"Bail-in Securities: Fit for Purpose?"*

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Seminar: Productivity Commission (Melbourne Office): Tuesday September 19th 11am

Abstract

"Bail-in Securities" are bank issued hybrid capital instruments that incorporate provision for conversion into equity or write down if some trigger point of inadequate capital or regulatory assessment of pending failure is hit. These conditions are required for their inclusion in banks' regulatory AT1 and Tier 2 capital, with the objective of facilitating regulatory resolution of a troubled bank. As well as explaining key features of such securities and providing data on their extensive recent use in Australian (and overseas) the seminar will address a number of important questions. Are such complex financial instruments suited for retail investors? Will the bail-in mechanism work? How should such securities be priced to compensate for the risks (or uncertainty) involved? What explains the significant fluctuations experienced on market yields on bail-in securities in recent years in Australia?

Introduction

"Bail-in" securities (often referred to as contingent capital) are hybrid securities issued by banks as an eligible component of regulatory capital. Eligibility requires that if certain "trigger" conditions occur, the securities are either converted into common equity or written down, such that the bank is recapitalised (in the sense of having an increase in common equity). The objectives of this security design feature are:

- to avoid the need for taxpayer bail-outs of failing banks (by "bailing-in" holders of these securities);
- by recapitalising a troubled bank, enabling it to continue operations;
- to facilitate bank supervisors in resolving a troubled bank; and
- enhance market discipline of issuing banks through investor monitoring of bank condition, and resulting price movements of the securities.

* Parts of this paper draw on an unpublished paper "Hunting the BIRP: Is there a Bail In Risk Premium in Australian Bank Hybrids" co-authored with Michael Saba.

While appealing in theory this paper argues that the approach is unlikely to work in practice.

Also of importance is the complex nature of these securities which, it is argued, involves "uncertainty" rather than "risk" which can be modelled probabilistically. As a result, there is no solid foundation available for pricing such securities and determining the yield premium which is appropriate for that uncertainty. Markets do, obviously, generate prices for such securities but the uncertainty associated with future outcomes raises the potential of significant fluctuations in price unrelated to "fundamentals". Perhaps even more concerning, these complex securities are, in Australia, being marketed to retail investors who are particularly at risk of not fully understanding the uncertainty involved and what yield premium is warranted.

In the following section, more detail is provided on the background to and characteristics of bail-in securities. Then, an overview of the growth of this market both in Australia and elsewhere is provided, demonstrating that these securities have quickly become a significant component of capital markets. That raises the question of the merits of their design (which has been driven by regulation) and the subsequent section argues that their design is unsuitable, both as a bank resolution device and for sale to unsophisticated retail investors. One aspect of that unsuitability relates to the problems in determining an appropriate price for such securities. This raises issues about their (hoped for) role in providing price signals which impose market discipline on banks (or information for regulators) as well as financial consumer protection issues. Consequently, the subsequent section examines the pricing of listed bail-in securities in Australia in order to identify determinants of fluctuations over time and whether differences in pricing across issuers conveys any information about relative risk.

Bail-In Securities: Evolution and Design

Since the introduction of the Basel 1 capital standards in 1988, a range of hybrid securities issued by banks have been allowed to supplement common equity as regulatory capital, on the grounds that they provided a "gone concern" buffer to absorb losses and protect depositors. The experience of the Global Financial Crisis demonstrated that hybrid securities permitted as part of bank regulatory capital did not effectively fulfil their intended role of loss-absorbency to protect depositors in the event of bank failure.[1] Instead, governments intervened to protect depositors (beyond the levels required by explicit deposit insurance schemes) and ensure the survival of "too big to fail" banks and associated financial sector disruption. These "bail-outs" meant that investors in such hybrid

[1] Indeed, even if failure occurred, unless there was legislated depositor preference (seniority) such hybrid securities unless specifically subordinated, would not necessarily provide a buffer to protect depositors. It should be noted, however, that there were some instances in which coupon payments on such securities were suspended thus providing some form of loss absorption.

securities were not exposed to losses from default which would otherwise have occurred, and which instead fell upon taxpayers. Looking ahead, perceptions of implicit guarantees by governments being exercised in similar circumstances meant that these forms of regulatory capital would not be likely to absorb losses as required unless specific requirements were put in place to prevent bail-outs, either completely, or without some prior absorption of losses by providers of regulatory capital.

The offset this concern, the Basel 3 standards (BCBS 2011a) now specify that securities other than common equity must meet specified "loss absorbency" requirements if they are to count towards regulatory capital requirements. In essence, a requirement that they should also provide a "going concern" loss absorbing buffer is now required. For securities to classify as Additional Tier 1 (AT1) capital, which is described as "going concern" capital, they must have a mandatory "bail-in" requirement. In the original Basel 3 proposals, for securities to qualify as Tier 2 ("gone concern") capital, a bail-in requirement was not necessary, but revisions to the framework in mid 2011 introduced such a requirement.

"Bail in" means that if a "trigger", reflecting some measure of financial weakness of the bank involved is hit, some or all of the eligible securities must be converted into equity or written down (partially or fully) thus achieving a recapitalisation of the bank. [2], Depending on the nature and terms of the bail-in, shareholders (via dilution of their interests) and/or investors in the bail-in securities may experience losses (beyond those already incurred from a reduced value of assets).[3] In a write down situation, holders of the bail-in securities bear the loss (although in some cases they may be entitled to recovery of value lost at some later date if the bank returns to good health).

The Basel standards allow for two types of "triggers" which might prompt mandatory bail-in. In the original version of the standards an undefined but "objective" pre-specified trigger was a requirement for AT1 securities which are classified by accounting standards as liabilities (BCBS, 2011a, p11). Such a trigger is a specified minimum risk-weighted CET1 (Common Equity Tier 1) ratio being reached, which is set in a number of jurisdictions at 5.125 per cent.[4] Subsequently (BCBS, 2011b) the minimum requirement for both AT1 and Tier 2 securities has been deemed to be inclusion in the contract terms of a "subjective" point of non-viability (PONV) trigger requirement

[2] The theoretical academic literature on contingent capital securities surveyed in Flannery (2014) focuses on securities with a stock market price trigger, which is quite distinct from the contingent capital securities issued by banks to meet regulatory capital standards, which have triggers based on accounting ratios or regulatory determinations

[3] The terms may, for example, require that a $100 security converts into greater or less than $100 worth of shares (at current market value) affecting dilution of existing shareholders.

[4] The figure of 5.125 represents the situation where the bank has reached a capital conservation buffer of only 25 per cent of the 2.5 per cent applied on top of a 4.5 per cent CET1 minimum (and at which no distributions are permitted).

(unless the national laws independently provide the regulator with powers to force a write down). A declaration by the regulator that the bank is at a PONV could be expected to occur at a CET1 ratio above any specified objective trigger (such as 5.125 per cent) unless the ratio had unexpectedly declined below that value prior to the regulator becoming aware of the situation.

Consequently, most AT1 securities will involve both an objective capital ratio trigger and a PONV trigger. For securities to be eligible for inclusion as Tier 2 capital, only the PONV trigger is required. Bail-in of AT1 securities should occur, in principle, prior to any bail-in of Tier 2 securities. Whether all of a class of securities would be bailed-in, or only sufficient of them to achieve some desired CET1 ratio is potentially at the discretion of the regulator (or may be specified contractually).

Other design requirements (which vary slightly between AT1 and Tier 2 instruments) are specified for eligibility. These include such characteristics as: subordination to other liabilities; unsecured status; perpetual for AT1 (but not Tier 2) instruments, with no incentives for redemption, but possibly callable (with regulatory approval and requirement to replace with at least equivalent quality capital) after five years; cancellable dividends/coupons which are not linked to the bank's credit standing, minimum term at issue (five years) before the bank has any option to call (redeem) the securities (and replace with new issues).[5]

National regulators thus have some discretion in the requirements they apply for AT1 and Tier 2 eligibility. Also, issuers can design preference share securities in ways which determine whether they are classed as liabilities under accounting standards or not, and thus whether an objective trigger needs to be specified.[6] Complications also exist for the design of bail-in securities for mutual/cooperative banks where absence of traded equity typically leads to a write down rather than conversion feature.[7] Similarly, for government owned banks, conversion would involve part privatisation and regulators may face political impediments to "pulling the trigger".

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[5] Many securities involve a date (often around 8 years after issue) for mandatory conversion into equity (if not called prior). This is generally expected to lead to banks' exercising the call option (often specified as around 6 years after issue), such that investors and analysts treat the securities as having an expected life of that term.

[6] IAS 32 provides an illustration "If an entity issues preference (preferred) shares that pay a fixed rate of dividend and that have a mandatory redemption feature at a future date, the substance is that they are a contractual obligation to deliver cash and, therefore, should be recognised as a liability. [IAS 32.18(a)] In contrast, preference shares that do not have a fixed maturity, and where the issuer does not have a contractual obligation to make any payment are equity. In this example even though both instruments are legally termed preference shares they have different contractual terms and one is a financial liability while the other is equity." http://www.iasplus.com/en/standards/ias/ias32

[7] APRA has previously proposed that "mutual equity interests' could be created by mutuals which would satisfy the bail-in requirement, but the logic and practicality of the concept is far from clear. The Hammond Review (https://treasury.gov.au/review/reforms-for-cooperatives-mutuals-and-member-owned-firms/) is currently considering options for capital instruments for mutual financial institutions.

The "Bail-In" Market: Australia and Overseas

Issuance of bail-in securities has been significant globally. Throughout Asia, larger banks (over the equivalent of AUD assets of 30 billion) have been significant issuers, with the large Chinese and Japanese banks being substantial issuers. As at February 2017, Chinese banks had made over 80 issues in a range of currencies which at that time had a USD total issue value of USD 182 billion.[8] Japanese banks had made over 40 issues with a February 2017 value of over USD 43 billion while Korean banks had made 47 issues with value of over USD 14 billion. A notable feature of Asian bail-in structures is that the most likely form of bail-in is via write-down of the value of the securities rather than conversion into equity.

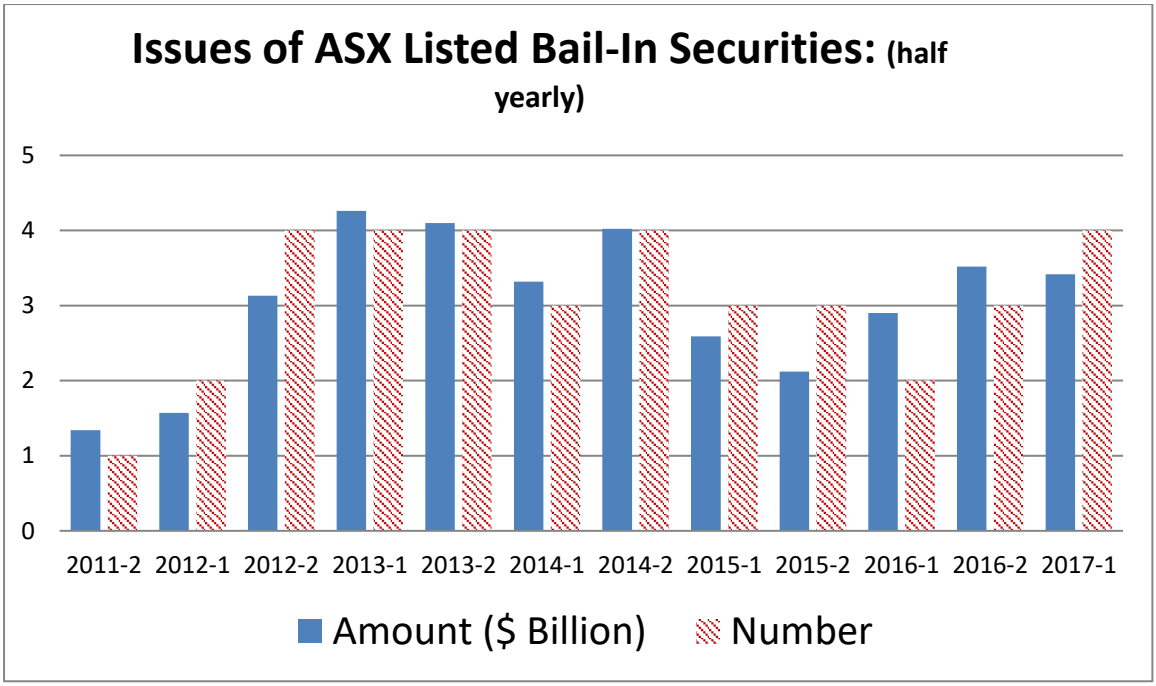
European banks have also been significant issuers of bail-in securities. In the three years to early 2016, European banks had issued over USD 100 billion of AT1 bail-in instruments. Notably US banks have not been issuers of bail-in securities, reflecting the fact that regulators have resolution powers to achieve a similar outcome of allocating losses to subordinated security holders. (The fact that the binding capital constraint is a leverage ratio (based on equity) rather than the Basel risk weighted assets approach which incorporates other non-equity regulatory capital is also relevant).

Figure 1 shows the size and development of the ASX-listed Bail-In Securities market from inception in 2011 to mid 2017. There have generally been between two to four issues per half year by banks and insurers with an average aggregate issue value of about $3 billion per half year, giving a total amount on issue at mid 2017 of around $36 billion. There have also been substantial unlisted issues, of similar order of magnitude, into wholesale markets – mostly being Tier 2 capital instruments (with unfranked distributions). For example, at mid 2017 ANZ Bank had 12 Tier 2, Basel compliant[9], securities on issue in a variety of currencies contributing $6.3 billion of regulatory capital. It had 6 AT1 instruments contributing $7.1 billion of regulatory capital. The wholesale market Tier 2 issues are not considered in the analysis which follows which focuses upon ASX listed bail-in securities.

[8] This has been approximated by using the total value of AT1 and Tier 2 securities which have been issued after January 1, 2012.

[9] Some additional older Tier 2 instruments without bail-in features are counted towards regulatory capital via grandfathering over a transition period unti they are no longer eligible.

Figure 1: Bail-In Issuance in Australia



All Australian domestic listed issues to date have been floating rate securities (with quarterly or semi-annual resets) typically paying a franked coupon amount of (BBSW + margin)*(1-t) where t is the corporate tax rate. (For example, if BBSW = 4.00 per cent, the margin is 1.5 per cent, and the corporate tax rate is 0.3, the cash distribution rate would be 3.85 per cent).[10] Foreign investors, who are unable to use the tax credits are thus generally not participants in this market.

While most of the ASX listed securities are perpetual, but with a mandatory conversion date (subject to the bank meeting some specified conditions) it is conventional wisdom that the issuer will exercise its option to redeem the securities at face value at a specified date typically around six years after issue. Consequently, most analysts treat them as if they are a floating rate security with a fixed maturity date which is subject to a bail-in risk.

The nature of bail-in conversion is generally that a $100 security will convert into $100 of common equity with the number of shares received given by $\$100/S_T$ where S_T is the VWAP share price over the five days before the bail-in.[11] Of course, the announcement of a bail-in can be expected to lead to a share price decline such that the current market value of shares received will be less than $100.

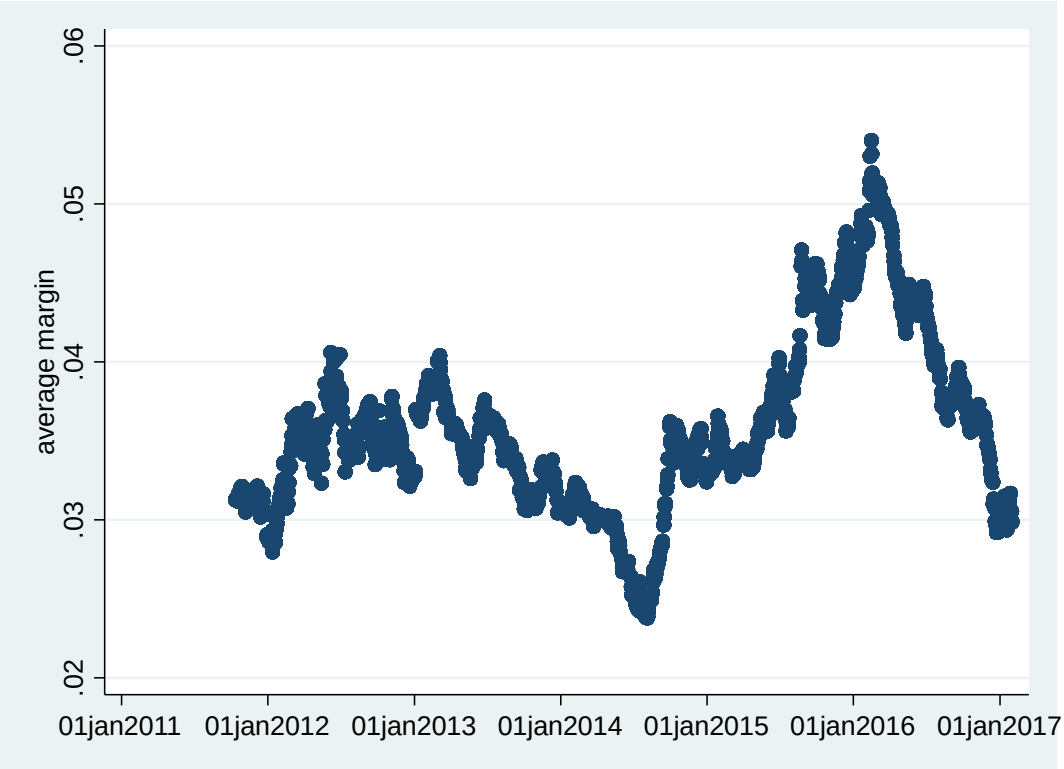
The ASX-listed bail-in securities have been popular with retail investors, and many issues have been oversubscribed. In many cases, the banks have restricted the issue to existing security holders, other

[10] There are some cases where the distribution is partially franked or unfranked, implying a different tax adjustment factor.

[11] There is also generally a condition that if the current share price is less than 20 per cent of the issue date share price, there is a maximum number of shares received.

than the component which has been allocated to stock-brokers for offerings to clients. The issue margin (over BBSW) has been determined by a book-build process for an amount offered to institutional investors and issue margins have varied substantially since 2011 when these securities were first issued. For the first few years issue margins for the major banks were in the order of 3 – 3.5 per cent (but higher for smaller banks). In 2016, they spiked to around 5 per cent, but recent issues in 2017 have had margins of around 4 per cent. (These figures are the "grossed-up" margins inclusive of franking credits, which correspond to the "margin" specified in the issue documentation for the coupon payment. For domestic investors who can use franking credits, this figure is thus directly comparable to unfranked interest payments on other securities).

Figure 2: Average Margin on ASX listed Bail-in securities



Secondary market trading (where dollar prices are generally converted by analysts into a "trade margin to call date")[12] has been at yields which have varied in a similar fashion. Figure 2 illustrates. This raises the question of what factors have been driving the pricing of these securities over time, and whether the fluctuations (and cross-sectional differences in yields between different banks) are indicative of changing perceptions of bail-in, or other risks. Before considering this question, the following section addresses the problem of how the design of bail-in securities creates significant

[12] If, for example, a security with a margin over BBSW of "m"(which was fixed at issued date) sells for a price of P, the trade margin is essentially found by calculating the value "t" such that P is the present value of future cash flows when discounted by (BBSW+t).

complexities for determining their value and whether the design is suited for achieving the objectives driving their introduction.

Deficiencies of Bail-In Securities

Even without the bail-in conditions, the design of bail-in securities issued to date is complex such that risks and value are hard to assess. Assessing the impact of the bail-in conditions is extremely complicated because they involve substantial uncertainty over and above the type of stochastic risks that financial engineers typically model and work with. The uncertainty involved is that it is not feasible to realistically estimate either the probability of bail-in occurring at some future date nor the consequences of a bail-in on the value of the investor's position.

Assessing the probability of bail-in is stymied by the specification of the bail-in triggers. The CET1 ratio trigger depends upon accounting data which is publicly available at best on a quarterly basis with a lag of 6-7 weeks. The PONV trigger creates even greater problems since regulators have given no guidance on what situation would be likely to lead to making such a declaration. In both cases, it is uncertain what proportion of bail-in securities on issue would be bailed-in. Assessing the likely loss which would be incurred by investors if a bail-in occurs is also problematic, because the announcement of a bail-in could be expected to precipitate a significant decline in the bank share price and thus the value of shares received under the bail in.

Hence, valuation of such securities is hindered by the significant "uncertainties" or "unknowns" involved regarding future outcomes. These uncertainties are not like probabilistic risks which are amenable to financial valuation techniques. There is something anomalous about regulators giving banks incentives to issue very complex securities, and allowing them to be issued to unsophisticated retail investors.

A more general issue is whether such securities will, when put to the test, achieve the outcomes desired. One such issue is the willingness of governments to permit bail-in when the effect would be to impose significant losses on retail investors (such as self managed super funds in Australia).[13] But also particularly relevant are the likely consequences from "pulling the bail-in trigger". This is likely to destroy market confidence, creating a "run" on the bank, even though it has been recapitalised. Thus, the objective of ensuring an orderly resolution process which enables the bank's essential operations to continue or be transferred to another entity would be threatened. Either a blanket

[13] One complication in Australia is that AT1 bail-in securities have generally been bought by retail investors while Tier 2 securities have been bought by wholesale and overseas investors. The priority ranking implies that AT1 securities should be bailed in prior to Tier2, which could be expected to lead to significant political issues.

government guarantee would be required, or it would be necessary to effect an immediate sale of the troubled bank to a healthy competitor. The latter outcome is the only instance of a significant bail-in to date, where the Spanish regulator bailed in investors in Banco Populare in 2017 and simultaneously sold the bank to Santander for a nominal sum (one Euro).

While bail-in securities might have significant potential hurdles involved in their fulfilling desired outcomes in dealing with a troubled bank, their existence might generate a new form of market discipline by introducing a new set of stakeholders exposed to significant potential losses. Thus it is worth examining the determinants of prices of bail-in securities and thus whether movements in these prices can provide a form of market discipline.

Determinants of Bail-in Security Prices

Relative Pricing

Investors should demand a yield premium on bail-in securities relative to (hypothetical) otherwise equivalent securities without attached bail-in uncertainty. Given the design of Australian bail-in securities as floating rate, (generally) franked dividend paying instruments, the relevant premium metric is the (grossed up) margin over the relevant (three or six month) Bank Bill Swap (BBSW) Rate. Since no directly comparable non-bail-in securities exist, it is thus problematic to estimate the size of the Bail-In-Risk-Premium (BIRP).

One possible approach is to compare yields on otherwise similar securities issued by the same bank, thereby avoiding potential pricing differences arising from perceived risk differences between issuers. Two possibilities appear to exist.

Several banks have had concurrently on issue bail-in and non-bail-in regulatory capital instruments, where the latter were issued before the Basel 3 requirements were introduced. Three of the major banks have had potentially comparable pairs of securities which can be used for this calculation. The table below (sourced from Davis and SABA (2016) illustrates. Differences in maturity dates complicate the comparison, but these figures suggest that a premium in the order of 150-200 basis points p.a. might be a ball-park estimate of the BIRP for securities with 3 or so years to call date. Unfortunately, differences in time to call (or maturity) make direct comparisons extremely approximate, and particularly at the shorter end of the maturity spectrum where the remaining time over which bail-in might occur reduces is relevance. Also muddying the waters could be the market's perception of what the existence of a bail-in security on issue means for the risk of loss on other securities if the bank is in financial distress.

Table 1: BIRP estimates:

		Average for Half Year[a]								
	Call date	2012H1	2012H2	2013H1	2013H2	2014H1	2014H2	2015H1	2015H2	2016H1
WBCHA	23/8/17					1.77	1.39	1.42	1.74	1.70
WBCHB	22/8/18					2.08	1.80	1.85	2.26	2.40
WBCDiff						**0.31**	**0.42**	**0.43**	**0.53**	**0.69**
ANZHA	14/6/17	2.73	2.29	1.98	1.94	1.71	1.31	1.34	1.65	1.64
ANZPC	1/9/17	3.62	3.42	3.19	2.99	2.80	2.86	3.24	3.84	3.69
ANZDiff		**0.89**	**1.12**	**1.22**	**1.05**	**1.10**	**1.55**	**1.90**	**2.20**	**2.05**
NABHB	18/6/17			1.98	1.93	1.66	1.31	1.36	1.63	1.65
NABPA	30/3/19			3.21	3.14	2.90	3.07	3.55	4.34	4.69
NABDiff				**1.23**	**1.21**	**1.23**	**1.75**	**2.19**	**2.72**	**3.04**

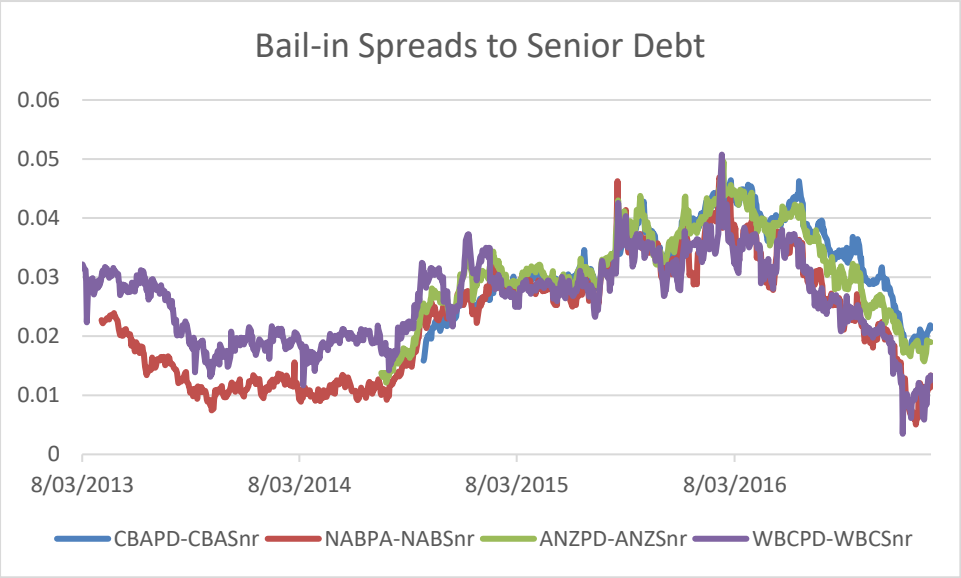
Notes: The first listed for each bank has a bail-in provision. The Westpac securities were unfranked, while the non-bail-in ANZ and NAB securities were unfranked.

An alternative approach to measuring the BIRP is to compare traded margins on bail-in securities to those on senior bonds of the issuers. Unfortunately there are few instances where maturities of senior bonds match up closely with first call dates of bail-in securities, and those bonds are generally fixed rate instruments unlike the bail-in securities which are floating rate. Nevertheless, some ball-park comparisons are possible, where it is necessary to adjust quoted spreads for term premium (0.25 or 0.5 year resets for bail-in securities versus approximately 5 years for CGS) reflecting interest rate expectations – but not difference in default risk (since maturities of the floating rate securities are approximately the same as the fixed rate securities). The latter figure can be approximated using the difference between 0.25 and 5 year zero coupon government yield curves (from RBA Table F17).[14] Figure X thus provides estimates of the BIRP (adjusted for the effect of interest rate expectations on yield to maturity) relative to senior bonds for a number of AT1 issues by the four major banks where the margin is calculated as:

BIRP = (bail-in spread over BBSW) – (senior bond spread over BBSW)– term spread (5 year-025 year zero rates).

[14] The adjustment should use the time to maturity of the senior debt (rather than five years). This will be done in future versions.

Figure 3: Bail-in spreads relative to senior debt



The marked increase in the BIRP after mid-2014 is readily observable. Some part of the cross-sectional variance can be attributed to differences in time to call of the bail-in securities relative to the senior bond maturity, as shown in Senior Bond and Bail-in Security maturities. The marked fall since late 2016 can be attributed partly to the declining remaining time to call of the bail-in securities used, particularly for the short term NAB and WBC issues. However, there are clearly other factors beyond changes in bank risk (reflected in senior bond spreads which are controlled for in Figure 3) which are relevant. This suggests that the margin of AT1 bail-in securities with around 4-5 years to call over senior bonds of similar maturity was around 200 basis points at the start of 2017 after having been substantially higher since mid 2014.

Table 2: Senior Bond and Bail-in Security maturities

Bank	Senior Bond (maturity)	Bail-In Security (call date)
CBA	7.25% May 2020	CBAPD, 17 Mar 2022
NAB	7.25% March 2018	NABPA 20 Mar 2019
ANZ	3.765% JUL 2019	ANZPD 1Sep 2021
WBC	7.25% Feb 2020	WBCPD 8 Mar 2019

Bail-in premia and time to call

As the time till the call date of a bail-in security decreases, it is to be expected that the yield premium required by investors will, *ceteris paribus,* be smaller. This reflects the fact that with less time remaining before a call will occur, there is less risk of a trigger event occurring which will prompt a bail-in and associated losses for investors. To examine this, Table 3 presents the results of a pooled OLS regression of the traded margins on bail-in securities issued by the four majors with

years to call-date and its square as dependent variables. Control variables for differences in risk between banks and over time are also included.

The results indicate that margins do increase with increased time to call. An increase in time to call from 4 to 5 years implies an increase in the margin of approximately 22 basis points. (The concave relationship between margin and years to call implied by the use of a quadratic is upward sloping over the relevant range of time to call data (a maximum of around 6 years). Other risk measures have the expected signs, and the coefficient on the margin on issuer bank senior bonds (snrmarg, which is measured in basis points) implies that a 100 basis point increase in the bond margin would lead to an increase in the bail-in margin of around 40 basis points. This incomplete adjustment confirms the role of other factors in the determination of bail-in margins.

Table 3: Bail-in Margins and time to Call

Dependent variable is trading margin over BBSW (expressed as percentage). Pooled regression results using margins on 17 bail-in securities issued by the four major banks. Daily data from 22 February 2011 till 31 January 2017. Explanatory variables are years till call date (ytc), years till call date squared (ytcsqr), and control variables reflecting differences in risk over time and between banks. These are: an indicator of stockmarket risk (itraxx); share price volatility of the issuing bank(bankvol) ; and the margin over the government bond rate of the issuing bank's senior debt.

	Coefficient	Std. Err.	T	
ytc	0.852	0.011	78.44	Number of observations = 6,329
ytcsqr	-0.070	0.001	-57.17	R^2 = 0.84
itraxx	157.242	5.172	30.4	
bankvol	3.577	0.149	24.06	
snrmarg	40.758	8.049	5.06	
_cons	-0.913	0.049	-18.64	

The positive relationship between time to call and margin is suggestive of bail-in risk being priced, since longer time to call implies increased possibility that bail-in might occur and losses eventuate. (Because the securities are floating rate instruments, the result is not due to the typical upward sloping relationship between yield and time to maturity for fixed rate securities). However, such a result could simply reflect a positive relationship between yield spreads on normal floating rate securities and maturity. Unfortunately it is difficult to find data to rule this out. However some insight may be gained by noting that the difference between 3 and 5 year credit spreads (over government debt) of A-minus rated bonds of non-financial corporations averaged 25 basis points over the four years ending January 2017.[15] Using the results in Table 3, a similar increase in time to

[15] Source: Reserve Bank of Australia, Statistical Table F3

call (from 3 to 5 years) for bail-in securities would generate an increase in margin of double that size of 59 basis points. This is suggestive of a bail-in premium, over and above a standard default risk.

In an earlier paper, Davis and Saba (2016) have attempted to identify the determinants of the bail-in yield margin using (daily) panel data on 19 bail-in securities of 8 issuers over the period July 2013 tile May 2016. Hypothesised determinants are summarized in Table 5, where the expected signs of coefficients are also given, as well as definitions of variables. Unfortunately, data is not currently available on all of these possible explanatory variables, such that the empirical work proceeds using those which are available.

The relationship between spreads and time to call shown in Table 4 implies that changing time to call needs to be allowed for. However, since for all securities this declines deterministically over time, it is much like a time trend and creates estimation problems, particularly given some trend like behaviour in other potential explanatory variables such as bank capital ratios. Consequently, a variable (RelMat) giving time to call for each security relative to the average cross section value is constructed to capture cross-section variation. Another complication is that observations on key accounting variables including capital ratios are only readily available at infrequent (quarterly) intervals. Because CET1 ratios have trended upwards over the sample period, this variable is transformed to be the difference of each bank's CET1 ratio to the average of all banks at each date (RELCET1).

Table 4: Hypothesised determinants of the bail-in margin

Variable	Expected Coefficient Sign	Definition and measurement
Bank specific		
CET1	-	Common equity tier 1 capital ratio - last available from quarterly bank Basel disclosures (expressed as difference from average CET1 ratio at each date)
PTS	+	Proximity to strike (current share price as multiple of 50% of issue date share price)
CR	-	Bank credit rating (AA = 0, AA- = 1, A+ = 2, etc
RelMat	+	Maturity – represented by time till first issuer call option (expressed as percentage difference from average maturity of securities on issue at each date)
Vol	+	Implied volatility of issuer's shares
Controls		
ITraxx	+	ITraxx index of Australian CDS spreads
SectorRisk	+	180 day bank bill swap rate minus 180 day Overnight Interest Swap rate

The time series behaviour of the traded margins, illustrated for the average margin in Figure 2 creates difficulties for regression analysis, since tests confirm that the variable is non-stationary. Consequently, the dependent variable used in panel data regressions on daily data is transformed to be the difference between the traded margin and ITraxx, for which the hypothesis of stationarity is not rejected. (Use of the variable (BBSW-OIS) rather than ITraxx for this transformation produced similar results). Consequently, the regression results indicate the extent to which the explanatory variables explain movements in bail-in yields different to movements in credit spreads reflected in the ITraxx. Bank Credit Rating has been omitted because of collinearity with other variables (and regression assumption of bank fixed effects).

These arguments lead to regression based tests applied to an unbalanced panel of secondary market yields, of the form

$$RiskSpread_{ijt} = \beta_0 + \beta_1 RELCET1_{jt} + \beta_2 PTS_{ijt} + \beta_3 BankVol_{it} + \beta_4 RelMat_{ijt} + \beta_5 SectorRisk_t + u_{ijt}$$

where i = 1 to 19 refers to security i, j=1 to 8 is the issuing bank, t is time, and the explanatory variables and predicted signs are as described in Table 6. The time period used is daily data from 1 July 2013 to 31 Mar 2016.

The Hausman test indicates that fixed effects regression is appropriate, and robust clustered standard errors are reported using bank ID as the clustering variable. Results are shown in Table 5. Notably the bank risk measure (bank volatility) and the short term banking sector risk measure (BBSW-OIS spread) are significant explanators and with expected positive signs. But other variables which are more specifically related to the characteristics of the bail-in securities and their risk are insignificant, and in the cases of PTS (which reflects current bank share price relative to issue date share price), and RELCET1 (which reflects relative capital adequacy) of the incorrect sign. This suggests that there has been little additional signalling of individual bank risk in bail-in yields beyond that available from equity market volatility and money market credit risk information. That could reflect the fact that bank capital positions are sufficiently high such that additional risks from bail-in are perceived to be relatively low.

Table 5: Determinants of bank bail-in risk spread

Dependent Variable: Risk Spread = (bail-in yields – Itraxx). Fixed Effects Unbalanced Panel Regression: Daily data: 1 July 2013 – 31 Mar 2016, 19 securities, 8 bank issuers				
	Coef.	Std.Error	t	p-value
PTS	0.0003	0.0012	0.28	0.790
Bankvol	0.0487	0.0065	7.43	0.000
SectorRisk	0.0206	0.0019	10.81	0.000
RelMat	0.0001	0.0042	0.02	0.985
RELCET1	0.0667	0.0675	0.99	0.356
Constant	0.0093	0.0037	2.54	0.039
R-sq: within = 0.6403		Number of obs = 10675		
between = 0.7549		Number of groups = 19		
overall = 0.6108				
		Obs per group: min = 260		
F(5,7) = 977.81		avg = 561.8		
Prob > F = 0.000		max = 690		
Group variable: idsecurity, Std. Err. adjusted for 8 clusters in bankID, corr(u_i, Xb) = 0.1940				

Conclusion

Australia and other countries have (courtesy of the Basel bank capital standard setters) entered into a major experiment involving regulatory inducements for banks to issue extremely complex, hard (possibly impossible) to value bail-in securities. Banks prefer to meet regulatory capital requirements by issuing such securities rather than by issuing more equity, because they perceive it as a cheaper form of funding.

There is something paradoxical in regulatory requirements inducing banks to issue extremely complex and difficult to value securities – particularly when a large part of the target market is retail investors. Their ability to assess the likely future outcomes (uncertainty/risk) and determine a fair return is undoubtedly questionable. Even if "sophisticated" investors ultimately determine market prices to give, for their circumstances, a "fair" return, retail investors may remain unaware of what risks they are taking on.

That cost might be socially justifiable if the benefit was that the existence of bail-in securities would either enable orderly resolution of troubled banks or strengthen market discipline and reduce the risk of banks becoming troubled. The latter (market discipline) effect requires that market prices of bail-in securities provide signals of impending trouble at the bank – but if the securities are virtually

impossible to properly value that would seem to be a forlorn hope. (Increasing likelihood of a bail-in might encourage bank management to take remedial actions, but this is not obviously a different or superior type of incentive effect to increased likelihood of breaching an equity capital requirement). Preliminary empirical analysis of determinants of bail-in margins, both cross sectionally and over time has yet to identify a clear role for bail-in prices as market determined signals of bank risk. This may be partly a reflection of the rapid growth of the market and changes in pricing reflecting the capacity of the retail investor market to absorb such changes in supply.

Likewise, the chances that a bail-in will, on its own, facilitate orderly resolution appear very slim. Yes, the bank will be recapitalised by the bail-in, but will depositors or other creditors feel confident that there is no other bad news yet to be revealed? A "run" is highly likely. To prevent that, and to enable an orderly resolution, it would seem likely that a government guarantee of uninsured depositors and other creditors would be required. Of course, if the bail-in has adequately recapitalised the bank, the taxpayer may not suffer any eventual cost from provision of that guarantee. But the guarantee still has to be unwound at some time, perhaps when a takeover by another bank can be arranged.

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