An alternative extrapolation method to estimate the 10-year BBB+ corporate yield

QUEENSLAND TREASURY CORPORATION

ATTACHMENT A

Background

QTC has developed an alternative method to extrapolate the Bloomberg 7-year BBB fair value yield to a 10-year tenor. The method is based on the same principles as the paired bond approach that is currently used by the AER, but uses data from QTC's credit margin survey to establish a quantitative relationship between 7 and 10-year credit margins.

By expressing the relationship as a formula, the AER can use the Bloomberg 7-year BBB fair value yield and the 7 and 10-year fixed swap rates published by the Australian Financial Markets Association (AFMA) to make automatic daily estimates of the 10-year BBB+ yield.

The alternative method has been developed to address the issues identified in the Draft Guideline regarding the difficulty in automating the paired bond approach, and in developing reliable alternative extrapolation methods.

AER's current extrapolation method

The AER currently estimates the 10-year BBB+ corporate yield as follows:

10yr BBB+ yield = 10yr CGS + Bloomberg 7yr BBB DRP + DRP term premium

The DRP term premium, which is the only variable that cannot be directly observed, is the margin between 7 and 10-year BBB+ DRPs. The AER currently estimates the DRP term premium based on difference in DRPs for pairs of bonds with different tenors that are issued by the same firm.

The AER has identified a number of practical difficulties in automating the current paired bond approach. It has also identified problems regarding the accuracy and reliability of alternative extrapolation methods. The AER's solution to these problems, which QTC does not agree with, is to shorten the benchmark debt tenor from 10 to 7 years.

QTC credit margin survey data

QTC performs a quarterly survey of debt capital market (DCM) specialists as part of the administration of the competitive neutrality fee on behalf of Queensland Treasury and Trade, to determine credit margins on corporate debt issuance for various tenors and credit ratings. Up to six DCM specialists are asked to provide indicative A$ issue margins to swap for new debt issuance based on the following criteria:

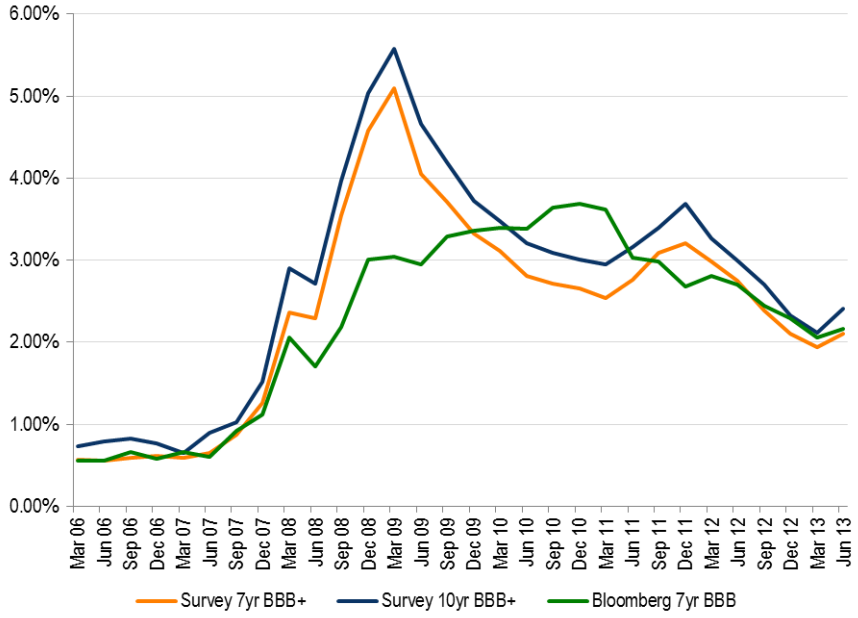
- a minimum total annual borrowing program of A$1 billion
- credit ratings from AAA to BBB-
- tenors ranging from 3 months to 10 years
- exclude margins for facility, underwriting or Commonwealth guarantees

The use of survey data to estimate the debt risk premium was noted by the Australian Competition Tribunal in ActewAGL:

> *'There are various ways to estimate the debt risk premium. Estimates based on historical averages are one of the most common proxies for the debt risk premium. Surveying market participants is another method and has the advantage of better reflecting prevailing market conditions.'* [1]

Figure 1 displays the average quarterly 7- and 10-year swap risk premiums (SRP) from the survey data and the Bloomberg 7-year SRP[2]. Figure 2 displays the SRP term premium between 7 and 10 years.

FIGURE 1: HISTORICAL SWAP RISK PREMIUMS

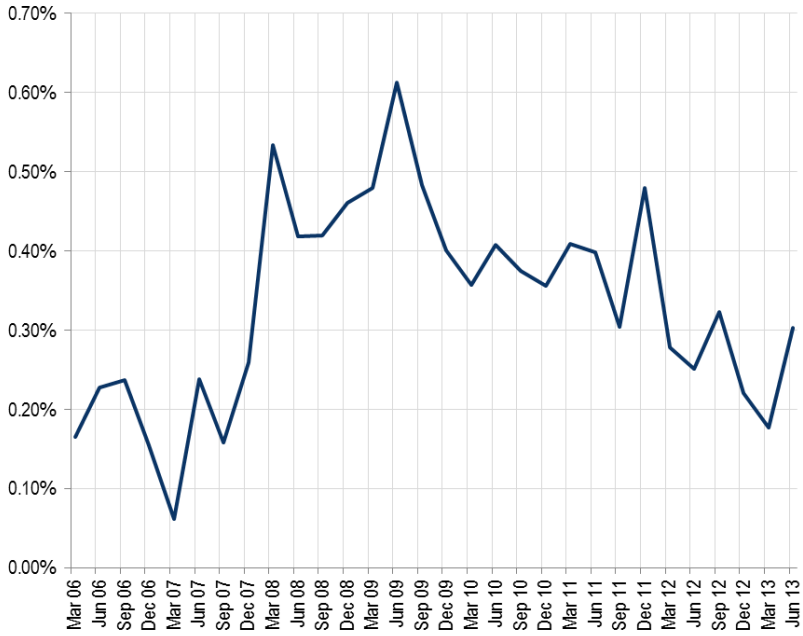


The divergence between the Bloomberg and survey data from June 2008 to December 2009 is consistent with the divergence between Bloomberg and other data providers, such as CBA Spectrum and the RBA, during the peak of the global financial crisis.

[1] Application by ActewAGL Distribution [2010] ACompT 4 (17 September 2010), para. 10

[2] The swap risk premium (SRP) is the margin between the annualised fixed corporate yield and the annualised fixed swap rate for the same term to maturity.

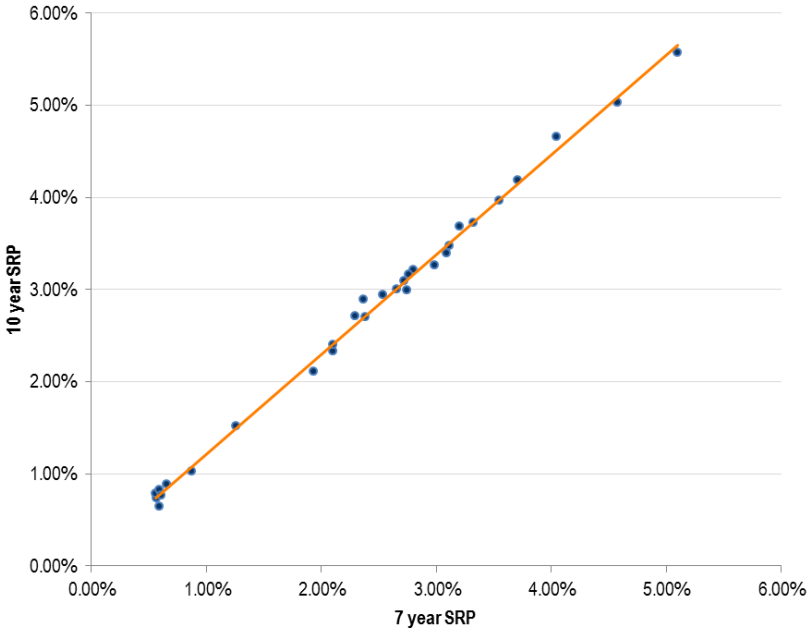
FIGURE 2: BBB+ SRP TERM PREMIUM BETWEEN 7 AND 10 YEARS (SURVEY DATA)



An alternative extrapolation method

Figure 3 displays the contemporaneous 7 and 10-year BBB+ SRPs between March 2006 and June 2013:

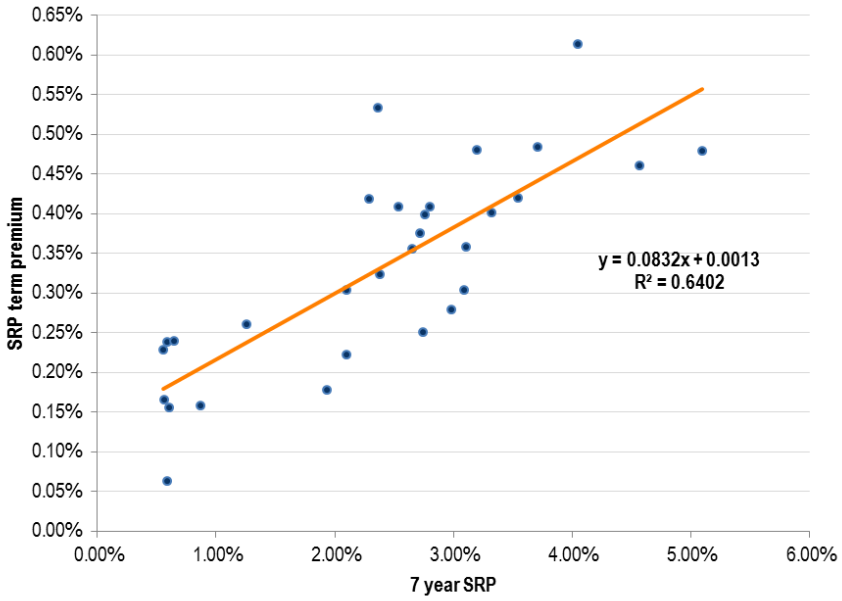
FIGURE 3: 7-YEAR BBB+ SRP VS. 10-YEAR BBB+ SRP



Despite the significant variation in the absolute value of the SRPs since 2006 there is a strong linear relationship between the 7- and 10-year SRPs at a given point in time. Importantly, the relationship holds before and after the start of the global financial crisis in 2008.

The strength and stability of the relationship suggests that an estimate of the SRP term premium between 7 and 10 years can be made based on a given 7-year SRP (Figure 4).

FIGURE 4: 7-YEAR SRP VS. SRP TERM PREMIUM BETWEEN 7 AND 10 YEARS



A simple linear regression using the quarterly data from March 2006 to June 2013 produced the following equation:

SRP term premium = 13 + 0.0832 × 7yr SRP **(Eq. 1)**

The intercept term (13 basis points) and the slope coefficient (0.0832) are both significantly greater than zero[3]. This indicates that the SRP term premium varies over time and is *proportional* to the size of the 7-year SRP, as shown in Table 1.

TABLE 1: ESTIMATED SRP TERM PREMIUM BETWEEN 7 AND 10 YEARS

7-year SRP (bp)	Estimated SRP term premium (bp)	Estimated 10-year SRP (bp)
50	17	67
100	21	121
150	25	175
200	30	230
250	34	284
300	38	338
350	42	392
400	46	446

The estimated SRP term premium can be viewed as a potential replacement for the output from the AER's current paired bond extrapolation method.

[3] The t-statistics for intercept and slope terms are 4.2 and 7.1 respectively. The standard error from the regression is 8 basis points.

Use of swap data

The alternative method has been developed using margins to the swap curve rather than margins to the CGS curve. We have taken this approach because:

- the survey data is provided as margins to the swap curve
- it is market convention to price, quote and trade corporate debt in terms of margins to the swap curve, and
- AFMA publish 7 and 10-year par swap rates on a daily basis. This simplifies the implementation of the alternative method as there is no requirement to interpolate between rates, as would be the case if CGS yields were used.

Testing the accuracy of the alternative method

QTC has tested the estimates from the alternative method against the 10-year DRP estimates produced by PwC's paired bond analysis (Table 2) and recent AER decisions that have used paired bonds to extrapolate the Bloomberg 7-year BBB DRP to a 10-year term (Table 3).

The alternative method has also been tested against earlier AER decisions that relied solely on some form extrapolation of the Bloomberg fair value curve, taking into account variations made by the Tribunal (Tables 4 and 5).

The Bloomberg 7-year BBB SRP has been used as the input in Eq. 1 to estimate the SRP term premium for each averaging period. The estimated SRP term premium has been added back to the Bloomberg 7-year BBB SRP to produce an estimate of the 10-year SRP. The estimated 10-year SRPs have been converted to DRPs based on the average margin between the 10-year swap and par CGS yields during each averaging period[4].

TABLE 2: PWC 10-YEAR DRP ESTIMATES USING PAIRED BOND EXTRAPOLATION

Averaging period	PwC 10-yr DRP (bp)	QTC estimated 10-yr DRP (bp)	Difference (bp)
40 days to 1 Apr 2011[5]	456	460	4
40 days to 14 Oct 2011[6]	408	410	2
20 days to 18 Nov 2011[7]	381	383	2
40 days to 9 Dec 2011[8]	391	387	(4)
20 days to 16 Dec 2011[9]	392	389	(3)
20 days to 7 Dec 2012[10]	328	333	5
Average	**393**	**394**	**1**

[4] The zero coupon CGS yields from the RBA website have been used to produce the 10-year par CGS yields.
[5] PwC, *Powerlink: Methodology to estimate the debt risk premium*, April 2011, p. 16
[6] PwC, *Powerlink: Debt risk premium and equity raising costs*, January 2012, p. vi
[7] PwC, *ElectraNet: Estimating the benchmark debt risk premium*, May 2012, p. 22
[8] PwC, *Powerlink: Debt risk premium and equity raising costs*, January 2012, p. vi
[9] PwC, *SP AusNet, Multinet Gas, Envestra, & APA Group: Estimating the benchmark debt risk premium*, March 2012, p. 22
[10] PwC, *SP AusNet: Debt risk premium for the 2013 Victorian Transmission Revenue Review*, March 2013, p. 14

TABLE 3: AER DECISIONS USING PAIRED BOND EXTRAPOLATION

Service provider	Averaging period	AER 10-yr DRP (bp)	QTC estimated 10-yr DRP (bp)	Difference (bp)
Aurora	10 Jan 2012–6 Feb 2012	411	405	(6)
Powerlink	6 Feb 2012–30 Mar 2012	393	390	(3)
APTPPL	25 Jun 2012–20 Jul 2012	406	397	(9)
APA GasNet	13 Sep 2012–26 Sep 2012	346	346	0
Multinet Gas	24 Oct 2012–20 Nov 2012	332	331	(1)
SP AusNet	12 Nov 2012–7 Dec 2012	335	333	(2)
Envestra	31 Jan 2013–20 Feb 2013	323	312	(11)
ElectraNet	18 Feb 2013–15 Mar 2013	318	306	(12)
Murraylink	27 Feb 2013–26 Mar 2013	317	305	(12)
SP AusNet	24 Jun 2013–19 Jul 2013	300	294	(6)
Average		**348**	**342**	**(6)**

TABLE 4: AER DECISIONS BASED ON 7YR BBB + (10YR AAA -7YR AAA)

Service provider	Averaging period	AER 10-yr DRP (bp)	QTC estimated 10-yr DRP (bp)	Difference (bp)
Jemena Gas	8 Apr 2010–6 May 2010	417	416	(1)
Jemena Electricity	19 Apr 2010–20 May 2010	434	433	(1)
Envestra	25 Feb 2011–10 Mar 2011	467	460	(7)
APT Allgas	4 May 2011–31 May 2011	437	427	(10)
Average		**439**	**434**	**(5)**

The average differences in Tables 2, 3 and 4 are relatively small and statistically insignificant[11].

[11] The standard error from the regression is 8 basis points.

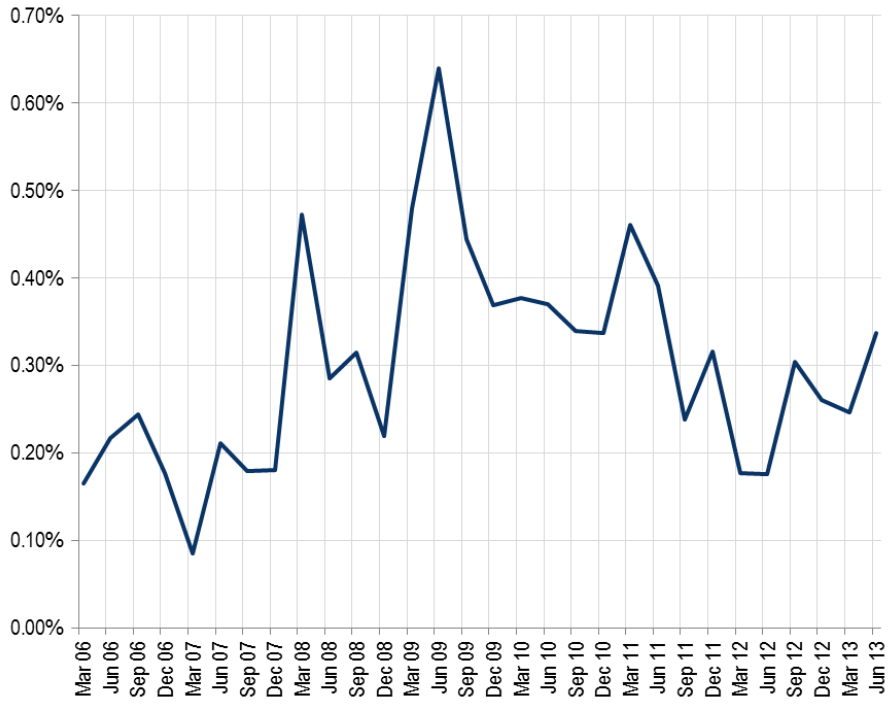
TABLE 5: AER DECISIONS BASED ON 8YR BBB + (10YR A – 8YR A)

Service provider	Averaging period	AER 10-yr DRP (bp)	QTC estimated 10-yr DRP (bp)	Difference (bp)
SP AusNet[12]	3 Dec 2007–14 Dec 2007	219	230	11
ElectraNet	4 Mar 2008–17 Mar 2008	342	358	16
Country Energy et. al[13]	18 Aug 2008–5 Sep 2008	300	309	9
ActewAGL	2 Feb 2009–27 Feb 2009	349	387	38
Average		**303**	**321**	**19**

The DRP term premium was negative during the February 2009 averaging period, with the 10-year DRP being 8 basis points lower than the Bloomberg 7-year and 8-year DRPs.

There are sound theoretical reasons for why the DRP term premium should be positive for investment grade credit ratings, and the theory is supported by empirical evidence[14]. The actual DRP term premium from the survey data (Figure 5) is positive for the entire sample period, and the average value for the December 2008 and March 2009 observations is **35** basis points. As consequence, the reported difference for February 2009 should be treated as an outlier.

FIGURE 5: BBB+ DRP TERM PREMIUM BETWEEN 7 AND 10 YEARS (SURVEY DATA)



[12] The final determination for SP AusNet awarded a DRP of 211 basis points, based on a 10-year risk-free rate of 6.09 per cent and a 10-year BBB+ yield of 8.20 per cent. However, the 8.20 per cent yield does not appear to have been converted to an annual effective rate. Doing so increases the DRP from 211 basis points to 219 basis points.

[13] As the revised averaging periods for Country Energy, EnergyAustralia, Integral Energy and TransGrid are overlapping, the final DRPs have been treated as a single observation.

[14] PwC, *Jemena Gas Networks (NSW) cost of debt report*, March 2010, pp. 30-33

Making automatic estimates of the 10-year BBB+ yield

The following equation can be used by the AER to estimate the 10-year BBB+ yield:

$$\begin{aligned} \textbf{10yr BBB+ yield} &= \textbf{10yr swap + 7yr SRP + SRP term premium} \\ &= \textbf{10yr swap + 7yr SRP + (0.13\% + 0.0832 × 7yr SRP)} \qquad \textbf{(Eq.2)} \end{aligned}$$

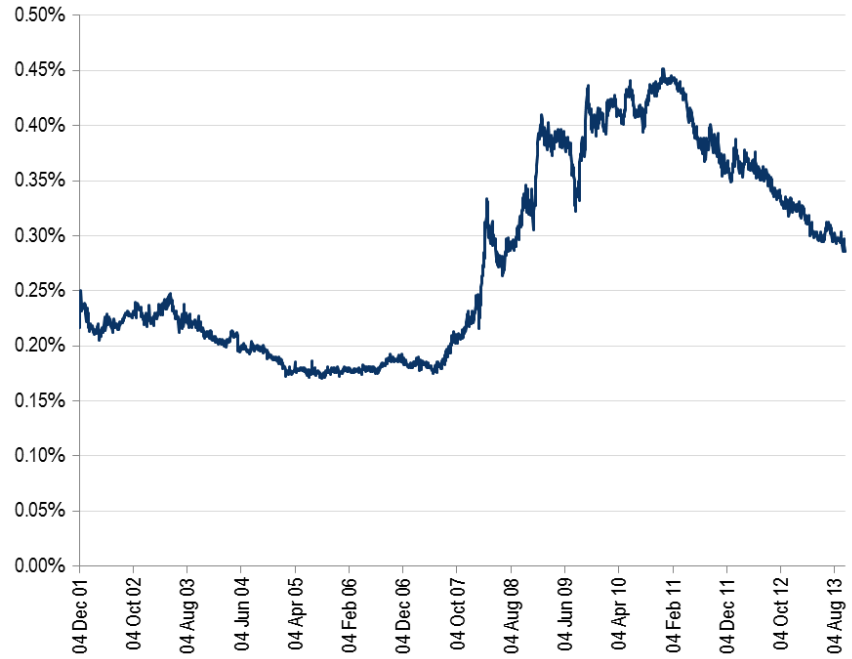
The *10yr swap* equals the annualised 10-year fixed swap mid rate published by AFMA. The *7yr SRP* equals the margin between the annualised Bloomberg 7-year BBB fair value yield and the annualised 7-year fixed swap mid rate published by AFMA.

Potential criticisms

QTC appreciates that the AER may have some concerns in using the survey data to estimate the 10-year BBB+ yield. To balance these concerns, QTC makes the following points:

- The survey data has only been used to establish a quantitative relationship between the SRP term premium and the 7-year SRP. This relationship is applied to the Bloomberg 7-year BBB SRP (ie, data from an independent third party) to estimate the SRP term premium.
- The test results should provide confidence in the quality of the estimates produced by the alternative method. In particular, the method tests well against the 10-year DRP estimates produced by PwC and the AER using the paired bond extrapolation method.
- The SRP term premium represents a relatively small, but not insignificant part of the total 10-year BBB+ yield, as shown in Figure 6. The majority of the 10-year BBB+ yield will still be based on data provided by independent third parties (ie, Bloomberg and AFMA).

FIGURE 6: ESTIMATED 10-YEAR SRP MINUS BLOOMBERG 7-YEAR BBB SRP



As an alternative approach the AER could use Eq.1 to estimate an average SRP term premium that would apply in each year of a service provider's regulatory control period. This would result in a fixed SRP term premium being added to the annually updated 10-year swap rate and Bloomberg 7-year BBB SRP to estimate the 10-year BBB+ yield.