SAHA

Department of Transport and Main Roads

Taxi Licence Review Model – User Guide

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SAHA

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Table of Contents

List of Figures

1 INTRODUCTION

1.1 Background

The Department of Transport and Main Roads (the Department) is responsible for the regulation of the State's taxi industry, including regulation of the number of licences and maximum taxi fares which may be charged by the industry. The Transport Operations (Passenger Transport) Act 1994 maintains that the Queensland Government must ensure that there are sufficient taxi service licences for an area to meet public demand accounting for factors such as:

- The views of users of taxi services in an area
- Recent changes in travel patterns
- Types of services available in an area
- The performance of the existing taxi fleet
- The productivity of the fleet

In 2004 the Department designed a taxi licence model as a means of meeting its obligations under the Act.

In September 2008, Saha International Limited (SAHA) was engaged by the Department to review the existing model and associated processes. Based on its independent model assessment, stakeholder consultation and international jurisdiction review, SAHA recommended that any proposed revised taxi licence model approach should aim to meet the following objectives:

Objective	Description
Regional Approaches	The assessment process should be 'fit-for-purpose' with no 'one size fits all' applied to all jurisdictions across the State. That is, the level of effort should be commensurate with the area's size, population and number of taxi licences
Objective Inputs	The Model needs to incorporate an objective approach which includes pre-agreed parameters, especially for the large contract areas
Defensible Outputs	The Model needs to produce an unambiguous outcome that is robust and defensible, particularly for larger contract areas
Periodic Reviews	Reviews should be undertaken periodically, and annually for the larger contract areas including six-monthly 'checks'
Budget Planning	The Model output should assist Government in their budget planning process.

Subsequently, the Department engaged SAHA to design and develop a taxi licence model based on the findings and recommendations of the initial Taxi Licence Model Review, as well as input from the Department and its stakeholders.

SAHA has developed a taxi licence model (the Model) which provides estimates of expected taxi licence numbers to assist with:

- assessing the appropriate number of taxi licences for each taxi service area,
- budgeting, and

- identifying the ratio of wheelchair to standard taxis required in each area.

This User Guide describes the major parameters and workings within the Model and will assist the Department in determining the appropriate licence numbers in each of the taxi service areas.

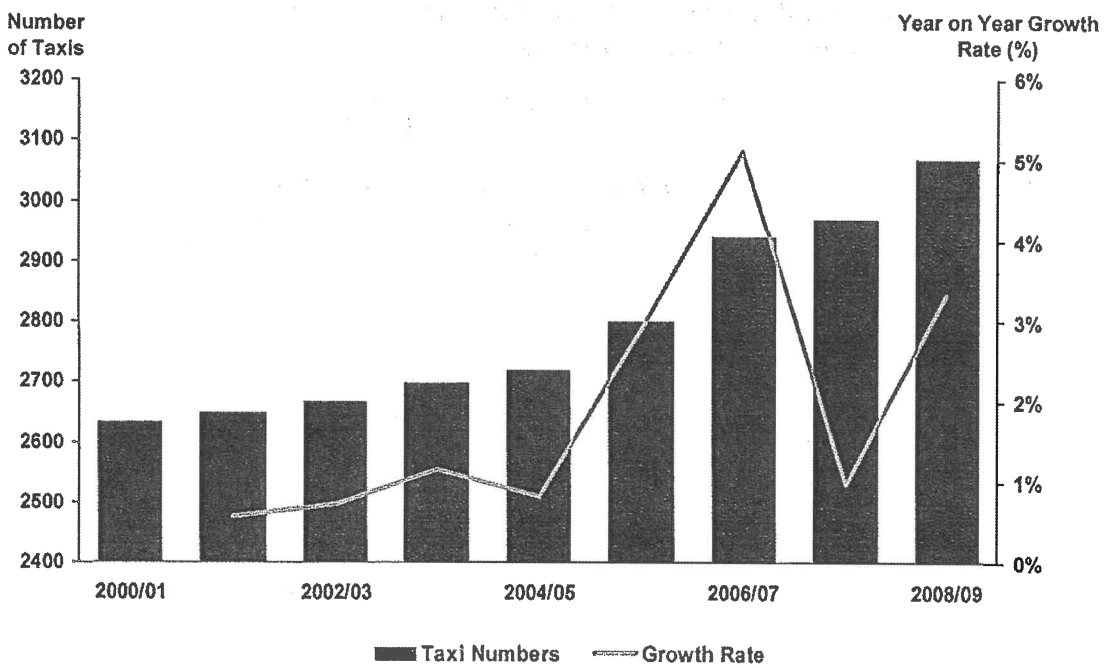
1.2 Purpose of the Model

The purpose of the Model is to provide the Department with a tool to assist with the estimation of the appropriate number of taxis in each of the 20 contract Taxi Service Areas (TSA). The Model provides a projection of taxi numbers and revenue from taxi licence sales over a ten year period[1]. The Model is Excel based to provide both flexibility and transparency for the User.

The Model is dynamic and has the capacity to allow for updates of actual dependent variables (number of taxis, bookings per taxi, bookings per capita) and actual and forecast data for independent variables (population, employment, tourism, GSP, fare levels and car ownership).

All licence number forecasting and the resulting revenue is modelled on an annual basis.

Figure 1-1: Taxi Licence growth in Queensland's Contract Taxi Service Areas



Source: SAHA analysis

[1] Although a 10 year projection period is provided, it is advisable that the Model be reviewed every three to five years.

2 UNDERSTANDING THE MODEL

2.1 Model Architecture

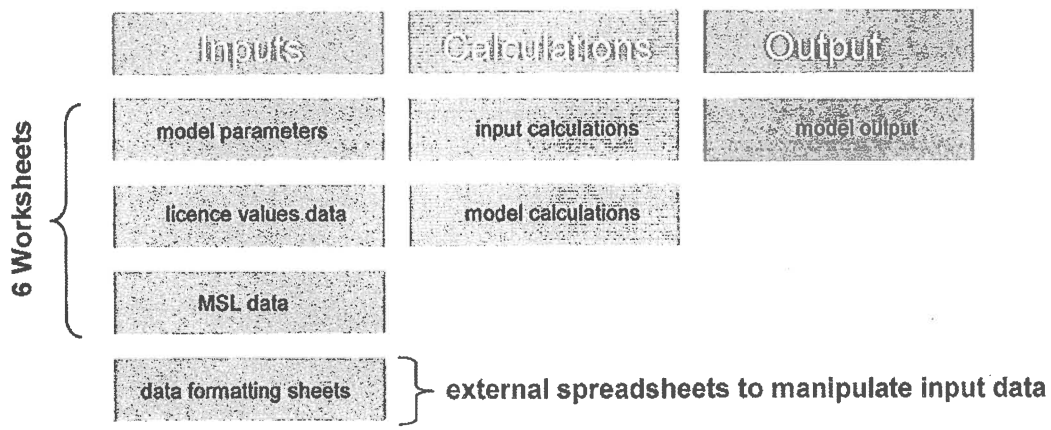
The Model is an Excel spreadsheet file made up of six Excel Worksheets used to project taxi numbers and potential revenue from licence sales in each Contract TSA over a five year period. To assist with the understanding of the Model, these Worksheets can be separated into three broad categories: Input Worksheets, Calculations Worksheets and an Output Worksheet

- Input Worksheets – By utilising these Worksheets, the User can update forecasts of the key independent variables driving the taxi number projections. These variables include expected fare increases, population growth, change in economic factors, and changes in visitor numbers and car ownership. The Model is already populated with current forecasts, but this will need to be updated as time progresses. The User will also update the historical input and output variables as they are available. This will include all the independent variables mentioned above, as well as taxi licence sale values, Minimum Service Level (MSL) data, taxi kilometre data, taxi revenue data and actual taxi numbers each year.
    - Additional Data Formatting Modules – some manipulation is required for certain inputs before they are entered into the Model worksheets. These additional worksheets are described in Section 3.2 'Updating the Model'.

- Calculations Worksheets – The mechanics driving the Model are embedded in these Worksheets. To preserve the integrity of the Model, these Worksheets are password protected and the cells cannot be changed or altered by the User. The User may refer to the Calculations Worksheet to gain a deeper understanding of the Model but all headline results generated in the Calculations Worksheets are displayed in the Output Worksheet.

- Output Worksheets – The Output Worksheet provides annual projections of the following information over a five year period for each TSA: a range of the appropriate number of new taxis required and the suggested wheelchair to standard taxi ratio, a potential revenue forecast based on the taxi number projection and historical licence values, and a performance indicator measuring performance against peak-time MSLs.

Figure 2-1: Model Architecture



The Model calculates the taxi number and revenue projections separately for each of the TSAs included. Recognising the different rates of change in population growth, economic activity and average fares in each TSA; the Model uses actual and forecast data for each variable at the most suitable disaggregated level easily available. In the Model each TSA is modelled separately with unique Inputs, Calculations and Output areas in each worksheet (refer to figure 2.1).

(1) The 20 Taxi Service Areas included in the Model are:

Brisbane	Toowoomba	Gladstone
Gold Coast	Warwick	Mackay
Gympie	Maryborough	Rockhampton
Ipswich	Hervey Bay	Capricorn Coast
Redcliffe	Bundaberg	Cairns
Sunshine Coast	Gladstone	Innisfail
Bribie Island		

(2) The separate outputs calculated for each TSA are:

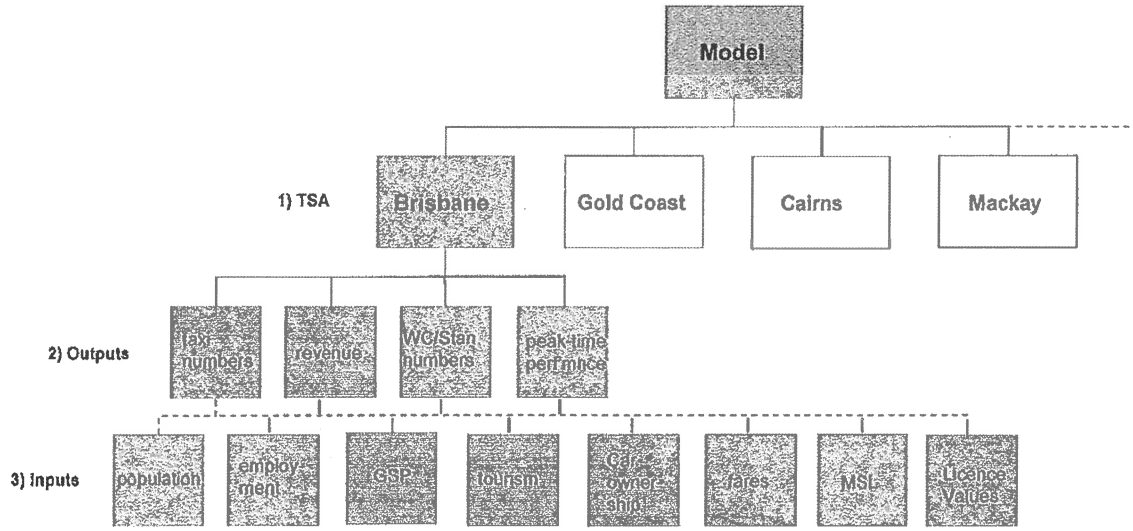
- projected change in taxi licence numbers (a range)
- recommended split between Wheelchair and Standard taxis
- projected licence revenue
- an indicator of peak-time performance

(3) Inputs used to derive the above outputs are:

- population
- number of employed persons
- gross state product
- number of 'visitor' nights in short-term rental accommodation in Queensland
- number of private vehicles registered
- change in taxi fares
- MSL data
- licence value data

Refer to Figure 2.2 for a "tree diagram" illustrating the Model segmentation.

Figure 2-2: Understanding the Model



In addition, the Model provides estimates of the average kilometres travelled per annum per taxi by TSA and the trend of taxi revenue per annum.[2]

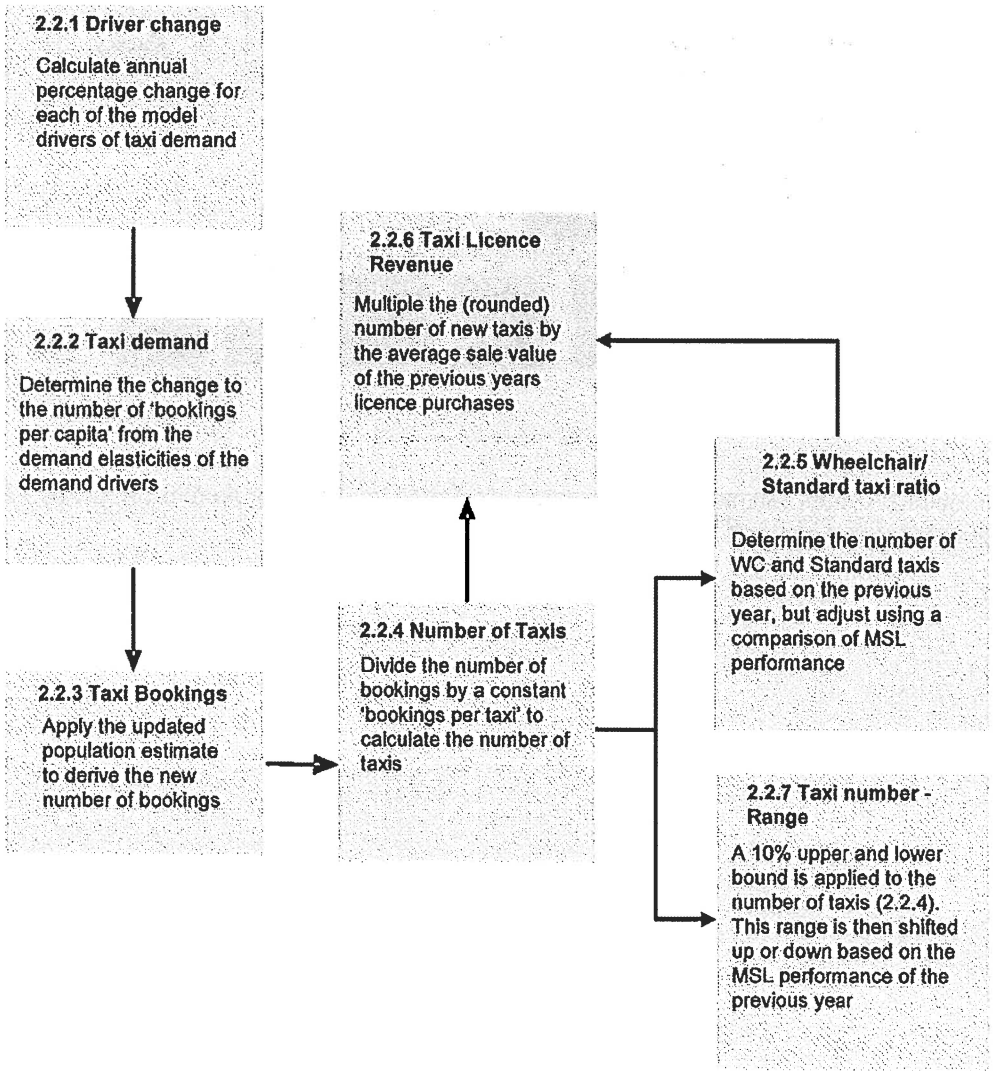
[2] Based on the estimated average km per annum and estimated taxi revenue per km available on the Australian Tax Office website.

2.2 High Level Explanation of the Model

This section to explains and illustrates the mechanics of the Model.

Figure 2.3 provides a step by step process map of the algorithm used to estimate the projection for number of taxis and for revenue for each TSA. Each process step is further explained with Model extracts in the following sections.

Figure 2-3: High level Model calculation flowchart



2.2.1 Driver Change

A number of drivers of taxi demand were selected based on desktop research of literature on taxi demand and public transport demand, and the 2008 review of the Department's previous taxi licence review model.

The variables selected for use in the Model as drivers of taxi demand are[3]:

- Fares
- Employment
- Income (GSP)
- Car Ownership
- Tourism

Data for each of the drivers is selected to be as representative of individual TSAs as practically possible. In some circumstances this means aggregating data from smaller areas to match a larger TSA (e.g. private car ownership by postcode), in other cases data from a larger area is taken as a proxy measurement for the smaller TSA (e.g. actual employment data at the Statistical Region level, and employment forecasts at the State level)[4].

Actual and forecast data for individual drivers is updated each time the Model is run. The annual percentage change for each driver is then calculated.

Figure 2-4: Change in estimated real fare by TSA (Model Extract)

Change in estimated average REAL fare by TSA

	Region	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07
South East District	Bribie Island		-2.9%	-3.1%	1.1%	0.7%	3.1%	1.6%
	Brisbane		-2.9%	-3.1%	1.5%	1.0%	3.7%	2.1%
	Gold Coast		-2.9%	-3.1%	1.1%	0.7%	3.1%	1.6%
	Gympie		-2.9%	-3.1%	1.1%	0.7%	3.1%	1.6%
	Ipswich		-2.9%	-3.1%	1.1%	0.7%	3.1%	1.6%
	Redcliffe		-2.9%	-3.1%	1.1%	0.7%	3.1%	1.6%
	Sunshine Coast		-2.9%	-3.1%	1.1%	0.7%	3.1%	1.6%
Northern District	Cairns		-2.9%	-3.1%	1.1%	0.7%	7.2%	1.4%
	Innisfail		-2.9%	-3.1%	1.1%	0.7%	7.2%	1.4%
	Mt Isa		-2.9%	-3.1%	1.1%	0.7%	7.2%	1.4%
	Townsville		-2.9%	-3.1%	1.1%	0.7%	7.2%	1.4%
Central District	Gladstone		-2.9%	-3.1%	1.1%	0.7%	7.2%	1.4%
	Mackay		-2.9%	-3.1%	1.1%	0.7%	7.2%	1.4%
	Rockhampton		-2.9%	-3.1%	1.1%	0.7%	7.2%	1.4%
	Capricorn Coast		-2.9%	-3.1%	1.1%	0.7%	7.2%	1.4%
Southern District	Bundaberg		-2.9%	-3.1%	1.1%	0.7%	7.2%	1.4%
	Hervey Bay		-2.9%	-3.1%	1.1%	0.7%	7.2%	1.4%
	Maryborough		-2.9%	-3.1%	1.1%	0.7%	7.2%	1.4%
	Toowoomba		-2.9%	-3.1%	1.1%	0.7%	7.2%	1.4%
	Warwick		-2.9%	-3.1%	1.1%	0.7%	7.2%	1.4%

[3] For discussion on the selection of demand drivers, see appendix 7.1

[4] Data sources for each of the inputs is found in appendix 7.2

2.2.2 Taxi Demand

Understanding the transport demand elasticities (including taxi demand) is a key factor underpinning the development of many Government policies.

Demand elasticities measure the percentage change in demand in response to a percentage change in a mode (supply or price) attribute. For example: a -0.5 price elasticity with respect to taxi fares, means that each 1% increase in fares results in a 0.5% reduction in taxi demand.

Elasticities for each of the demand drivers were derived based on reviews of elasticity in academic and transport industry literature, with guidance from taxi demand 'backcasts'. Appendix 7.1 provides a more detailed methodology of the estimation of elasticities.

In the absence of any solid population elasticity estimates, it was therefore desirable to express taxi demand in terms of each TSAs resident population thereby removing the need to include population as a separate variable in the Model and to appropriately define the elasticity. The Model therefore measures taxi demand as the number of bookings per capita. The number of trips per capita would be a more accurate assessment of demand, but at the time of Model build, only phone booking data was available. (This also does not take into account any latent demand, which is demand that may exist if certain variables such as waiting times, service quality, price, etc, were to change).

Figure 2-5: Taxi demand elasticities with respect to demand drivers and TSAs (Model Extract)

Elasticities	Regions:	Brisbane	Gold Coast	Gympie	Ipswich	Redcliffe
	Drivers:					
	Real Fares	-0.4	-0.5	-0.5	-0.5	-0.5
	Employment	0.3	0.3	0.3	0.3	0.3
	GSP	0.05	0.05	0.05	0.05	0.05
	Passenger Vehicle per Capita	-0.25	-0.25	-0.25	-0.25	-0.25
	Tourism	0.05	0.05	0.05	0.05	0.05

"Demand Elasticities are, in general, rather crude and approximate measures of aggregate responses in a market...

...They do, however, have the great attractions of being empirically estimable, reasonably easily understood, tested by experience, and directly usable for policy assessment"

(Goodwin, 1992)

2.2.3 Taxi Bookings

Multiplying the updated population estimate (actual or forecast) by the bookings per capita estimate will result in a new number of taxi bookings for each TSA.

2.2.4 Number of Taxis

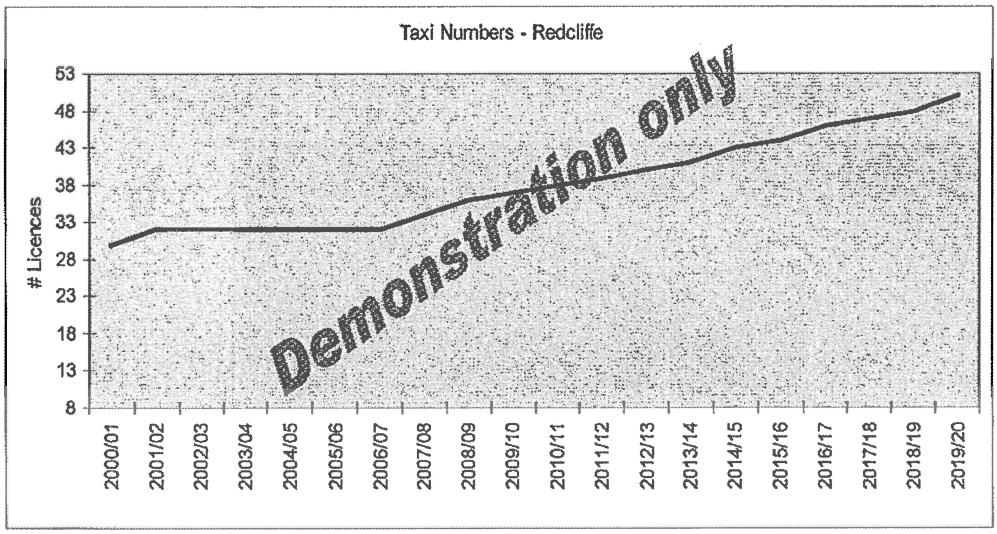
The Model divides the calculated number of bookings a constant 'bookings per taxi' to derive the estimate for the appropriate number of taxis in an area. (NOTE: the 'bookings per taxi' constant can be set by the Department in column G of the model calculation sheet. These cells are formatted yellow).

Figure 2-6: Taxi demand calculations for Brisbane TSA (Model Extract)

Brisbane Calculations

Growth in Demand Drivers		Year 0	Year 1	Year 2	Year 3	Year 4
	elasticity	2008/09	2009/10	2010/11	2011/12	2012/13
Real Fares	-0.4	0.0%	1.2%	1.9%	1.8%	1.7%
Employment	0.3	0.0%	0.2%	1.3%	2.5%	2.8%
GSP	0.05	0.0%	1.6%	2.8%	4.5%	4.8%
Passenger Vehicle per Capita	-0.25	0.0%	1.9%	1.7%	1.6%	1.6%
Tourism	0.05	0.0%	3.0%	2.3%	1.8%	1.8%
	change	0.0%	-0.7%	-0.6%	-0.1%	0.1%
Population growth		0.0%	1.7%	1.7%	1.6%	1.6%
Population		1582	1609	1636	1662	1689
Bookings per Capita	4.71	4.71	4.67	4.65	4.64	4.65
Bookings	7,444,820	7,444,820	7,519,624	7,600,495	7,719,768	7,850,706
Bookings per Taxi	3,988	3,988	3,988	3,988	3,988	3,988
Modelled taxi demand	1,867	1867	1886	1906	1936	1969
Change in taxi numbers			19	20	30	33
Percentage change			1.0%	1.1%	1.6%	1.7%

Figure 2-7: Number of Taxis (Model Extract)



2.2.5 Wheelchair to Standard Taxi Ratio

Having established a point estimate for the appropriate number of taxis, the Model then calculates the allocation between wheelchair accessible and standard taxis. The base number of wheelchair taxis is derived using the ratio of wheelchair to standard taxis from the previous year. The allocation of additional wheelchair taxis is then adjusted depending on the performance against MSLs of wheelchair taxis compared to standard taxis using the following method:

- If both types of taxis performed above the MSLs then there is no adjustment.
- However if either wheelchair or standard taxis performance was below the MSLs then the comparative difference between the two performance levels is used to adjust the ratio of wheelchair to standard taxis.
- For example, if standard taxis performance was 3% above MSLs and wheelchair taxis performance was 7% below MSLs, then a wheelchair/standard adjustment factor of 10% would result (3% minus - 7%)
- This adjustment factor is then applied to the change in taxi numbers, so that an additional 10% of the additional taxis would be allocated as wheelchair accessible taxis.

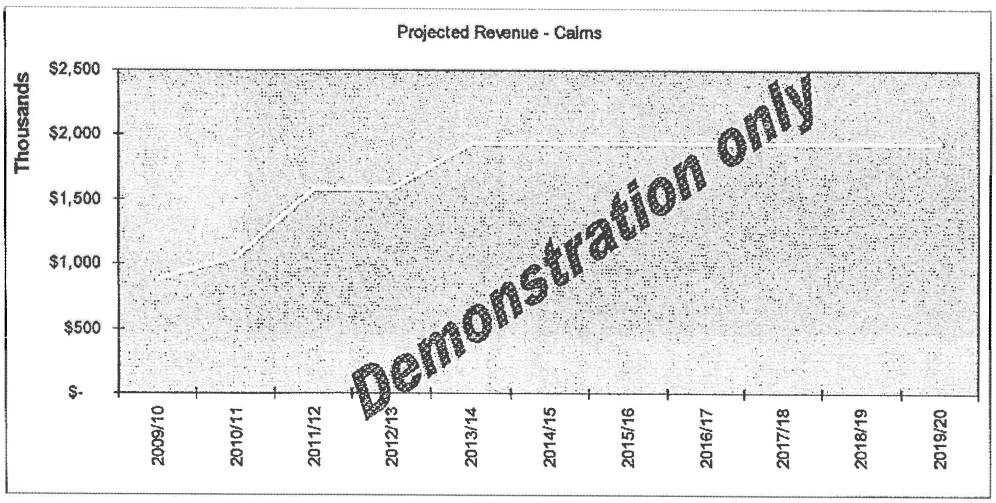
Over time it is expected that the difference in performance against MSLs between wheelchair and standard taxis will reduce.

2.2.6 Projected Revenue

A projected revenue stream from licence sales for each TSA is derived from using the single point taxi number estimates for each year and the average licence value from all taxi licence sales in the TSA in previous financial year (or most recent financial year when taxi licences were sold).

This is a very basic estimate of future revenue with no attempt made to forecast future licence values.

Figure 2-8: Chart of a projected revenue stream from taxi licence sales (Model Extract)



2.2.7 Deriving a Taxi Number Range (upper and lower bounds)

As requested by the Department, the Model's taxi number projection is not a single figure, but in the form of an output range. It is understood the change in the number of taxis will be finalised from within that range after consultation with stakeholders from industry and the community.

Initially a 10% upper and lower band is applied to the number of additional taxis point estimate, so, for example, a point estimate of 30 additional taxis would have an upper bound of 33 and a lower bound of 27 taxis. Performance against MSL data is then used to shift the range up or down.

Waiting times can be used as a demand driver and some studies have derived an elasticity of demand for waiting times[5]. However these elasticities are not appropriate for use with the MSL data available for the following reasons:

- the elasticities are for waiting times, while the MSL data measures dispatch times
- MSL data does not provide any estimates of average dispatch (or waiting) times

Also, as MSL data is a performance based method of measuring how well the taxi industry is meeting demand for taxi services, it is not easily adaptable to becoming a demand driver itself.

In this Model, MSL data is used as a measure of how well the supply of taxis is meeting the demand for taxis, with the underlying assumption that demand is being sufficiently met if the MSL is being met. Therefore, all else being equal, if the MSL is not being met then an increase in the supply of taxis will improve performance and if the MSL is being well exceeded then a decrease in the supply of taxis may be tolerated without dropping performance below the MSL.

The adjustment to the range is calculated by the following:

- Schedule 3 of the contract between the Department and taxi booking companies gives the following MSLs in relation to dispatch times (which are measured in MSL data):
    - 85% of hirers shall experience a dispatch time of no more than 6 minutes (peak time) or 3 minutes (off-peak time) - labelled Level One in the MSL data
    - 95% of hirers shall experience a dispatch time of no more than 15 minutes (peak time) or 10 minutes (off-peak time) - labelled Level Two in the MSL data
- The range adjustment factor is found by averaging the difference between actual and contract MSL levels for Level One and Level Two
- For example, if actual MSL levels were 82% for Level One and 94% for Level Two, then the Range Adjustment Factor would be the average of (82%-85%) and (94%-95%) = -2%.

[5] 'Deregulation of the Dutch Taxi sector', Jan Rouwendal, MuConsult and Wageningen Agricultural University, 1998; 'ACT Transport Demand Elasticities Study', Department of Urban Services, April 2003

- As MSL are not being met, the adjustment in the range would be an upwards shift
- Note that as MSLs are minimum levels, as opposed to target levels, the Range Adjustment Factor must be above 2% before the taxi number range is shifted downwards
- The initial point estimate must always remain within the upper and lower bounds of the range, so the range cannot be shifted beyond the initial point estimate.

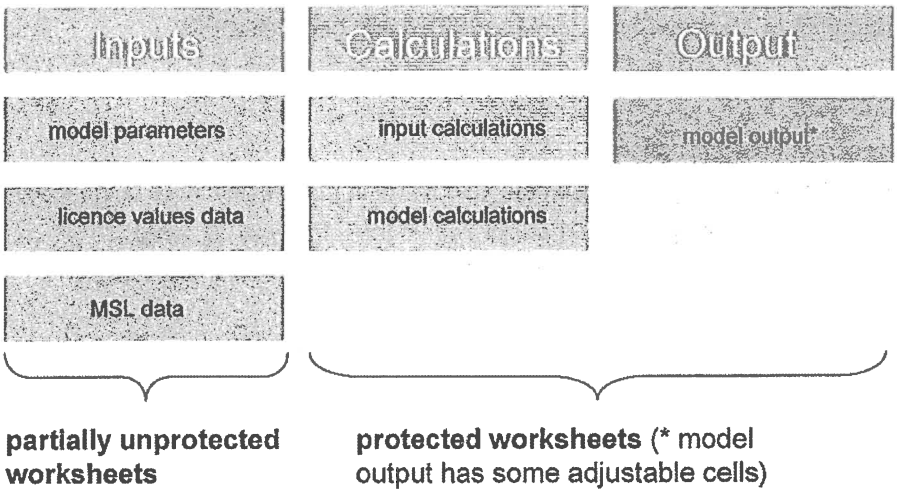
3 Using the Model Worksheets

3.1 Getting Started

At the front of the Model is a 'Contents and Instructions' worksheet. This sheet provides information on how the User can navigate simply around the workbook and instructions on how to update Model inputs, run the Model and interpret the Model outputs.

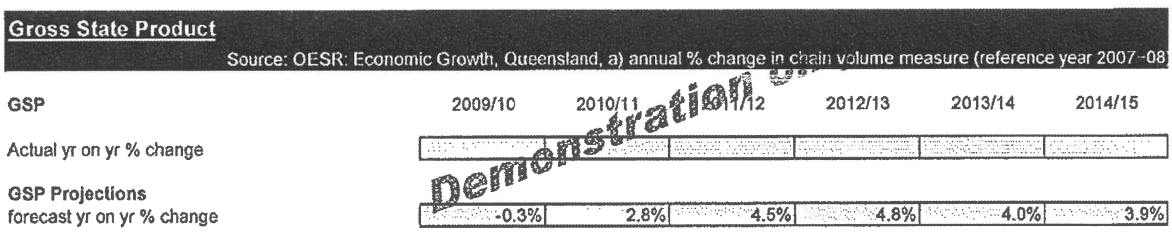
In the Model, all non input cells and Worksheets have been password protected (refer to Figure 3.1) to ensure the integrity of the outputs and reduce errors. Only the Input Worksheets are partially unprotected allowing the User to update key inputs. The Output Worksheet also has two cells for each TSA that can be updated.

Figure 3-1: Password Protected Worksheets



All unprotected input cells are clearly marked with yellow shading for updating actual (or historical) data, while cells shaded in light green are inputs based on forecasts, which also need updating. Grey shading is used for input cells containing historical data and should not need to be updated.

Figure 3.2: Input cells (Model Extract)



Gross State Product

Source: OESR: Economic Growth, Queensland, a) annual % change in chain volume measure (reference year 2007-08)

GSP	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15
Actual yr on yr % change						
GSP Projections forecast yr on yr % change	-0.3%	2.8%	4.5%	4.8%	4.0%	3.9%

3.2 Updating Input Sheets

Updating the Model is designed to be as straight forward as possible, with Input Sheets formatted in the same way as the original data as much as possible, and where it is not, data formatting workbooks are used to manipulate input data into an appropriate format.

Data sources are provided with the descriptions of how to update each of the Model inputs, with a full list of data sources also provided in Appendix 4. A checklist is also provided in Section 3.3 to ensure the User considers all the input variables in running the Model and producing a new estimate of taxi numbers and revenue stream.

3.2.1 Updating Licence Values

Licence values are not used in the Model as a driver of taxi demand, but are simply used to provide an estimate of future licence values to project a future revenue stream.

Data source: The Department of Transport and Main Roads Taxi and Limousine Unit

Updating licence value data:

1. Select the 'LicenceValuesData' tab
2. Select the TSA to be updated by clicking on the TSA name in the 'Region' area at the top of the sheet
3. Select the financial year to be updated (Financial Year is from 1 July to 30 June)
4. Enter in the new values from sales of licences (including new and existing plate sales)

The Average, Minimum and Maximum sale prices are automatically calculated immediately above each the input cells for each area.

Figure 3.3: Licence Values Input Sheet (Model Extract)

Ipswich Licence Values

Ipswich: Standard Licences	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Average Standard Licence Values ($)								330,000	337,500	340,000		
Minimum Standard Licence Value	-	-	-	-	-	-	-	325,000	335,000	340,000	-	-
Maximum Standard Licence Value	-	-	-	-	-	-	-	335,000	340,000	340,000	-	-
								335,000	340,000	340,000		
								325,000	335,000			

Ipswich: Wheelchair Licences	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Average Wheelchair Licence Values ($)	131,100		947,000			155,000	123,667	89,000			195,000	
Minimum Wheelchair Licence Value	131,100		947,000	-	-	155,000	51,000	81,000	-	-	195,000	-
Maximum Wheelchair Licence Value	131,100	-	947,000	-	-	155,000	160,000	105,000	-	-	195,000	-
	131,100		947,000			155,000	51,000	81,000			195,000	
							160,000	105,000				
							160,000	85,000				
								85,000				

3.2.2 Updating Minimum Service Level Data

MSL data is a key input into the Model as it provides information used to establish:

- The number of bookings per annum
- The Wheelchair/Standard taxi adjustment factor
- The Range Adjustment factor

Data source: The Department of Transport and Main Roads Taxi and Limousine Unit

Updating MSL data for each TSA:

1. Open the Departments MSL data spreadsheets
2. Copy the latest full financial year's MSL data for the TSA to be updated
3. Select the 'MSLData' tab in the Model
4. Select the TSA to be updated by clicking on the TSA name in the 'Region' area at the top of the sheet
5. Select the financial year to be updated (Financial Year is from 1 July to June 30)
6. Paste the data for the selected financial year directly into the MSLData worksheet (use paste special/ values to maintain Model formatting)

To make the transfer of MSL data into the Model as easy as possible, the MSLData worksheet has the same structure as the original worksheet containing MSL data supplied by the Department.

Figure 3.4: Minimum Service Level Input Sheet (Model Extract)

Region	Operator	Type / Period	Level/Acheivement	Sep-00	Dec-00	Mar-01	Jun-01	Sep-01	Dec-01	Mar-02
Toowoomba	Yellow	Standard / Peak	First Level	1468	1575	641	666	759	1270	1127
			First Level % achieved	97.5%	98.9%	98.8%	97.9%	99.1%	98.9%	99.7%
			Second Level	1499	1590	649	674	764	1284	1128
			Second Level % achieved	99.6%	99.8%	100.0%	99.1%	99.7%	100.0%	99.8%
			Third Level	6	3	0	6	2	0	2
			Third Level %achieved	0.4%	0.2%	0.0%	0.9%	0.3%	0.0%	0.2%
			Total Fares	1505	1593	649	680	766	1284	1130
		Standard / Off-Peak	First Level	18189	21126	20536	17093	18492	16523	15304
			First Level % achieved	83.7%	85.8%	86.8%	86.1%	84.4%	91.3%	91.1%
			Second Level	21398	24334	23413	19616	21487	17947	16599
			Second Level % achieved	98.4%	98.9%	98.9%	98.9%	98.0%	99.2%	98.8%
			Third Level	342	278	255	228	435	141	197
			Third Level %achieved	1.6%	1.1%	1.1%	1.1%	2.0%	0.8%	1.2%
			Total Fares	21740	24612	23668	19844	21922	18088	16796
		Wheelchair / Peak	First Level			22	18	29	32	37
			First Level % achieved			88.0%	75.0%	87.9%	84.2%	84.1%
			Second Level			25	24	32	36	44
			Second Level % achieved			100.0%	100.0%	97.0%	94.7%	100.0%
			Third Level			0	0	1	2	0
			Third Level %achieved			0.0%	0.0%	3.0%	5.3%	0.0%
			Total Fares	0	0	25	24	33	38	44
		Wheelchair / Off-Peak	First Level			439	368	436	512	393
			First Level % achieved			49.1%	42.5%	43.6%	58.9%	49.9%
			Second Level			733	651	795	711	637
			Second Level % achieved			82.0%	75.3%	79.6%	81.7%	80.9%
			Third Level			161	214	204	159	150
			Third Level %achieved			18.0%	24.7%	20.4%	18.3%	19.1%
			Total Fares	0	0	894	865	999	870	787
		Total Standard fares (Peak and Off-Peak)		23245	26205	24317	20524	22688	19372	17926
		Total Wheelchair fares (Peak and Off-Peak)		0	0	919	889	1032	908	831
		Total all fares, Standard and Wheelchair (Peak and Off-Peak)		23245	26205	25236	21413	23720	20280	18757

3.2.3 Updating Population Inputs

A population estimate for each TSA is required derive a 'taxi per capita' used as an estimate of taxi demand. An initial population estimate for each TSA was supplied by the Departments GSI unit, based on the 2006 Census Collection Districts. This is the 'Base' population estimate. Non-Base year population estimates are calculated by applying the annual percentage change in the population for each TSA based on the closest match with Statistical Local Areas (SLA) or Urban Centres/Localities (UCL) to the 2006 Base Population. Maps of each TSA were overlaid against maps of the Office of Economic and Statistical Research (OESR) UCLs and the Australian Bureau of Statistics (ABS) SLAs to determine which was the 'best fit' for each TSA.

Data source for population (historical data):

- SLA data: ABS Regional Population Growth, series 3218.0, Table 3. Estimated Resident Population, Statistical Local Areas, Queensland, and
- Urban Centre data: http://www.oesr.qld.gov.au/queensland-by-theme/demography/population/tables/erp/erp-ucl-qld/index.shtml
- Population updates for the previous June are usually available in early April of the following year

Updating historical population inputs:

A. SLA population estimates

1. Open 'TaxiModelPopulationDataTemplate.xls' (the Data Formatting Module for population data)
2. Select the 'ABS Table 3_SLA' tab - paste the updated ABS SLA population estimates into this sheet
3. Select the updated population estimates from the blue cells at the bottom of the worksheet
4. Select the 'model parameters' tab in the Model
5. Select the 'Population' under 'Updating Actual' at the top of the sheet
6. Scroll down to the 'Estimated population at SLA level' table (row 136)
7. Paste in the updated population estimates (use paste special/values to retain Model formatting)

B. UCL population estimates

1. Open 'TaxiModelPopulationDataTemplate.xls'
2. Select the 'erp-ucl-qld' tab - paste the updated OESR UCL population estimates into this sheet
3. Select the updated population estimates from the blue cells at the bottom of the worksheet
4. Select the 'model parameters' tab in the Model
5. Select the 'Population' under 'Updating Actual' at the top of the sheet
6. Scroll down to the 'Estimated population at UCL level' table (row 162)
7. Paste in the updated population estimates (use paste special/values to retain Model formatting)

Figure 3.5: Population estimates at the Statistical Local Area level (Formatting Module Extract)

Table 3. Estimated Resident Population, Statistical Local Areas, Queensland												
			STATISTICAL DIVISION (SD),		ERP at 30 June							
			Statistical Subdivision and		2001	2002	2003	2004	2005	2006	2007r	2008p
ASGC Code				Statistical Local Area	no.	no.	no.	no.	no.	no.	no.	no.
05			BRISBANE									
	01		Inner Brisbane									
		1067		Bowen Hills	900	982	1025	1482	1494	1652	1695	1755
		1143		City - Inner	1021	1418	1965	2281	2602	2823	3434	3322
		1146		City - Remainder	1827	1821	2652	3213	4124	4658	5137	5163
		1187		Dutton Park	1347	1374	1397	1419	1431	1448	1455	1453
		1227		Fortitude Valley	3106	3445	4421	4820	5231	5673	5931	6141
		1274		Herston	1810	1845	1854	1868	1882	1894	1911	1925
		1277		Highgate Hill	5361	5478	5559	5593	5653	5755	5767	5912
		1304		Kangaroo Point	5667	6097	6548	6789	6979	7235	7247	7238
		1315		Kelvin Grove	4145	4144	4121	4158	4206	4610	4968	5098
		1378		Milton	1569	1533	1497	1451	1811	1804	1863	1936
		1421		New Farm	10124	10408	10915	11126	11354	11507	11586	11637
		1427		Newstead	2878	3346	4306	4615	4770	5113	5384	5494
		1454		Paddington	7369	7490	7605	7792	7947	8072	8121	8277
		1481		Red Hill	4953	5104	5242	5306	5427	5524	5514	5633
		1525		South Brisbane	2972	3305	3511	3934	4106	4427	4732	4822
		1528		Spring Hill	3485	3843	4545	4912	5083	5483	5801	5836

Data source for population (forecast data):

- Source: ABS projections for the Australian Government Department of Health and Ageing, based on preliminary 2007 Census-based ERP and assumptions from the 2006-2101 issue of Population Projections, Australia (ABS Cat. No. 3222.0).

The population forecast used in the Model was a one-off forecast done for the Department of Health and Ageing. It would be useful to have a new population forecast at the SLA level every one to three years to update the model with. If this is not possible, and the existing forecast becomes to inconsistent with actual population estimates, then the forecast may need to be substituted by an annually updated forecast calculated at the Local Government Area (LGA) level by Queensland Government's Planning Information and Forecasting Unit, or the OESR population forecast at the Statistical District (SD) Level.

Updating the population forecast at the SLA level:

1. Select the 'model parameters' tab in the Model
2. Select the 'Population Projections' under 'Updating Forecast Data' at the top of the sheet
3. Scroll down to the 'Population forecast at SLA level' table (row 226)
4. Paste in the updated population forecast (use paste special/values to retain Model formatting)

Updating the population forecast at the SD or LGA level:

1. Select the 'model parameters' tab in the Model
2. Select the 'Population Projections' under 'Updating Forecast Data' at the top of the sheet
3. Scroll down to either the 'Population forecast at SD level' table (row 189) or 'Population forecast at LGA level' (row 204)
4. Paste in the updated population forecast (use paste special/values to retain Model formatting)
5. Remove worksheet protection (Select: Tools/Protection/Unprotect Sheet)
6. Select cell B251 – this is a switch that changes the population forecast the Model uses
7. Select either LGA or SD depending on what forecast is to be used. The default setting for the switch is SLA.

3.2.4 Updating Employment Inputs

The change in employment (number of employed persons) is used as a driver for forecasting taxi demand for each TSA. As employment data is not readily available at the SLA level or below, the ABS estimation of employed persons at the Statistical Region (SR) level is used.

The June figure of employment of persons (male and female) for each SR is used to compare the percentage difference in employment between years.

Data source for employment (historical data):

- ABS, 6291.0.55.001 Labour Force, Australia, Detailed, Table 16. Labour force status by Regions and Sex
- Employed person updates for June are usually available in mid July of the same year.

Updating historical employment data:

1. Open the ABS website and paste "6291" into the search bar
2. Select the link "6291.0.55.001 - Labour Force, Australia, Detailed..."
3. Select the Downloads tab
4. Download "Table 16, Labour Force Status by Regions"
5. Calculate the average value for the June year (July previous year to latest June)
6. Select the 'model parameters' tab in the Model
7. Select the 'Employment Data' under 'Updating Actuals' at the top of the sheet
8. Scroll down to the 'Employment Data at the Statistical Region' table (row 280)
9. Paste in the latest Labour data from step 5 (use paste special/values to retain Model formatting)

Figure 3.6: Number of Employed Persons at the Statistical District level (Model Extract)

Number of employed persons by statistical region

	Jun-2001	Jun-2002	Jun-2003	Jun-2004	Jun-2005	Jun-2006	Jun-2007
Brisbane Major Statistical Region	808.03	802.93	852.85	878.25	909.25	966.27	986.01
North BSD Balance Statistical Region	131.83	133.67	141.12	143.30	145.49	161.24	163.28
Ipswich City Statistical Region	57.19	57.98	61.22	62.16	63.11	69.94	70.83
Gold Coast Statistical Region	206.33	215.92	222.70	234.49	234.46	250.27	257.79
Sunshine Coast Statistical Region	107.33	112.17	115.26	116.92	127.10	131.63	133.08
West Moreton Statistical Region							
Wide Bay-Burnett Statistical Region	96.75	94.53	103.21	95.37	94.10	103.88	104.27
Mackay-Fitzroy-Central West Statistical Region	160.28	157.24	163.98	165.24	174.23	189.17	195.48
Darling Downs-South West Statistical Region	105.33	110.79	105.15	116.73	113.53	122.24	126.94
Northern - North West Statistical Region	108.63	112.02	110.45	115.52	130.56	139.09	141.46
Far North Statistical Region	112.09	115.62	110.56	116.24	124.85	117.85	125.65

Data source (forecast data):

- Employment forecasts are only freely and readily available at the State level.
- The Queensland Treasury economic forecasts prepared for each budget round contain short-term (four year) forecasts of the percentage change in employment in Queensland.
- These forecasts are revised at the Mid Year Fiscal and Economic Review.
- Both the Budget forecasts and the Mid Year Reviews are available on the Queensland Treasury website.
- The Model uses a 10 year moving average to 'estimate' the employment forecast in out-years

Updating forecast employment data:

1. Open the Queensland Treasury website
2. Select the State Budget or Mid Year Fiscal and Economic Review, depending on which is the latest
3. For State Budget, select 'Budget and Strategy Outlook', then select 'Economic performance and outlook'
4. For the mid year review select 'Mid Year Fiscal and Economic Review' and download latest review
5. Both the Budget Outlook and Mid Year Review have economic forecast tables
6. Select the 'model parameters' tab in the Model
7. Select the 'Employment Projections' under 'Updating Forecast Data' at the top of the sheet
8. Scroll down to the 'Queensland Annual % change' table (row 299)
9. Paste in the updated employment data (use paste special/values to retain Model formatting)

Figure 3.7: Employment Projections (Model Extract)

Employment projections Return to top

Source: Short-term: QLD Treasury economic forecasts/projections - latest, Queensland Treasury economic reviews

Employment projections	Jun-2001	Jun-2002	Jun-2003	Jun-2004	Jun-2005	Jun-2006	Jun-2007	Jun-2008	Jun-2009	Jun-2010	Jun-2011
Queensland (Annual % change)	0.6%	0.2%	3.0%	3.5%	6.3%	2.0%	3.9%	2.8%	2.3%	0.2%	1.3%

3.2.5 Updating Gross State Product Inputs

Gross State Product (GSP) is a measure of income and is used as a driver of taxi demand.

GSP data source (historical data):

- OESR: Economic Growth, Queensland, a) annual % change in chain volume measure (reference year 2007–08): June quarter

Updating historical GSP data:

1. GSP updates are generally available after the following quarter
2. Open the OESR Website
3. Select the 'GSP' link in the 'At a Glance' box
4. Select the 'Supplementary Tables'
5. Download " Table 1 - Qld domestic production account, Trend, chain volume measures (a), $m"
6. Go to " gross state product" (approximately row 55)
7. Divide the sum of the latest financial year (Sep to Jun quarter) by the previous financial year to get the percentage change
8. Select the 'model parameters' tab in the Model
9. Select the 'GSP' under 'Updating Actual' at the top of the sheet
10. Scroll down to the 'GSP Actual annual % change' table (row 333)
11. Paste in the updated GSP data (use paste special/values to retain Model formatting)

GSP data source (forecast data):

- As for the employment forecast, the GSP forecast also uses the Queensland Treasury economic forecasts prepared for each budget round for short-term (four year) forecasts.
- These forecasts are revised at the Mid Year Fiscal and Economic Review.
- Both the Budget forecasts and the Mid Year Reviews are available on the Queensland Treasury website.
- The Model uses a 10 year moving average to 'estimate' the GSP forecast for out-years.

Updating forecast GSP data:

1. Open the Queensland Treasury website
2. Select the State Budget or Mid Year Fiscal and Economic Review, depending on which is the latest
3. For State Budget, select 'Budget and Strategy Outlook', then select 'Economic performance and outlook'
4. For the mid year review select 'Mid Year Fiscal and Economic Review' and download latest review
5. Both the Budget Outlook and Mid Year Review have economic forecast tables
6. Select the 'model parameters' tab in the Model
7. Select the 'GSP Projections' under 'Updating Forecast Data' at the top of the sheet
8. Scroll down to the 'GSP forecast annual % change' table (row 336)
9. Paste in the updated employment data (use paste special/values to retain Model formatting)

Figure 3.8: Updating GSP Data (Model Extract)

Gross State Product

Source: OESR: Economic Growth, Queensland, a) annual % change in chain volume measure (reference year 2007–08) http://www.oesr.qld.gov.au/queensland-by-theme/economic-performance/state-

GSP	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Actual annual % change	2.4%	4.1%	5.6%	5.6%	6.1%	3.6%	5.2%	5.5%	0.8%		
GSP Projections forecast annual % change	Source: Short-term: QLD Treasury economic forecasts/projections - latest, Queensland Treasury economic reviews										
	2.4%	4.1%	5.6%	5.6%	6.1%	3.6%	5.2%	5.5%	0.6%	1.0%	3.5%

3.2.6 Updating Consumer Price Index Inputs

The Consumer Price Index (CPI) is used to convert nominal taxi fares into real taxi fares. It is the change in real fares that will affect taxi demand.

CPI data source (historical data):

- OESR: Consumer Price Index (a)(b): Brisbane:

Updating historical employment data:

1. CPI updates for June are usually available in late July of the same year
2. Open the OESR website
3. Select on the 'CPI' link in the 'At a Glance' box
4. Select the Consumer Price Index (a)(b): Brisbane and weighted average of eight capital cities by group..." link at the bottom of the page
5. Open up the CSV file
6. Select the 'model parameters' tab in the Model
7. Select the 'CPI' under 'Updating Actuals' at the top of the sheet
8. Scroll down to the 'CPI Index number (June qtr)' table (row 319)
9. Paste in the updated CPI data (use paste special/values to retain Model formatting)

CPI data source (forecast data):

- As for the employment forecast, the CPI forecast also uses the Queensland Treasury economic forecasts prepared for each budget round for short-term (four year) forecasts.
- These forecasts are revised at the Mid Year Fiscal and Economic Review.
- Both the Budget forecasts and the Mid Year Reviews are available on the Queensland Treasury website.
- The Model uses a 10 year moving average to 'estimate' the GSP forecast for out-years.

Updating forecast CPI data:

1. Open the Queensland Treasury website
2. Select the State Budget or Mid Year Fiscal and Economic Review, depending on which is the latest
3. For State Budget, select 'Budget and Strategy Outlook', then select 'Economic performance and outlook'
4. For the mid year review select 'Mid Year Fiscal and Economic Review' and download latest review
5. Both the Budget Outlook and Mid Year Review have economic forecast tables
6. Select the 'model parameters' tab in the Model
7. Select the 'CPI Projections' under 'Updating Forecast Data' at the top of the sheet
8. Scroll down to the 'CPI forecast annual % change' table (row 325)
9. Paste in the updated employment data (use paste special/values to retain Model formatting)

Figure 3.9: Updating CPI Data (Model Extract)

CPI

Source: OESR: Consumer Price Index (a)(b): Brisbane: http://www.oesr.qld.gov.au/queensland-by-theme/economic-performance/prices/tables/cpi-bos-wt-avg-eight-group/index.shtml

CPI - ALL Groups, Brisbane	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
CPI index number (June qtr)	132.4	136.3	140.7	144.8	148.5	153.2	158.3	164.8	171.0		
Actual yr on yr % change	4.7%	2.9%	3.2%	2.9%	2.6%	3.2%	3.3%	4.1%	3.8%		
CPI Projections	Source: Short-term: QLD Treasury economic forecasts/projections - latest, Queensland Treasury economic reviews										
Forecast annual % change	4.7%	2.9%	3.2%	2.9%	2.6%	3.2%	3.3%	4.1%	3.6%	2.5%	2.5%
Forecast CPI index number	132.4	136.3	140.7	144.8	148.5	153.2	158.3	164.8	171.0	175.3	179.7

3.2.7 Updating Tourism Inputs

While there is limited evidence in literature of the impact of tourism on taxi or overall transport demand, a 2005 North American study showed strong correlation between demand for taxi service and the number of airport taxi trips[6]. As the number of airport taxi trips and the number of tourists/business travellers are highly correlated and that an increase in the number of tourists/ business travellers would increase demand for taxis, a measure of tourism is used as a driver of taxi demand in the Model.

The annual percentage change in number of guest nights in accommodation with over 15 rooms is used as a proxy for total change in tourist numbers and is used as a driver for forecasting taxi demand.

Tourism data source (historical data):

- ABS 8635.0 Tourist Accommodation, Australia, Table 4. Summary of accommodation establishments with 15 or more rooms, Queensland, data series: A1919374V

Updating historical tourism data:

1. Open the ABS website and paste "8635" into the search bar
2. Click on the link "8635.0 Tourist Accommodation, Australia..."
3. Click on the Downloads tab
4. Download "Table 4. Summary of accommodation establishments with 15 or more rooms, Queensland"
5. Click on "Queensland ; Hotels Motels and Serviced Apartments with 15 or more rooms ; Guest nights ('000) ;" (around row 50)
6. Sum the values for the financial year (Sep, Dec, Mar, Jun)

[6] 'A Regression Model of the Number of Taxicabs in U.S. Cities', Bruce Schaller, January 2005

7. Select the 'model parameters' tab in the Model
8. Select the 'Tourism' under 'Updating Actuals' at the top of the sheet
9. Scroll down to the 'Actual Guest Nights' table (row 398)
10. Paste in the updated guest night data (use paste special/values to retain Model formatting)

Tourism data source (forecast data):

- http://www.tq.com.au/fms/tq_corporate/research - Tourism Forecasts updates
- Tourism Queensland provide projections of international and domestic 'guest nights' for the whole of Queensland
- The figures from the latest forecast can be inserted into the appropriate cells in the Model.
- Note: the forecasts are for calendar years, which fall mid way in the financial year so that the visitor night forecast for 2009 would be copied into the 2009/2010 financial year cell.

Updating forecast tourism data:

1. Go to the Tourism Queensland website: http://www.tq.com.au/
2. Select 'Get the facts, latest research and tourism snapshots'
3. Select 'Economic and Forecast Data'
4. Select the latest 'Tourism Forecast Snapshot'
5. Find the tables showing forecasts for total Domestic visitor nights in Queensland and total International visitor nights in Queensland
6. Select the 'model parameters' tab in the Model
7. Select the 'Tourism Projections' under 'Updating Forecast Data' at the top of the sheet
8. Scroll down to the 'forecast visitor nights – International QLD, Domestic QLD' (rows 402, 403))
9. Paste in the updated visitor night data (use paste special/values to retain Model formatting)

Figure 3.10: Tourism Data Inputs (Model Extract)

Tourism

Source: ABS 8635.0 Tourist Accommodation, Australia, Table 4. Summary of accommodation establishments with 15 or more rooms, Queensland, data series: A1919374V

Guest Nights	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Actual Guest nights	22110	22927	23502	25114	26697	27225	27415	27885	27424	28247	
Annual % change in guest nights	0.7%	3.7%	2.5%	6.9%	6.3%	2.0%	0.7%	1.7%	-1.7%	3.0%	

Tourism Projections

Source: http://www.tq.com.au/fms/tq_corporate/research - Tourism Forecasts updated December 2009

forecast visitor nights: International - QLD									40500000	39300000	40300000
forecast visitor nights: Domestic - QLD									72190000	69916000	71426000
forecast % yr on yr change - QLD										-3.2%	2.3%

3.2.8 Updating Car Ownership Inputs

The level of car ownership, and in particular the number of households with no vehicles available is noted as a driver of taxi demand in literature[7]. As measures of no vehicle households are not readily available, the number of private vehicles per capita is used as a proxy measure.

Car ownership data source (historical):

- Department of Transport and Main Roads: Road Crash, Registration, Licensing and Infringement Database
- A separate Data Formatting Module is used to manipulate the data from the original source into a format useable by the Model

[7] 'A Regression Model of the Number of Taxicabs in U.S. Cities', Bruce Schaller, January 2005

Updating historical data:

1. Request data from the database with the following headings: Postcode, Suburb, Purpose of Use, Number of vehicles for the year ending 31 December
2. Go to 'TaxiModelCarRegistrationDataTemplate.xls' and Paste the data from the database into the yellow input cells
3. The blue output cells contain the formatted data for input into the Model
4. Select the 'model parameters' tab in the Model
5. Select the 'Car Registration' under 'Updating Actuals' at the top of the sheet
6. Scroll down to the 'Car registrations by region' table (row 342)
7. Paste in the updated car registration data (use paste special/values to retain Model formatting)

Forecast data: A suitable forecast for passengers vehicles was not found, so the number of private vehicles per capita growth is forecast to continue at the average growth rate of the previous four years.

Figure 3.11: Private Vehicle Ownership (Formatting Module Extract)

End of Year: 2012 **Financial year:** 2012/2013

TSA	Postcode	Suburb	Purpose of Use	Vehicles
Bribie Island	4507	BANKSIA BEACH	PRIV	4,964
Bribie Island	4507	BELLARA	PRIV	2,908
Bribie Island	4507	BONGAREE	PRIV	5,815
Bribie Island	4507	BRIBIE ISLAND	PRIV	348
Bribie Island	4507	BRIBIE ISLAND NORTH	PRIV	0
Bribie Island	4507	WHITE PATCH	PRIV	122
Bribie Island	4507	WOORIM	PRIV	1,555
Bribie Island	4511	GODWIN BEACH	PRIV	512
Bribie Island	4511	NINGI	PRIV	3,528
Bribie Island	4511	SANDSTONE POINT	PRIV	3,587
Brisbane	4000	BRISBANE	PRIV	3,672
Brisbane	4000	BRISBANE ADELAIDE STREET	PRIV	0
Brisbane	4000	BRISBANE GPO	PRIV	0
Brisbane	4000	SPRING HILL	PRIV	2,220
Brisbane	4005	NEW FARM	PRIV	6,299
Brisbane	4006	BOWEN HILLS	PRIV	841
Brisbane	4006	FORTITUDE VALLEY	PRIV	2,430
Brisbane	4006	FORTITUDE VALLEY BC	PRIV	1

3.2.9 Updating Taxi Fare Inputs

The annual percentage change in real fares is used as a driver in the model for forecasting taxi demand.

Data Source (historical and forecast):

- The Department of Transport and Main Roads, Taxi and Limousine Unit
- Once changes to the fares are known, these can be entered into the yellow input cells in the 'Fares Update' rows of the 'model parameters' worksheet.
- A 'dummy' forecast for fares has been included in the Model, but it is advisable for the Department to replace this with its own fare projections.
- The dummy forecast includes a 10 cent increase in the flag fall rate every five years and the per km rate increases at the average rate of increase of the previous 6 years.

Updating Taxi Fare Inputs:

1. Select the 'model parameters' tab in the Model
2. Select the 'Fare Updates' under 'Updating Actuals' at the top of the sheet
3. Scroll down to the 'Fares as at' table (row 371)
4. Paste in the updated fares data (use paste special/values to retain Model formatting)

Figure 3.12: Taxi Fare Inputs (Model Extract)

Fare Updates — Return to top

Source: TMR

Fare Type	Fares as at: / Region	1/12/2000	1/02/2002	1/09/2003	1/12/2004	1/12/2005	1/07/2006	1/12/2007	1/07/2008	1/12/2008	
Flagfall 1	SEQ	$ 2.50	$ 2.50	$ 2.60	$ 2.60	$ 2.60	$ 2.60	$ 2.60	$ 2.60	$ 2.60	
Flagfall 1	Non-SEQ	$ 2.50	$ 2.50	$ 2.60	$ 2.60	$ 2.60	$ 2.60	$ 2.60	$ 2.60	$ 2.60	
per km	SEQ	$ 1.25	$ 1.25	$ 1.32	$ 1.38	$ 1.60	$ 1.60	$ 1.74	$ 1.82	$ 1.87	
per km	Non-SEQ	$ 1.25	$ 1.25	$ 1.32	$ 1.38	$ 1.68	$ 1.68	$ 1.82	$ 1.91	$ 1.97	

Fare as at 30 June		Jun-2001	Jun-2002	Jun-2003	Jun-2004	Jun-2005	Jun-2006	Jun-2007	Jun-2008	Jun-2009	Jun-2010
Flagfall	SEQ	$ 2.50	$ 2.50	$ 2.50	$ 2.50	$ 2.50	$ 2.50	$ 2.50	$ 2.50	$ 2.60	
	Non-SEQ	$ 2.50	$ 2.50	$ 2.50	$ 2.50	$ 2.50	$ 2.50	$ 2.50	$ 2.50	$ 2.60	
Distance	SEQ	$ 1.25	$ 1.25	$ 1.25	$ 1.32	$ 1.38	$ 1.60	$ 1.60	$ 1.74	$ 1.87	
	Non-SEQ	$ 1.25	$ 1.25	$ 1.25	$ 1.32	$ 1.38	$ 1.68	$ 1.68	$ 1.82	$ 1.97	

Projected Fare Changes		Jun-2001	Jun-2002	Jun-2003	Jun-2004	Jun-2005	Jun-2006	Jun-2007	Jun-2008	Jun-2009	Jun-2010
Fare Type	Region										
Flagfall 1	SEQ										$ 2.60
Flagfall 1	Non-SEQ										$ 2.60
per km	SEQ										$ 1.95
per km	Non-SEQ										$ 2.07

3.2.10 Updating Taxi Kilometre Inputs

Taxi kilometres gives the average annual kilometres travelled by each taxi based on data from the six-monthly checks. The taxi kilometre data is not used by the Model to estimate the number of taxis, but is used in conjunction with the Australian Tax Office (ATO) estimate of taxi revenue per kilometre to estimate change in taxi revenue per annum.

Taxi Kilometre data source (historical):

- Department of Transport and Main Roads: TRAILS database (distance travelled by taxis between inspections)
- Department of Transport and Main Roads: SILAS database (taxis by area and plate)
- A separate Data Formatting Module is used to manipulate the data from the original source into a format useable by the Model

Updating Taxi Kilometre Inputs:

1. Open 'TaxiKMDataTemplate.xls' and follow instructions to gather and manipulate data from the Department databases
2. Select the 'model parameters' tab in the Model
3. Select the 'Taxi Kilometres' under 'Updating Actuals' at the top of the sheet
4. Scroll down to the 'Average km per annum per taxi' table (row 71)
5. Paste in the updated km data (use paste special/values to retain Model formatting)

Figure 3.13: Taxi Kilometre Input Sheet (Formatting Module Extract)

1. Enter financial year:	2009-10	2.Delete old data	3. Paste in new data	4. Go to output

Plate	TSA	From	To	Days	Odometer Start	Odometer Finish	Distance Travelled
T42695	Bribie Island	5/5/05	9/5/06	369	174790	316917	142127
T43242	Bribie Island	7/12/05	7/6/06	182	105543	157023	51480
T45652	Brisbane	9/5/06	9/11/06	184	316917	383066	66149
T45652	Brisbane	7/6/06	4/12/06	180	157023	208868	51845
T45652	Brisbane	9/11/06	10/5/07	182	383066	446873	63807
T45652	Brisbane	4/12/06	5/6/07	183	208868	259643	50775
T45652	Brisbane	8/3/07	10/8/07	155	22360	105475	83115
T45780	Bribie Island	18/4/07	11/10/07	176	70646	154376	83730
T45652	Brisbane	10/5/07	25/11/08	565	446873	654398	207525
T45780	Bribie Island	5/6/07	5/12/07	183	259643	308549	48906
T99518	unknown	25/7/07	22/1/08	181	321670	358902	37232
T46102	Bribie Island	10/8/07	31/7/08	356	105475	262914	157439

3.2.11 Updating Taxi Revenue per km Inputs

The taxi revenue per kilometre earnings rate is the average amount of income earned by a taxi per kilometre travelled by the taxi in a year as estimated by the ATO.

The taxi revenue per kilometre data is not used by the Model to estimate the number of taxis, but is used in conjunction with the taxi kilometre data to estimate change in taxi revenue per annum

Taxi Revenue Data Source (historical):
The Australian Tax Office

Updating Taxi Revenue Inputs:

1. Go to: http://www.ato.gov.au/businesses/content.asp?doc=/content/38263.htm
2. Select the 'model parameters' tab in the Model
3. Select the 'Taxi revenue per km' under 'Updating Actuals' at the top of the sheet
4. Scroll down to the 'Taxi cents per km rate' table (row 100)
5. Paste in the updated cents per km data (use paste special/values to retain Model formatting)

A dummy forecast growth rate of 3% per annum is used in the Model, but this should not be needed as the ATO updates the estimate annually.

Figure 3.14: Taxi Revenue per KM (Model Extract)

Taxi Revenue per km — Return to top

Source: Australian Tax Office: Taxi cents per kilometre rates. Webpage: http://www.ato.gov.au/businesses/content.asp?doc=/content/38263.htm

	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
Taxi cents per km rates	$ 1.01	$ 1.01	$ 1.01	$ 1.01	$ 1.01	$ 1.06	$ 1.10	$ 1.14	$ 1.18	
Taxi revenue per km projections										
Yr on yr forecast increase	3%									
Taxi cents per km rates										$ 1.22

3.2.12 Updating Number of Taxi Licences Inputs

The number of Standard and Wheelchair Taxis in service at the end of June each year is entered for each region. The actual number of taxis input for each year is used as the starting value for the following years calculation of taxi numbers.

Taxi Licence Data Source:
Department of Transport and Main Roads, Taxi and Limousine Unit

Updating Taxi Licence Number Inputs:

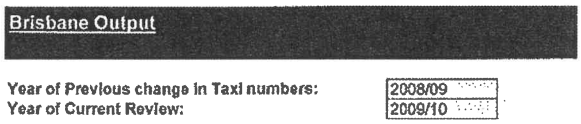
1. Select the 'model parameters' tab in the Model
2. Select the 'Number of Licneces' under 'Updating Actuals' at the top of the sheet
3. Scroll down to the 'Standard Taxis' table (row 21) to update the number of standard taxis
4. Scroll down to the 'Wheelchairs Taxis' table (row 44) to update the number of wheelchair taxis

3.3 Running a Review

Running a review is a four step process:

1. Update all input data (actuals and forecast) as shown in the Review Checklist (3.4)
2. In the 'model output' sheet, set the yellow input cells for "Year of Previous change in Taxi numbers" and "Year of Current Review" for all TSAs that either:
   - DID NOT get reviewed the previous year
   - The Model DID NOT predict a change in taxi numbers the previous year (See figure 3.15)
3. In the 'model output' sheet, the suggested range (high and low) for new taxis is shown in bold. The suggested range for new standard and wheelchair taxis is also shown in bold.
4. The Model's output for each TSA can be printed if required (See figure 4.1)

Figure 3.15: Year of current and previous review (Model Extract)



3.4 Review Checklist

Below is a quick summary of the steps and updates required to run a review. This can be used as a checklist for the User. This Checklist is repeated as Appendix 7.4 to allow easy printing for use.

Table 3.1 Review Checklist

Step	Description	Worksheet	Check
1	Update actual number of taxis (Wheelchair and Standard)	Model Parameters	
2	Update population inputs (actual and forecast)	TaxiModelPopulationDataTemplate.xls Model Parameters	
3	Update MSL data	MSLData	
4	Update licence value data	LicenceValuesData	
5	Update Employment data (actual and forecast)	Model Parameters	
6	Update GSP and CPI data (actual and forecast)	Model Parameters	
7	Update Tourism data (actual and forecast)	Model Parameters	
8	Update Car Registration data (actual)	TaxiModelCarRegistrationDataTemplate.xls Model Parameters	
9	Update Fares data (actual and forecast)	Model Parameters	
11	Set dates of current and previous reviews	Model Output	

4 Interpreting Model Output

The example of the Model output for each TSA highlights areas of output that are further explained in the following sections.

Figure 4.1: Taxi Model Output (Model Extract)

Brisbane Output — Return to top

Year of Previous change in Taxi numbers:		2008/09									2008/09		
Year of Current Review:		2009/10										2009/10	
Taxi numbers			2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
		Actual	1628	1639	1639	1639	1663	1716	1800	1807	1867		
		Modelled Projection									1867	1886	1906
		Adjusted Projection									1867	1886	1906
		Review Projection									1867	1886	1906
		Net increase (rounded)		11	0	0	24	53	84	7	60	19	20
		Standard	1628	1639	1470	1470	1484	1517	1546	1548	1557	1569	1586
		Wheelchair	0	0	169	169	179	199	254	259	310	317	320
		%Wheelchair									16.60%	16.78%	16.78%
		Wheelchair adjustment factor										17.81%	0.00%
	net increase	Standard										12.462	16.64
		Wheelchair										6.538	3.36
	net increase (rounded)	Standard										12	17
		Wheelchair										7	3
		Total										19	20
10%	Range	Adjustment factor										-0.3%	0.0%
		High										21	22
		Low										17	18
	High	Standard										13	19
	Low	Standard										11	15
	High	Wheelchair										8	3
	Low	Wheelchair										6	3
Revenue	Licence Value	Standard										$ 396,500	$ 396,500
		Wheelchair										$ 230,820	$ 230,820
		Total Revenue										$ 6,373,740	$ 7,432,960
Peak Time performance											Good		

1. Taxi number projections
2. Wheelchair and Standard taxi number projections
3. Wheelchair/ Standard taxi adjustment factor
4. Net increase in taxis (rounded)
5. Range adjustment factor and Upper and Lower bounds
6. High and Low bounds for Wheelchair and Standard taxis
7. Revenue projection
8. Peak time performance indicator

4.1 Taxi number projections

In order for the Model to be dynamic and allow for updated actual data to be incorporated into the Model analysis, three point estimates of taxi numbers are calculated in the Output worksheet:

1. Modelled Number: This is the number of taxis estimated by the Model without adjusting for updated actual taxi numbers
2. Adjusted Number: This is the number of taxis estimated by the Model, but adjusted for updates of actual taxi numbers
3. Review Number: The Model includes an adjustment mechanism for TSAs that either do not get reviewed every year, or those that did not have a change in taxi numbers the previous year. In the above circumstances, the Model has a manual setting that will alter the review dates so that the review will compare data from the most recent year when a change in taxi numbers occurred, instead of the usual year on year comparison.

4.2 Wheelchair and standard taxi number projections

The Model provides a projection for the number of wheelchair and Standard taxis based on the ratio of taxis in the previous year and the wheelchair/standard taxi adjustment factor.

4.3 Wheelchair and standard taxi adjustment factor

An adjustment based on the comparative difference in MSL performance between wheelchair and standard taxis. The adjustment factor is the additional percentage of the net increase in taxis that will be allocated to Wheelchair taxis (for a positive adjustment factor) or to Standard taxis (for a negative adjustment factor).

4.4 Net increase in taxis (rounded)

As taxis can only come in whole numbers, the Model rounds the total number of taxis, then rounds the number of wheelchair taxis and the number of standard taxis when the two do not sum to the rounded total.

4.5 Range adjustment factor and upper and lower bounds

A 10% range is initially applied to the Models point estimate of the net increase in taxi numbers. This range is then shifted up or down depending on performance against MSLs. If performance has been below the MSLs then the range will be shifted upwards, if performance has well exceeded MSLs then the range will be shifted downwards.

4.6 Wheelchair and standard taxis - upper and lower bounds

The upper and lower bounds are also applied to the Wheelchair and Standard taxi point estimates to provide a range of possible new taxi licences in both categories.

4.7 Revenue projection

A revenue projection is calculated using the point estimates for Wheelchair and Standard taxis along with the average licence value from sales in the most recent financial year.

4.8 Peak-time performance indicator

A simple indicator of MSL performance during Peak times. This does not affect model output numbers but is included as an indicator of Peak-time performance only:

- If the actual Peak time MSLs are greater than 2% above contract MSLs then the indicator reads "Good"
- If actual Peak time MSLs are within 2% either side of contract MSLs then the indicator reads "Average"
- If the actual Peak time MSLs are greater than 2% BELOW contract MSLs then the indicator reads "Check Peak MSL"

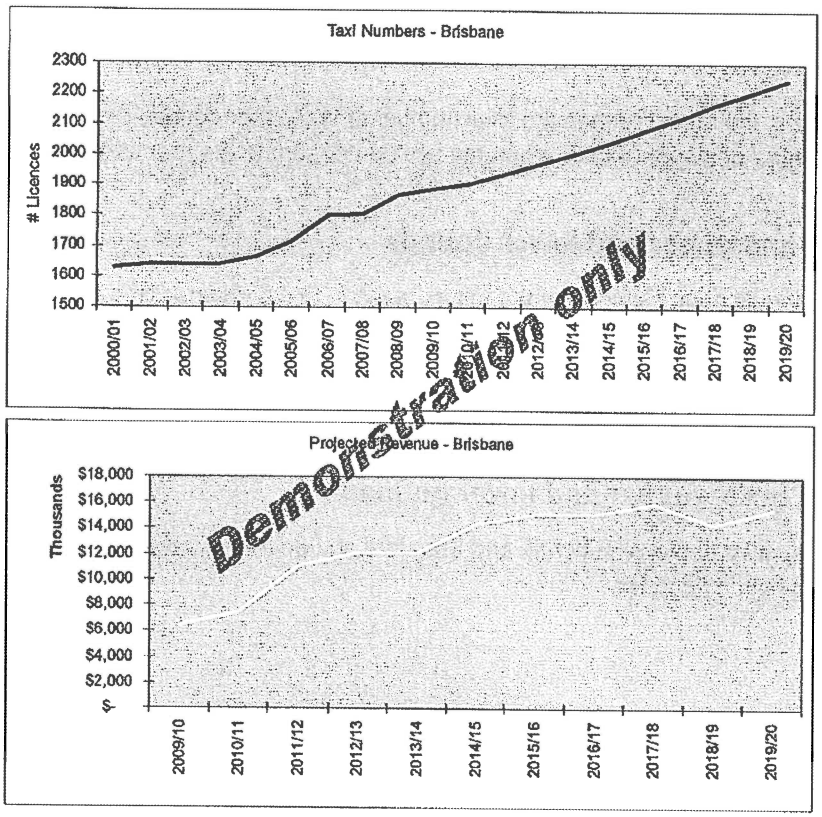
4.9 Output graphs

The Model produces two graphs for each TSA:

1. The modelled projection and the review projection (see 4.1) number of taxis against actual taxis
2. The projected revenue

An example of these graphs is shown below.

Figure 4.2: Taxi Model Output Graphs (Model Extract)



5 Future Enhancement

Despite the high level of detailed modelling undertaken to date, the Model has been constrained by both necessary elements of time and scope, as well as data availability. As such, there are a number of enhancements that could be made to the Model. These enhancements encompass improvements in functionality, detail, forecasting and future proofing.

5.1 Data specificity

While every attempt was made to find sound data that was specific for each of the TSAs, there remains a certain amount of disconnect between some of the variables and the TSA region they represent, as well as some variables historical and forecast values, which may come from differently specified areas. For example:

1. Population data is gathered at either the SLA level or the Urban Centre level, depending on what area appears to 'best fit' the individual TSA. However the population forecast is at the SLA level only.
2. Employment data is gathered at the Statistical Region level, but employment forecasts are only at the State level.
3. Tourism data and forecasts were only found to be easily available at the State level.

Maintaining a watch on potential historical and forecast data sources that more closely match each other and the TSA areas they are to represent, and using those that become available, will increase the level of robustness in the Model.

5.2 Data integrity

Obtaining industry data second hand can lead to some data integrity issues. It is understood that the Department will shortly be able to access taxi industry data directly from taxi booking companies' data warehouses. This should help address any integrity issues in the data used in the Model.

5.3 Elasticity estimation

While there is a wealth of academic literature discussing and providing elasticity estimates for public transport as a whole, the amount of studies dealing directly with taxi demand and specifically elasticities of taxi demand is considerably lighter. As a result the demand elasticities used in the Model rely a narrow group of taxi related studies, mainly non-Australian, or have used the broader public transport studies as a guide and taken a conservative estimate as a result.

Improving the accuracy of the demand elasticities would improve the predictive capabilities of the Model and provide a more robust estimate of taxi numbers – perhaps allowing a narrowing of the range of taxi licences currently used as the main output of the Model. Improving the elasticities can be done indirectly, by keeping a watching brief on transport related research waiting for new data to become available, or directly through primary research. The first method is inexpensive but may take a long-time before any relevant studies are published. The second method is more expensive, but will probably give more accurate results, specific for the areas required.

It is recommended that the demand elasticities be reviewed at least every two to three years to see if they can be improved upon.

5.4 Ease of updating the Model

A number of variables require additional data manipulation before they can be entered into the Model. Removing the need for this would decrease the resource requirement for updating and running the Model and reduce the risk of data entry error creeping into the Model over time. Variables that currently require additional manipulation and could provide benefits from a simplified process include:

1. Car Registrations per TSA – currently the data containing the number of private vehicles in each Queensland postcode is received from the Department of Transport and Main Roads Road Crash, Registration, Licensing and Infringement Database. This data is then put into a separate spreadsheet and the number of registered vehicles sorted into separate TSAs based on postcodes. This sort could probably be done more efficiently at the time of data extraction, with a simple match between postcodes and TSAs (which could be supplied from TaxiModelCarRegistrationDataTemplate.xls)

2. Historical population data is copied into TaxiModelPopulationDataTemplate.xls where SLAs and Urban Centres are added into their respective TSAs. This is fairly straight forward, but may require additional analysis if rows are added or removed by the ABS or OESR. The Department has some expertise in population statistics within the GIS unit, and they are probablybest placed to provide a population estimate for each TSA. Using the Departments GIS team for this would have the benefits of keeping the process in house, and using analysts familiar with population statistics to provide this data directly would reduce the risk of erroneous population estimates and forecasts being included.

3. Data on taxi kilometres is pasted into TaxiKMDataTemplate.xls where taxi km and taxi numbers for each TSA are sorted according to the start and finish dates to provide an average km per taxi estimate. This could probably also be done more efficiently at the data extraction phase and again reduce the risk of data entry error being introduced into the Model.

6 Limitations of the Model

Like all forecasting models, the Model attempts to forecast the outcome of the future based on best available data and assumptions derived from research and inherent industry knowledge. There will always be uncertainty when predicting future events.

This section of the User Guide highlights some of the "gaps" in available data and research that might affect the accuracy of the Model that are not already mentioned in the 'Future Enhancement' section.

6.1 Exclusion of possible drivers of taxi demand

By nature a model is a simplification of the real world. It cannot include all possible variables or drivers as it would become unwieldy and incomprehensible. As a result some elements affecting taxi demand will not be captured, resulting in an over or under estimation of taxi numbers.

Some possible drivers of taxi demand that have remained external to the Model include:

- Changes in the service levels of public transport alternatives. A new bus route or an increase in the number of train services may reduce demand for taxis, especially if the services are between key destinations such as an airport and a CBD. Likewise a reduction in the quality or quantity of service by other modes of public transport may lead to an increase in taxi demand.
- The commencement or cessation of major road works may affect the demand for taxis, if there are alternatives to road transportation, or it may just affect performance against MSLs.
- Weather can play a factor in taxi demand, with user's willingness to pay for a door to door taxi service more appealing than a walk in the rain to public transport stops or stations. A long period of unseasonable weather could affect the number of bookings and MSL levels in a quarter.

While these factors are not included in the Model, it is likely that the difficulty in estimating elasticities and providing useable forecasts would limit their effectiveness in the Model. These factors can also be incorporated into the analysis at the end of the process, when the range of taxi numbers is narrowed down to a final point estimate.

6.2 Data availability

Some areas of the Model require data that is not available. To overcome the 'gap', other data is used as a replacement measure. While this is not ideal, the proxy data will still provide a useable result, although not as accurately as would be expected if the actual data was available. Some examples include:

1. The number of bookings is used to calculate the number of bookings per capita and the number of bookings per taxi. Ideally the variable should be the number of TRIPS, but at the time of building the Model this data was not available. Substituting the number of bookings with number of trips (if/when it becomes available) should enhance the accuracy of the Model.

2. MSL data currently only measures dispatch times, where waiting times could prove a more accurate measure of taxi industry performance. A superior measuring method would be if actual waiting times were recorded so an average waiting time could be measured. This could then be incorporated within the Model as a demand driver, with its own elasticity estimate.
3. Queensland specific taxi industry data such as average operating costs per taxi or average revenue per taxi is not available. If this data was available it could be incorporated within the Model to provide some additional supply-side input.

7 Appendices

7.1 Determining taxi demand drivers and associated elasticities

A number research studies, reports and summary reviews of taxi and passenger transport demand, were reviewed in to ascertain drivers of taxi demand and their associated elasticities. Table 7.1 lists the studies that noted different demand drivers as well as any estimates of demand elasticity that were identified in the studies.

It can be seen that, except for taxi fares, there is limited information on relationships between taxi demand and the remaining drivers. To help account for this, the review also included a number of studies looking at overall demand for public transport, as opposed to solely taxi demand[8].

The drivers in Table 7.1 are consistent with the drivers used in the Departments previous Taxi Area Review Model.

Table 7.1 Study Findings

Demand Driver	Report Suggesting Use/Correlation	Elasticity Estimate
Taxi Fares	– Booz/ACT, 2003	-0.36
	– Rouwendal, 1998	-1.14
	– Schaller, 1998	-0.22
	– San Francisco, 2006	-0.3
	– QLD TMR, 2004	-0.74 to -1.12(derived)
	– Gaunt and Black, 1996	
	– Frankena, 1984	-0.8
	– OXENA, 2003	
	– Abelson, 2009	-1.0
	– Booz/IPART, 2003	-0.3 to -0.8
	– QT, 2000 (unseen)	-0.36 Brisbane -0.50 QLD
Employment	– Schaller, 1998	0.65
	– OXENA, 2003	
	– Streeting and Barlow, 2004	0.38 (PT*)
Income/Economy	– Schaller, 1998	0.65
	– Frankena, 1984	
	– OXENA, 2003	
	– SAHA, 2009	-0.5 to 0.5 (PT*)
	– TRL, 2004 (Income including car ownership)	-0.5 to -1.0 (Bus) 0.90 to 1.93 (Rail)
	– Clark, 1997	0.33 to 0.45 (Bus)
	– Holmgren, 2007	-0.62 to 0.47 (Bus)

[8] Koehler, 2004 noted: J.P.Toner of Leeds University's Institute for Transport Studies in an unpublished discussion note (November 2002) for the Office of Fair Trading called for further empirical studies: "We are left with a difficulty: elasticities are what will determine whether the public is best served by entry derestriction (in terms of waiting time benefits); but the necessary information is conspicuous by its absence. I would think that a limited programme of work is necessary to try to establish these key parameters with greater clarity."

Demand Driver	Report Suggesting Use/Correlation	Elasticity Estimate
Tourism/ Airport trips	- Schaller 1998 - Schaller, 2005 - OXENA, 2003 - Streeting and Barlow, 2004	 0.05 (PT*)
Car Ownership	- Schaller, 2005 - SAHA, 2009 - TRL, 2004 (Income including car ownership) - Clark, 1997 - Holmgren, 2007	 -0.2 to -1.0 (PT*) -0.5 to -1.0 (Bus) 0.90 to 1.93 (Rail) -1.04 to -1.43 (Bus) -1.48 (Bus)
Service Levels/ Waiting times	- Booz/ACT, 2003 - Rouwendal, 1998 - Frankena, 1984 - OXENA, 2003 - BTE elasticity database (tables 9B16 and 9C02)	-0.17 (Bus) -0.45 0.53 (Brisbane bus) 0.63 (Brisbane train)

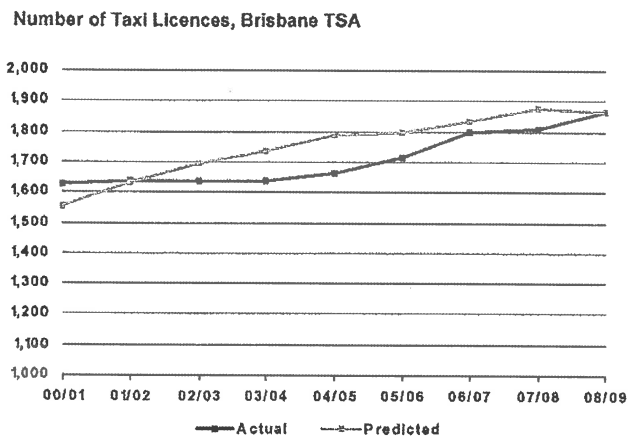
(PT = public transport)

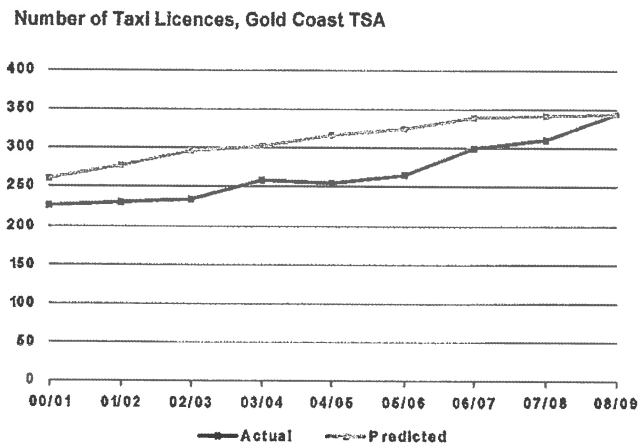
Backcasting was used to help guide the selection of the explanatory variables associated elasticities for use in the Model. This was done by attempting to minimise the variation between predicted and observed number of taxis.

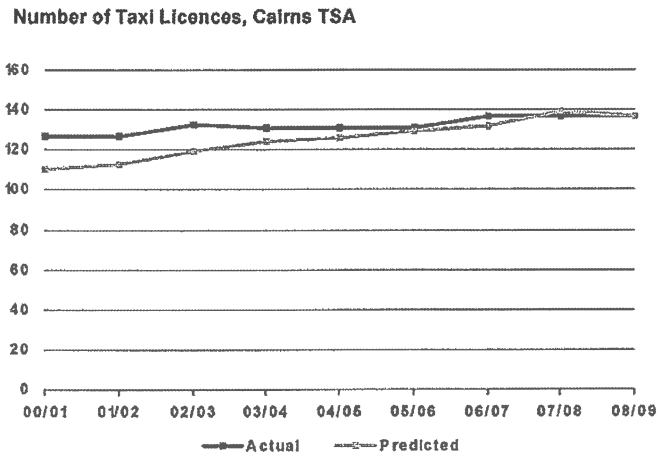
Data from 2000/01 to 2008/09 was used, with the period of analysis constrained by taxi industry data availability. Due to the uncertainty around elasticity levels, a conservative initial estimate was used for all elasticities.

The Figure 7.1 below show the number of taxis predicted using the backcasting method against actual taxis for the four largest taxi areas, while Table 7.2 shows the percentage difference in the predicted to actual taxi numbers for each TSA over a two year, four year and eight year period.

Figure 7.1: Taxi numbers – backcast prediction against actual







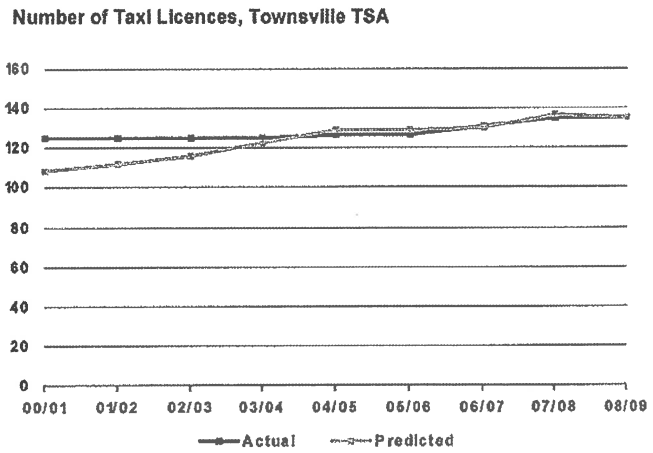


Table 7.2 Backcasting results

	Difference between predicted and actual taxi numbers		
TSA	8 years (2001-08)	4 years (2004-08)	2 years (2006-08)
Brisbane	2.9%	4.6%	2.9%
Gold Coast	17.7%	16.6%	11.2%
Sunshine Coast	12.8%	6.5%	4.1%
Cairns	-6.2%	-2.0%	-1.1%
Townsville	-3.6%	0.8%	0.1%
Toowoomba	-7.1%	-2.5%	-2.4%
Gladstone	N/A	3.8%	4.6%
Mackay	N/A	3.0%	0.8%
Ipswich	N/A	-6.5%	-6.1%
Redcliffe	-3.1%	3.7%	5.3%
Mt Isa	2.9%	4.0%	1.5%
Bundaberg	-3.2%	-1.1%	-1.5%
Rockhampton	N/A	5.6%	5.0%
Gympie	N/A	-12.6%	-12.2%
Innisfail	-0.7%	3.7%	3.1%
Capricorn Coast	6.0%	7.3%	5.7%
Hervey Bay	-4.4%	-2.8%	-1.3%
Maryborough	-2.5%	-3.1%	-6.7%
Warwick	-2.0%	-1.6%	-5.4%
Bribie Island	N/A	N/A	0.3%
Overall	1.7%	4.6%	3.0%

As seen, the difference in the number of taxis predicted via the backcasting exercise to the actual number of taxis varied across the TSAs. This is expected due to the historical number of taxis being regulated (not modelled) as well as the data limitations of the model.

Overall, the number of taxis predicted by the Model for all contract areas was 1.7% above the actual number over the eight year backcasting period.

Table 7.3 shows the elasticities used in the Model to estimate taxi demand in Queensland contract TSAs.

Table 7.3 Elasticities used in Model

TSA	Fares	Employment	GSP	Car Ownership	Tourism
Brisbane	-0.4	0.3	0.05	-0.25	0.05
Gold Coast	-0.4	0.3	0.05	-0.25	0.05
Other TSAs	-0.5	0.3	0.05	-0.25	0.05

7.2 Taxi Licence Model data sources

Data	actual/forecast	data source
population	actual	1. ABS Regional Population Growth, series 3218.0, Table 3. Estimated Resident Population, Statistical Local Areas, Queensland 2. http://www.oesr.qld.gov.au/queensland-by-theme/demography/population/tables/erp/erp-ucl-qld/index.shtml
Population	forecast	The Commonwealth Department of Health and Ageing, based on preliminary 2007 Census-based ERP and assumptions from the 2006-2101 issue of Population Projections, Australia (ABS Cat. No. 3222.0).
Employment	actual	ABS, 6291.0.55.001 Labour Force, Australia, Detailed, Table 16. Labour force status by Regions and Sex
Employment	forecast	QLD Treasury economic forecasts/projections – latest, QLD Treasury 'Mid Year Fiscal and Economic Review' – latest
Gross State Product	actual	OESR: Economic Growth, Queensland, a) annual % change in chain volume measure (reference year 2007–08): June quarter
Gross State Product	forecast	QLD Treasury economic forecasts/projections – latest, QLD Treasury 'Mid Year Fiscal and Economic Review' – latest
Consumer Price Index	actual	OESR: Consumer Price Index (a)(b): Brisbane:
Consumer Price Index	forecast	QLD Treasury economic forecasts/projections – latest, QLD Treasury 'Mid Year Fiscal and Economic Review' – latest
passenger vehicles	actual	Department of Transport and Main Roads: Road Crash, Registration, Licensing and Infringement Database
passenger vehicles	forecast	Existing trend
tourism	actual	ABS 8635.0 Tourist Accommodation, Australia, Table 4. Summary of accommodation establishments with 15 or more rooms, Queensland, data series: A1919374V
tourism	forecast	http://www.tq.com.au/fms/tq_corporate/research - Tourism Forecasts
taxi fares	actual	Department of Transport and Main Roads, Taxi and Limousine Unit
taxi fares	forecast	Existing trend and/or Department of Main Roads, Taxi and Limousine Unit
number of licences	actual	Department of Transport and Main Roads, Taxi and Limousine Unit
taxi kilometres	actual	The Department of Transport and Main Roads: TRAILS and SILAS databases
taxi revenue per km	actual	http://www.ato.gov.au/businesses/content.asp?doc=/content/38263.htm
licence values	actual	Department of Transport and Main Roads, Taxi and Limousine Unit
MSL data	actual	Department of Transport and Main Roads, Taxi and Limousine Unit

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7.4 Review Checklist

Step	Description	Worksheet	Check
1	Update actual number of taxis (Wheelchair and Standard)	Model Parameters	
2	Update population inputs (actual and forecast)	TaxiModelPopulationDataTemplate.xls Model Parameters	
3	Update MSL data	MSLData	
4	Update licence value data	LicenceValuesData	
5	Update Employment data (actual and forecast)	Model Parameters	
6	Update GSP and CPI data (actual and forecast)	Model Parameters	
7	Update Tourism data (actual and forecast)	Model Parameters	
8	Update Car Registration data (actual)	TaxiModelCarRegistrationDataTemplate.xls Model Parameters	
9	Update Fares data (actual and forecast)	Model Parameters	
11	Set dates of current and previous reviews	Model Output	

Cost component	2007 value	Index weight	2007 TCFI Assumptions	Escalation Factor	2013 TCFI Assumptions
Driver labour	-	45%	Based on traditional income sharing agreement, where drivers retain approximately 45 per cent of the revenue (if they do not pay for the fuel, or 50% per cent if fuel is paid for by drivers), and operators retain approximately 55 per cent of the revenue per taxi operated	QLD Labour Price Index (LPI) Source: ABS Cat no 6345.0 Table 2b. Total Hourly Rates of Pay Excluding Bonuses: All Sectors by State, Original (Quarterly Index Numbers)	No change
Operator labour	-	5%			No change
Fuel	$19,084	14%	Based on assumptions: 1. the average number of kilometres travelled per taxi in 2006 of 157,000 kilometres per annum 2. an average LPG fuel price is 54.7 c per litre 3. average consumption of LPG in taxis of 4.5 kilometre per litre	Brisbane Metro LPG Prices Source: FUELtrac provided by TCQ	1. the average number of kilometres travelled per taxi of 157,000 kilometres per annum 2. an average unlead fuel price is 71.0 c per litre 3. average consumption of petrol in taxis of Option 1 manufacture recommendation for urban cycle Option 2 U.S Department of Engery statistics
Repair & Maintenance	$7,205	5%	Based on assumptions: 1. eight major services for eight hours each (64 hours in total) 2. eight minor services for four hours each (32 hours in total) 3. An allowance of 35 hours of unplanned maintenance per annum 4. An average mechanics fees of $55 per hour	QLD Labour Price Index (LPI) Source: ABS Cat no 6345.0 Table 2b. Total Hourly Rates of Pay Excluding Bonuses: All Sectors by State, Original (Quarterly Index Numbers)	Assume the number of labour hours spent on major services is the same as servicing with additional maintenance requirements. Assume the average mechanics fees to increase by LPI since 2007 (apply escalation) Option 1: no change [assume in core model] Option 2: 10% decrease
Parts & panels	$10,890	8%	Based on assumptions: 1. In 2003/2004, the ACT repairs and maintenance cost including both maintenance labour and parts and panels is $15,948 2. Applying 13.5 per cent inflation over four year to 2007 3. The current labour maintenance cost is estimated as above ($7,205)	CPI Motor vehicle parts and accessories (Brisbane) Source: ABS Cat no. 6401.0 Table 13. CPI: Group, Sub-groups and Expenditure Class, Index Numbers by Capital City	Assume battery price is added onto the current parts and panel cost Assume battery needs to be changed every 160,000km Option 1: no change to 2007 assumptions Option 2: add battery cost of $4,000 for Prius and $6,000 for Prius V
Cleaning	$2,912	2%	Based on assumptions: 1. An average of 208 hours per year spent cleaning a taxi 2. An average hourly cost rate of $14 per hour	CPI: All groups (Brisbane) Source: ABS Cat no. 6401.0 Table 1 and 2. CPI: All Groups, Index Numbers and Percentage Changes	No change
Comprehensive insura	$4,593	3%	Comprehensive insurance from the Taxi Industry Australia Insurance Brokers (TIAIB) for a $20,000 vehicle with a 40 per cent no claim bonus	Premium for M RATE (40% No Claim Bonus & 20,000 Agreed Value) including all charges Source: Taxi Industry (Aust) Insurance Brokers (TIAIB) provided by TCQ	Updated with increase vehicle value including fit-out cost
Third party insurance	$3,812	3%	Class 3 vehicles from QBE insurer	Class 3 CTP premiums for 12 months with Input Taxi Credit Entitlement (ITCE) for Taxi (cars and station wagons only) Source: Motor Accident Insurance Commission (MAIC) provide by TCQ	No change
Vehicle leasing charge	$4,693	3%	Based on assumptions: 1. 4 year lease at 8.5 per cent interest with a 10% residual value 2. The purchase value of vehicle is $13,176 3. An one-off fit-out cost of $6,824 (average $1,706 per annum)	Small Business Term Loan Rate* Source: Reserve Bank of Australia (RBA) F05 Lending Indicator Rates	Updated with increase vehicle value including fit-out cost
Network fees	$7,967	6%	Market quotes for network fees are currently $8,145 per annum for Blank and White Taxis and $7,788 per annum for Yellow Cabs. The cost weight on the simple average of these two network fees , the two largest taxi networks in Queensland, which is $7,967	Yellow Cabs and B&WCabs radio dues/service fees (adjusting 13 months annual charges into monthly fees inc GST) Source: Yellow Cabs and B&WCabs General Manager, provided by TCQ	No change
Other	$6,798	5%	- tyres of $2,700 from ACT estimates based on lower-cost suppliers -Personal accident work injury costed by TCQ at $498 per annum - Unirforms cost of $600 according to ACT estimates - Governemt charges pf $1,000 - $2,000 of other expenses	CPI: All groups (Brisbane) Source: ABS Cat no. 6401.0 Table 1 and 2. CPI: All Groups, Index Numbers and Percentage Changes	No change
TOTAL	$67,954	100%			

*The TCFI model was updated to adopt RBA's small business term loan rate as the cost inflator for vehicle leasing/financing charges as per the recommendation set out in PwC letter dated 4 June 2010

920 Prius Hybrid
733 Camry "

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TCFI Model Review

November 2013

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Agenda

Introduction (5 mins)

Features of the median taxi (15 mins)

Our approach

- Step 1: Identify cost components affected by hybrid vehicle (5 mins)
- Step 2: Estimate the current value of unaffected cost components (5 mins)
- Step 3: Review of updates required for affected cost components (45 mins)
  - How does this change the weights in the TCFI model?
- Step 4: Assess inflators for cost components (5 mins)

Next steps (5 mins)

Introduction

- The current TCFI was developed in 2007, based on a median taxi that runs on LPG fuel
- The current taxi fleet in Queensland consists of 62.3% of hybrid vehicle

Queensland Taxi fleet as at 24 Oct 2013	Conventional (Standard) Taxi Licences	Wheelchair Accessible Taxi Licences	Total Taxi Service Licences
	2618	642	3260
Number of hybrid taxi	1631 (62.3% of conventional taxi licences)		

Source: DTMR

- The objective of this review is to update the TCFI weights to be representative of the median taxi in the Queensland fleet – hybrid vehicle
- This workshop will demonstrate change of TCFI index for individual cost component and discuss these key decisions:

  #1. The median taxi type

  #2. Fuel consumption under taxi driving condition

  #3. Repair and maintenance cost

  #4. Parts and panels cost

The TCFI is based on cost of the median taxi

This model update requires a decision on the vehicle type of the median taxi

Assumptions	Median taxi in 2007 TCFI Review ($2007)	Median taxi in 2013 TCFI Review ($2013)	
		Option 1 (Core)	**Option 2**
Vehicle	Ford Falcon	Hybrid Prius	Hybrid Prius V
Seater	5-seater	5-seater	7-seater
Vehicle value	$13,176 (weighted average of new and used vehicles) and a fit-out cost of $6,824	$38,000* (brand new) and a fit-out cost of $8,095	$40,000* (brand new) and a fit-out cost of $8,095
First launch in Australia (year)		2000	2012
Fuel type	LPG	Unleaded petrol and electricity	Unleaded petrol and electricity
Fuel consumption	Taxi efficiency: 4.5 km/L Manufacturer**: 5.5 km/L	Taxi efficiency: 20.4 km/L Manufacturer**: 25.6 km/L	Taxi efficiency: 18.5 km/L Manufacturer**: 23.26 km/L
Average km travelled per year	157,000 km	157,000 km	157,000 km
Insurance (TIAIB)	40% No claim bonus & $20,000 agreed value (include fit-out), including all charges	40% No claim bonus & $46,095 agreed value (purchase value with fit-out cost) including all charges	40% No claim bonus & $48,095 agreed value (purchase value with fit-out cost) including all charges
Other cost		Battery cost $4,000***	Battery costs $6,000***

Notes: *Prices are rounded up from full driveway price. ** Manufacturer fuel consumption is for urban cycle only.*** Quoted from Toyota Brisbane Service Centre over the phone
Source: Manufacture official website and PwC summary

The TCFI is based on cost of the medi

This model update requires a decision on the vehicle type of the m

#1. Which vehicle is a better representation of the median taxi?

Assumptions	Median taxi in 2007 TCFI Review ($2007)	Median taxi in 2013 TC[illegible]w ($2013)	
		Option 1 (Core)	**Option 2**
Vehicle	Ford Falcon	Hybrid Prius	Hybrid Prius V
Seater	5-seater	5-seater	7-seater
Vehicle value	$13,176 (weighted average of new and used vehicles) and a fit-out cost of $6,824	$38,000* (brand new) and a fit-out cost of $8,095	$40,000* (brand new) and a fit-out cost of $8,095
First launch in Australia (year)		2000	2012
Fuel type	LPG	Unleaded petrol and electricity	Unleaded petrol and electricity
Fuel consumption	Taxi efficiency: 4.5 km/L Manufacturer**: 5.5 km/L	Taxi efficiency: 20.4 km/L Manufacturer**: 25.6 km/L	Taxi efficiency: 18.5 km/L Manufacturer**: 23.26 km/L
Average km travelled per year	157,000 km	157,000 km	157,000 km
Insurance (TIAIB)	40% No claim bonus & $20,000 agreed value (include fit-out), including all charges	40% No claim bonus & $46,095 agreed value (purchase value with fit-out cost) including all charges	40% No claim bonus & $48,095 agreed value (purchase value with fit-out cost) including all charges
Other cost		Battery cost $4,000***	Battery costs $6,000***

Notes: *Prices are rounded up from full driveway price. ** Manufacturer fuel consumption is for urban cycle only.*** Quoted from Toyota Brisbane Service Centre over the phone
Source: Manufacture official website and PwC summary

Step 1: Identify TCFI cost components that are affected by hybrid vehicle (1)

Overall, **34%** index weights of the TCFI model will be directly affected by hybrid vehicle

Cost component	2007 Model Assumptions	Escalation Factor	Directly affected by hybrid vehicle?	2007 index weights	Comment
Driver labour	Based on traditional income sharing agreement, where drivers retain approximately 45 per cent of the revenue (if they do not pay for the fuel, or 50% per cent if fuel is paid for by drivers), and operators retain approximately 55 per cent of the revenue per taxi operated	QLD Labour Price Index (LPI) from ABS *Cat no 6345.0 Table 2b. Total Hourly Rates of Pay Excluding Bonuses: All Sectors by State, Original (Quarterly Index Numbers)*	No	45%	
Operator labour			No	5%	
Fuel	1. the average number of kilometres travelled per taxi in 2006 of 157,000 kilometres per annum 2. an average LPG fuel price is 54.7 c per litre 3. average consumption of petrol in taxis of 4.5 kilometre per litre	Brisbane Metro LPG Prices from FUELtrac *provided by TCQ*	Yes	14%	Hybrid vehicle consumes petrol instead of LPG, and has lower fuel consumption
Repair & Maintenance labour	1. eight major services for eight hours each (64 hours in total) 2. eight minor services for four hours each (32 hours in total) 3. An allowance of 35 hours of unplanned maintenance per annum 4. An average mechanics fees of $55 per hour	QLD Labour Price Index (LPI) from ABS *Cat no 6345.0 Table 2b. Total Hourly Rates of Pay Excluding Bonuses: All Sectors by State, Original (Quarterly Index Numbers)*	Yes	5%	Hybrid vehicles may require fewer maintenance because they are newer vehicles and they have fewer parts

Step 1: Identify TCFI cost components that are affected by hybrid vehicle (2)

Cost component	2007 Model Assumptions	Escalation Factor	Directly Affected by hybrid vehicle?	2007 index weights	Comment
Parts & panels	1. In 2003/2004, the ACT repairs and maintenance cost including both maintenance labour and parts and panels is $15,948 2. Applying 13.5 per cent inflation over four year to 2007 3. The current labour maintenance cost is estimated as above ($7,205)	CPI Motor vehicle parts and accessories (Brisbane) from ABS *Cat no. 6401.0 Table 13. CPI: Group, Sub-groups and Expenditure Class, Index Numbers by Capital City*	Yes	8%	Hybrid vehicles requires a battery change for every 160,000km travelled
Cleaning	1. An average of 208 hours per year spent cleaning a taxi 2. An average hourly cost rate of $14 per hour	CPI: All groups (Brisbane) from *ABS Cat no. 6401.0 Table 1 and 2. CPI: All Groups, Index Numbers and Percentage Changes*	No	2%	
Comprehensive insurance	Comprehensive insurance from the Taxi Industry Australia Insurance Brokers (TIAIB) for a $20,000 vehicle with a 40 per cent no claim bonus	Premium for M RATE (40% No Claim Bonus & 20,000 Agreed Value) including all charges from Taxi Industry (Aust) Insurance Brokers (TIAIB) *provided by TCQ*	Yes	3%	Increases with vehicle value
Third party insurance	Class 3 vehicles from QBE insurer	Class 3 CTP premiums for 12 months with Input Taxi Credit Entitlement (ITCE) for Taxi (cars and station wagons only) from Motor Accident Insurance Commission (MAIC) *provide by TCQ*	No	3%	

Step 1: Identify TCFI cost components that are affected by hybrid vehicle (3)

Cost component	2007 Model Assumptions	Escalation Factor	Directly affected by hybrid vehicle?	2007 index weights	Comment
Vehicle leasing charges	1. 4 year lease at 8.5 per cent interest with a 10% residual value 2. The purchase value of vehicle is $13,176 3. An annual fit-out cost of $1,706	Small Business Term Loan Rate from Reserve Bank of Australia (RBA) *F05 Lending Indicator Rates**	Yes	3%	Changes based on loan amount according to vehicle purchase value
Network fees	Market quotes for network fees are currently $8,145 per annum for Blank and White Taxis and $7,788 per annum for Yellow Cabs. The cost weight on the simple average of these two network fees , the two largest taxi networks in Queensland, which is $7,967	Yellow Cabs and B&WCabs radio dues/service fees (adjusting 13 months annual charges into monthly fees inc GST) from Yellow Cabs and B&WCabs General Manager, *provided by TCQ*	No	6%	
Other	1. tyres of $2,700 from ACT estimates based on lower-cost suppliers 2. Personal accident work injury costed by TCQ at $498 per annum 3. Unirforms cost of $600 according to ACT estimates 4. Governemt charges pf $1,000 5. $2,000 of other expenses	CPI: All groups (Brisbane) from ABS *Cat no. 6401.0 Table 1 and 2. CPI: All Groups, Index Numbers and Percentage Changes*	No	5%	Assume that hybrid vehicles do not impose additional cost that have not already been captured in the cost components above.

Note: *The TCFI model was updated to adopt RBA's small business term loan rate as the cost inflator for vehicle leasing/financing charges as per the recommendation set out in PwC letter dated 4 June 2010

Step 2: Estimate the current value of unaffected cost components

Cost components that are unaffected have been estimated based on assumptions determined in the 2007 review.

Cost component	Directly affected by hybrid vehicle?	Assumptions underpinning conversion to Sept 2013 values
Driver labour	No	Based on traditional income sharing agreement, where drivers retain approximately 45% of revenue.
Operator labour	No	Based on traditional income sharing agreement, where operators retain ~~5%~~ 50% of revenue.
Cleaning	No	Escalated based on CPI for all sector groups in Brisbane (increased by 18.6% from Sep 2007 to Sep 2013)
Third party insurance	No	Based on Class 3 CTP premiums for 12 months with Input Taxi Credit Entitlement (ITCE) for taxis. Sourced from Motor Accident Insurance Commission (MAIC)
Network fees	No	Based on average of Yellow Cabs and B&W Cabs radio due/service fee data provided by TCQ
Other	No	Escalated based on CPI for all sector groups in Brisbane (increased by 18.6% from Sep 2007 to Sep 2013)

Step 3: Estimate values for each cost component
How does this affect the weights?

Key decisions

2013 Model Assumptions	Cost components directly affected	Core	Alternative option
The median taxi type	Fuel cost Part and panels Comprehensive insurance Vehicle leasing charges	Toyota Hybrid Prius	Toyota Hybrid Prius V
Fuel consumption under taxi driving condition	Fuel cost	Manufacturer's estimation	Prius: 20.4km/L Prius V: 18.5 km/L
Repair and maintenance cost	Repair and maintenance cost	1. eight major services for eight hours each (64 hours in total) 2. eight minor services for four hours each (32 hours in total) 3. An allowance of 35 hours of unplanned maintenance per annum 4. An average mechanics fees of $55 per hour ***(Same as 2007 TCFI and hour rate inflated to Sep 2013)***	Assuming 10% lower for hybrid vehicles given less maintenance requirement for hybrid vehicle
Parts and panels cost	Parts and panels cost	1. In 2003/2004, the ACT repairs and maintenance cost including both maintenance labour and parts and panels is $15,948 2. Applying 13.5 per cent inflation over four year to 2007 3. The current labour maintenance cost is estimated as above ***(Same as 2007 TCFI and value inflated to Sep 2013)***	Include battery replacement cost

Key decision #2: Fuel Consumption

- Under the driving condition, the fuel consumption in kilometre per litre for taxi is usually close to manufacture recommendation for urban cycle*

QLD TCFI 2007 estimate	WA 2007 industry survey	NSW 2011 industry survey	ATO Small Business Benchmarks for Taxi drivers and Operator – Issued 2013
4.5 km/L	5.8 km/L	4.6 km/L***	5.6 km/L
Ford Falcon (LPG)**	Manufacture recommendation for urban cycle: 5.5 km/L		

Note: *Conducted according to Australian Design Rules (ADR) 81/02 involving a series of stop-start procedure with the vehicle travelling at up to 50 km/h **Majority of Australian Taxi fleet is Ford Falcon ***Assuming average LPG price of 60.9 c/L
Source: QLD TCFI 2007, WA TCI 2007, NSW CIE Survey 2011, ATO available at http://www.ato.gov.au/Business/Small-business-benchmarks/In-detail/Benchmarks-A-Z/R-Z/Taxi-drivers-and-operators---issued-2013/ , Green Vehicle Guide available at http://www.greenvehicleguide.gov.au/GVGPublicUI/SearchResults.aspx

- There is lack of research for hybrid taxi fuel consumption across jurisdictions in Australia. U.S Department of Energy** estimates fuel consumption of Toyota Prius taxi is 20.4 km/L

Assumption 2 Fuel Consumption (kilometre per litre)	Manufacturer - Toyota Recommendation for Urban Cycle (Core)	Alternative option: U.S Department of Energy estimates
Hybrid Prius	20.4	25.6
Hybrid Prius V	18.5*	23.8

Note: *Calculated based on the ration of manufacture (urban cycle) and U.S Department of Energy statistics for Hybrid Prius
Source: Green Vehicle Guide available at http://www.greenvehicleguide.gov.au/GVGPublicUI/SearchResults.aspx, Clean Cities, U.S Department of Energy (April 2009) available at http://www.afdc.energy.gov/pdfs/45148.pdf

Step 3: Estimate values for each cost component

How does this affect the weights?

2013 TCFI cost model results with core assumptions

Cost component	Sept 2007 values (Ford Falcon)	Sept 2013 values (Ford Falcon)	Sept 2013 values (Prius)	2007 index weights	2013 index weights
Driver labour				45%	45%
Operator labour				5%	5%
Fuel	19,084	24,858	9,040[1] ↓	14%	6%
Repair & Maintenance labour	7,205	8,888	8,888	5%	6%
Parts & panels	10,890	11,623	11,623	8%	7%
Cleaning	2,912	3,454	3,454	2%	2%
Comprehensive insurance	4,593	7,583	8,341[2] ↑	3%	5%
Third party insurance	3,812	6,906	6,906	3%	4%
Vehicle leasing charges	4,693	4,670	14,064[3] ↑	3%	9%
Network fees	7,967	9,722	9,722	6%	6%
Other	6,798	8,064	8,064	5%	5%
Total	**67,954**	**85,770**	**80,104** ↓	**100%**	**100%**

Assumptions:

1 Estimated with Toyota recommendation for urban cycle fuel consumption.

2 To be sourced from TIAIB once vehicle type is confirmed. Current estimates assumes a 10% increase from the Ford Falcon Sept 2013 value.

3 Vehicle leasing charges was estimated assuming an 8.5% p.a. interest rate, 4 year loan, 10% residual value, and a loan value of $38,000, plus a fit out cost of $2,024 per year.

Step 3: Estimate values for each cost component

How does this affect the weights?

2013 TCFI cost model results with core assumptions

Cost component	Sept 2007 values (Ford Falcon)	Sept 2013 values (Ford Falcon)	Sept 2013 values (Prius)		
Driver labour				45	45%
Operator labour					5%
Fuel	19,084	24,858	9,040[1]	14%	6%
Repair & Maintenance labour	7,205	8,888	8,888	5%	6%
Parts & panels	10,890	11,623	11,623	8%	7%
Cleaning	2,912	3,454	3,454	2%	
Comprehensive insurance	4,593	7,583	8,341[2]		
Third party insurance	3,812	6,906	6,906		
Vehicle leasing charges	4,693	4,670	14,064[3]	3%	
Network fees	7,967	9,722	9,722	6%	
Other	6,798	8,064	8,064	5%	
Total	**67,954**	**85,770**	**80,104**	**100**	

#3. Assume repair and maintenance cost remain the same (Alternative option: assuming 10% lower for hybrid vehicles. Given less maintenance requirement for hybrid vehicle)

#4. Assume parts & panels cost remain the same (Alternative option: assuming current parts and panels cost with battery replacement cost of $4,000 for Prius and $6,000 for Prius V quoted from Toyota Brisbane Service Centre)

Assumptions:

1 Estimated with Toyota recommendation for urban cycle fuel consumption.

2 To be sourced from TIAIB once vehicle type is confirmed. Current estimates assumes a 10% increase from the Ford Falcon Sept 2013 value.

3 Vehicle leasing charges was estimated assuming an 8.5% p.a. interest rate, 4 year loan, 10% residual value, and a loan value of $38,000, plus a fit out cost of $2,024 per year.

Step 4: Assess inflators for each cost component

Cost component	Current Inflator	Source	Changes between 2007 and 2013 model
Driver labour	Queensland Labour Price Index (LPI)	ABS	No change
Operator labour	Queensland LPI	ABS	No change
Fuel	Brisbane Metro Unleaded Petrol Price	FUELTrac *(provided by TCQ)*	Changed from LPG price to unleaded petrol price
Repair & Maintenance labour	Queensland LPI	ABS	No change
Parts & panels	Brisbane CPI for Motor Vehicle Parts and Accessories	ABS	No change
Cleaning	Brisbane CPI for all sectors	ABS	No change
Comprehensive insurance	Premium for M RATE (40% no claim bonus & $40,000 agreed value) including all charges	TIAIB *(provided by TCQ)*	Insured value has changed from $20,000 to $46,095/$48,095 depending on vehicle type
Third party insurance	Class 3 CTP Premium for 12 months with Input Taxi Credit Entitlement (ITCE)	Motor Accident Insurance Commission (MAIC) *(provided by TCQ)*	No change
Vehicle leasing charges	Small business term loan rates*	RBA	No change
Network fees	Average of Yellow Cabs and B&W Cabs radio dues/service fees	Yellow Cabs and B&W Cabs *(provided by TCQ)*	No change
Other	Brisbane CPI for all sectors	ABS	No change

Note: *The TCFI model was updated to adopt RBA's small business term loan rate as the cost inflator for vehicle leasing/financing charges as per the recommendation set out in PwC letter dated 4 June 2010

Next steps

- Source comprehensive insurance estimates from TIAIB
- Recalculate and finalise weights for the 2013 TCFI model review
- PwC to provide DTMR and TCQ with draft report on Wednesday, 27th November 2013.

Thank you