups. An example of this would be the ability to divide the population into students and non-students, and specify different adjusted populations and rates for each different subpopulation.

If the Sub Population option selected is 'Yes', then the user must choose 'Modify' and then specify at least two individual sub-populations (students and non-students, for example, or different marital statuses). A title is then required, such as 'Student status' or 'Marital status'.

Sub-Populations	Specify Sub-Pops	l
Use Sub-Populations	C No	
Label for the Sub-Populations		
		POPGROUP Derived Forecasts
		Modify Sub-Populations
		No. of Sub-Populations Finished
		No. Data Description Name
		1 Students
		2 Non-Students

Figure 36: Specification of sub-populations

Skeleton files will be configured accordingly and data will be expected for the specified sub-population(s).

8.4 Population adjustment parameters

The Population Adjustment options allow the user to specify the rules which dictate how the final 'population-at-risk' is determined. The user can choose whether or not to make an adjustment to the population (removing people not in households, or adding visitors, for example).

Population Adjustment		
Make Population Adjustment	💽 Yes	🖸 No
Title for Population Adjustment		
Adjustment applied using	© %	🔲 Number
Adjustment method	🌅 Add	🖸 Subtract

Figure 37: Population adjustment parameters

If an adjustment is chosen then the user must supply an appropriate title. In addition, the method by which the adjustment needs to be made must be specified: '% or number' and

whether the value needs to be added or subtracted from the base population. These will be defaults which the user can also alter on the input file for one or more age-sex groups.

The skeleton file will be configured accordingly and data will be expected to enable the population adjustment to be applied.

8.5 Modification of derived categories

Within the advanced setup the user also has the option to modify the derived units (Figure 37). The 'Modify' button allows the user to edit an existing set of derived units or to create a new set from scratch.

Once complete, the user can select a name for the final derived units and can provide a separate 'title' for the definition.

The 'View' option allows the user to review the derived units either prior or after any amendments have been made.



Figure 38: Modification of derived categories

8.6 Validation options

The user must also select the 'Validation' options that are to be applied to the 'rates' that will be input for each derived unit. This validation specifies the 'value' of each rate and the expected 'sum' of rates across categories. The DF will use these parameters to guide its validation, both during data input and at scenario run-time.

Validation			
Value of each rate	🖸 0 or +ive	💽 From 0 -1	🖸 No Limit
Sum across categories	🚺 Sum To 1	1 or Less	🖸 No Limit

Figure 39: Validation options

8.7 Calculations on Derived Units: Size Factors

In some cases it will be necessary for an additional 'factor' to be applied to calculate the final derived units total. This is the case in WAG, for example, where an 'average household size' is required to convert the calculated derived unit population into a number of households.

This information will be held within the DFFactor.xls file and must be specified at set-up as either a 'Divide' or 'Multiply' calculation.

C None				
Average Houshold Size				
Label for Final Derived Units after factors				
1				

Figure 40: Calculations on derived categories

The DFFactor.xls skeleton file will be configured according to the selection and data will be expected to enable the DF scenarios to be run successfully. Validation checks on data input and at run-time will again assist this process for the user.

9. USING DF WITHIN PG - INCLUDING SUPPLY-LED POPULATION PROJECTIONS

9.1 Summary

The DF model has the flexibility that allows it to be used within POPGROUP for the production of population forecasts which are constrained by derived forecasts. This means that POPGROUP can be used to produce housing or employment led forecasts for example – where the DF is used to change the migration to meet a specific target. It can also be used to simply report the implications for the derived units of the current population projection.

This functionality replaces similar functionality that allowed POPGROUP to run using HOUSEGROUP (HG) and/or LABGROUP (LG) files. The POPGROUP link to DF requires an updated version of POPGROUP that is only compatible with the DF model. The updated version will no longer work with HG or LG files.

The updated functionality has meant that a number of PG files have now changed. There is a new format for the PG constraints file and the Constraints_and_impacts sheet on the PG scenario file. The HHDwell.xls and LFJobs.xls files have been replaced with a new file – DFSupply.xls

Previously the operation of this functionality was covered in the PG Reference manual. Given that the operation has now changed some of this information is repeated here in an updated form to reflect the new link to the DF model.

9.2 PG Constraints

In deriving a population forecast constrained by either population or a derived forecast POPGROUP will adjust the migration flows until the constraints are met. In addition to the application of population constraints (covered in the PG reference manual) the following constraints may be used within a PG forecast.

Derived and Supply unit constraints

- Provide change in total derived units (e.g. households or labour force)
- Provide change in total supply units (e.g. dwellings or jobs

The rules for PG constraints are that in any year:

- 1. At most one of the Options may be chosen on any sheet.
- 2. Each group must have the same option (or none) chosen.
- 3. All-groups and Groups for derived and supply unit constraints cannot both be chosen.
- 4. If All-groups and Groups population constraints are chosen, the All-groups must be more detailed than the Groups.



Figure 41: Derived & supply unit constraints section within PG constraints file

It is possible to specify *population and derived unit* constraints in the same file. This might be done if a constraint to ONS or other mid-year estimated populations is required for early years, and a constraint to housing or labour force targets (for example) is required for later years.

It is possible to specify both a *population constraint for each Group and for All- Groups*. This might be done to use ward totals with a district age-sex structure, each estimated for recent years. If the two constraints are inconsistent, the All-Groups constraint takes precedence: the Group constraints are scaled to agree with them.

The calculations to adjust the migration flows to be consistent with the constraints specified are described in detail in Chapter 6 of the PG Reference manual. By default, the first migration flow (the UK in-migration unless labelled otherwise by the user) is adjusted. Alternatively, all four flows, or any weighted combination of them, can be specified on the PG Scenario file at the time of a forecast.

On validation, a 'diagnostics table' is written to the "Notes" sheet, summarising the options chosen on the workbook.

The constraints workbook validation routine carries out the following checks:

Rules
Only one option may be chosen for any year on any sheet.
For any chosen option, a non-blank entry is required for each appropriate data entry. For population constraints, either 5 year or single year values are allowed.
If constraint data are entered, the appropriate option must have been selected.

For Derived unit or Supply unit options, there cannot be a constraint on the "All Groups" **and** on Population Group sheets

For derived forecast or population constraints, if a constraint is given for any individual population group, a constraint must be provided for each population group.

For population constraints, a constraint may be provided on both the "All Groups" sheet and on each population sheet. In this case, the following combinations are allowed:

– Total population on each group sheet, 5 year or 1 year on the "all groups" sheet.

- 5 year constraints on each group sheet, 1 year on the "All Groups" sheet.

In any year, there cannot be a population constraint for "All Groups" and a DF constraint for individual population groups, or vice versa.

If any of these rules is not followed, a note of the error is provided on the "Notes" sheet of the workbook. The forecast program will terminate if an error is detected on the constraints workbook.

9.3 DFSupply: converting between Derived Units and their supply unit equivalent

A conversion file may be used to transform the derived units into their supply unit equivalent. For example households may be converted to dwellings or labour force may be converted to jobs. These 'supply' conversions may be used as a constraint or to report the implications of a population forecast.

A further POPGROUP input file DFSupply is used to specify this conversion. The DFSupply.xls file replaces previous files HHDwell.xls and LFJobs.xls which were used to convert from households to dwellings and labour force to jobs respectively. The DFSupply.xls file allows for specific households and labour force conversions (as before) and also allows for a general conversion factor to be used where the detail of the separate housing and labour force rates is not required or where the derived units are neither households nor labour force. These choices are selected from the "Notes" sheet of the DFSupply.xls file.

le anna bha ait le nia scharachaich ba ait a	the annual strength the ratio and some for the the week land.				
The same section $M(r) > 0 > 0 > 0$, where is because the solution of provide the solution of the provident of the solution $(r, r) > 0$, where $r > 0$ is the solution of th					
Angle conversion with derived and the pily and a	e				
${\bf x}_{\rm eff}$ and ${\bf x}_{\rm eff}$ is the second state of the second ${\bf y}_{\rm eff}$ contains the second state ${\bf y}_{\rm eff}$	4				
calculation for the select constraints for an analysis and and a second	e				
ann Albahaltaite					

Figure 42: DFSupply choice of conversion factors

The DFSupply file also provides the option of naming the supply units (e.g. Dwellings or Jobs). This label is used in the model output.

The DFSupply.xls file allows the following:

- One overall conversion factor – derived units / supply units.

Population Estimates and Foreca	asts Example Ar	ea	DF supply allows the level of vacan a particular area.	the user to asses at properties within
Derived/Supply units conversion info	ormation			
Validate Single conversion ratio derived units/suppy units	Forecast Years	2006 2007	2008 2009 20	10
	A figure of 100% means that all the properties are occupied while 0% means that all are empty. This is then taken into account to assess the numbers of households in a given area			

Figure 43: Detail from DFSupply workbook

- Households to dwellings – with separate rates for vacancy, holiday home and sharing.

Population Estimates and Forecasts			Examp	le Are	a
Derived/Supply units conversion inform	rmation				
Validate	Forecast Y	ears 1992	1003	1994	1005
Dwellings vacant rate	100.0%	1552	1000	1554	1555
Dwellings holiday/second homes rate	100.0%				
Households sharing rate	100.0%				
Rules					

Figure 44: Detail from DFSupply workbook shows different household types

- Labour force to jobs – with separate rates for unemployment and commuting.

Population Estimates and Forecasts		E	xampl	e Area		
Derived/Supply units conversion inform	n information					
Validate	Forecast Yo 1991	ears 1992			 1996	1997
Unemployment rate	2.0%					
Commuting rate	1.00					
Rules						

Figure 45: Detail from DFSupply workbook showing different unemployment and commuter rates

In each case, values on a "Default" sheet will be used if none appears on the relevant Population Group sheet.

The derived unit to supply unit conversion validation routine makes the following checks:

In the base year, a non blank entry must be provided on each population group sheet OR on the default sheet

An overall conversion factor must be greater than 0% and less than 200%

If separate vacancy, holiday home and sharing rates are used, each must be greater than

or equal to 0% and less than 100%, and the value of (1 - vacancy rate - holiday home rate) / (1 - sharing rate) must be greater than 0% and less than 200%

If separate unemployment and commuting rates are used, the unemployment rate must be greater than or equal to 0% and less than 100%, the commuting ratio must be from 0 up to 100 and the value of (commuting ratio) / (1 - unemployment rate) must be greater than 0 and less than 200.

If separate rates are used for either of the two above example (households or labour force), each must have a nonblank entry in the base year.

If any of these rules is not followed, a note of the error is provided on the "Notes" sheet of the workbook. The forecast program will terminate if an error is detected on the constraints workbook.

9.4 Using DF to constrain, or to report impacts of, a population forecast

Setting up a PG model is covered in detail in the PG reference Manual. This section describes only the additional inputs required when using DF constraints or reporting the impact of a forecast.

If a PG forecast is to be constrained, the names of the constraints workbook and any workbooks that are required to allow derived forecast constraints are entered on the second worksheet, the "Constraints_and_impacts" sheet.



Figure 46: Constraints_and_impacts sheet for PG forecast

In addition to the specification of the PG constraints file there are two main sections on this form – 'First Derived Forecast' and 'Second Derived Forecast'.

The first derived forecast model is used if you specify annual constraints file containing a derived forecast. Otherwise it is used to provide the impact of the population forecast.

The second derived forecast model is used only to provide the impact of the population forecast; it is not used as a constraint. For example, it might provide the labour force implied

by a population forecast constrained by housing targets. The housing targets would be set in the PG constraints file and modelled in the first derived forecast.

In each section the files relevant to a particular DF model are listed. The 'Check files' button validates that the files listed are compatible, that all files belonging to a particular setup are listed and that they are all in the locations stated.

9.5 Migration weights

POPGROUP has two sets of migration weights, one for each of the potential constraints – i.e. population and / or derived forecast.



Figure 47: Migration weights set on the 'Run_Details' sheet of the PG scenario workbook

Depending on which of the alternative constraints is being applied for any year, the appropriate set of weights is used by the forecasting program to decide which migration flows to adjust, to meet the constraint.

- The migration weights are only used when there is a constraint, but they are specified on the 'Run Details' sheet, to the right of the migration flows.
- The arithmetic of how migration weights and constraints are implemented is detailed in the POPGROUP Reference manual section 6.5.

10. HELP FOR OLD FRIENDS - USERS OF HOUSEGROUP AND LABGROUP

The Derived Forecasts module has been designed to provide all the functions of HOUSEGROUP, LABGROUP and HOUSEGROUP-Wales. Every usage of these existing modules is also available through the DF module.

The design and usage of the Derived Forecasts module has also been based on existing POPGROUP software, so that existing users will find it familiar and straightforward to use.

This section describes what extra functionality the Derived Forecasts (DF) module provides, when a user should consider transferring their existing work to the DF module, and how to transfer it. It also advises on how to transfer data from an existing POPGROUP model in order to run dwellings-led and jobs-led projections with the DF module.

What's new?

In addition to existing functionality of HOUSEGROUP and LABGROUP:

- DF will allow projection of *any* characteristic that is closely related to age and sex, including disability.
- The household projection calculations of UK statistical output from CLG, GROS, WAG and NISRA are all accommodated in DF. HOUSEGROUP was designed only to replicate the CLG model in use up to a 2006 base, which is no longer in use.
- The number of categories is set by the user in DF, from 1 to 20 (for example the number of household types).
- A utility to compare the results of more than one household projection is provided (DFCompare.xls), similar to the Comparison_summ facility in POPGROUP.
- The constraints file, which allows results to be constrained to an independent forecast of households or the labour force, is more flexible, allowing subsets of information, including simply the total number of households or economically active, to be used as a constraint.
- Sub-populations are allowed, for example students and others, or marital status categories.
- 'Size factors' allow calculations after household membership rates have been applied. This allows the WAG and NISRA approaches which project the household population before dividing by an average household size for each household type. This facility can be generalised to allow modelling of other calculations, such as household waste.
- The population adjustment, which in household projections deducts the population in communal establishments, is more flexible. An adjustment can be applied to a finer agesex breakdown than is used for household membership or representative rates, and may be added or subtracted.
- The Reporter allows the aggregation of household types to provide sub-totals.
- A variety of smaller improvements.

Should I move to use DF even if I am happy with HOUSEGROUP and LABGROUP?

If you wish to continue to use your current models in HOUSEGROUP and LABGROUP, you may continue to do so, until changes of data or the extended functionality of DF persuade you to change. However, you must keep the two systems separate: you cannot directly use the files from HOUSEGROUP or LABGROUP within a DF model, nor vice versa.

How do I transfer to DF the data from an existing HOUSEGROUP or LABGROUP model?

Follow the guidance in this manual to install DF in a separate folder from your existing POPGROUP, HOUSEGROUP and LABGROUP folders, and to set up your new model. If you use both HOUSEGROUP and LABGROUP, there will be two DF models to set up.

When using DFSetup, you may choose from the standard models, or make your own userdefined settings.

You may find that you wish to set up the model in a different way, making use of the extended flexibility of the DF model. In this case, you will fill the DF skeleton files with data as usual.

If you wish to replicate your HOUSEGROUP or LABGROUP models in DF, you will need to transfer the data. Copy the data on your HOUSEGROUP or LABGROUP files and paste into the equivalent DF skeleton files. You may find it convenient to use formulae and array formulae on the DF skeleton files to point to cells or blocks of cells on your existing HOUSEGROUP or LABGROUP files. There is no easy way around this extensive copying and pasting, or extensive use of formulae, and it will be laborious if you have many different areas in your model. For a model with 23 small areas, it took between one and two hours to successfully transfer a complete set of data from HOUSEGROUP to the DF model.

Fill the DFScenario file with the names of your input files and run a forecast. If the settings have been maintained from HOUSEGROUP and LABGROUP, and all data has been replicated, the results will also be the same.

Existing users of HOUSEGROUP-Wales should follow the same procedures. The DF files are very similar in design to HOUSEGROUP-Wales, so the transfer of data will be slightly easier – but the HOUSEGROUP-Wales files may not be used in DF directly.

How do I transfer a POPGROUP model so that I can run dwellings-led population projections with my DF model?

The notes here refer to dwellings-led projections. The same principles and steps apply to jobs-led projections.

When running a dwellings-led forecast in POPGROUP, the existing version of POPGROUP will not interface with the DF module. For this reason a separate version of POPGROUP is provided with DF, as described in section 9 above. After this is installed in an area separate from the existing POPGROUP, the following steps will allow an existing POPGROUP forecast to be transferred to the DF-compatible POPGROUP, and run with DF models of HOUSEGROUP and LABGROUP.

• DF-compatible POPGROUPSetup file. Complete using the same options and the same Groups as in the existing POPGROUP model. Run, to produce empty input and output folders, and a folder of DF-compatible skeleton files.

- Copy all the files you wish to use from your existing POPGROUP input folder, to the DFcompatible input folder. Do NOT copy the constraints files (cons), the scenario files, nor the HHDwel files.
- Run the utility UpdateModelFolders.xls which is located in the same folder as DFSetup. Choose POPGROUP and enter the DF-compatible POPGROUPSysfiles folder and the new DF-compatible input folder which now has in it your existing POPGROUP files. Run the model update so that those files will register where the programs are located.
- Open cons.xls from the DF-compatible skeleton folder. Copy the data from your existing constraints file to it. If you have dwelling constraints, these will be entered in the panel 'Derived & Supply Unit Constraints' (see Section 9). Save in your new DF-compatible input folder. If you wish to use the same filename, you will have to close the old constraints file first.
- If you were using an HHDwel file to convert between households and dwellings, open DFSupply.xls from the DF-compatible skeleton folder. Again, copy the data from your existing HHDwel file to it (see section 9). Save in your new DF-compatible input folder.
- Open POPGROUPscenario.xls from the DF-compatible skeleton folder. Complete the Run_Details sheet with the relevant files from your input folder, and the same scenario ID, migration weights and other information that you used in your existing POPGROUP scenario.
- The Constraints_and_impacts sheet on the scenario file has a new format in the DFcompatible POPGROUP:
 - Enter the name of the new constraints file.
 - Enter the new DFSupply file, and the files from your DF household model under the 'First Derived Forecast' panel.
 - If you wish at the same time to find the implications of the constrained forecast for the labour force, you will have set up a second Derived Forecast model for the labour force, and will enter these filenames under the 'Second Derived Forecast' panel.
 - Click the 'CheckFiles' button to verify that the files you have named are all present in the locations that you have specified.
- Run the new POPGROUP scenario from the Run_Details sheet. If the settings have been maintained from your existing POPGROUP and HOUSEGROUP models, and all data has been replicated, the results will also be the same.

Appendix 1 – DF Example

To provide further guidance in the application of the DF, an 'example' model has been configured and the input files, scenario files and output files have been provided with the main DF installation.

The example is based upon a configuration of the DF using the CLG 2006-household model set-up (using household membership rates to derive household numbers). The example data are presented for a two-zone study area (Area 1 and Area 2) and their aggregate (District). Two alternative scenarios have been run, to generate household numbers from different population forecasts.

The example data (all .xls files) are provided using the standard folder structure as follows:

Folder name	File names		Description
DFTest\	DFSetup - Exam	ple	DF set-up used to generate the example skeleton data files
DFTest\DFM Exa	mple_skel\		
	DFCompare DFCons DFFactor DFPop	DFPopAdjust DFRates DFScenario	Skeleton files produced by the 'set-up' process. See Reference Manual for a definition of each.
DFTest\DFM Exa	mple_inp\		
	DFPopAdjust - E	xample	Population adjustment, removing communal household population from the 'population-at-risk'
	DFRates – Exam	ple	Membership rates by age, sex and household type
	DFPop – Exampl	e Mig1	Population forecast, Scenario 1
	DFPop – Exampl	e Mig2	Population forecast, Scenario 2
	DFScenario_1-E	xample	Scenario 1 set-up
	DFScenario_2-E	xample	Scenario 2 set-up
DFTest\DFM Exa	mple_out\		
	DFForecastTotal DFForecastTotal	_1–Example 2-Example	Household forecast by household type and year
	DFForecastDetai	I_1-Example	Household population by age, sex, household type and year
			Population-at-risk used in the household
	DFRiskPop_1-E DFRiskPop_2-Ex	xample cample	forecasts
	DFRatesOut_1–E DFRatesOut_2-E	Example Example	Final membership rates (same as DFRates in this case)
	DFReporter_1–E DFReporter_2-Ex	xample xample	Utility for producing reports and charts of scenario results
	DFCompare - Ex	ample	Utility for comparing the output from different scenarios

The example data files will all be accessible once they are installed to a user's PC. If users wish to 'run' the scenarios that have been provided then an additional step is required to enable each of these files to operate correctly on a 'new' machine.

A utility called 'UpdateModelFolder' is provided in the same folder as the DFSetup file. Users should run this utility, specifying the relevant path names to ensure files are configured to the local PC. The following details need to be provided:

- 1. Full path of folder where DF SysFiles now reside
- 2. Full path of folder where skeletons now reside
- 3. Full path of folder where input workbooks now reside
- 4. Full path of folder where output workbooks now reside

Once this procedure is complete the example scenarios may then be run. Path names in each scenario set-up files will again need to be modified to ensure the data are picked up from the correct folder locations.

Appendix 2 – MS Excel settings

Note: when using any of the POPGROUP family of products, if you are asked to 'allow macros' always allow the option.

In order to run the POPGROUP family of software on your PC you will need to modify your MS Excel macro and security settings. The procedure for doing this will be different for each version of MS Excel.

For MS Excel 2003 users:

To modify the security settings, click on Tools > Macros> Security and then follow the steps below to 'enable macros' and 'trust access to Visual Basic Project':

Enable Macros



It is recommended that you set the macro security setting to 'Medium'. Any security setting that disables macros completely will prevent the POPGROUP models from running correctly. All POPGROUP files require macros to be enabled.

Trust Access to Visual Basic project

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POPGROUP also requires that '*Trust access to Visual Basic Project*' is enabled. In the Excel menu, click on *Tools – Macro – Security...* and tick the appropriate Box on the Trusted Publisher tab.

For MS Excel 2007 users:

In MS Excel 2007 the format of these controls is different. The steps required are as follows:



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Step 1:

Click on the round 'office button' in the top left hand corner of MS Excel.

Click on the 'Excel Options' button at the foot of this drop-down list of items.

Step 2:

Click on the 'Trust Center' button on the left hand side of the resulting dialog.

Then click on 'Trust Center Settings' on the right hand side.

Step 3:

Click on the 'Macro Settings' button on the left hand side of the resulting dialog.

In the 'Developer Macro Settings' tick the box that says 'Trust access to the VBA project object model'.

On the same settings tab choose the option to 'Enable all macros'.

Click OK to exit.

Appendix 2 – MS Excel 2007: saving workbooks

If you are using MS Excel 2007 to run POPGROUP programs it is necessary to ensure that all workbooks are saved as *MS Excel 97-2003 compatible files* by default. To achieve this, follow the instructions below:

Default Save Settings

- Open a blank MS Excel 2007 workbook
- Click on the round 'office button' in the top left hand corner of MS Excel.
- Click on the 'Excel Options' button at the foot of this drop-down list of items.
- Click on the 'Save' button on the left hand side of the dialog
- On the drop-down menu of the 'Save files in this format' option, choose Excel 97-2003 Workbook and click OK, as shown below:

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Setting Excel 2007 to save workbook as 97-2003 compatible

Run-time saving of workbooks:

In MS Excel 2007, when saving any workbook whilst using a POPGROUP product, users must always choose Excel 97-2003 workbooks as below:



'Save as' option

Appendix 3 – Standard Models

The table below indicates the settings for each standard model included in the DFSetup. Further standard models will be made available from the POPGROUP website on a regular basis.

Standard Model	S1. WAG 2006 household	
Data example provided?	See appendix 1	
<u>Options</u>		
Age-sex	Both Males and Females: - 0-4 - 5-9 - 10-15 - 16-18 - 19-24 - 25-29 - 30-34 - 35-39 - 40-44 - 45-49 - 50-54 - 55-59 - 60-64 - 65-74 - 75-84 - 85+	
PopAdjust	Subtract (privpop)	
PopAdjust age-sex	Subtract (privpop)	
PopAdjust % or N	% for all age-sex	
Sub-Pops	No	
Rate Derived units	Households	
Categories	 1 person 2 person (no children) 2 person (1 adult, 1 child) 3 person (0 children) 3 person (2 adults, 1 child) 3 person (2 adults, 1 child) 3 person (1 adult, 2 children) 4 person (0 children) 4 person (2 adults, 1+ children) 9 4 person (1 adult, 3 children) 10 5+ person (no children) 11 5+ person (2+ adults, 1+children) 12 5+ person (1 adult, 4+children) 	
Calculation Name and Type	Average Household Size Divide by	
Validation – each rate	0 to 1 inclusive	
Validation – sum	=1	
Sub-totals		

Standard Model	S2. GROS 2006 household	S2. GROS 2008 household
Data example provided?	See Appendix 1	See Appendix 1
Options		
Age-sex	Both Males and Females: - 0-15 - 16-24 - 25-29 - 30-34 - 35-44 - 45-54 - 55-59 - 60-64 - 65-74 - 75-84 - 85+	Both Males and Females: - 0-15 - 16-29 - 20-24 - 25-29 - 30-34 - 35-39 - 40-44 - 45-49 - 50-54 - 55-59 - 60-64 - 65-69 - 70-74 - 75-79 - 80-84 - 85-89 - 90+
PopAdjust	Subtract (Back1: same values for every year)	Subtract (Back1: same values for every year)
PopAdjust age-sex	Finer (m and f, and 0-15) – see Back 1	Finer (m and f, and 0-15) – see Back 1
PopAdjust % or N	% for all age-sex	% for all age-sex
Sub-Pops	No	No
Rate	Headship	Headship
Derived units	Households	Households
Categories	 1 adult 2+ children 1 adult, 1 child 1 person female 1 person male 2 person all adult 2+ adult 1+ children 3+ person all adult Non-heads 	 1 adult 2+ children 1 adult, 1 child 1 person female 1 person male 2 person all adult 2+ adult 1+ children 3+ person all adult Non-heads
Calculation Name and Type	None	None
Validation – each rate	0 to 1 inclusive	0 to 1 inclusive
Validation – sum	1 or less	1 or less
Sub-totals	None	None

Standard Model	S3. CLG 2006 household	S3. CLG 2008 household
Data example provided?	See Appendix 1	See Appendix 1
Age-sex	Both Males and Females - 0-4 - 5-9 - 10-15 - 15-19 - 20-24 - 25-29 - 30-34 - 35-39 - 40-44 - 45-49 - 50-54 - 55-59 - 60-64 - 65-69 - 70-74 - 75-79 - 80-84 - 85+	Both Males and Females: - 15-19 - 20-24 - 25-29 - 30-34 - 35-39 - 40-44 - 45-49 - 50-54 - 55-59 - 60-64 - 65-69 - 70-74 - 75-79 - 80-84 - 85+
PopAdjust	Subtract (privpop)	Subtract (privpop)
PopAdjust age-sex	Subtract (privpop)	Subtract (privpop)
PopAdjust % or N	N for all age-sex	N for all age-sex
Sub-Pops	No	Marital status: never married, married, widowed, divorced
Rate	Household representative	Household representative
Derived units	Households	Households
Categories	 One person household rep Other multi-person household rep Unconcealed cohabiting couple household rep Unconcealed lone parent household rep Unconcealed married couple household rep Concealed cohabiting couple family rep Concealed lone parent family rep Concealed married couple family rep 	 One person male One person female Couple no children Couple 1 child Couple 2 children Couple 2 children Couple 3+ children Lone parent 1 child Lone parent 2 children Lone parent 3+ children Couple 1+ adult, no children Couple, 1+ adult, 2 children Couple, 1+ adult, 3+ children Lone parent, 1+ adult, 1 child Lone parent, 1+, adult 2 children Lone parent, 1+, adult 3 Children Couple, 1+ adult, 1+, adult 3
Calculation Name and Type	None	None
Validation – each rate	0 to 1 inclusive	0 to 1 inclusive

Validation – sum	1 or less	1 or less
Sub-totals	All households <i>(categories 1, 2, 3, 4, 5)</i> All concealed families <i>(categories 6, 7, 8)</i> . Suppress overall total.	 Two standard sets 1. One person households (categories 1, 2), Couple households (categories 3, 4, 5, 6), A couple and one or more other adults (categories 10, 11, 12, 13), A lone parent (with or without other adults) (categories 7, 8, 9, 14, 15, 16) Other households (category 17) Households with no dependent children (categories 1, 2, 3, 10) Households with 1 dependent children (categories 4, 7, 11, 14) Households with 2 dependent children (categories 5, 8, 12, 15) Households with 3+ dependent children (categories 6, 9, 13, 16) Other households (category 17)