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Review of the regulatory treatment of inflation

Prepared for the Australian Energy Regulator

30 June 2020

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Dear Robyn

Review of the regulatory treatment of inflation

I enclose Deloitte Access Economics' review of the approaches to estimating expected inflation, prepared for the Australian Energy Regulator (AER) as part of the 2020 Inflation Review.

In April 2020 the AER published a notice announcing a review of the treatment of inflation in the regulatory framework that applies to regulated electricity network and gas pipeline service providers. The AER engaged Deloitte Access Economics in June 2020 to undertake the review of the AER's current approach to estimating expected inflation as part of the wider 2020 Inflation Review.

This report includes Deloitte Access Economics' assessment of whether the AER's current approach, or any alternative approach, derives the best estimate of expected inflation and is appropriate in the context of the applicable National Energy Rules and the National Gas Rule requirements.

Yours sincerely,

Stephen Smith
Partner
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Glossary

ABS	The Australian Bureau of Statistics
ACCC	The Australian Competition and Consumer Commission
AER	The Australian Energy Regulator
AGS	Australian Government Securities
BBIR	Bond Breakeven Inflation Rate
CPI	Consumer Price Index
GDP	Gross Domestic Product
NER	National Energy Rules
NGR	National Gas Rules
NSP	Network Service Providers
PTRM	Post-tax revenue model
RBA	The Reserve Bank of Australia
RFM	Roll-forward model
TMI	Trimmed Mean Inflation

Executive Summary

Background

The Australian Energy Regulator (AER) regulates energy networks in all jurisdictions in Australia except Western Australia. The AER's regulation of energy networks promotes efficient investment in, and efficient operation and use of energy services for the interest of consumers.

The AER is required to estimate expected inflation over a 10-year horizon as part of the regulatory framework that applies to regulated electricity network and gas pipeline services providers. Deloitte Access Economics has been engaged by the AER to review the current approach to estimating expected inflation as part of the wider 2020 Inflation Review.

This review includes Deloitte Access Economics' assessment of whether the AER's current approach, or an alternate approach, derives the best estimate of expected inflation in relation to its congruence with market expectations appropriateness in the context of applicable National Energy Rules and the National Gas Rule requirements.

Approaches used to estimate expected inflation

The five approaches for estimating expected inflation considered in this report are:

- **The AER approach** – The AER approach involves using CPI inflation forecasts published by the Reserve Bank of Australia (RBA) for the first two years of the forecast period (the limit of the RBA forecast series) and reverting to the mid-point of the target band for inflation (2.5%) from years 3 to 10. The final estimate for expected inflation for regulatory purposes is then taken as the geometric average of the ten annual inflation figures. The AER approach has been used by the AER after implementing the 2007 decision to change from the BBIR approach.
- **A glide path** – The glide path approach proposes smoothing the transition between the end of the RBA's forecast (years one and two of the forecast period) and the mid-point of RBA's inflation target (2.5% from year three of the forecast period) using linear interpolation.
- **The bond breakeven inflation rate (BBIR)** – The BBIR approach is a market-based measure of inflation expectations derived from taking the difference in yields between nominal and inflation-indexed Australian Government Securities (AGS).
- **Swaps** – The swaps approach involves deriving an estimate of inflation from a type of derivative where one party receives a payment indexed to inflation in exchange for a payment determined by a fixed rate.
- **Surveys** – A survey-based approach involves obtaining inflation expectations from professional forecasters, market economists or other stakeholders.

Each approach has its own strengths and weaknesses with respect to their use for regulatory purposes by the AER.

Evidence on the anchoring of inflation expectations to the RBA's target range

Much of the recent literature in this field comes from international studies. Moessner and Takáts (2020) examined survey-based inflation expectations data across multiple countries for the period 1996 to 2019, concluding that long term inflation expectations remained well-anchored in advanced economies where inflation was near the lower bound of the target range. However, persistent deviations of inflation from target were found to affect long term inflation expectations in advanced economies. This aligns with findings in previous studies (Ehrmann, 2015).

There is evidence that long term inflation expectations are better anchored than shorter-term forecasts, and that inflation expectations diverge from the long term anchor as the forecast period

shortens (Mehrota and Yetman, 2018). Yetman (2020) finds that periods of low inflation are correlated with the decreased effects of short term inflation expectations on long term inflation expectations, further suggesting that longer-term expectations have remained well anchored.

There is evidence that Australian inflation expectations are anchored within the RBA's target band (Gillitzer and Simon, 2015; Mallick, 2015). However, there remain significant limitations in the current academic literature. Most notably, there are few studies that examine inflation expectations in 2019 and 2020 – the period in which some measures of Australian inflation expectations have shown signs of movement. The most recent studies on inflation expectations also focus on countries other than Australia and tend to analyse data over several years (which may cloud potential insights into recent changes in inflation expectations).

Criteria for assessing inflation estimation approaches

The comparative assessment of the best approach for estimating expected inflation is informed by the criteria included in the AER's May 2020 discussion paper on the regulatory treatment of inflation:

- Congruence with market expected inflation rate
- Robustness
- Transparency and replicability
- Simplicity

Comparative assessment of inflation estimation approaches

Each of the approaches used to estimate expected inflation considered in this report have advantages and disadvantages in relation to their use by the AER in its regulatory framework. Deloitte Access Economics finds that two approaches lend themselves to recommendation for use by the AER – the AER approach and a glide path approach.

The current AER approach is highly robust, transparent, replicable and simple. The AER approach is also found to be sufficiently congruent with current 10-year market expectations of inflation. Survey-based measures of inflation expectations and recent academic literature suggest that long term inflation expectations remain well-anchored within the RBA's target band, however there are concerns around short term and medium term expectations. There is no clear evidence as of yet, but if inflation remains below the RBA target band for an extended period there may be a degree of de-anchoring of inflation expectations in Australia. If this were to occur the congruence of the AER approach would deteriorate.

The use of a glide path would provide a provision for potential de-anchoring of inflation expectations in coming years. There are issues around how to define the length of the glide path and how to interpolate between the end of the RBA forecast series and the end of the glide path (whether to adopt a linear or exponential path back to the long term target). That said, if inflation remains below the RBA's target range for an extended period the probability of de-anchoring of medium term expectations increases (Ehrmann, 2015). If this de-anchoring were to occur the glide path is likely to produce an estimate of 10-year inflation expectations that is closer to market expectations when compared to the AER approach.[1]

Surveys rank highly in terms of relative congruence as professional forecasters invest substantial time and effort to ensure that their models track relevant changes in information relating to the formation of inflation expectations. The key drawback of using surveys relates to their transparency and replicability. Surveys of professional forecasts are often proprietary in nature, limiting their ability to be published and scrutinised. The inflation estimates obtained using surveys

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[1] The use of the RBA target band as a long term target for the glide path approach is only appropriate in-so-far as long term inflation expectations remain anchored within the RBA's target band. There is no evidence of the de-anchoring of long term inflation expectations in Australia, but if this were to occur an alternate (market-based) measure of long term inflation expectations would be required for use to inform the end point of the glide path.

are also susceptible to the timing of surveys (long term forecasts are only published twice a year by Consensus Economics) and the sample of forecasters being surveyed.

Approaches such as using swaps or BBIR have the advantage of being market-based measures. As market-based approaches they derive estimates of inflation expectations from an aggregation of all available information. However, both approaches are affected by the presence of material and time-varying distortions that limit their use in a regulatory context.

Overall, the current data and literature assessed indicate that the AER approach is still fit for purpose at present given the lack of clear evidence of the de-anchoring of inflation expectations from the RBA target range. However, there is a risk that this may occur in coming years. If this de-anchoring were to occur, a glide-path approach would produce inflation estimates that most closely align with 10-year market expectations.

Table i includes Deloitte Access Economics' assessment of the various approaches to estimating expected inflation against the criteria of congruence, robustness, transparency and replicability and simplicity.

Key: Excellent Good Fair Poor

Table i: Summary of inflation estimation approaches

	Relative congruence	Robustness	Transparency and Replicability	Simplicity
AER approach	Contains no significant biases and/or distortions. Evidence that inflation expectations remain anchored within the RBA's target range, but congruence of approach is vulnerable to potential de-anchoring of expectations over coming years. Rank: Good	Includes the influence of changes to short term inflation expectations (up to two years) and the relative stability of long term inflation expectations. Rank: Excellent	Approach is highly transparent and easily verified by stakeholders. Rank: Excellent	Simplest approach analysed Rank: Excellent
Glide path	Contains no significant biases and/or distortions. Evidence that inflation expectations remain anchored within the RBA's target range, but congruence of approach remains vulnerable to potential de-anchoring. Approach may be less susceptible to error compared to AER approach if de-anchoring occurs (i.e. expectations remain below 2.5% for the duration of the glide path if RBA forecast inflation of less than 2.5% in year two of the forecast period). Rank: Excellent	Balances relative volatility of short term forecasts with stability of longer-term expectations. Estimates obtained may differ when other appropriate assumptions are applied (i.e. changes to length of glide path and structure of the glide path). Rank: Good	Approach may be considered transparent to the extent that the determination of the glide path is clearly defined by the AER. Easily verified by stakeholders. Rank: Good	The glide path approach is simple, but more complex than the AER approach due to the introduction of a glide path. Rank: Excellent

BBIR	Market-based measure of expected inflation. Presence of risk premia, biases and other distortions may affect the resulting estimate of expected inflation (even following adjustments). Market for inflation-linked bonds remains relatively illiquid in Australia. Rank: Good	Estimates may change significantly in response to events or data that have little or no influence on 10-year market expectations of inflation. Estimates obtained may differ when other, appropriate, assumptions are applied (i.e. changes to the size of the bias adjustment). Rank: Fair	BBIR approaches may vary based on the method used to fit yield curves and account for various premia, biases and other distortions. Calculations are also more complex when compared to other methods. Rank: Poor	Most complex method analysed due to the need to fit yield curves and attempt to account for embedded premia, biases and distortions. Rank: Poor
Swaps	Market-based measure of expected inflation. Biases and risk premia may affect the resulting estimate of expected inflation. Sensitive to market fluctuations and swaps are traded among a small group of market participants. Less distorted by liquidity concerns than BBIR. Rank: Good	Estimates may change significantly in response to events or data that have little or no influence on 10-year market expectations of inflation. Rank: Fair	Approach is relatively easy for stakeholders to verify. Unlike BBIR there are no issues related to congruency of interpolated estimates with market expectations. Rank: Good	Less complex when compared to BBIR, but more complex when compared to the AER and glide path approaches. Rank: Fair
Surveys	Estimates of expected inflation from professional forecasters closely track changes in relevant data with respect to the formation of inflation expectations. Rank: Excellent	Balances relative volatility of short term forecasts with stability of longer-term expectations. Robustness may be affected by the timing of the survey and the sample of professional forecasters surveyed. Rank: Good	Inflation expectations produced by professional forecasters, and surveys of these forecasters, are often proprietary in nature. This severely limits both the transparency and replicability of the survey approach. Rank: Poor	Surveys are simple to procure, but the results of surveys may be open to contention by stakeholders. Rank: Fair

1   Introduction

1.1   Background and purpose of this review

The Australian Energy Regulator (AER) regulates energy networks in all jurisdictions in Australia except Western Australia. The AER's regulation of energy networks promotes efficient investment in, and efficient operation and use of energy services for the interest of consumers.

The AER is required to estimate expected inflation as part of the regulatory framework that applies to regulated electricity network and gas pipeline services providers.

Inflation impacts on the costs and revenues of networks. Inflation is an important component in the post-tax revenue model (PTRM), roll-forward model (RFM) and annual pricing mechanisms used by the AER. Regulatory determinations for Network Service Providers (NSP) are forward looking. That is, the AER uses an estimate of expected inflation over a 10-year horizon in its pricing determinations.

The AER has a number of regulatory requirements relating to the treatment of inflation. The National Energy Rules (NER) state that the PTRM for electricity distribution and transmission must specify a methodology that the AER determines is likely to result in the best estimate of expected inflation.[2] The National Gas Rules (NGR) state that the estimate of inflation must be accompanied by a supporting statement, must be arrived at on a reasonable basis, and must represent the best estimate possible in the circumstances.[3]

The AER last conducted a review of its inflation approach in 2017. In the 2017 review the AER noted that it would monitor information relevant to the estimation of inflation. The AER has subsequently observed movements in key data, suggesting that a new review of the method for estimating expected inflation is appropriate.

On 7 April 2020 the AER published a notice announcing a new review of the treatment of inflation in the regulatory framework, including the current method for estimating inflation. A discussion paper was subsequently released in May 2020. The AER's draft position is expected to be released in September 2020, with a final position paper announced by December 2021.

In Australia, as in other countries, a recent period of low inflation has raised concerns about whether the existing monetary policy framework remains fit-for-purpose. According to Dr Lowe, Governor of the RBA, the RBA is not currently looking to change the monetary policy framework that has worked well for the past 30 years, but may review this decision over the next few years (AFR, 2020).

It is also worth noting that 2020 has been a unique year. The Australian economy has been affected by bushfires and COVID-19. The resulting impacts on supply and demand across the economy make it more difficult than usual to forecast key variables such as inflation. As such, data from 2020 should be interpreted carefully in the development of forecasts.

1.2   Key concepts

1.2.1   Defining inflation

Inflation refers to the rate of change in the prices of goods and services in the economy. Prices typically rise over time (inflation), but prices can also fall (deflation) or remain unchanged. Over time positive inflation lowers the purchasing value of money.

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[2] National Energy Rules 6.4.2(b)(1) and 6A.5.4(b)(1)
[3] National Gas Rules rule 75B(2)(b)

Prices in the economy can be expressed as either nominal (current) or real (constant). Nominal prices include the effects of inflation, while real prices remove the effects of inflation. This can be summarised by the formulae referred to as the Fisher equation:

$$(1 + i) = (1 + r) \times (1 + \pi)$$

Where:

- i is the nominal interest rate
- r is the real interest rate
- π is the inflation rate

This expression can be approximated as follows:[4]

$$i \approx r + \pi$$

$$r \approx i - \pi$$

This relationship has important implications for regulated electricity and gas service providers. When inflation is positive the nominal return is greater than the real return. Accurate estimates of inflation are important in correctly calculating real and nominal returns.

1.2.2 Measures of inflation

There are several different ways to measure inflation in the Australian economy. These include the most widely used measure, the Consumer Price Index (CPI), as well as other measures such as the Gross Domestic Product (GDP) deflator and producer price indices.

1.2.2.1 Consumer Price Index

The CPI measures prices paid by households for goods and services consumed. The CPI is calculated by the Australian Bureau of Statistics (ABS, 2019) and published once per quarter. This is done by:

> *"measuring the cost of purchasing a fixed basket of consumer goods and services of constant quality and similar characteristics, with the products in the basket being selected to be representative of households' expenditure during a year or other specified period."*

In total the ABS collects around 100,000 individual prices each quarter. The change in the price of these goods is then calculated and this is aggregated up to the 87 categories (expenditure classes) and 11 groups used in the CPI basket.

The CPI is generally considered the most appropriate measure of inflation due to its wide use across the economy, relative simplicity, timeliness and credibility. The CPI is used in Australian monetary policy, industry price determinations (e.g. indexing energy prices, government payments, taxes and charges, business contracts, etc.) and in anchoring wage determinations.

Despite the clear strengths of the CPI as a measure of inflation, there are a number of limitations:

- Coverage – the CPI only measures price changes in the metro areas of Australia's eight capital cities, not regional areas (where around one third of Australians live). The CPI does not account for differences in the individual spending patterns between households.
- Quality changes – the CPI does not directly capture price changes that result from variations in the quality of items. The ABS accounts for this by estimating the price impact due to quality, but this process may lead to under- or over-estimation.
- Substitution bias – the CPI does not frequently adjust for changes in household spending patterns. This may mean that the CPI fails to capture, in a timely manner, the impact of households purchasing fewer items that have increased in cost and additional items that have fallen in cost.

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[4] Linear approximation given by using two first order Taylor expansions. Approximation is valid only for small changes in inflation and interest rates.

- New products – it can take some time until new products are included in the CPI basket.
- Alignment – the CPI is a measure of the change in consumer prices, which might differ from the change in labour and capital costs of electricity network and gas pipeline service providers subject to regulation.

The outbreak of COVID-19 and measures to contain the spread of the virus may also have an impact on the CPI (RBA, 2020b). Following the introduction of physical distancing in mid-March, the ABS ceased the in-person collection of prices. The impact of this change is likely to be minimal, with in-person collection accounting for around 2% of the CPI basket. Some items in the CPI basket have also not been transacted for some time (e.g. international airfares and tickets to sporting and cultural events) and will need to be estimated. The fixed CPI basket is also likely to ignore the changes to household spending patterns that have taken place during COVID-19 (e.g. greater spending on home entertainment and groceries, less spending on holidays and dining) (RBA, 2020b).

These factors stress the importance of careful interpretation of CPI growth in 2020, particularly the June 2020 release (due to be released on 29 July 2020).

1.2.2.2 Measures of underlying inflation – trimmed mean, weighted median and CPI excluding volatile items

Underlying inflation excludes items from the CPI basket that have particularly large price changes in a given quarter. This can occur due to events such as supply disruptions (e.g. weather events affecting agricultural production) or changes in tax arrangements (e.g. the introduction of the GST in 2000). Measures of underlying inflation are one of the tools used by the RBA and other forecasters to analyse what part of recent price movements is likely to be 'noise' and which part is likely to affect future inflation (Richards and Rosewall, 2010).

Trimmed mean inflation

Trimmed Mean Inflation (TMI) refers to the average rate of inflation after removing items in the CPI basket with the largest price changes (positive or negative). The ABS publishes historical data (from 2007) for the 15% trimmed mean, which removes the 15% of items with the smallest and largest prices changes.

The advantage of trimmed mean inflation is that it removes the effect of large price changes that might be considered unrepresentative of price changes among other goods and services. However, trimmed mean inflation can also be sensitive to expenditure items with large weights in the CPI basket – potentially adding volatility to the series.

Weighted median inflation

Weighted median inflation refers to the price change of the item at the middle of the 50th percentile of the CPI basket (the middle of the price changes in the CPI basket – after sorting by change in price). This approach tends to be more exposed to items with large weights in the CPI basket compared to the trimmed mean approach. There is also evidence to suggest that year-end growth in CPI should not be used in weighted trims (Richards and Rosewall, 2010).

CPI excluding volatile items

CPI excluding volatile items takes the average inflation rate excluding fruit, vegetables and fuel. These items have historically been the most affected by supply disruptions or seasonal factors and are therefore considered inherently more volatile than other items in the CPI basket. The CPI excluding volatile items always removes the same items from the CPI basket.

1.2.2.3 GDP deflator

The GDP deflator measures the change in prices for all goods and services produced in the Australian economy. It includes the prices paid by businesses, governments and consumers. As such, it covers a broader range of prices when compared to the CPI. Data is released by the ABS as part of the quarterly national accounts.

In practice the historical difference between the GDP deflator and CPI inflation has been relatively small (see Chart 1.1). Since the early 2000s there has been a larger than average divergence between these two price measures. This is primarily due to fluctuations in the prices for Australian commodity exports over this period. Changes in commodity prices affect the GDP deflator, but as households consume few of these commodities the impact on CPI is modest (Productivity Commission, 2019).

Chart 1.1: Growth in the GDP deflator compared to growth in the CPI, 1960 to 2020
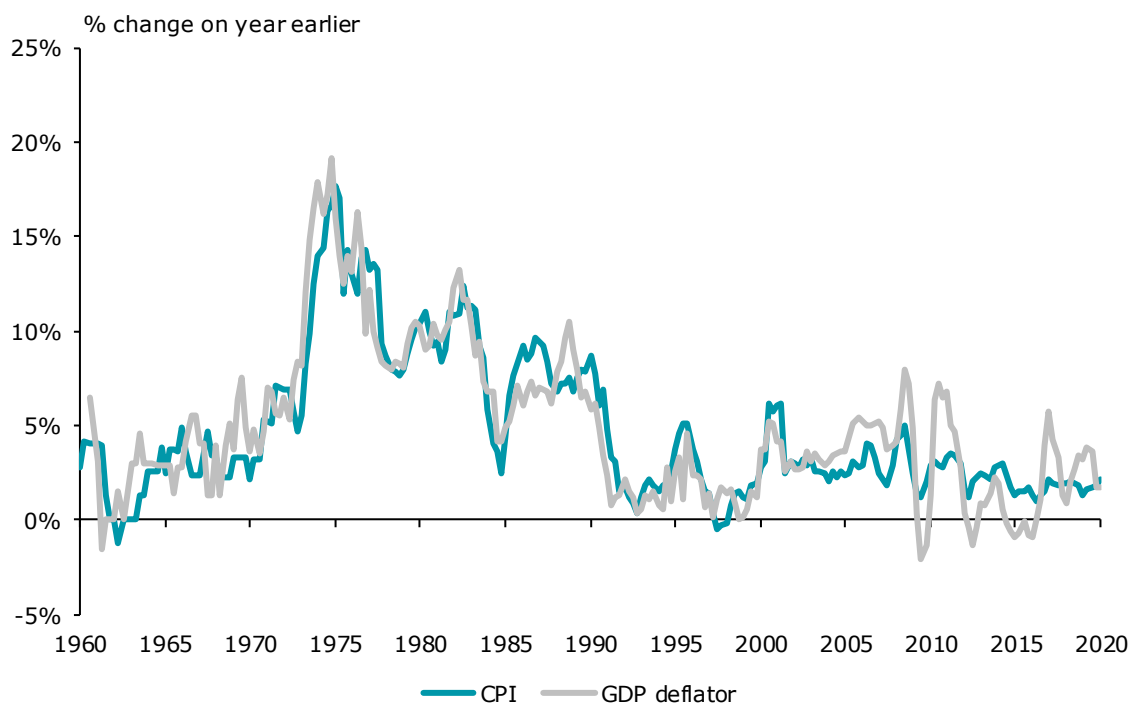
Source: Australian Bureau of Statistics

A key drawback of the GDP deflator is that it is subject to revision each quarter. This means that the GDP deflator is not a practical solution for use in estimating inflation expectations (or for annual price adjustments) for regulatory purposes.

1.2.2.4   Producer price indices

Producer price indices provide a measure of the average change in the prices of goods and services as they enter or leave the production process. The ABS publishes producer price indices on a quarterly basis for the mining, manufacturing, construction and selected services industries. There is no index that applies specifically to regulated electricity and gas networks. It is also unclear how closely the indices for the published industries align with electricity and gas networks. As such, producer prices indices have limited application for the AER.

1.2.2.5   Choice of measure

CPI inflation is considered to be the most appropriate measure of inflation for use by the AER due to its widespread use, general acceptance, frequency of release, stability and broad coverage. While the GDP deflator measures a wider range of prices, it is unsuitable for use by the AER due to issues around regular revision and sensitivity to changes in commodity prices. Producer price indices, in theory, provide the closest alignment to the changes in labour and capital costs faced by industries subject to regulation. However, no index is available for the utilities sector and there is clear volatility in the producer price indices among those industries for which data is published.

According to the Australian Financial Markets Association (AFMA, 2017) Inflation Products Conventions, headline CPI, not underlying inflation, is used for the purposes of Australian inflation

products (instruments such as bonds and swaps that provide cashflows that are linked to an inflation rate). Headline CPI is the measure of inflation targeted by the RBA in the medium term and most accurately reflects the inflation rate that investors' real returns are exposed to.

Measures of underlying inflation are useful in removing the effects of volatility in the CPI series but have limited application for the AER in its regulatory determinations. The appropriate choice of underlying inflation measure may differ based on the nature of the volatility in the headline CPI series. As such, there is unlikely to be a single measure of underlying inflation that can be considered the best measure at all times. In addition, long term forecasts of underlying inflation are not published by the RBA and are typically not captured in surveys of professional forecasters (although the RBA does publish short term TMI forecasts in its Statement on Monetary Policy, and it can be reasonably assumed that headline and underlying measures of inflation converge in the long term).

1.2.3 Distinguishing between inflation expectations, forecasts and outcomes

The AER is required under the NER and NGR to provide the best estimate of expected inflation possible. Expected inflation refers to the rate of change in the prices of goods and services in the economy that is expected by participants in the economy (market participants). Expected inflation cannot be directly observed from the data. As such, various approaches (discussed in Section 2 of this report) are required in order to estimate expected inflation.

Forecasts of inflation are developed using macroeconomic models of the Australian economy that combine model-based projections, other information and professional judgement. Macroeconomic modelling is a constantly improving discipline, but the results of forecast models may differ from inflation expectations in the economy. This may occur due to variation in the views of professional forecasters and wider market participants as well as when forecasts were finalised.

Both expected inflation and forecast inflation may also differ from actual inflation. Actual inflation refers to the historical CPI data released by the ABS. Variation between the estimate of expected inflation at a point in time and the subsequent actual inflation result does not necessarily imply that the estimate of expected inflation was inaccurate. Rather, inflation expectations are formed using the best possible information available at a given point in time.

1.2.3.1 Disagreement in inflation expectations

Expected inflation is typically considered a point estimate, but there is evidence to suggest that median measures of inflation expectations obscure a substantial dispersion of expectations (Mankiw, Reis and Wolfers 2003). Inflation expectations may more accurately be reflected by a probability distribution than a point estimate (Vahey 2017).

Disagreements about inflation expectations may arise because of the way agents in the economy process new information. It may be the case that acquiring new information and determining the impact of this information on inflation expectations requires costly effort (Reis 2006), referred to as a sticky-information model. As such, inflation expectations are typically only updated periodically and disagreements may arise between those who have processed the latest information, and those that have not. This disagreement will tend to decay over time as all agents incorporate the new information into their inflation expectations, but given the frequency of new data there is always likely to be some disagreement.

It may also be the case that agents in the economy filter out unnecessary data to infer the true state of estimated inflation, referred to as noisy-information models (Lucas 1972; Sims 2003; Woodford 2003). This assumes that agents continuously update forecasts, but individual agents face new data with different errors at any given point in time. Despite this, Coibion and Gorodnichenko (2012) show that disagreement is constant over the business cycle, that it is uncorrelated with macroeconomic shocks. In Australia it has also been shown that disagreement in inflation expectations responds little to most macroeconomic news, but expectations of inflation in the year ahead respond to deviations in current inflation from the mid-point of the RBA's inflation target (RBA, 2016).

Disagreement in inflation expectations may also arise because of differences in beliefs around the level of long term inflation (Patton and Timmerman 2010). This may include agents having different views on the credibility of the RBA inflation target, and therefore forming different views of expected inflation. However, data from the RBA suggests that there has been a decline in disagreement among professional forecasters since the early 1990s – a period in which the RBA adopted inflation targeting (RBA 2016). Additionally, even if market participants agree on the anchoring of long term inflation expectations and incorporate the latest information, they are likely to use different models to form forecasts and expectations.

As such there is likely to be some level of disagreement around the mean level of expected inflation in the economy. However, due to the competing views in the academic literature and practical difficulties (including added complexity and reduced transparency) in incorporating probability distributions of expected inflation, the AER should continue to use a point estimate of inflation in its regulatory framework that applies to NSPs.

1.3   The formation of inflation expectations

The formation of inflation expectations has become a key discussion point for central banks in the recent past. The discussion has been driven by the sustained period of low interest rates experienced globally. Increasingly, as nominal interest rates approach the zero-lower bound, the question of how to directly manage household inflation expectations has resulted in an increased focus on the formation of those expectations.

Typically, it is assumed that households form rational expectations based on information signals in the economy. According to Loleyt and Gurov (2011), inflation expectations are a function of the level of data perceptivity of the agent and the level of belief in perceived information signals.

Additionally, key assumptions in the formation of inflation expectations in academic economics include the notion of adaptability and rationality (i.e. economic agents believe that authorities such as the central bank control how well actual inflation coincides with forecasted inflation) (Loleyt and Gurov, 2011).

Evidence by D'Acunto, Malmendier and Weber (2019) found that the price changes households observe (i.e. through their everyday purchases), rather than all price changes, are a significant driver of household inflation expectations. Specifically, the study found that a majority of survey respondents cited price changes observed in grocery shopping as the most important source of information for forming their inflation expectations (2019). Fluctuations in short term inflation expectations induced by price changes on grocery items provide valuable insights into the formation of household expectations.

It is likely that both headline and underlying inflation are jointly considered when economic agents are forming inflation expectations. As noted by the RBA (1999):

> *"The fact that the inflation target in Australia is expressed as a medium term average means that the distinction between underlying and CPI inflation (as now defined) does not have a direct operational significance for monetary policy. Over time, core and headline measures of prices can be expected to increase at similar rates."*

In the short term, there may be a divergence between those who base inflation expectations on headline or underlying measures of inflation. During periods of low volatility in prices this divergence is likely to be immaterial, however during periods of high volatility in prices some agents may base their inflation expectations on underlying measures. In the long term, estimates obtained using headline and underlying inflation are expected to converge.

Deloitte Access Economics is not aware of any studies that attempt to distinguish between what proportion of agents base their inflation expectations on underlying and/or headline measures of CPI. This is likely to depend upon the familiarity of the economic agent with measures of inflation and the type of shock observed (i.e. a regulated NSP may focus on underlying inflation in the short term following a drought that raises the price of fruit and vegetables – which is not directly relevant to the operation of the business).

It is most likely that investors use headline inflation when hedging against their long term inflation exposure. The RBA inflation target of 2-3% is expressed in terms of headline inflation and inflation products traded on Australian financial markets (such as bonds and swaps) relate to headline inflation. As such, over the medium to long term the inflation exposure of investors is most likely to match headline rather than underlying inflation (to the extent that there are any differences).

1.4   Current approach to estimating expected inflation

Under the current approach, the AER estimates the expected inflation rate over a 10-year period to ensure consistency with the benchmark term of the nominal rate of return. The CPI is used due to its simplicity, timeliness and high degree of credibility and familiarity when compared to other inflation measures (such as the GDP deflator and producer price indices). However, due to the impact of COVID-19 on inflation, TMI (which is less volatile than the CPI) has been used by the AER in recent regulatory decisions.

Following the 2008 final decision for AusNet Services the AER transitioned from using a bond breakeven inflation rate (BBIR) approach to what is now referred to as the 'AER approach'. The BBIR approach involves deriving expected inflation from the difference in yields between nominal and inflation-indexed securities. The 'AER approach' involves adopting the RBA's forecast inflation rate for years 1 and 2 of the forecast period, and then the average of the mid-point of the RBA target band (2.5%) over forecast years 3 to 10. A geometric average of these 10 annual figures is then taken as the value for estimated inflation over the forecast period.

The AER approach, along with alternatives, is discussed further in Section 2.

1.5   The rationale for this review: Recent movements in inflation outcomes and expectations

The CPI grew by 2.2% in the year to March 2020, below the mid-point of the RBA's target range of 2-3%. This follows a period where inflation has been below or close to the bottom of the target range for a number of years (see Chart 1.2). While the CPI has grown at an average annual rate of 2.5% over the period in which inflation targeting has been used (from March 1993 onward), average growth has fallen to 1.8% over the past five years (March 2015 to March 2020).

Chart 1.2: Decline in the pace of CPI inflation growth
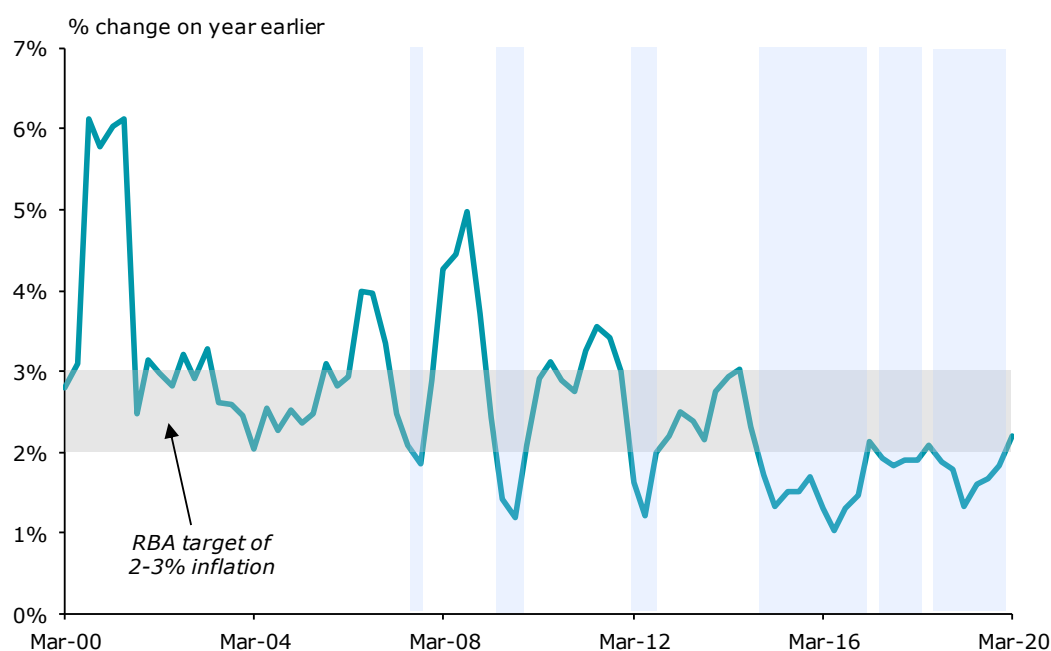
Source: Australian Bureau of Statistics

Note: Blue shaded areas indicate periods when inflation growth was below the RBA target band of 2-3%.

Low inflation in recent years has been partly driven by weakness in two of the main sources of inflation – domestic demand and labour costs.

Domestic demand (a measure of total spending by Australian consumers, businesses and governments) grew at an average annual rate of 1.1% in the five years to 2020, below the 10 year average of 1.7% (from 2010 to 2020) and the 20 year average of 2.9% (from 2000 to 2020). Domestic demand is expected to fall in 2020 amid the impact of measures to contain the spread of COVID-19 and the associated impact on consumer and business confidence.

Labour costs, which are dependent on wages and productivity, are the largest single source of inflation. The wage price index grew by 2.1% in the year to March 2020, but has remained low for several years. Wage growth is also likely to slow in 2020 and beyond as COVID-19 lowers demand in the economy and disrupts supply chains. The combined impact of the negative demand and supply shocks has resulted in job losses and falling business profits across the Australian economy.

Low growth in CPI inflation has also been partly driven by other factors such as competition in the retail sector, improvements in technology (without matching cost increases for consumers), large increase in global production, low interest rates, historically low increases in rent, low new dwelling costs, weak growth in services inflation, and a recent decline in the price of utility services (Debelle, 2018). CPI will reduce in the near term as a result of the sharp fall in oil prices and the introduction of temporary child care subsidies (with those effects expected to reverse when the subsidy is unwound). These factors can have a significant impact on short term price movements, but inflation should be determined by macroeconomic factors over the long term.

There is some evidence that the weakness in inflation outcomes has started to affect inflation expectations. But the extent of the impact depends heavily on both the approach used to estimate expected inflation (market-based or survey-based) and the time horizon being examined (short term or long term). Market-based approaches derive expected inflation from instruments traded on financial markets, while survey-based approaches aggregate the inflation expectations of market participants such as professional forecasters.

Short term inflation expectations have fallen over the past decade. This has been observed in both survey and market-based approaches used to estimate inflation expectations.
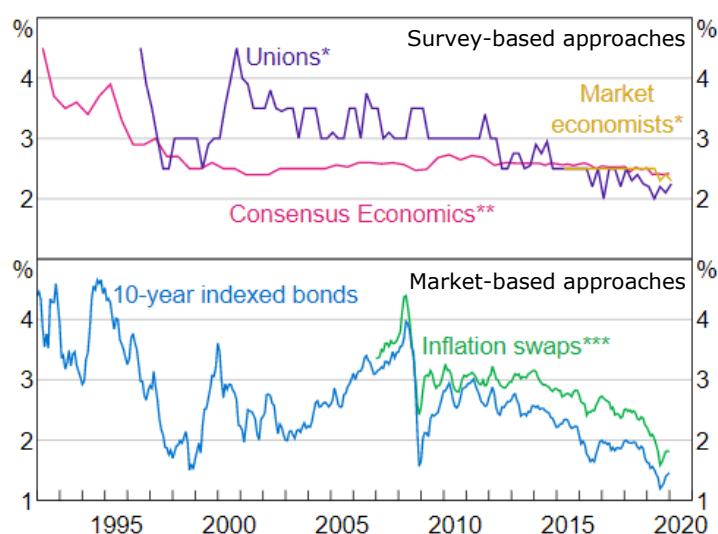
Chart 1.3: Short term inflation expectations (over the next year)
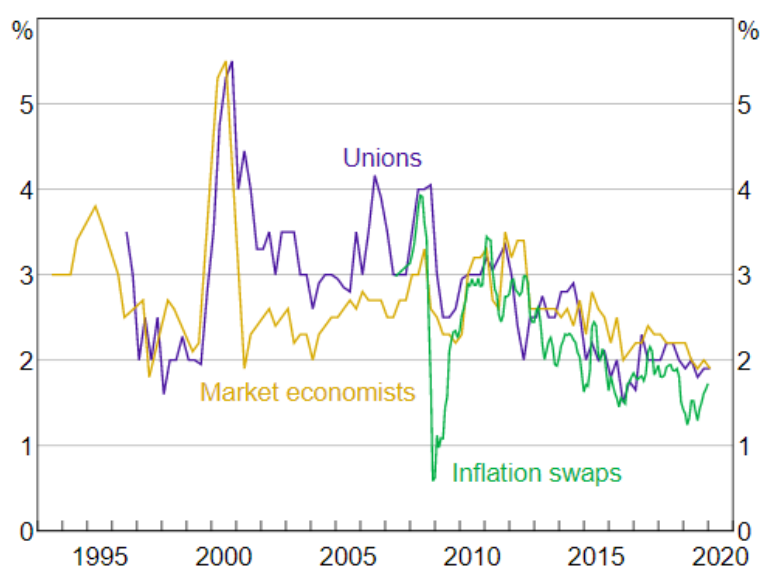
Source: Australian Council of Trade Unions, Bloomberg, RBA, Workplace Research Centre

Long term inflation expectations have also fallen, with more modest declines in survey-based approaches compared to market-based approaches. Long term survey-based approaches of estimating expected inflation remain within the RBA's medium term target band.

Chart 1.4: Long term inflation expectations

*Average over the next 5-10 years.

**Average over 6-10 years in the future. Consensus Economics forecasts are provided by leading economists whose individual views are aggregated to produce a mean forecast of inflation.

***5-10 years forward

Source: Australian Council of Trade Unions, Bloomberg, Consensus Economics, RBA, Workplace Research Centre, Yieldbroker

The relative strengths and weaknesses of market-based and survey-based approaches to estimating expected inflation are discussed in Section 2 of this report. Section 2 also includes a discussion as to whether long term inflation expectations have become de-coupled from the RBA's inflation target range.

Given the movements in inflation outcomes and expectations over the last five years, it is appropriate for the AER to review its approach to estimating inflation expectations in the context of a changed inflationary environment.

1.6 Structure of this report

Section 2 of this report outlines the various approaches for estimating expected inflation and discusses their strengths and weaknesses. There is also a review of academic literature on whether inflation expectations have become de-anchored from the RBA target range.

Section 3 assess the various approaches against a set of criteria, in order to determine which approach produces the best estimates of expected inflation for use by the AER.

2 Review of literature on estimating expected inflation

This section of the report introduces the five key methods for estimating expected inflation and draws on evidence from academic literature, industry reports and other sources to highlight the relative strengths and weaknesses of each approach.

2.1 The AER's approach to estimating expected inflation

2.1.1 Outline of approach

The AER approach involves using CPI inflation forecasts published by the RBA for the first two years of the forecast period (the limit of the RBA forecast series) and reverting to the mid-point of the target band for inflation (2.5%) from years 3 to 10. The final estimate for expected inflation for regulatory purposes is then taken as the geometric average of the 10 annual inflation figures.

In the early 1990s the RBA introduced a target for monetary policy in Australia to achieve an inflation rate of between 2-3% over time. As noted by the RBA (2020a):

> *"Seeking to achieve this rate, on average, provides discipline for monetary policy decision-making, and serves as an anchor for private-sector inflation expectations."*

The inflation target is a medium term average rather than a rate (or band of rates) that must be held at all times. This permits short term fluctuations outside of the target band, for example due to economic shocks or the lagged impact of monetary policy. Since the introduction of inflation targeting the inflation rate has experienced periods both within and outside of the RBA's target band for inflation (see Chart 2.1).

Chart 2.1: Inflation over the long term and the Reserve Bank's inflation target
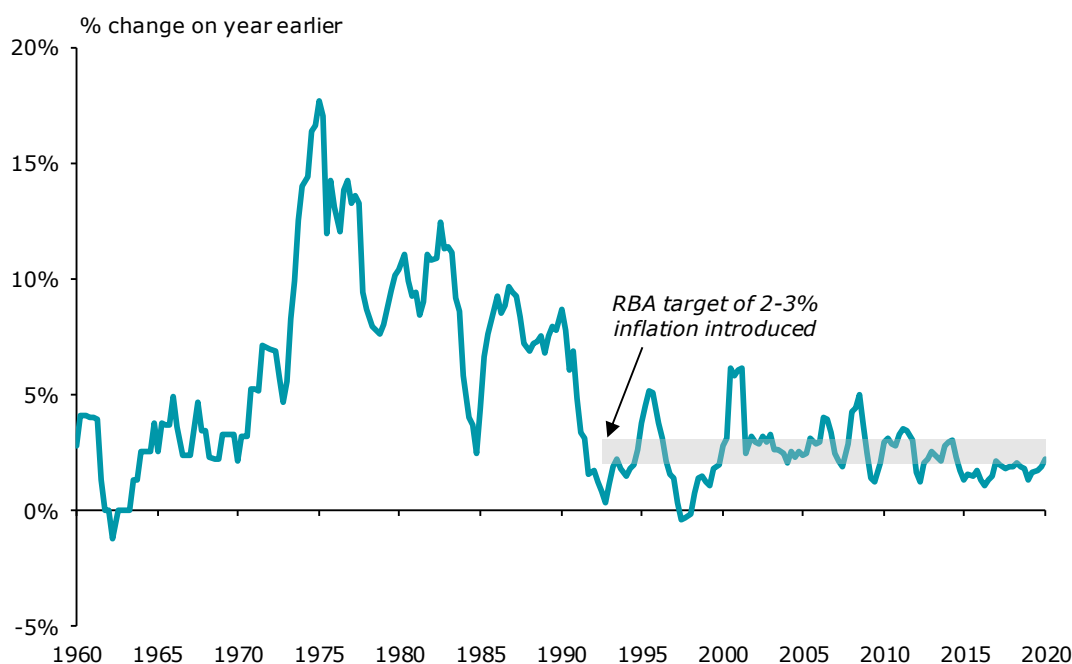
Source: Australian Bureau of Statistics, Reserve Bank of Australia

2.1.2   Advantages

There are three main advantages to the AER approach. These are: 1) RBA forecasts of CPI are relatively accurate, 2) the AER approach balances volatility in short term inflation expectations with stability in long term expectations, and 3) the method is simple, transparent and easily replicated.

Forecast accuracy

Several studies show that RBA forecasts of CPI are relatively accurate and have substantial explanatory power. A study by Tawadros (2013) found that the RBA's forecasts have lower forecasting errors than other private forecasters and that the RBA's forecasting judgement contributes to the forecast performance. There is also evidence to suggest that the RBA possesses information that is not necessarily publicly available, creating information asymmetry in the market, contributing to the forecast accuracy.

Another study by Tulip and Wallace (2012) found that RBA forecasts of CPI are more accurate than other private forecasters (albeit only slightly). Additionally, the study found that the RBA forecasts outperform CPI inflation forecasts based on a random walk and the mid-point of the target band over one year. The study also found that RBA forecasts outperform the random walk over two years, and marginally outperform the mid-point of the target band forecasts over two years. The explanatory power of the RBA method implies that it both informs and reflects short term inflationary expectations in the economy.

Insights from the Reserve Bank's MARTIN model

The Macroeconomic Relationships for Targeting Inflation (MARTIN) model is an economy-wide model that the RBA uses to produce forecasts and conduct scenario analysis. The RBA has published an overview of the model that describes the operation of the model and includes its core behavioural equations.

CPI inflation is an endogenous variable in the MARTIN model as it responds to the unemployment rate and import prices within the model. CPI inflation is modelled as a function of trimmed mean inflation and oil prices plus an error term. In the long-term, trimmed mean inflation is forecast as a function of nominal unit labour costs and the imported consumption goods implicit price deflator plus an error term. In the short-term, trimmed mean inflation is a function of trimmed mean inflation in the previous period, inflation expectations, the unemployment gap (the unemployment rate minus the Non-Accelerating Inflation Rate of Unemployment (NAIRU)) and an error term.

Inflation expectations are exogenous variables in the MARTIN model and are instead constructed using a separate model (RBA, 2019). Previous versions of the RBA model derived inflation expectations from 10-year bond rates, but these measures were found to not purely reflect inflation expectations due to the presence of risk and liquidity premia (RBA, 2017).

The RBA combines a range of measures of inflation expectations and takes the mean (controlling for the co-movement of individual measures with recent inflation). The mean is then adjusted to match the mean of inflation since 1996 (the period over which expectations appear to have been anchored around the RBA's target range for inflation). This adjustment is made to account for any upward bias in the various measures of inflation expectations.

Accounting for short term volatility in inflation expectations

The AER approach is considered to be robust in that it accounts for short term shocks and their impact on inflation expectations (within the first two years of the forecast period), but shocks have minimal impact on medium to long term inflation expectations. A number of studies have shown that inflation expectations are relatively stable over time, anchored within the RBA target band and do not significantly respond to shocks to the economy in the longer term (Gillitzer and Simon, 2015).

A study by Rondina (2018) estimating unobservable inflation expectations in the New Keynesian Phillips curve note that:

> *"…estimated expectations are relatively persistent and do not exhibit large permanent shifts during the period under analysis, not even following major events as for instance the recent financial crisis. These results can be interpreted as providing evidence of the anchoring of long run inflation expectations to the target rate."*

An extended discussion on the evidence related to anchoring of inflation expectations is provided in Section 2.6.

Simple, transparent and easily replicated

The AER approach is relatively simple, transparent and easy to replicate. This means the approach requires less effort for the AER to construct and update, and for stakeholders to verify. The greater ease of verification also increases regulatory certainty by reducing the risk that errors made in the calculation of inflation estimates go unchecked. Further, the RBA is an independent body meaning that the inflation forecasts lie outside the influence of regulators and other stakeholders (ACCC/AER, 2017).

2.1.3 Disadvantages

A significant disadvantage of the AER approach is if monetary policy loses, or is perceived to have lost, its effectiveness in influencing economic activity, there is a risk that inflation expectations may deviate systematically from the target inflation band. Extended periods of low interest rates, recessions and/or low global demand may contribute to the perception that central banks cannot effectively control inflation or enact monetary policy (Vahey, 2017).

An extended discussion of whether inflation expectations have become de-anchored from the RBA's target band is provided in Section 2.6.

In certain circumstances, the AER approach may be less congruent with 10-year market-based expectations of inflation. The RBA method is a combination of a policy objective (the inflation target band) and quarterly forecasts provided by the RBA. As such, it relies less on an aggregation of current information that may inform 10-year market expectations of inflation compared to other approaches. This creates a risk that estimates provided by the AER approach may depart from expectations at a given point in time.

2.2 Glide path approach

2.2.1 Outline of approach

The glide path approach proposes smoothing the transition between the end of the RBA's forecast (years one and two of the forecast period) and the mid-point of RBA's inflation target (2.5% from year three of the forecast period) using linear interpolation. This approach attempts to reflect the fact that expected inflation may not immediately return to approximately the mid-point of the RBA's inflation target from year three of the forecast period, particularly if the year two value is well outside the target range.[5]

2.2.2 Advantages

The key advantage of the glide path approach is that it allows for inflation expectations to revert to the target value or range over a longer period. It can be argued that in extreme circumstances it may take several years for inflation expectations to return to the mid-point of the RBA's target band.

There is also international precedent for the adoption of a glide path approach. A glide path has been adopted by regulators in countries such as New Zealand to allay concerns from stakeholders

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[5] The value for inflation expectations in year three of the forecast period may not be equal to the mid-point of the RBA's target range (2.5%). Rather, the average from years three to ten will equal 2.5%.

that earlier inflation estimates were too high (against a similar backdrop of low inflation realisations as seen in Australia).

The New Zealand Commerce Commission (2020) uses a glide path approach in the determinations relating to electricity distribution and gas transmission services. Quarterly CPI forecasts published by the Reserve Bank of New Zealand (RBNZ) are used for the first three years of the of the forecast period (the limit of the series). Years four to six of the forecast period are adjusted by an equal amount such that inflation reaches the RBNZ's target of 2% by the end of year six. That is, the glide path from the end of the RBNZ's forecast series and the RBNZ's target is linearly interpolated.

The Essential Services Commission of South Australia (ESCOSA, 2020) in its final regulatory determination relating to SA Water has adopted a glide path approach. Specifically, this involves using RBA forecasts for the first two years of the forecast period, followed by a linear glide back to 2.5% 2026-27 (year seven of the forecast period) and remaining at 2.5% thereafter. As noted in the determination:

> "The glide path approach recognises there is a degree of uncertainty over the timing of the recovery path for inflation, which may currently be affecting household, firm and investor long-term expectations about inflation. At the same time, the glide path approach recognises that most available evidence suggests that the flexible inflation targeting framework pursued by the RBA has anchored long-term inflation expectations within the RBA's two to three percent target band."

Glide path approaches, to the extent that the transition path is clearly defined by the regulator, are simple, easily replicated and potentially more congruent with long term inflation expectations of market participants.

2.2.3   Disadvantages

The key disadvantage of the glide path approach is in determining when it is appropriate to use. There is also a challenge in determining how to specify the length and speed of the glide path.

There is no clear method for identifying the types of disturbances that would affect medium term inflation expectations. Deloitte Access Economics has updated analysis conducted by the AER in the 2017 Inflation Review to determine how long inflation expectations take to return to the mid-point of the RBA's target range. Chart 2.2 uses Consensus Economics' 10-year forecasts for Australian inflation from 2001 to 2020. Forecasts are grouped by the expected inflation in the first year. This allows an examination of whether there is variation in how quickly forecasts return to 2.5% based on disturbances (proxied by either very high or very low inflation in year one of the forecast period).

As shown in Chart 2.2, expected inflation returns to within the RBA's target band by the third year of the forecast period within each group. Evidence on the impact of very high and very low inflation in year one on the reversion to the mid-point of the RBA target range is mixed. Inflation forecasts that were expected to be above 3.5% in year one returned to 2.5% by year three of the forecast period, while those below 1.5% in year one only returned to 2.3% by year three. There were only two observations of forecast inflation in year one being less than 1.5%. Adding to this, there are examples of inflation expectations below 2% in year one of the forecast period reverting to 2.5% by year four of the forecast period as recently as April 2020.[6]

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[6] The time periods examined may not be reflective of the current inflationary environment or expectations over the coming years. For example, only one set of long term inflation forecasts has been published by Consensus Economics (April 2020) following the outbreak of COVID-19. A second set of long-term forecasts is due to be published in October 2020.

Chart 2.2: Average forward rates of expected inflation, grouped by inflation in first year
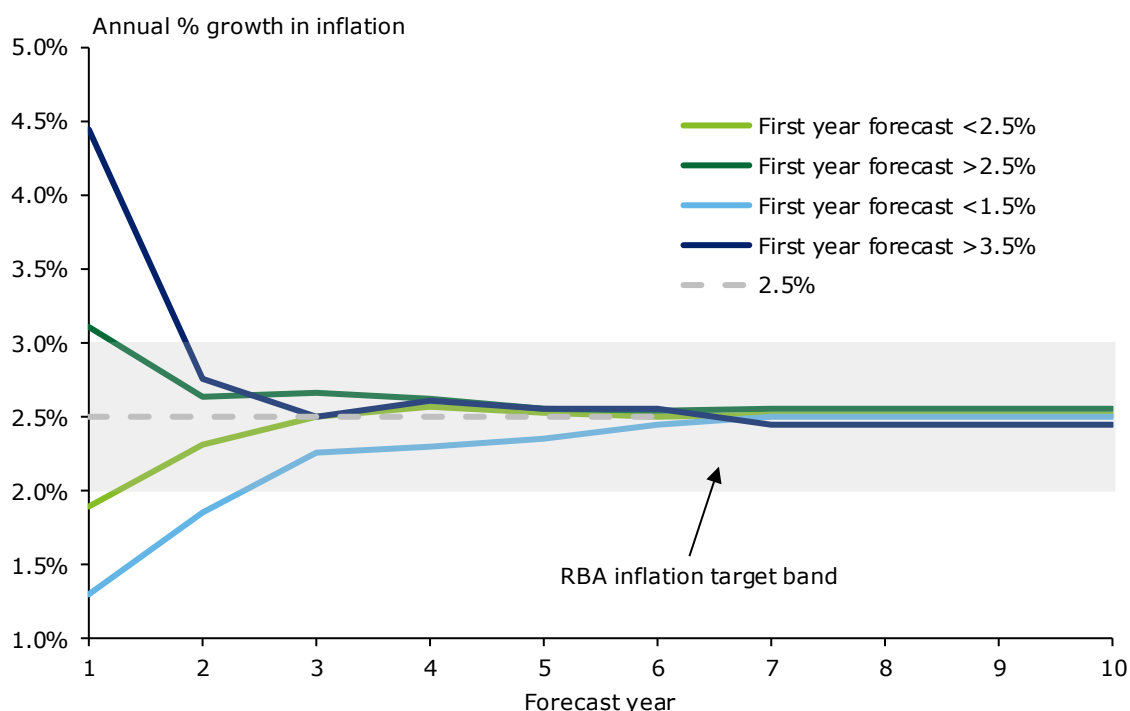
Note: Four observations (October 2002, October 2007, April 2010 and April 2015) are not included in the chart due to the unavailability of the data.

Source: Consensus Economics, Deloitte Access Economics

This analysis confirms that inflation expectations largely converge to the mid-point of the RBA's target range by the third year of the forecast period. And while it may be possible that one-off disturbances can impact on medium term inflation expectations, it is unclear how to identify these disturbances.

A glide path may be appropriate to use in instances where inflation realisations remain below the RBA target range for an extended period. This situation increases the probability that expectations become de-anchored (Ehrmann, 2015). The signs of such de-anchoring include: 1) inflation expectations become more dependent on lagged inflation 2) forecasters tend to disagree more 3) inflation expectations get revised down in response to lower-than-expected inflation, but do not respond to higher-than-expected inflation.

Another key challenge when using the glide path approach includes specifying the length and speed of the glide path. The length of the glide path is most appropriately defined as the point between the end of the RBA forecast period (in year three) and the point at which inflation expectations are assumed to return to around the mid-point of the RBA's target band.[7] Table 2.1 includes an example of how the 10-year geometric average can be affected by changes to the length of the glide path.

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[7] The use of the RBA target band as a long term target for the glide path approach is only appropriate in-so-far as long term inflation expectations remain anchored within the RBA's target band. There is no evidence of the de-anchoring of long term inflation expectations in Australia, but if this were to occur an alternate (market-based) measure of long term inflation expectations would be required for use to inform the end point of the glide path.

Table 2.1: Impact of glide path length on the 10-year inflation expectation estimates

	Length of the glide path (number of years)										
	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
2020	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%
2021	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%	1.25%
2022	2.50%	1.88%	1.67%	1.56%	1.50%	1.46%	1.43%	1.41%	1.39%	1.38%	1.36%
2023	2.50%	2.50%	2.08%	1.88%	1.75%	1.67%	1.61%	1.56%	1.53%	1.50%	1.48%
2024	2.50%	2.50%	2.50%	2.19%	2.00%	1.88%	1.79%	1.72%	1.67%	1.63%	1.59%
2025	2.50%	2.50%	2.50%	2.50%	2.25%	2.08%	1.96%	1.88%	1.81%	1.75%	1.70%
2026	2.50%	2.50%	2.50%	2.50%	2.50%	2.29%	2.14%	2.03%	1.94%	1.88%	1.82%
2027	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.32%	2.19%	2.08%	2.00%	1.93%
2028	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.34%	2.22%	2.13%	2.05%
2029	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.36%	2.25%	2.16%
Geometric average	**2.15%**	**2.09%**	**2.03%**	**1.96%**	**1.90%**	**1.84%**	**1.78%**	**1.71%**	**1.65%**	**1.60%**	**1.56%**

Note: The period from beyond the end of the glide path is represented as 2.5% in each year for illustrative purposes. In practice, the average over this period is equal to 2.5% rather than each individual year being equal to 2.5%.
Source: Deloitte Access Economics, Reserve Bank of Australia May 2020 Statement on Monetary Policy

Australian and international regulators have made different assumptions about when inflation expectations return to mid-point of central bank targets. For the New Zealand Commerce Commission this occurs in year six, while for ESCOSA this occurs in year seven. The determination of the length of the glide path appears to be a judgement that is informed by an examination of inflation forecasts of professional forecasters (at which point they converge to the mid-point of the central bank target band) and analysis of how changes in the length of the glide path affect the resulting 10-year geometric average (and how sensitive the estimates are to changes in the length of the path in different inflation forecast scenarios (e.g. high, low and baseline)).

The speed of the glide path refers to the pace at which the glide path interpolates between the end of the RBA forecast series and the end of the glide path. There is limited evidence on the advantages and disadvantages of approaches such as linear interpolation and exponential growth. However, linear interpolation appears to be the most widely used by regulators as it is simple, neutral and transparent (ESCOSA, 2020).

2.3   Bond breakeven inflation rate (BBIR)

2.3.1   Outline

The BBIR approach is a market-based measure of inflation expectations derived from taking the difference in yields between nominal and inflation-indexed Australian Government Securities (AGS).

The BBIR is calculated using the Fisher Equation:

$$\pi^e = \frac{1 + i_n}{1 + i_r} - 1$$

Where:

- i_n is the 10-year nominal risk-free rate (represented by the yield to maturity on 10-year nominal AGS)
- i_r is the 10-year real risk-free rate (represented by the yield to maturity on 10-year inflation linked AGS (referred to as inflation indexed AGS)
- π^e is the expected average inflation rate over a 10-year period.

As noted by Moore (2016):

"Because their face value is indexed to the CPI, the yield on inflation-indexed bonds is a real yield. Thus, the difference between the nominal and inflation-indexed AGS is the average rate of inflation over the next 10 years that equates the expected return on nominal AGS to the expected return on inflation-indexed AGS; this is often referred to as the 'break-even' inflation rate."

The BBIR approach was used by the AER to estimate expected inflation prior to the 2008 final decision for AusNet Services.

As shown in Chart 2.3, the break-even 10-year inflation rate has fluctuated above and below the RBA target band since inflation targeting was introduced in the 1990s. Since September 2018, the BBIR has fallen below the lower bound of the RBA target. In March 2020, the BBIR fell to 0.7%, the lowest value since records began in 1986.

Chart 2.3: Break-even 10-year inflation rate
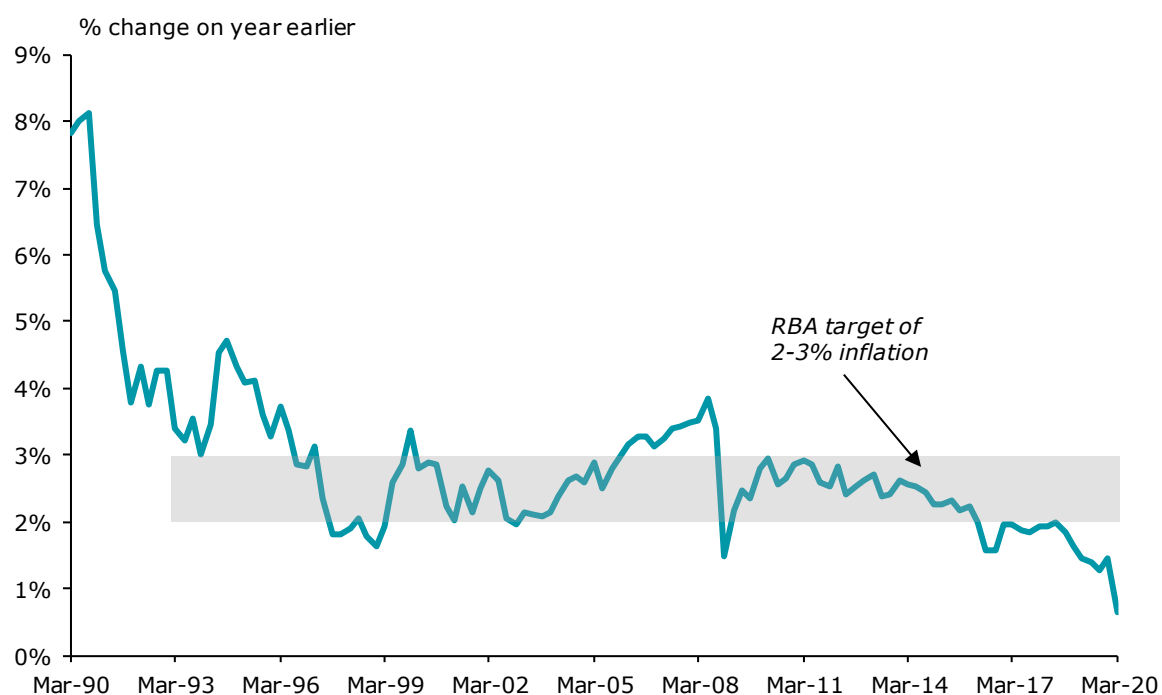
Source: Reserve Bank of Australia, Deloitte Access Economics

2.3.2   Advantages

The BBIR is a market-based approach to estimating expected inflation that draws on market prices – nominal and inflation index government securities. It is argued in the literature that market-based approaches provide the best estimates of expected inflation. This is because:

- Market-based approaches are more consistent with the use of market-based estimates of parameters in the wider regulatory framework that applies to regulated businesses (e.g. weighted average cost of capital (WACC)).
- Market-based approaches are determined based on an aggregation of all available information.
- Market-based approaches provide more timely readings of inflation expectations compared to non-market approaches and can respond to structural shifts in behaviour (Sack 2000).

The BBIR approach can be adjusted to account for the estimated impact of potential biases and distortions (to the extent that adjustments made are appropriate). Adjusted BBIR approaches for estimating expected inflation are more stable than unadjusted approaches (D'Amico, Kim and Wei, 2016).

There is also precedent for the use of a BBIR approach to estimate expected inflation. The AER used a BBIR approach prior to 2008 final decision for AusNet Services, and BBIR approaches (both adjusted and un-adjusted) are used by regulators in other countries. As such, stakeholders are likely to be somewhat familiar with the BBIR approach.

2.3.3   Disadvantages

Fitting a yield curve

BBIR estimates are ideally based on 10-year nominal and indexed AGS with identical dates of maturity. However, in practice this does not occur and estimates usually require the derivation of a yield curve due to the shortage of outstanding indexed AGS across multiple terms. As such, BBIR estimates may vary depending on the yield curve chosen. There is also no clear consensus on the most appropriate method in the academic literature.

Liquidity

One of the key disadvantages of the BBIR approach is that the market for inflation linked bonds in Australia is relatively illiquid. Liquidity constraints and the subsequent distortions induced by that lack of liquidity was a key contributing factor as to why the AER stopped using the BBIR approach to measure inflation expectations. Changes in the liquidity and market volatility may mean that the yields on nominal and inflation-indexed bonds are driven not just by inflation expectations, but also by liquidity premia and other biases (Fender, Ho and Hördahl 2009).

As the Australian Office of Financial Markets states in its 2018-19 annual report:

> "…monitoring of the market indicates that liquidity in Treasury Indexed Bonds has continued to prove noticeably more challenging than for Treasury Bonds. This is consistent with the relative liquidity of nominal and inflation-linked securities in other sovereign debt markets. Treasury Indexed Bond turnover in 2018-19 was around $52 billion, an increase of 3 per cent from 2017-18."

This statement indicates that liquidity for inflation linked bonds remains a considerable disadvantage of the BBIR approach.

As noted by the Independent Pricing and Regulatory Tribunal of New South Wales in its July 2020 review of prices for Sydney Water (IPART, 2020):

> "While our analysis suggests that liquidity in the inflation-linked bond market is not currently an acute concern, we remain concerned that the market may not remain sufficiently liquid throughout the business cycle. Therefore, the accuracy of the breakeven inflation method may vary at different points in the economic cycle."

Risk premia, biases and other distortions

There are several risk premia, biases and other distortions embedded within the BBIR approach that can affect the estimate of expected inflation. These include:

- Inflation risk premia – the compensation demanded by market participants for the inflation risk they bear by holding inflation linked bonds.
- Convexity bias – the difference between forward yields and expected future yields on bonds. The difference in the convexity bias of nominal and indexed bonds may see the BBIR depart from market expectations of inflation.
- Inflation indexation lag – lags between actual changes in CPI and adjustments of the cash flows linked to indexed bonds. In Australia, the lag with indexed bonds remains significant despite relatively stable inflation.
- Mismatched pattern of cash flows – the difference in the pattern of coupon payments may result in different discount factors for nominal and indexed bonds. Therefore, changes in bond yields may be due to factors other than changes in market participants' inflation expectations.
- Sensitivity to short term inflation expectations when calculated from coupon-paying bonds – under this scenario, the BBIR becomes more sensitive (and therefore less robust) to short term changes in expected inflation.
- Changes to the demand for and supply of indexed and nominal AGS that are unrelated to changes to inflation expectations – circumstances and factors that impact the relative supply and demand of indexed and nominal AGS may artificially appear to be changes in market participants inflation expectations when they are in fact unrelated.
- The effect of the deflation floor on the yields of indexed AGS – periods of deflation may artificially increase indexed AGS prices due to the protection offered by the deflation floor. This is unrelated to market participants' views on expected inflation
- Personal price indices and the substitution effect[8] – The CPI may overstate true inflation if substitution effects have not been considered. Investors may also have a personal price index that is different to the CPI (and subsequently demand a risk premium).

These distortions appear to have significantly influenced the behaviour of inflation estimation approaches derived from inflation-indexed bonds since the 2008 financial crisis (Galati et al., 2011). Recent evidence also supports the presence of significant risk and liquidity premia in market-based approaches to estimating expected inflation such as bonds (Apokoritis et al 2019). Analysis by the European Central Bank highlighted that shifts in risk premia can explain the bulk of the recent changes in long term inflation expectations in the Eurozone (Cœuré 2019).

Even when adjusting for the effects of risk premia, biases and other distortions it is possible that not all the effects of these factors is or can be removed. There is a degree of variation in the various methods applied to estimating these factors, with few studies conducted in the Australian context, and evidence that inflation risk premia are time-variant.

2.4   Swaps

2.4.1   Outline of approach

Inflation swaps, a type of over-the-counter derivative, occurs when one party receives a payment indexed to inflation in exchange for a payment determined by a fixed rate, which is agreed on at initiation of the contract (Moore, 2016). Inflation swaps are typically used by pension funds and infrastructure project providers.

2.4.2   Advantages

Swaps are a market-based approach to estimating expected inflation. As noted in Section 2.3.2 it can be argued that market-based approaches provide the best estimates of expected inflation. This may be because they are consistent with market-based estimates in the wider regulatory

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[8] The substitution effect refers to the impact a change in the price of one good has on the demand of another.

framework, are based on an aggregation of all available information, and are more timely compared to many non-market approaches.

Inflation swaps possess several advantageous attributes when compared with other market-based approaches. Firstly, information on expected inflation derived from swaps can be obtained at longer time horizons that the BBIR method. Inflation swaps are available over a longer term – from 1 year to 30 years – and as such provide a valuable framework for assessing expected inflation over a longer time horizon when compared with the BBIR approach, as discussed by Devlin and Patwardhan in 2012.

Inflation swaps can also be an unbiased and congruent predictor of expected inflation over short time horizons (Vahey, 2017). A study by Ribeiro and Curto (2017) on zero-coupon inflation swaps examined the inflation swaps market in the Euro Area between 2005 and 2007 and found that:

> *"1-year zero-coupon inflation swaps are unbiased predictors of inflation rates. Further, there is no empirical evidence of an inflation risk premium and the assumption of rationality seems to hold."*

Additionally, inflation swaps are likely to be less affected by a liquidity premium than inflation linked bonds (Moore, 2016).

2.4.3   Disadvantages

There are several disadvantages noted in the literature regarding inflation swaps. Namely, inflation swaps can be sensitive to fluctuations in the market, particularly when associated with deflationary pressures in recessions (Vahey, 2017).

Inflation swaps tend to be completed by a small number of economic actors as the market in Australia is not very active (Moore, 2016). And the inflation expectations of participants in the swaps market may not be reflective of inflation expectations in the wider Australian economy.

The 2019 Annual Report of the Australian Financial Markets Association notes that:

> *"Liquidity issues have been prevalent for some time in the Inflation Products market as a low inflation and low interest rate environment has stifled client interest which in turn has had a dampening effect on secondary trading activity. Liquidity may remain constrained until the market sees a pickup in inflation or higher interest rates."*

The annual report also notes the lack of scale in the Australian market for inflation products. This is further evidence of constrained liquidity in the market.

2.5   Surveys

2.5.1   Outline of approach

A survey-based approach involves obtaining inflation expectations from professional forecasters, market economists or other stakeholders. Survey-based approaches can often provide estimates of inflation expectations by individual year over time horizons greater than 10 years, but also tend to be proprietary in nature.

2.5.2   Advantages

The academic literature finds a number of benefits associated with using surveys as a cross-check for RBA inflation estimates. A study by Nath and Sarkar in 2019 on the use of survey-based approaches for estimating expected inflation in Australia concluded that survey data should be included in forecasts to increase the reliability of evaluations on the impact of expected inflation on relative price variability.

The main advantage of the survey approach is the use of professional forecasters who are invested in providing accurate estimates of expected inflation. Professional forecasters develop models and invest time, effort and critical assessments of the economic environment and policy to ensure their

expected inflation forecasts are as accurate as possible, as discussed in Moore's 2016 *Measures of inflation expectations in Australia* bulletin paper.

Professional forecasters' expectations of inflation tend to move closely with changes in interest rates, suggesting that the professional forecasters closely track changes in relevant data when forming inflation expectations according to a paper by Berge in 2018.

2.5.3   Disadvantages

There are four main disadvantages of surveys when compared with other methods. These include the quality of RBA forecasts, concerns around transparency and replicability, frequency of publication and representativeness.

The use of professional surveys may be difficult to justify to stakeholders, especially considering it would require making a strong case that the RBA forecasts are less reliable than the forecasts derived from survey respondents (Vahey, 2017). It may be necessary to use RBA forecasts for the first two years of the forecast period and surveys thereafter.

Surveys also face issues of transparency and replicability. Professional forecasters are often unable or unwilling to provide significant detail on their forecast methodology. The absence of regularly updated and publicly available inflation forecasts also makes it challenging for the AER and stakeholders to cross-check the outputs of a survey-based approach. The Essential Services Commission of South Australia (ESCOSA, 2019), found that while surveys are simple and grounded in research, they may not be a practical way to assess expected inflation, especially when considering proprietary restrictions that may prevent professional forecasters from releasing their methodology.

Survey estimates that are updated infrequently may not reflect the latest information and data relevant to the formation of inflation expectations. For example, Consensus Economics 10-year inflation forecasts are updated twice per year (in April and October). This is likely to have a minimal impact on long term inflation expectations but may have a material impact on short term expectations.

Another disadvantage of the survey approach is that it represents the inflation expectations of a relatively small number of individual forecasters, particularly when compared to market-based approaches that are aggregations of all market participants.

2.6   Have inflation expectations de-anchored from the RBA target range?

An extended period of low inflation outcomes and falls in some measures of inflation expectations has raised the question as to whether inflation expectations have become de-anchored from central bank targets. The suitability of the various approaches to estimating expected inflation depends heavily upon the answer to this question.

Much of the recent literature in this field comes from international studies. Moessner and Takáts (2020) examined survey-based inflation expectations data across multiple countries for the period 1996 to 2019, concluding that persistent deviations of inflation from target affect long term inflation expectations in advanced economies. It was found that periods where inflation is persistently above target have a more significant impact on long term inflation expectations than periods where inflation is persistently below target. The results also show that long term inflation expectations remained well-anchored in advanced economies where inflation was near the lower bound of the target range.

That is not to say that there is no sign of de-anchoring of inflation expectations during periods of low inflation. Ehrmann (2015) found that under persistently low inflation, some de-anchoring of inflation expectations occurs, relative to situations where inflation is around target. This was examined across a sample of 10 countries which use inflation targeting. In this study, there were three signs of de-anchoring: 1) inflation expectations become more dependant on lagged inflation 2) forecasters tend to disagree more 3) inflation expectations get revised down in response to lower-than-expected inflation, but do not respond to higher-than-expected inflation. Still, it is

concluded that inflation expectations in the countries examined are generally better anchored than they were in Japan (during its period of prolonged weak inflation) (Ehrmann, 2015).

Yetman (2020) finds that periods of low inflation are correlated with the decreased effects of short term inflation expectations on long term inflation expectations, further suggesting that longer-term expectations have remained well anchored. There is evidence that long term inflation expectations are better anchored than shorter-term forecasts, and that inflation expectations diverge from the long term anchor as the forecast period shortens (Mehrota and Yetman, 2018). Competing studies have found only weak evidence of long term inflation forecasts becoming somewhat more sensitive to short term forecasts and actual inflation results (Lyziak and Paloviita (2016)).

The degree of de-anchoring is found to differ substantially across different countries and regions. Buono and Formai (2018) analysed the effects of short term inflation expectations on long term expectations using time-varying parameter regressions, determining that since the 2008 financial crisis inflation expectations have been well-anchored in the United States and to a lesser extent the United Kingdom. They also concluded that long term inflation expectations have been de-anchored in the Euro Area from 2014 and from 1989 in Japan.

The degree of de-anchoring may also differ within countries based on the group being analysed. A study by Xu on inflation expectations in the United States (2019), found that "*no de-anchoring of long term inflation expectations is found for professional forecasters across time, and frequencies, thereby indicating that the central bank's credibility varies for different group of economic agents.*" However, the study did identify the presence of de-anchoring among consumers.

Analysis has also been conducted using market-based approaches for estimating expected inflation. Estimates based on inflation swaps and options suggested only mild changes to inflation expectations in response to macroeconomic announcements during the 2014 European Debt Crisis (Antrup and Grothe 2014) and following the crisis (Scharnagl and Stapf 2015 and Speck 2016). However, other studies find that the risk of less well-anchored inflation expectations rose in the Euro Area, the United States and the United Kingdom in 2014 (Natoli and Sigalotti 2018).

Studies that use market-based approaches may also be capturing the impact of falling risk premia rather than declining expectations (Coeuré 2019). There is evidence that liquidity, risk premia and other biases have significantly influenced the behaviour of market-based approaches for estimating expected inflation, such as bonds and swaps, since the 2008 financial crisis (Galati et al., 2011).

There is some, limited, evidence that Australian long term inflation expectations are indeed informed by and anchored within the RBA's target band. Gillitzer and Simon (2015) examined how effective the RBA inflation target has been in anchoring inflation expectations. Their study found that long term inflation expectations have historically been firmly anchored within the inflation target band. The study also found that inflation shocks between 2001 and 2013 have had only minor effects on long term inflation expectations.

Additionally, Gillitzer and Simon found that whilst the relationship between unemployment and inflation has resulted in a flatter Phillips Curve, and less responsive changes in the unemployment rate in response to changes in inflation, this has primarily been driven by the anchoring of inflation expectations within the target band.

A paper title *A spectral representation of the Phillips Curve in Australia* found similar results to Gillitzer and Simon, in that the Phillips Curve has flattened since the introduction of inflation targeting in Australia (Mallick, 2015). Mallick also found that whilst the Phillips Curve has flattened in Australia, it remains downward sloping over the business cycle, indicating that that the RBA's role in managing monetary policy has not diminished and it still remains an effective way to stabilise fluctuations over the business cycle.

As such, there is little evidence to suggest that Australian inflation expectations have become de-anchored from the RBA's target range of 2-3%. However, there remain significant limitations in the current academic literature. Most notably, there are few studies that examine inflation expectations in 2019 and 2020 – the period in which some measures of Australian inflation

expectations have shown signs of movement. The most recent studies on inflation expectations also focus on countries other than Australia and tend to analyse data over several years (which may cloud potential insights into recent changes in inflation expectations).

3 Framework for assessing inflation estimation approaches

This section outlines criteria to facilitate the comparative assessment of the various approaches to estimating expected inflation. The approaches are then analysed with respect to the criteria, drawing upon insights from the literature discussed in Section 2 of this report.

3.1 Assessment criteria

The comparative assessment of the best approach for estimating expected inflation is informed by its relative congruence, robustness, transparency, replicability and simplicity.

Relative congruence

Relative congruence refers to how closely the chosen approach aligns with 10-year market expectations of inflation. As noted by the ACCC 2017 working paper, an approach may be considered relatively congruent if, for example:

- There are several or more research findings that this method results in estimates of expected inflation which may contain zero, small or insignificant biases and/or distortions.
- There are several or more research findings that this method produces estimates that closely mimic the characteristics and processes of market expectations of inflation.
- There is less evidence that alternative methods produce estimates that more closely correspond to market expectations of inflation.
- The biases, premia and/or distortions related to alternative methods are well documented in the literature and are difficult to estimate and remove.

It is not possible to exactly measure the relative congruence of each approach in a way that can be compared. Rather, the above criteria facilitates an ordinal ranking of approaches.

Robustness

An approach is considered robust if it does not change significantly in response to events or data that have little or no influence on 10-year market expectations of inflation.[9] An approach is also considered robust if the estimates obtained do not differ when other (appropriate) models or estimation methods are applied.

Transparency and replicability

An approach that is transparent and replicable can be easily verified by stakeholders, improving regulatory certainty for stakeholders and reducing the risk that errors have been made in the calculation of estimates of inflation expectations for regulatory purposes.

Simplicity

A simple approach is likely to produce estimates of expected inflation that require less effort to construct and check (for both the AER and stakeholders). A simpler method may also provide less scope for contentiousness.

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[9] A robust estimator will respond appropriately to events and data that influence long term inflation expectations

3.2   Analysis of inflation estimation approaches

Table 3.1. includes Deloitte Access Economics' assessment of the various approaches to estimating expected inflation against the criteria outlined above. For each of the criteria the various approaches are classified as either excellent, good, fair or poor against each criterion.

Relative Congruence

Excellent	Glide Path
	Surveys
Good	AER Approach
	BBIR
	Swaps

Both the glide path and survey approaches are found to be the most congruent with 10-year market expectations of inflation. There is no evidence of biases or distortions in either of the two approaches. The glide path approach outperforms the AER approach due to its greater ability to account for potential de-anchoring of inflation expectations from the RBA target range. If clear evidence of de-anchoring were to emerge in coming years, the 10-year estimates obtained using the glide path approach are more likely to accurately reflect market expectations than estimates derived from the RBA approach. Surveys are also considered more congruent than the AER approach as professional forecasters are able to adjust their inflation expectations (over both the short and long term) in the event of de-anchoring.

Estimates obtained using the AER approach are considered congruent with 10-year market expectations of inflation. There is no evidence to suggest bias or distortions are present and the approach remains highly congruent with long term inflation expectations. That said, the AER approach is susceptible to overestimating expected inflation if expectations were to de-anchor in coming years.

Market-based measures such as swaps and BBIR are also considered congruent. As market-based approaches, both bonds and swaps derive expectations of inflation from an aggregation of all available information and are therefore likely to account for changes in key data affecting expectations. They are also more timely and therefore able to respond to structural shifts faster than non-market approaches. However, both are affected by various premia, biases and distortions. These factors can be significant and time varying, limiting the extent to which the estimates obtained align with inflation expectations. Swaps are less affected by liquidity concerns than BBIR, but the BBIR approach can be adjusted to account for the estimated impact of the various distortions. As such, both approaches are considered equally congruent.

Robustness

Excellent	AER Approach
Good	Glide path
	Surveys
Fair	BBIR
	Swaps

The AER approach is the highest-ranking approach in terms of robustness. The AER approach includes the influence of changes to short term inflation expectations (up to 2 years) and the relative stability of long term inflation expectations. As such, it is unlikely to be materially influenced by events or data that have little to no influence on 10-year market expectations of inflation. There are also no alternate assumptions that can be applied that will change the resulting 10-year inflation estimate under the AER approach.

The glide path and survey approaches are considered the next most robust approaches. Both approaches balance the relative volatility of short term forecasts with stability of longer-term expectations. However, the glide path approach may deliver different estimates of 10-year expected inflation based on changes in assumptions around the length of the glide path and the speed of the glide path (e.g. linear interpolation compared to exponential return to 2.5%). The survey approach is also susceptible to changes in the timing of the survey as well as the sample of

professional forecasters being surveyed. As such, both the glide path and survey approaches are more affected by changes in key parameters than the AER approach.

The BBIR and swap approaches are given a fair ranking for relative robustness. The estimates obtained may change significantly in response to events or data that have little or no influence on 10-year market expectations of inflation. And while BBIR can be adjusted to account for the estimated impact of factors unrelated to inflation expectations (biases, premia and other distortions), the estimates of expected inflation obtained can differ when alternative (and otherwise appropriate) assumptions are applied. For example, this could occur when choosing a model to fit a yield curve or determining the size of the bias adjustment.

Transparency and replicability

Excellent	AER Approach
Good	Glide path
	Swaps
Poor	BBIR
	Surveys

The AER approach is given the highest rank for transparency and ease of replication. Regulated businesses and other stakeholders can easily verify inflation expectations derived from the AER approach. The consistency of the estimates provides a degree of stability for key stakeholders.

Both the glide path and swaps approaches are considered the next most transparent and replicable. The glide path is easy for stakeholders to verify, but the transparency of the approach may be limited by the extent to which the determination of the glide path is communicated by the AER to stakeholders. The swaps approach is relatively easy for stakeholders to verify as no significant adjustments are required (compared to other market-based approaches such as BBIR).

The BBIR and survey approaches are given a poor rank for transparency and ease of replication. The BBIR approach may require relatively complex calculations to fit yield curves and account for the various premia, biases and other distortions. This makes the approach much more challenging to replicate than the AER, glide path and swaps approaches. The BBIR approach is also limited with respect to transparency, to the extent that the models and adjustments applied are published for stakeholders to examine. Inflation expectations produced by professional forecasters, and surveys of these forecasters, are often proprietary in nature. This severely limits both the transparency and replicability of the survey approach.

Simplicity

Excellent	AER Approach
	Glide path
Fair	Swaps
	Surveys
Poor	BBIR

Both the AER and glide path approaches are ranked as the simplest of the potential alternatives. If the determination of the glide path is transparent and easily replicated, then the introduction of a glide path does not make this approach materially more complex than the AER approach. Swaps are also the least complex of the market-based approaches. That said, the swaps method requires understanding of financial markets, access to financial data and consideration of related issues such as the liquidity of the Australian market.

The BBIR approach is considered the most complex approach of those surveyed. To obtain estimates of expected inflation the use of BBIR requires fitting a yield curve and will often include adjustments to attempt to account for premia, biases and other distortions. Yield curve models and the adjustments applied can be relatively complex. There are several methods available for adjusting the BBIR, which creates scope for contentiousness in the final inflation estimate. The BBIR approach also requires understanding of financial markets, access to financial data and consideration of related issues such as the liquidity of the Australian market.

Key: | Excellent | Good | Fair | Poor |

Table 3.1: Summary of inflation estimation approaches

	Relative congruence	Robustness	Transparency and Replicability	Simplicity
AER approach	Contains no significant biases and/or distortions. Evidence that inflation expectations remain anchored within the RBA's target range, but congruence of approach is vulnerable to potential de-anchoring of expectations over coming years. Rank: Good	Includes the influence of changes to short term inflation expectations (up to two years) and the relative stability of long term inflation expectations. Rank: Excellent	Approach is highly transparent and easily verified by stakeholders. Rank: Excellent	Simplest approach analysed Rank: Excellent
Glide path	Contains no significant biases and/or distortions. Evidence that inflation expectations remain anchored within the RBA's target range, but congruence of approach remains vulnerable to potential de-anchoring. Approach may be less susceptible to error compared to AER approach if de-anchoring occurs (i.e. expectations remain below 2.5% for the duration of the glide path if RBA forecast inflation of less than 2.5% in year two of the forecast period). Rank: Excellent	Balances relative volatility of short term forecasts with stability of longer-term expectations. Estimates obtained may differ when other appropriate assumptions are applied (i.e. changes to length of glide path and structure of the glide path). Rank: Good	Approach may be considered transparent to the extent that the determination of the glide path is clearly defined by the AER. Easily verified by stakeholders. Rank: Good	The glide path approach is simple, but more complex than the AER approach due to the introduction of a glide path. Rank: Excellent

BBIR	Market-based measure of expected inflation. Presence of risk premia, biases and other distortions may affect the resulting estimate of expected inflation (even following adjustments). Market for inflation-linked bonds remains relatively illiquid in Australia. Rank: Good	Estimates may change significantly in response to events or data that have little or no influence on 10-year market expectations of inflation. Estimates obtained may differ when other, appropriate, assumptions are applied (i.e. changes to the size of the bias adjustment). Rank: Fair	BBIR approaches may vary based on the method used to fit yield curves and account for various premia, biases and other distortions. Calculations are also more complex when compared to other methods. Rank: Poor	Most complex method analysed due to the need to fit yield curves and attempt to account for embedded premia, biases and distortions. Rank: Poor
Swaps	Market-based measure of expected inflation. Biases and risk premia may affect the resulting estimate of expected inflation. Sensitive to market fluctuations and swaps are traded among a small group of market participants. Less distorted by liquidity concerns than BBIR. Rank: Good	Estimates may change significantly in response to events or data that have little or no influence on 10-year market expectations of inflation. Rank: Fair	Approach is relatively easy for stakeholders to verify. Unlike BBIR there are no issues related to congruency of interpolated estimates with market expectations. Rank: Good	Less complex when compared to BBIR, but more complex when compared to the AER and glide path approaches. Rank: Fair
Surveys	Estimates of expected inflation from professional forecasters closely track changes in relevant data with respect to the formation of inflation expectations. Rank: Excellent	Balances relative volatility of short term forecasts with stability of longer-term expectations. Robustness may be affected by the timing of the survey and the sample of professional forecasters surveyed. Rank: Good	Inflation expectations produced by professional forecasters, and surveys of these forecasters, are often proprietary in nature. This severely limits both the transparency and replicability of the survey approach. Rank: Poor	Surveys are simple to procure, but the results of surveys may be open to contention by stakeholders. Rank: Fair

3.3 Final recommendation

Each of the approaches used to estimate expected inflation considered in this report have advantages and disadvantages in relation to their use by the AER in its regulatory framework. Deloitte Access Economics finds that two approaches lend themselves to recommendation for use by the AER – the AER approach and a glide path approach.

The current AER approach is highly robust, transparent, replicable and simple. The AER approach is also found to be sufficiently congruent with current 10-year market expectations of inflation. Survey-based measures of inflation expectations and recent academic literature suggest that long term inflation expectations remain well-anchored within the RBA's target band. However there are concerns around short term and medium term expectations. There is no clear evidence as of yet, but if inflation remains below the RBA target band for an extended period there may be a degree of de-anchoring of inflation expectations in Australia. If this were to occur the congruence of the AER approach would deteriorate.

The glide path approach is found to be highly congruent and simple, as well as relatively robust, transparent and replicable. The use of a glide path would provide a provision for potential de-anchoring of inflation expectations in coming years. There are issues around how to define the length of the glide path and how to interpolate between the end of the RBA forecast series and the end of the glide path (whether to adopt a linear or exponential path back to 2.5%). That said, if inflation remains below the RBA's target range for an extended period the glide path is likely to produce a 10-year inflation expectation that better reflects expectations.

Surveys rank highly in terms of relative congruence as professional forecasters invest substantial time and effort to ensure that their models track relevant changes in information relating to the formation of inflation expectations. The key drawback of using surveys relates to their transparency and replicability. Surveys of professional forecasts are often proprietary in nature, limiting their ability to be published and scrutinised. The inflation estimates obtained using surveys are also susceptible to the timing of surveys – long term forecasts are only published twice a year by Consensus Economics – and the sample of forecasters being surveyed.

Approaches such as using swaps or BBIR have the advantage of being market-based measures. As market-based approaches they derive estimates of inflation expectations from an aggregation of all available information. However, both approaches are affected by the presence of material and time-varying distortions that limit their use in a regulatory context.

Overall, the current data and literature assessed indicate that the AER approach is still fit for purpose at present given the lack of clear evidence of the de-anchoring of inflation expectations from the RBA target range. However, there is a risk that this may occur in coming years. If this de-anchoring were to occur, a glide-path approach would produce inflation estimates that most closely align with 10-year market expectations.

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Deloitte.