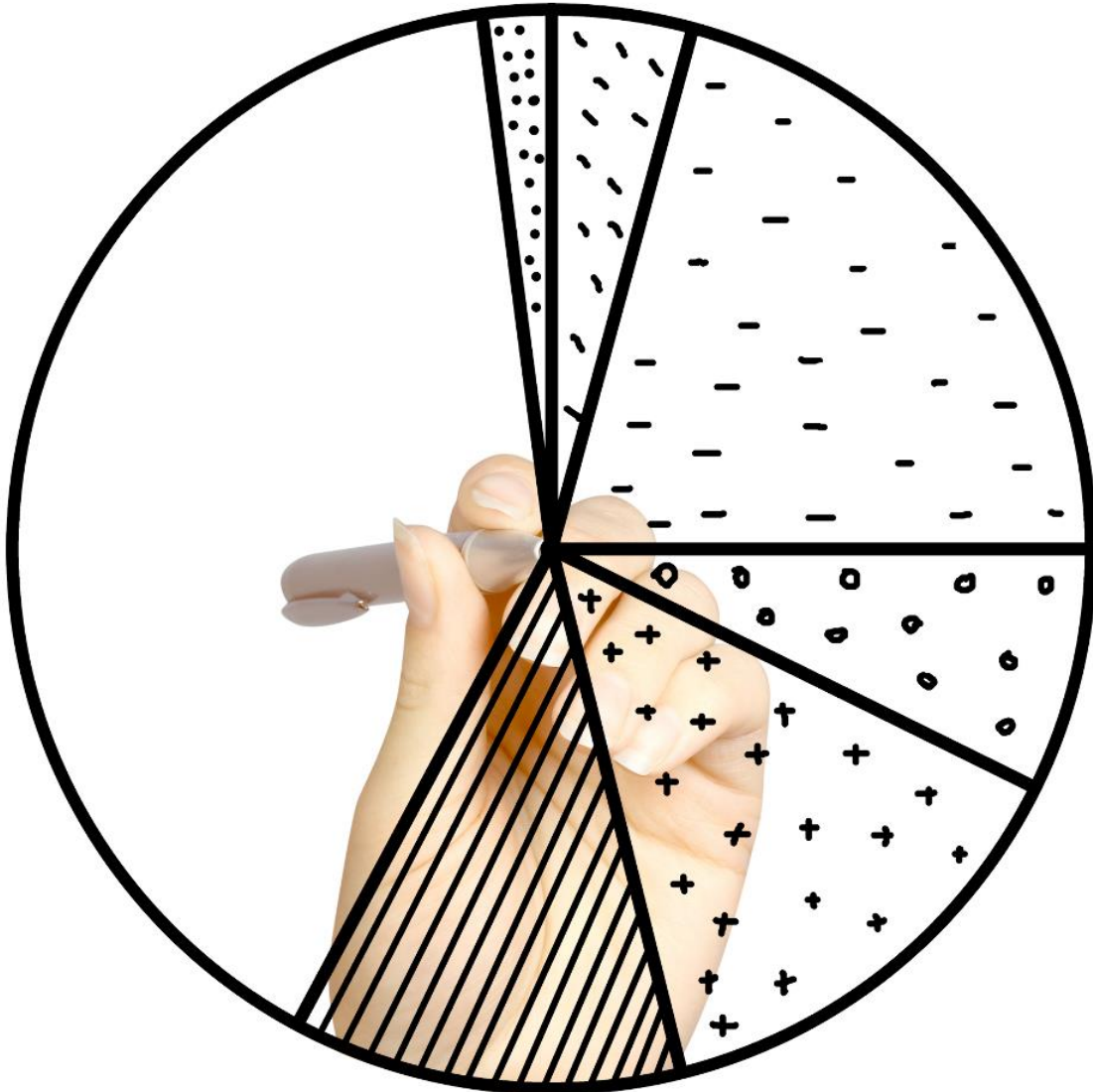


Deloitte.



**Report on the Victorian
DTF's analysis of the new
Horizontal Fiscal
Equalisation standard**

17 October 2018

Deloitte
Access **Economics**

Contents

Executive summary	ii
1 Background	4
2 The Commonwealth's proposed GST distribution model	6
2.1 Overview	6
2.2 The inputs	6
2.3 The existing system	6
2.4 Proposed system	6
3 The six scenarios considered by DTF	9
3.1 Scenario relativities	9
3.2 Economic rationale underpinning the scenarios	10
4 The reliability of forecasts	17
4.1 Forecasting is challenging and subject to error	17
4.2 Some illustrative examples of the challenges of forecasting	18
4.3 Some official forecasters have highlighted the issue of forecast uncertainty	20
4.4 Considerations for the use of the Commonwealth's 10-year projections	21
Limitation of our work	23
General use restriction	23

Executive summary

GST funding is a significant component of the revenue base for each State and Territory (the States).

The recent Productivity Commission inquiry into the method of GST distribution among States and Territories examined the horizontal fiscal equalisation (HFE) system. The Commonwealth Government, in its July 2018 response to the inquiry, proposed a **new HFE system**. This new system has two key components. The first is a new equalisation standard, which sees weaker States brought into line with the strongest of either New South Wales (NSW) or Victoria, rather than the "strongest" State as it is now. This results in less redistribution across States.

The other significant aspect of this proposal is to provide a "floor" for each State's GST relativity (guaranteeing a base per capita share of GST funding). This floor would be set at 70 cents in the dollar initially, rising to 75 cents from 2024-25. The Commonwealth proposes that, from 2021-22, this floor be "within-system"; that is, with the floor – should it need to be enacted for an individual State – being accommodated by lower relativities for other States, thus lowering those other States' GST shares.

To ensure that **'no State is worse off'** in dollar terms under the new HFE system relative to the existing system, the Commonwealth proposed that it would provide additional funding to increase the overall GST revenue pool.

The Commonwealth has modelled the impacts of its proposal on the States' GST revenues, with the modelling based on its base case projections for the States' GST relativities from 2019-20 to 2026-27. Under these projections, all States are better off in dollar terms under the proposed new HFE system relative to the existing system.

Yet alternative scenarios for the broader economy and related tax bases would see State GST relativities differing from the Commonwealth's base case projections for them. These differences could leave some States worse off in dollar terms under the new HFE system. Whether no State is worse off under the new system therefore depends on the accuracy of the Commonwealth's base case projections.

Economic forecasting, though, is inherently difficult. As David Gruen so neatly put it some years ago, *"economic forecasters aren't stupid; what we are trying to do is hard!"*¹ Forecasts are a "best guess" of the most likely outcome, given information available at the time. They are based on simplifying models of the economy, and require making simplifying assumptions about the future. **Actual outcomes typically differ from forecasts**, and can do so by significant margins. This is especially so for economic forecasts beyond one or two years, as the **deviations from a base case projection can compound over time**.

We do not draw a conclusion about whether the Commonwealth's base case projections represent the most likely outcome. Yet, given the challenges in forecasting, it is very likely that actual outcomes will differ from this base case, perhaps significantly so.

The Victorian Department of Treasury and Finance (DTF) has considered a number of scenarios that differ from the Commonwealth's base case. These scenarios include: (i) one of higher iron ore prices; (ii) one of weaker housing markets in Sydney and Melbourne (amid gradually moderating commodity markets); and (iii) a group of scenarios which see some variation of a repeat of the economic conditions experienced through Australia's recent mining boom.

¹ Gruen, D. 2000, *Forecasting methods: final observations — economic forecasters aren't stupid; what we are trying to do is hard!*, in Abelson, P. and Joyeux, R. (eds) *Economic Forecasting*, Allen & Unwin, Sydney.

Report on the Victorian DTF's analysis of the new Horizontal Fiscal Equalisation standard

DTF asked Deloitte Access Economics to comment on the reasonableness of the alternate scenarios. We find:

- **Scenario 1**, based on higher iron ore prices, is not unreasonable, as iron ore prices are an important driver of revenues and historical experience shows they can be highly volatile.
- **Scenario 2**, based on weaker housing markets, is not unreasonable, given the highly cyclical nature of housing markets and current concern over downward movements in the Sydney and Melbourne markets, based on stretched valuations.
- **Scenarios 3-6**, are a group of scenarios based on GST relativities which have occurred over the past decade, and so are not unreasonable based on that actual observation. That said, the economic conditions which produced these GST relativities may have a low probability of occurring again, given the likely one-off nature of China's period of rapid industrialisation, which was a key driver of those economic conditions.

In all of the scenarios considered by DTF, which we consider to be not unreasonable scenarios about the future path of the economy over the next decade, the DTF modelling shows that some States would be worse off under the proposed new HFE system compared to the existing system. Deloitte Access Economics was able to replicate the GST relativities and GST revenue allocations under each of DTF's six scenarios.

Deloitte Access Economics

1 Background

The Victorian Department of Treasury and Finance (DTF) engaged Deloitte Access Economics to review its use of the Commonwealth's distribution model in the transition to and application of the new horizontal fiscal equalisation (HFE) standard. It also asked Deloitte Access Economics to comment on the reasonableness of the six scenarios modelled by DTF, and to comment on the appropriateness and potential forecast error when using 10-year forecasts as the basis for transitioning to the new HFE standard.

The HFE system is used by the Commonwealth to distribute revenue from the goods and services tax (GST), which is collected by the Commonwealth Government and distributed among the States and Territories (the States). This is done based on the principle of horizontal fiscal equalisation so that each State has the capacity to provide its citizens with a comparable level of public services.

In recent years, there has been considerable public debate about whether the existing HFE system is working as it was originally intended. This particularly reflects the impact of volatile iron ore prices on Western Australia's (WA's) GST shares over recent years. The Commonwealth referred the issue to the Productivity Commission, which delivered its report to the Government in May 2018.

The Productivity Commission made a number of recommendations to change the HFE system and governance². A particular focus has been on Recommendation 8.1, which states that:

The Commonwealth Government should transition Australia's system of HFE towards equalisation to the average (pre-GST) fiscal capacity of all States, with the remaining GST revenue distributed on a per capita basis.

This is in contrast to the current system, which equalises to the strongest State. The strongest State has historically been one of NSW or Victoria, but has more recently been WA due to the effect of the mining boom on Australia's economy and State budgets.

In response to the recommendations from the Productivity Commission, the Commonwealth proposed a new approach to distribute the GST pool³. The Commonwealth's proposed changes involve:

- Changing the equalisation standard to be the highest of NSW or Victoria; and
- Setting a relativity floor of 0.70, moving to 0.75 from 2024-25. This would see that no State's per capita share would fall below 70 (75) cents in the dollar.

The change in the equalisation standard and the introduction of relativity floors could result in a different GST distribution, which would see some States "worse off" if they received a smaller share of a fixed revenue pool. To ensure that all States would be no worse off, the Commonwealth has proposed to provide top-up payments to the GST pool from 2021-22. These are:

- an additional \$600 million in 2021-22
- a second injection of \$250 million in 2024-25

These amounts would be indexed annually in line with the growth in the overall GST pool.

The determination that these top-up payments would be adequate to ensure that no State was worse off under the proposed new HFE system was determined based on a set of projected relativities for

² Productivity Commission 2018, Horizontal Fiscal Equalisation, Report no. 88, Canberra. Available at: <https://www.pc.gov.au/inquiries/completed/horizontal-fiscal-equalisation/report/horizontal-fiscal-equalisation.pdf>

³ The Commonwealth of Australia 2018, Productivity Commission inquiry into horizontal fiscal equalisation: Government interim response, July 2018. Available at: <https://static.treasury.gov.au/uploads/sites/1/2018/07/HFE-Government-Response.pdf>

each State to 2026-27. It is possible that a different set of relativities would yield a different set of results, thereby providing a different distribution of the GST pool across the States and Territories.

DTF has undertaken some analysis to understand the effect of different sets of GST relativities on the projected distribution of GST revenue across the States. DTF has modelled six scenarios, which are illustrative – rather than exhaustive – of how variations in relativity factors could result in some States being worse off under the new model, given that supplementary funding is capped at the \$600 million and \$250 million levels proposed by the Commonwealth. The various scenarios show that even a small departure from the Commonwealth’s central scenario with respect to the relativity factors could see individual States worse off under the new model compared with the current system.

The remainder of this report is as follows:

Section 2 provides an overview of the model used by the Commonwealth to estimate the GST distribution among the States under the current HFE system as well as the Commonwealth’s proposed new approach.

Section 3 examines the six alternate scenarios of relativities used by DTF to model different GST outcomes. Specifically, we examine:

- the economic and other factors which support each scenario, and whether these are reasonable scenarios to model;
- the extent to which the scenario relativities appear consistent with the economic description of the scenarios (for those scenarios not defined using historical relativities); *and*
- the results of using these scenarios in the Commonwealth’s GST distribution model and whether or not it was used correctly by DTF.

Section 4 provides some background on uncertainty in forecasting and discusses some of the difficulties in forecasting economic and other variables, especially over a ten-year horizon.

2 The Commonwealth’s proposed GST distribution model

This section provides an overview of the Commonwealth’s approach to modelling its proposed HFE system, including a comparison to outcomes under the existing system.

This section looks more closely at the Commonwealth’s own modelling underpinning its Interim Response document of July 2018 and subsequently shared with the States.

2.1 Overview

Our understanding of the analysis undertaken by the Commonwealth is that it only considers a “central case”, and that no sensitivity testing has been provided by the Commonwealth. It is on the basis of these central case projections that the Commonwealth has estimated the required amount of top-up payments to ensure that no State is worse off under its proposed system.

2.2 The inputs

Table 2.1 contains the list of inputs used by the Commonwealth Treasury and their source. These inputs are used across the model to estimate the GST revenue amounts and relativities for each of the States under both the existing and proposed HFE systems.

Table 2.1: Inputs used in the Commonwealth GST distribution model

Input	Source
State GST relativities	PC final report
State population forecasts	Commonwealth Treasury
GST pool forecasts, including top up payments	Commonwealth Treasury
Phase in path to new HFE system	Commonwealth Treasury

2.3 The existing system

Commonwealth Treasury estimate the amount of GST revenue received for each State in each year under the existing system. This was done by combining each State’s projected GST relativity and population with the GST revenue pool to estimate the dollar amount received by each State from 2019-20 to 2026-27.

2.4 Proposed system

The Commonwealth Government’s proposed HFE system involves keeping the current system for the first two years (2019-20 and 2020-21) with some minor amendments and then a six-year transition period to the new system which will be fully operational from the 2026-27 financial year.

For 2019-20 and 2020-21, the amount of GST revenue each State would receive under the existing system is estimated. There are then some changes made to that amount to ensure that:

1. No State’s relativity falls below 0.70; and

2. The relativity for the NT does not fall below 4.66, to ensure that the NT keeps at least its current share of the GST pool.

If either of these are found to be the case, top-up payments are provided to that State in that year. WA receives additional funding in both years while the NT receives additional funding in 2019-20.

The approach for estimating the amount of GST revenue for **2021-22 to 2026-27** is more complicated, as it involves the transition from the existing to the proposed HFE system.

For each year, the model projects the amount of GST revenue each State would receive under both HFE standards. The estimating process for the **new proposed HFE standard** is:

- The total dollar and per capita amount of GST revenue received by each State is estimated using the existing relativity, population and new GST pool projections. The new pool incorporates the Commonwealth’s top-up payments. This is consistent with the existing approach, but contains the Commonwealth’s top-up payment amounts to the GST pool.
- States below the average earnings per capita (EPC) amount are brought up to the average.
- States with an EPC below the strongest of NSW or Victoria are brought up to that EPC.
- The remaining GST pool is then distributed among the States on a per capita basis.
- The amount of GST revenue received is the summation of the amounts received at each of the previous three steps

An initial estimate received for each State in that year is then calculated as the weighted average of the existing and proposed system, according to the schedule in Table 2.2 below. The weights in the table represent the proportion of the GST pool that is distributed to States based on the existing and proposed methodologies. For example, in 2022-23, two-thirds of the pool is apportioned based on the current “full equalisation” system while the remaining third of the pool is apportioned based on the proposed system.

Table 2.2: Share of GST apportioned under the existing and proposed HFE systems during the transition period

Phase-in to new HFE benchmark	% pool full equalisation	% pool equalised to NSW/VIC
2019-20	100.0%	0.0%
2020-21	100.0%	0.0%
2021-22	83.3%	16.7%
2022-23	66.7%	33.3%
2023-24	50.0%	50.0%
2024-25	33.3%	66.7%
2025-26	16.7%	83.3%
2026-27	0.0%	100.0%

An effective relativity is then determined using the total pool and that State’s population share. A check is then performed to ensure that:

1. No State’s relativity falls below 0.70, moving to 0.75 from 2024-25; and
2. The relativity for the NT does not fall below 4.66 in 2021-22.

Adjustments to the GST pool distribution are made if either of these conditions are broken, either from outside the GST pool in years prior to 2022-23 or from within the pool thereafter. WA receives a top-up payment in 2021-22.

The final total amount of GST revenue received and the final GST relativity for each State is then calculated.

The results of the Commonwealth’s modelling are shown in Table 2.3 below.

Table 2.3: Results of the Commonwealth’s modelling of its proposed new HFE system, relative to the existing system (\$ million)

Difference between models (\$m)	NSW	Vic	Qld	WA	SA	Tas	ACT	NT
2019-20	0	0	0	814	0	0	0	69
2020-21	0	0	0	585	0	0	0	0
2021-22	78	84	87	568	41	17	7	24
2022-23	30	45	61	421	31	14	5	24
2023-24	14	32	51	495	28	13	5	25
2024-25	70	84	101	575	50	22	9	37
2025-26	85	96	112	580	54	23	10	39
2026-27	74	85	105	663	53	23	10	40

Source: The Commonwealth of Australia 2018, Productivity Commission inquiry into horizontal fiscal equalisation: Government interim response, July 2018

3 The six scenarios considered by DTF

This section provides an assessment of whether the six scenarios considered by DTF are not unreasonable, both in relation to the economic rationale for the scenarios, and the related GST relativities.

3.1 Scenario relativities

DTF, with some other States, has prepared a range of scenarios that are illustrative of possible outcomes under the Commonwealth's proposed transition to a new system for distributing GST among the States.

For the six scenarios, DTF has applied scenario relativities in 2026-27, and mechanically transitioned from the latest actual relativity (for 2018-19) to 2026-27, using a simple linear approach.

The six scenarios chosen are illustrative – rather than exhaustive – of how variations in relativity factors alone could result in some States being worse off under the new model as proposed by the Commonwealth.

The outcomes of the six scenarios on each State's GST distribution in the eight years to 2026-27 (the first year in which the new system would be fully phased in) are summarised in Table 3.1. This shows that departures from the Commonwealth's central scenario with respect to the relativity factors could see individual States worse off under the proposed new system compared with the current system.

DTF developed these six scenarios using a spreadsheet model provided by the Commonwealth following the release of the interim response. Deloitte Access Economics was provided access to the spreadsheet for the sole purpose of verifying DTF's calculations. Deloitte Access Economics was able to replicate the GST relativities and GST revenue allocations under each of DTF's six scenarios using the workbook provided for the purpose of demonstrating the mechanics of the new HFE standard.

Table 3.1: Cumulative increases/decreases in individual State GST grants, \$ million, 2019-20 to 2026-27

	Scenario					
	1	2	3	4	5	6
NSW	-722	-1,144	-1,115	-1,822	-5,462	-3,316
Vic	-482	-856	-940	-1,494	-4,580	-2,744
Qld	-182	-522	-651	-491	-3,199	-1,914
WA	9,547	10,916	10,894	12,425	25,132	18,086
SA	39	-63	-99	-238	-965	-528
Tas	46	14	1	-39	-248	-125
ACT	-9	-32	-41	-75	-267	-150
NT	616	696	400	502	232	404
Total	8,853	9,009	8,449	8,768	10,643	9,713

Source: Victorian Department of Treasury and Finance

3.2 Economic rationale underpinning the scenarios

DTF has presented its scenarios in terms of a set of GST relativities that are consistent with certain economic scenarios. This section considers the economic rationale that underpins each of the six scenarios.

3.2.1 Scenario 1 – Modest lift in iron ore prices

Scenario 1 assumes that iron ore prices are higher than in the Commonwealth’s base case so that WA’s iron ore royalty revenue increases enough to cause its relativity to fall to about 0.70 by 2026-27.

The relativities for Scenario 1 are shown below:

Table 3.2: Relativities for Scenario 1, 2026-27

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT
Base case	0.82825	0.90611	1.10919	0.76421	1.38330	1.75433	1.17827	4.91058
Scenario 1	0.83425	0.91267	1.11723	0.69733	1.39332	1.76705	1.18681	4.94617
Change	0.00600	0.00657	0.00804	-0.06687	0.01003	0.01272	0.00854	0.03559
% change	0.7%	0.7%	0.7%	-8.8%	0.7%	0.7%	0.7%	0.7%

Source: Victorian Department of Treasury and Finance

Relative to the Commonwealth’s base case, under Scenario 1 WA is the only State with a lower relativity. All other States’ relativities are higher.

Deloitte Access Economics has estimated that the change in States’ relativities under Scenario 1 is consistent with a higher iron ore price (relative to the base case) of about US\$10/tonne. We did this using the following approach:

- We first noted that the relativities in Scenario 1 imply that a higher iron ore price would only lower WA’s relativity. We consider this a reasonable simplifying assumption since WA accounts for the vast majority of all iron ore royalty income in Australia.⁴ We confirmed that, using the Scenario 1 relativities, the weighted population summed across all States remains the same as under the base case.
- Deloitte Access Economics input the relativities for Scenario 1 into the Commonwealth’s workbook to calculate the change in WA’s GST revenue in 2026-27 under the current GST method. We found that the relativities implied a fall in GST revenue for WA of \$669 million in 2026-27, relative to the Commonwealth base case.
- It is assumed that this fall in GST revenue for WA is directly due to the increase in iron ore royalty revenue. As an approximation, we assumed that WA loses the additional iron ore royalty revenue which is above its population share of about 10%. Therefore, the loss of GST revenue of \$669 million implies an increase in iron ore royalty revenue for WA of around \$743 million.
- Finally, we used the sensitivity analysis in WA’s budget papers to estimate the change in iron ore price that would increase WA’s royalty revenue by \$743 million. The budget papers note that each US\$1 increase in iron ore price would increase revenue by \$76 million. We assume that this sensitivity analysis holds over the period to 2024-25 (the last year that informs the 2026-27 relativity).⁵ From this, we derive an implied increase in the iron ore price of approximately US\$10/tonne.

⁴ For example, the CGC has previously reported that WA accounted for approximately 97% of Australia’s total iron ore royalty revenue in 2013-14. See

<https://www.cgc.gov.au/sites/g/files/net5366/f/documents/Fiscal%20Equalisation/History%20of%20Selected%20Assessments/Fiscal%20Equalisation%20-%20History%20of%20the%20Mining%20Assessment.pdf>

⁵ Should iron ore production levels be higher, then a smaller iron ore price increase would yield the modelled increase in royalty revenue. The opposite is also true.

Over the period from 2006-07 to 2016-17, iron ore price volatility has been in excess of 40% (measured by the standard deviation of financial year growth). The 2018-19 Western Australian Budget reports that “since the 2017-18 Budget, the iron ore price has ranged from a low of \$US57.40 per tonne to a high of \$US80 per tonne, a range of \$US22.60 per tonne in just eight months.” Historical price volatility is shown in Chart 3.1.

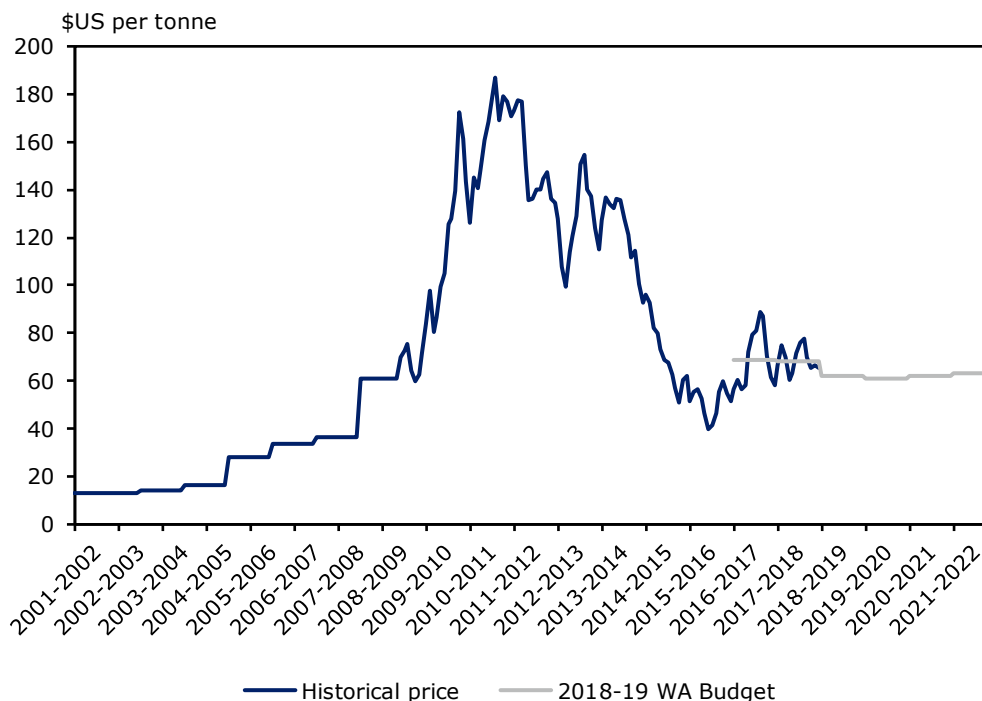
The iron ore price assumption that underpins Scenario 1 is therefore well within the range of historical price movements over the past decade. In addition, the Commonwealth Budget papers (BP1, at pages 8-15 and 8-16) themselves set out sensitivity analysis based on a sustained change in iron ore prices of \$US10 per tonne.

Iron ore price volatility is a large source of risk for WA’s government revenue. Since 2008, iron ore prices have become more responsive to short-term market developments. This coincided with the shift away from long-term pricing contracts as more iron ore began to be traded in reference to short-term contracts and spot prices. The prices received by Australia’s iron ore producers became more responsive to global short-term supply and demand dynamics and the shift to spot price sales gathered pace at the end of 2011.⁶

The 2018-19 Western Australian Budget assumes the benchmark iron ore price will average \$US60-63 per tonne over the forecast period reaching \$US63.40 in 2021-22. For prices to be \$US10 per tonne higher than forecast is well within the realms of recent experience, let alone the wide price band seen over the past decade.

Deloitte Access Economics considers that the iron ore price and royalty revenue assumptions that underpin Scenario 1 are not unreasonable based on historical movements in iron ore prices and the difficulty in accurately predicting those fluctuations.

Chart 3.1: Iron ore price \$US per tonne, CFR



Source: Market Index and 2018-19 Western Australia Budget papers

⁶ RBA, 2012, Statement of Monetary Policy, August 2012, Box B: Iron ore Pricing, Sydney. Available at: <https://rba.gov.au/publications/smp/2012/aug/>

3.2.2 Scenario 2 – Lower property transactions and lower royalty revenues

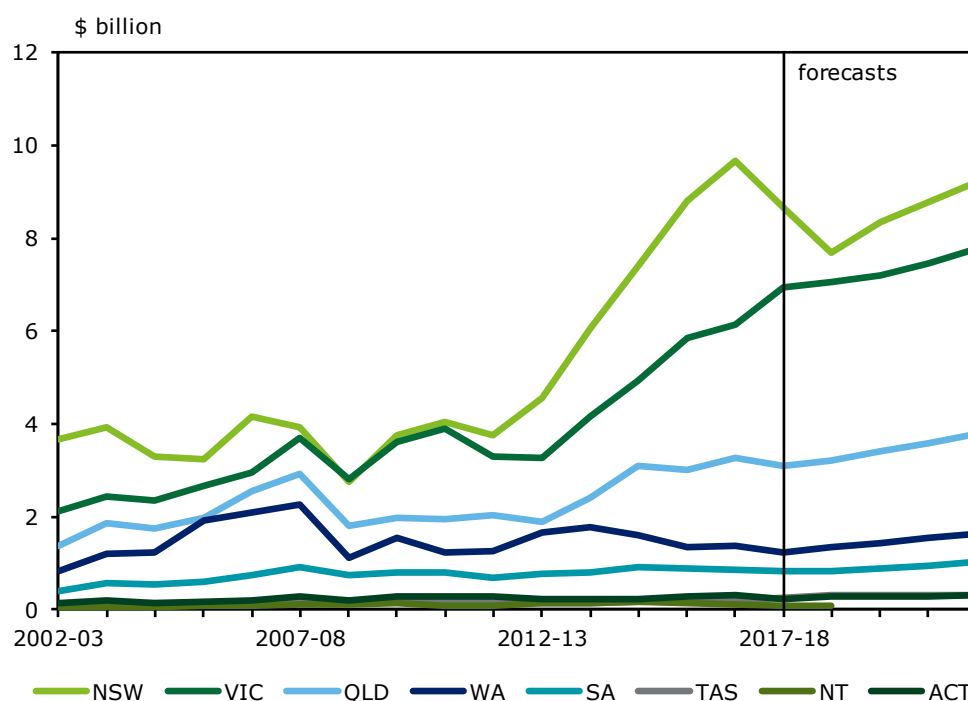
Scenario 2 assumes that property transactions are lower than in the base case, resulting in stamp duty revenue growing more slowly in both Victoria and NSW. This scenario also assumes that WA and Queensland royalties moderate slowly (as opposed to falling sharply) from current levels by 2026-27.

Stamp duty revenue

States' stamp duty (i.e. land transfer duty) revenue is driven by property prices and property turnover. For unchanged price levels and tax rates, a decline in property turnover reduces States' stamp duty revenue. Falls in property turnover also tends to be associated with falls in prices, which compounds the volatility of stamp duty revenue.

Property market dynamics in Sydney and Melbourne over the past housing market cycle have been more pronounced than in other major cities. As a result, stamp duty revenue in NSW and Victoria has grown strongly over the past few years, and much more rapidly than in other States (see Chart 3.2).

Chart 3.2: Stamp duty revenue



Source: various State government budget papers; for 2017-18, figures are budget estimates (except for Victoria, which is an actual); forecasts for NT beyond 2018-19 are not available

More recently, property prices and transaction volumes have been falling in Sydney and Melbourne. This has already caused stamp duty revenue to fall in NSW, and may lead to, if not further revenue falls, then considerably slower growth in stamp duty revenue in both NSW and Victoria than has been witnessed in recent years.

It is therefore not unreasonable to envisage a scenario where a slowing housing markets leads to a reduction in stamp duty revenue in Victoria and NSW that is more pronounced than in other States.

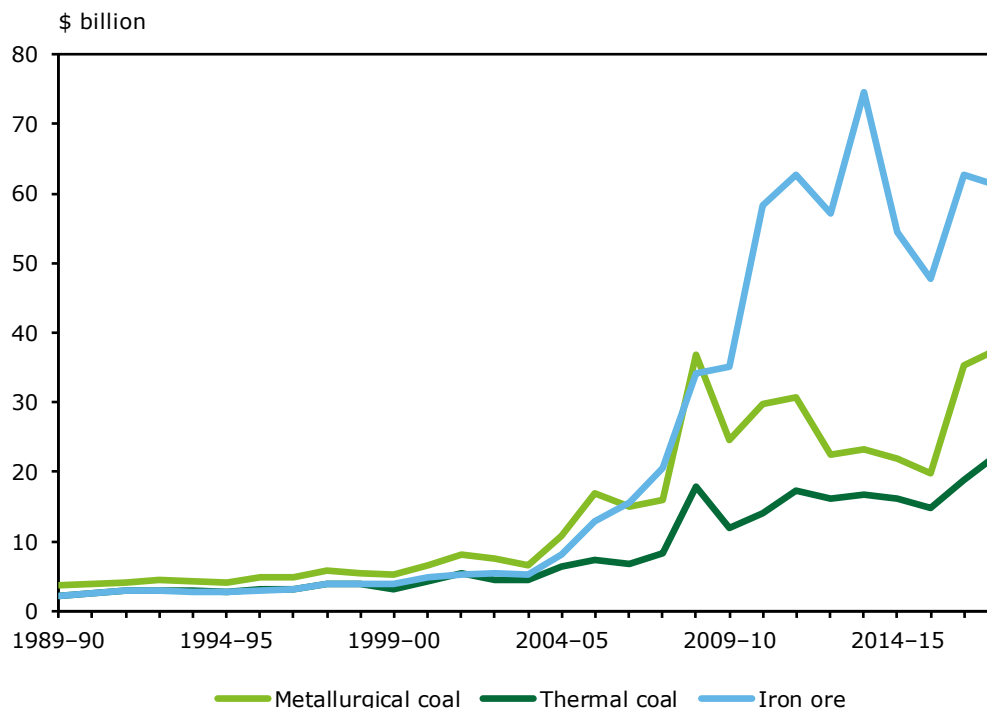
Royalty revenue

A second key element of Scenario 2 is that royalty revenue in both WA and Queensland moderates slowly (as opposed to falling more sharply) over the period to 2026-27. (Either broadly flat or rising royalty revenue, on the other hand, would only further decrease WA's relativity in this scenario and worsen the negative effects on some other States under the proposed new GST standard.)

The past decade-and-a-half has been a highly dynamic one for commodity prices and commodity output, and therefore Western Australian and Queensland royalty revenues. This largely reflects the strong growth of China, which led to a structural change in the level of global commodity demand, which in turn was met by a large increase in global (including Australian) supply.

However, across previous periods there has been greater relative stability. The value of iron ore and coal exports in the decade or so up to 1999-00, for example, was fairly stable relative to the decade or so up to 2017-18 (see Chart 3.3). The Australian export values of some other commodities have also exhibited periods of relative stability, particularly in the period before China’s economic growth significantly affected commodity prices.

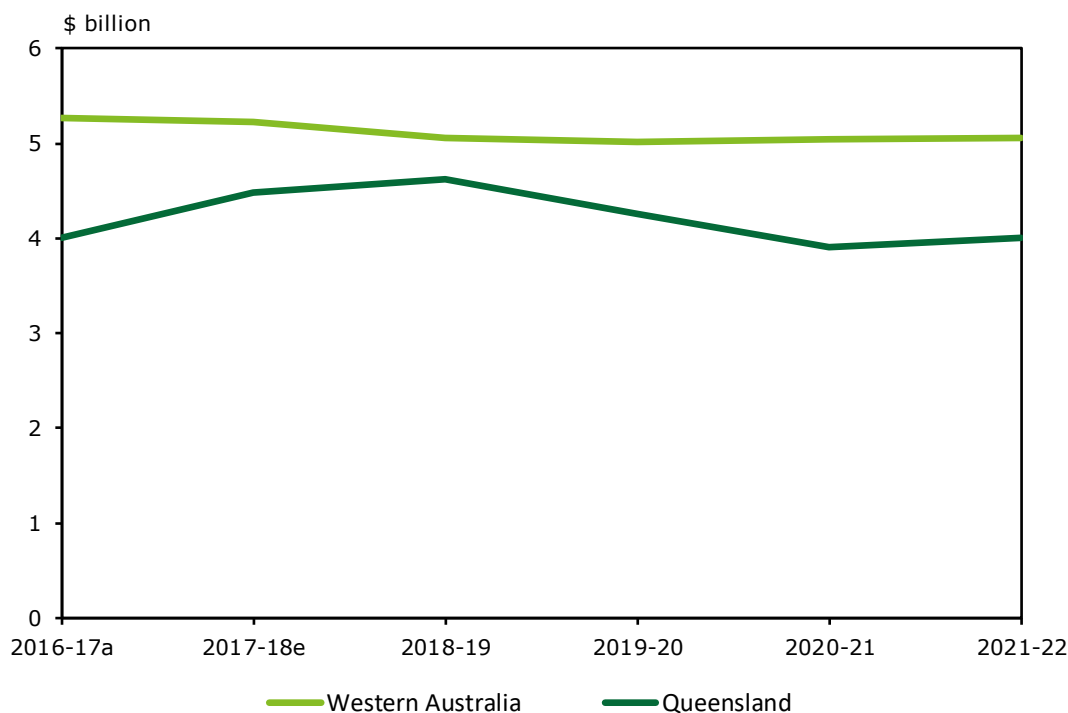
Chart 3.3: Australian export values of selected commodities



Source: Department of Industry, Innovation and Science

We also note that both WA and Queensland currently forecast broadly stable to gradually moderating royalty revenues over the forward estimates period (see Chart 3.4).

Chart 3.4: Royalty revenue forecasts, Western Australia and Queensland



Source: 2018-19 Western Australian and Queensland budget papers;
 Note: a = actual; e = estimate

An extended period of moderation in royalty revenue could entail, for instance, an economic scenario where China’s economic growth continues to slow, or global supply of iron ore and coal continues to gradually rise, causing iron ore and coal prices to gradually moderate (at a faster pace than volumes rise). This is a not unreasonable economic scenario.

Deloitte Access Economics considers that the economic assumptions that underpin scenario 2 are not unreasonable, based on the historical performance of housing markets and stamp duty revenue across the States. Similarly, we consider it is not unreasonable to postulate a scenario where royalty revenue moderates slowly over the period to 2026-27, or that this occurs in the context of slowing housing markets in Sydney and Melbourne.

Deloitte Access Economics also sought to examine whether the relativities presented in Scenario 2 broadly reflected the economic scenario described. We did this by postulating revenue parameters for each of the States that we considered consistent with the economic narrative for this scenario, and determining whether we yielded broadly similar relativities to those in Scenario 2.

Given the complexity in calculating relativities, and the range of different assumptions that would be consistent with the economic narrative underlying this scenario (for all factors that affect relativities, not just stamp duty and royalty revenue) we did not expect that we would be able to closely replicate the relativities in Scenario 2. We simply sought to determine whether our assumptions achieved broadly consistent relativities.

Deloitte Access Economics initially assumed that the current economic and revenue outlook for each of the States, as published in their latest budget papers for the years to 2021-22, represented a reasonable basis for modelling the relativities in this scenario. We then adjusted the forecasts by assuming a flat profile for stamp duty receipts for NSW and Victoria such that they stay at the level of 2018-19 over the forecast horizon. The royalty revenue forecasts for Queensland and WA were

also adjusted so that they are lower than expected under the respective Budget forecasts. This analysis is broadly consistent with the narrative described above.⁷

Undertaking this analysis gives broadly consistent results for the GST relativities as the results in Scenario 2. In particular, we note that our modelling of the relativity for WA is broadly similar, and this reasonably low relativity leads to a number of States being worse off compared to the existing GST system, notwithstanding that we obtain somewhat different relativities for some other States.

This analysis suggests that the relativities used by DTF are not unreasonable, given the economic narrative used to support them.

Table 3.3: Relativities for Scenario 2

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT
Base case	0.82825	0.90611	1.10919	0.76421	1.38330	1.75433	1.17827	4.91058
Scenario 2	0.87489	0.93293	1.04864	0.68225	1.36753	1.72053	1.20485	4.75575
DAE analysis	0.93347	0.92159	0.98098	0.66663	1.46125	1.60154	1.13124	4.43488

Source: Victorian Department of Treasury and Finance; Deloitte Access Economics

3.2.3 Scenario 3 – Strong increase in mining production by 2026-27

Scenario 3 replicates the 2011-12 GST relativities. In the relevant assessment years (2007-08, 2008-09, 2009-10), Australia was amid the investment phase of an unprecedented mining boom, with high prices for Australia’s resources, very strong demand from China and domestic production increasing. This period was also characterised by the 2008 Global Financial Crisis which saw the terms of trade drop temporarily, with flow-on effects for the Australian economy.

For this scenario to eventuate over the next decade, with rising mining production by 2026-27, mining investment would need to increase strongly over the coming years. However, the 2018-19 Commonwealth Budget forecasts mining investment to continue to fall over the next couple of years, before firms begin investing to maintain existing capital stock. Current expectations are that Australia’s mining capacity will reach full production by 2019-20, driven by LNG and iron ore production.

If relatively high commodity prices were sustained for longer than expected, this may boost mining investment going forward. This scenario would require some unexpected market developments, for example a surge in demand from China of a similar scale to that seen over the last decade and a half. This could be the result of unanticipated economic conditions or changes in Chinese government policy. However, Deloitte Access Economics considers such a scenario as unlikely over the next decade, given that China’s economy is now slowing and that China’s authorities are increasingly concerned about financial stability.

Another possible development that might lead to Scenario 3 is the rapid industrialisation or infrastructure-led growth of another populous emerging economies (such as India, Indonesia and the Philippines) over the next decade, leading to large rise in global demand for Australia’s resources.

Future opportunities in alternative minerals, such as lithium, could also contribute to a possible future significant rise in mining investment. Increased demand for electric cars has driven an upturn in the prices of lithium and cobalt, which are used in electric car batteries. Australia is the world’s largest export of lithium and Australian lithium exports experienced a seven-fold increase from 2012 to 2017⁸.

⁷ Deloitte Access Economics was provided with DTF’s GST model to undertake this modelling. Deloitte Access Economics took the outputs of this model, but did not seek to verify the model itself.

⁸ Department of Industry Innovation and Science, 2018, Resources and Energy Quarterly, September 2018, Canberra. Available at: <https://www.industry.gov.au/data-and-publications/resources-and-energy-quarterly-all>

This scenario is not unreasonable on the basis that it reflects an outcome that has occurred in the past. However, we suggest this scenario (being based on a very large surge of mining production) would have a "low probability" of occurring again over the next decade, given the likely one-off nature of China's period of rapid industrialisation and its impact on commodity prices and mining output.

3.2.4 Scenario 4 – Queensland becomes the second strongest State or Territory by 2026-27

Scenario 4 replicates the 2010-11 GST relativities. Similar to Scenario 3, in the relevant assessment years (2006-07, 2007-08, 2008-09), Australia was amidst the investment phase of a major mining boom with high prices for our resources, unprecedented demand from China and domestic production increasing.

Iron ore production and royalty revenues grew strongly for WA, while coal exports in Queensland also lifted. This contributed to low relativities for both States.

Again, this scenario would require some unexpected market developments (as discussed for Scenario 3) that would lead to another mining boom.

This scenario is not unreasonable on the basis that it reflects an outcome that has occurred in the past. However, we suggest this scenario (being based on a very large surge of mining production) would have a "low probability" of occurring again over the next decade, given the likely one-off nature of China's period of rapid industrialisation and its impact on commodity prices and mining output.

3.2.5 Scenario 5 – Peak of mining boom again in 2026-27

Scenario 5 replicates 2015-16 relativities. In the relevant assessment years (2011-12, 2012-13, 2013-14), investment in mining reached its peak in Australia, coal and iron ore exports had been growing strongly, and the terms of trade began to fall.

WA was at the centre of the expansion. WA's iron ore royalties grew by 41% in 2013-14 contributing to the State's relativity dropping to 0.30 in 2015-16. Production levels were high in Queensland over the assessment years, but were affected by flooding in 2011, and lower coal prices saw royalty revenue fall in 2012-13.

As in Scenarios 3 and 4, this scenario would require some unexpected market developments leading to demand for our resources of a similar scale to what has been experienced over the last decade and a half.

This scenario is not unreasonable on the basis that it reflects an outcome that has occurred in the past. However, we suggest this scenario (being based on a very large surge of mining production) would have a "low probability" of occurring again over the next decade, given the likely one-off nature of China's period of rapid industrialisation and its impact on commodity prices and mining output.

3.2.6 Scenario 6 – Relativities return to 10-year average by 2026-27

Scenario 6 adopts ten-year average relativities for each State and Territory.

Using a long run average represents an appropriate benchmark for possible future outcomes. That being said, the last decade has seen Australia's largest mining boom. This phase has had a large influence on relativities and is unlikely to occur again to the same extent over the next decade.

This scenario is not unreasonable on the basis that it reflects an outcome that has occurred in the past. However, we suggest this scenario (being based on a very large surge of mining production) would have a "low probability" of occurring again over the next decade, given the likely one-off nature of China's period of rapid industrialisation and its impact on commodity prices and mining output.

4 The reliability of forecasts

We consider the inherent difficulty of forecasts – especially over long periods – and the implications for the transition to the new HFE standard.

The medium to long-term projections used by the Commonwealth can be thought of as the Commonwealth’s view of the most likely path that the relativities could take, given the assumptions used to generate the forecasts. However, the future is not certain and forecasting is inherently difficult and subject to error. Actual realisations will therefore likely differ from this path.

In considering the transition to the new HFE standard, it would be prudent to recognise that, while any base case projections may reflect a view, based on current information, of the most likely path of future outcomes, actual outcomes are likely to differ, possibly substantially, from those base case projections.

4.1 Forecasting is challenging and subject to error

Modelling the economy is an inherently difficult task. This is true for short-term (e.g. 1–2 year) projections, and it becomes even more difficult over longer time horizons. The mechanisms driving the changes we observe are complex and not fully understood – economic and revenue modelling amounts to making approximations of this complex system. The forecasts generated by models are conditional on these approximations and other information processed by the model. That is, forecasts are generally the “best guess” of future outcomes given the available information and assumptions.

There are several challenges faced by the economic forecaster: the information used by the model is not known with certainty, the assumptions underpinning the model may not be valid, and the way these are combined – information and assumptions – can result in a false approximation of the system under consideration. Further, factors that are not accounted for within the model (such as economic “shocks”) can have significant effects on actual outcomes. As a result, the accuracy of the forecasts that the model generates are uncertain, and this uncertainty increases with the forecast horizon period.

This is even more the case when it comes to forecasting State Government revenue. As part of an external review Deloitte Access Economics conducted for the WA Department of Treasury, we noted that⁹:

- “Forecasting tax revenues is more challenging than forecasting macroeconomic parameters. Any errors in forecasts of macroeconomic parameters will have implications for the accuracy of tax forecasting.
- “Economic and revenue forecasting for any State or Territory is more difficult than forecasting at the national level. State and Territory economies are less diverse, the historical data is less reliable, there is a greater reliance on property and transaction taxes which are inherently difficult to forecast, and there is a reduced likelihood of offsetting errors.
- “The rise of China and other emerging economies has been associated with increased volatility in national income, with much of that increased volatility generated by commodity prices. As Australia’s leading commodity producer, WA’s economy and its tax take have become more volatile and harder to forecast since the turn of the century.
- “Forecasting errors can be correlated, leading to the amplification of errors. For example, if forecasts of Chinese activity are inaccurate, this would lead to inaccurate forecasts for

⁹ Deloitte Access Economics, 2018, Review of Revenue Forecasting for the Western Australian Department of Treasury, Canberra. Available at: <http://www.treasury.wa.gov.au/uploadedFiles/Treasury/Publications/Review-of-Revenue-Forecasting.pdf>

commodity prices and exchange rates, and in turn, iron ore revenues. This would have flow-on effects for expectations of employment and population growth as well as housing market conditions, affecting forecasts of payroll tax and transfer duties respectively.”

4.2 Some illustrative examples of the challenges of forecasting

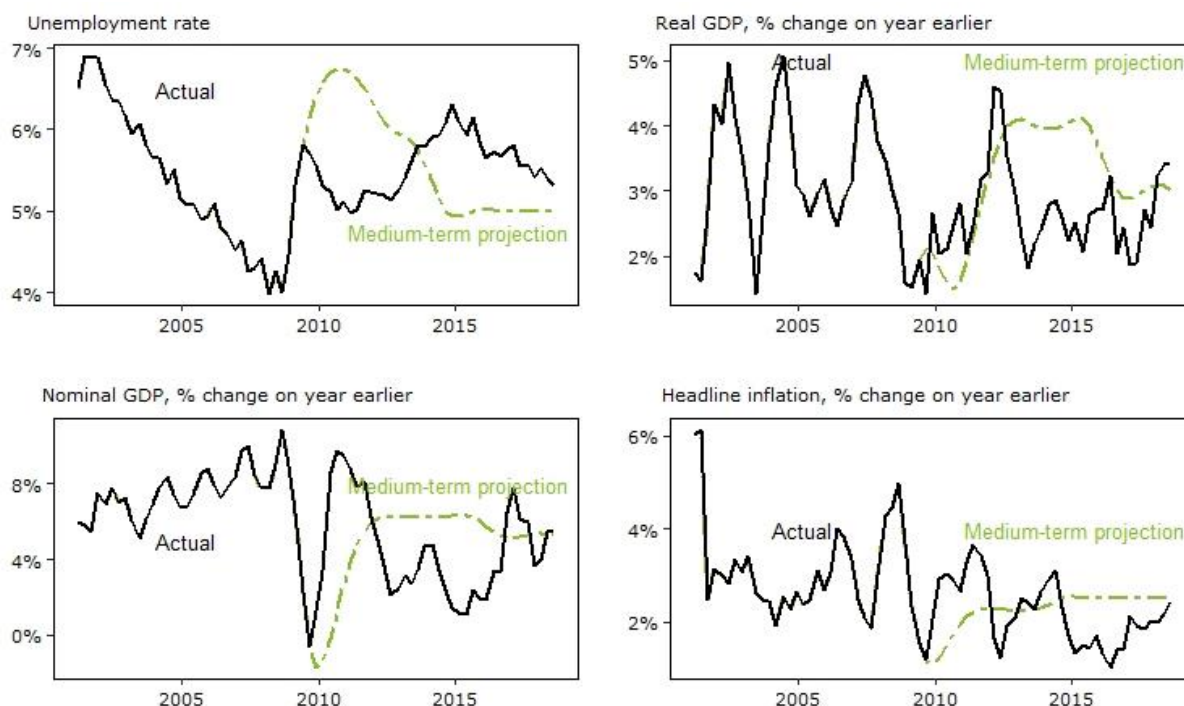
To illustrate, we consider a number of past forecasts in the Australian context, and compare those forecasts to actual outcomes.

First, consider the Commonwealth Treasury’s medium term (10 year ahead) forecasts of key economic variables as of 2009¹⁰ and their realisations, presented on Chart 4.1. As is clear from the chart, there are significant periods of over and under estimation in the projections, especially over the medium term.

This highlights an important limitation of medium term projections. Many structural forecasting models assume that the economy will reach a stable growth path (for example, inflation and the unemployment rate reaching their theoretic steady state values of 2.5% and 5% respectively).

In reality, the economy is never stable and is subject to frequent and sometimes large unforeseen shocks. For example, in 2011-12 Australia’s terms of trade peaked, reflecting significant changes in the global supply-demand balance for commodities which Australia produces. The effects of this ‘shock’ to Australia’s terms of trade is shown through the actual performance of various economic indicators on Chart 4.1. The unemployment rate rose, real and nominal GDP growth slowed, as did headline inflation. This is in contrast to the stable growth path assumed by the Commonwealth’s projections produced in 2009.

Chart 4.1: Medium term projections of key economic variables, Federal Treasury MYEFO 2009.



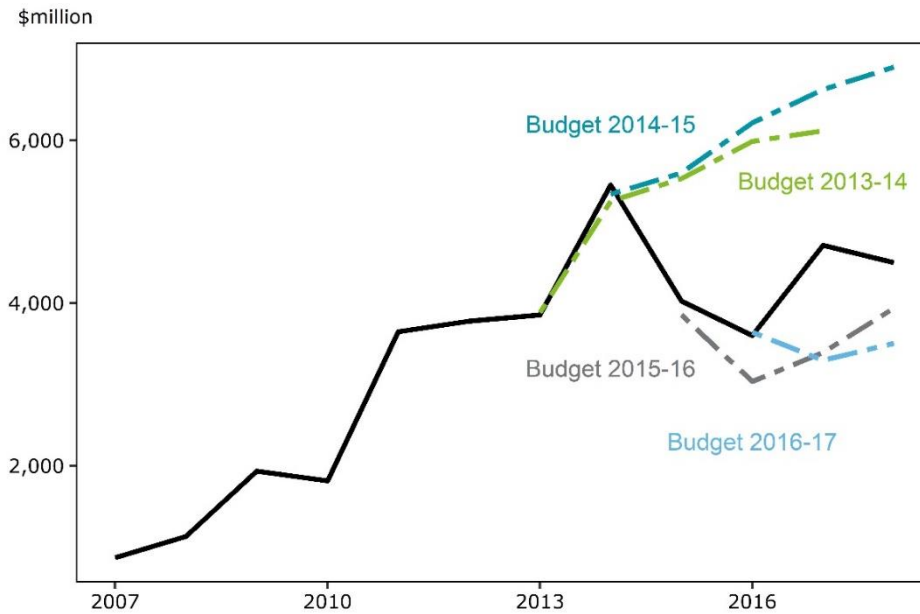
Source: ABS; Commonwealth Treasury MYEFO 2009-10; Deloitte Access Economics

Further, consider the Western Australian government’s forecasts of iron ore royalties. The outlook for iron ore royalties contained in Western Australian Treasury’s 2014-15 forward estimates, for

¹⁰ Treasury, 2009, 2009-10 Commonwealth Budget – Mid-Year Economic and Fiscal Outlook, Canberra. Available at: https://www.budget.gov.au/2009-10/content/myefo/download/02_Part_2.pdf Data has been interpolated by way of cubic splines.

example, were approximately \$6.1 billion above actual royalties for the three years to 2016-17 (Chart 4.2). The forecasts at the time assumed that prices would continue on their upward trajectory. In reality, slower growth in demand from China and a big lift in production globally resulted in a decline in the iron ore price.

Chart 4.2: Western Australian iron royalties, forecast and actuals

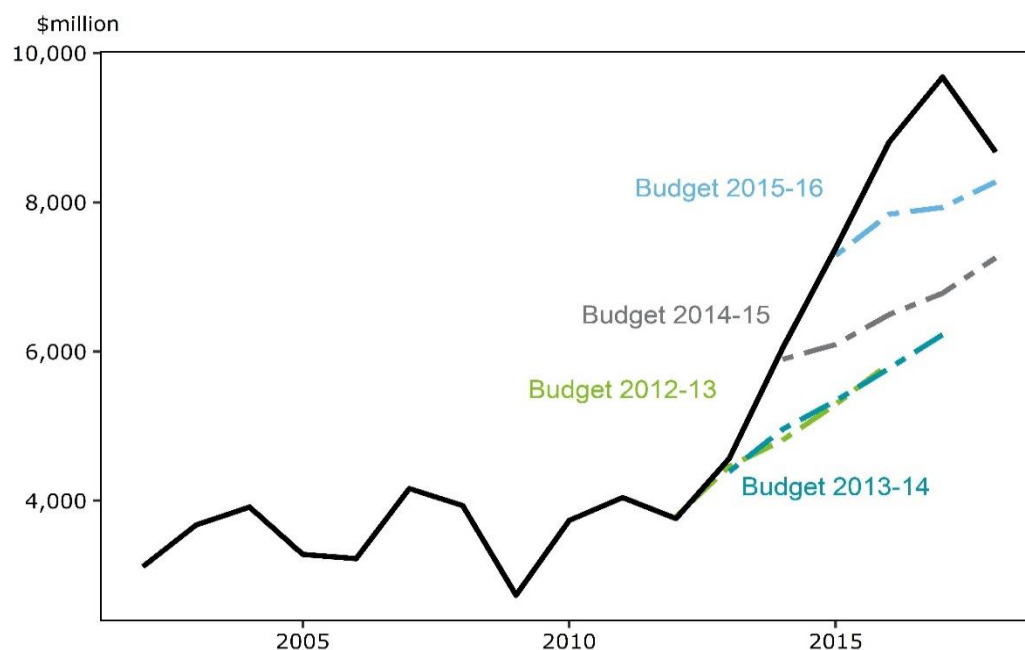


Source: Western Australian Department of Treasury and Finance Budget Papers (various); Deloitte Access Economics

Forecast errors can also surprise on the upside. For example, NSW’s 2013-14 Budget forecast for transfer duties revenue in 2016-17 was \$6.2 billion, some \$3.4 billion less than what was realised (Chart 4.3).

We present the examples above to illustrate the challenges of forecasting. In all three cases, the forecasts represented the forecasters’ view of the most likely trajectory of the economic and revenue variables at the time. Yet, in all three cases, actual outcomes differed widely from those predicted.

Chart 4.3: New South Wales transfer duties revenue, forecast and actuals.



Source: NSW Treasury Budget Papers (various years); Deloitte Access Economics

4.3 Some official forecasters have highlighted the issue of forecast uncertainty

That forecasting is inherently difficult and subject to error is well understood by forecasters themselves. A number of official forecasters, both in Australian and overseas, have been drawing increased public attention to this in recent years (see Box 1).

Both the Commonwealth Treasury¹¹ and the RBA¹² have recently conducted reviews into their forecasting practices. Both reviews found that there is a need to focus more on the uncertainty in the forecasts, be it through quantitative assessments or qualitative discussion.

¹¹ Treasury, 2016, Forecasting in Treasury. Available at: <https://treasury.gov.au/speech/forecasting-in-treasury/>

¹² Reserve Bank of Australia, 2016, Economic Forecasting at the Reserve Bank of Australia, Hobart. Available at: <https://www.rba.gov.au/speeches/2016/sp-ag-2016-04-06.html#background-to-the-pagan-wilcox-review>

Box 1: Communicating uncertainty

Communicating uncertainty

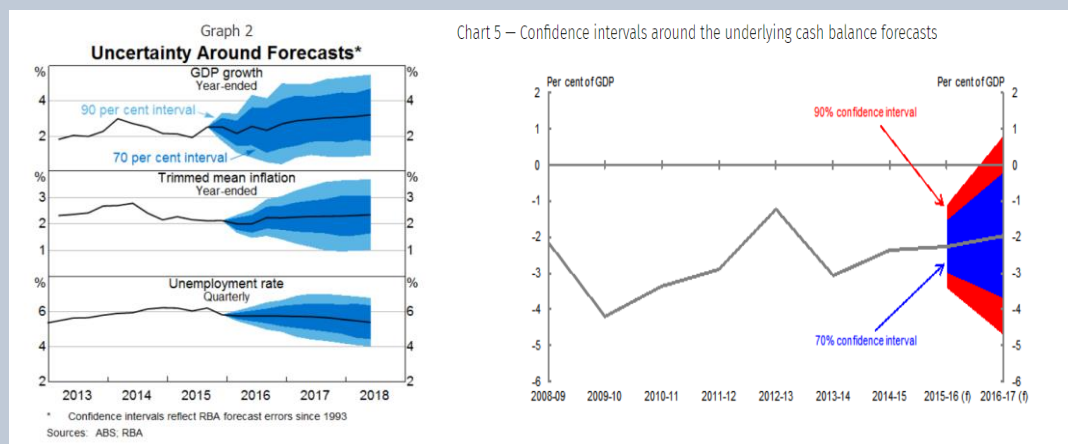
Many reputable forecasters communicate the uncertainty in their forecasts. This is achieved through a number of mechanisms, such as written or verbal communication of the upside or downside risks (such as in Deloitte Access Economics' *Business Outlook* publication) or through graphical representations via "fan charts".

Fan charts are a useful way to communicate that the central estimate is one of many possible future states that a variable may take. While the approaches taken to their construction differ by institution, they all reflect two things: namely, (i) forecast uncertainty as a function of historical forecast errors and (ii) this uncertainty is an increasing function of time.

The importance of these distributions was neatly summarised by Warren Tease in his 2016 review of forecasting at the Treasury:

"Unfortunately, these [fan] charts do not attract as much attention as they deserve. While it is natural that the point estimate of the budget outcome attracts most of the attention it is in reality only one of a wide range of possible outcomes ... These charts deserve more attention as they are a better reflection of the possible range of economic and budget outcomes. The central point estimate forecast is essentially an estimate of how the economy may look under one scenario which assumes close to consensus global growth, unchanged commodity prices and broadly unchanged financial conditions. It will be wrong if these assumptions are wrong or if our understanding of the behaviour of the economy under these assumptions is wrong."

Figure 1: Uncertainty in forecast, Treasury and RBA



Source: RBA, Commonwealth Treasury.

4.4 Considerations for the use of the Commonwealth's 10-year projections

As described in Section 2 of this report, the Commonwealth's approach to modelling the effect of its proposed change to the HFE system is based on comparing the outcomes for each State under a "central case" set of projections. Under that set of projections, the Commonwealth's proposed system would leave no State "worse off".

However, this does not account for the significant uncertainty surrounding this central case due to that inherent in forecasting, which increases over time.

The Commonwealth Treasury's forecasts for State populations, the GST relativities and the GST pool all reflect the "best guess" of the most likely outcome for each of these series.

Section 3 of this report shows that it would not take a considerable change in the forecast **GST relativities** away from the central case for a State to be worse off under the Commonwealth's proposed HFE model.

Different projections for State populations or the GST pool could also leave some states worse off without the GST relativities changing. For example:

- Growth of the GST pool by at least **10% p.a. from 2020-21** would result in at least one State being worse off under the new system; and
- **Alternate population growth forecasts** of 1.0% pa for NSW, 1.5% pa for Victoria, and 3.25% pa for WA from 2020-21 would leave at least one State worse off.

These represent very large deviations from what might be considered likely to occur. This does therefore suggest that the impact of different GST relativities far outweighs the effects of different growth rates in the GST pool or relative State population growth rates.

It is not unreasonable, though, to consider that changes across all three inputs could occur together. For example, periods with higher commodity prices have coincided with periods of relatively higher population growth in WA and stronger growth in the GST pool. This occurred as recently as in the period at the start of the mining boom prior to the global financial crisis. This would suggest that smaller deviations across all three inputs from the base case – which are more likely to occur – could lead to an adverse outcome for any given State.

Understanding and accounting for this uncertainty is important in evaluating the effect of the Commonwealth's proposed changes to the HFE system on the amount of GST received by each State.

Limitation of our work

General use restriction

This report is prepared solely for the use of the Department of Treasury and Finance (Victoria). This report is not intended to and should not be used or relied upon by anyone else and we accept no duty of care to any other person or entity. The report has been prepared for the purpose of reviewing the Department's GST distribution analysis set out in our engagement letter dated 12 October 2018. You should not refer to or use our name or the advice for any other purpose.

Deloitte.

Access Economics

Deloitte Access Economics

ACN: 149 633 116
8 Brindabella Circuit
Brindabella Business Park
Canberra Airport ACT 2609
Tel: +61 2 6263 7000
Fax: +61 2 6263 7004

Deloitte Access Economics is Australia's pre-eminent economics advisory practice and a member of Deloitte's global economics group. For more information, please visit our website

www.deloitte.com/au/deloitte-access-economics

Deloitte refers to one or more of Deloitte Touche Tohmatsu Limited, a UK private company limited by guarantee, and its network of member firms, each of which is a legally separate and independent entity. Please see www.deloitte.com/au/about for a detailed description of the legal structure of Deloitte Touche Tohmatsu Limited and its member firms.

The entity named herein is a legally separate and independent entity. In providing this document, the author only acts in the named capacity and does not act in any other capacity. Nothing in this document, nor any related attachments or communications or services, have any capacity to bind any other entity under the 'Deloitte' network of member firms (including those operating in Australia).

About Deloitte

Deloitte provides audit, tax, consulting, and financial advisory services to public and private clients spanning multiple industries. With a globally connected network of member firms in more than 150 countries, Deloitte brings world-class capabilities and high-quality service to clients, delivering the insights they need to address their most complex business challenges. Deloitte's approximately 244,000 professionals are committed to becoming the standard of excellence.

About Deloitte Australia

In Australia, the member firm is the Australian partnership of Deloitte Touche Tohmatsu. As one of Australia's leading professional services firms, Deloitte Touche Tohmatsu and its affiliates provide audit, tax, consulting, and financial advisory services through approximately 7,000 people across the country. Focused on the creation of value and growth, and known as an employer of choice for innovative human resources programs, we are dedicated to helping our clients and our people excel. For more information, please visit our web site at www.deloitte.com.au.

Liability limited by a scheme approved under Professional Standards Legislation.

Member of Deloitte Touche Tohmatsu Limited

© 2018 Deloitte Access Economics Pty Ltd