Why do banks issue Contingent Convertible Bonds?

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ABSTRACT

This study investigates why banks issue Contingent Convertible Bonds (CoCos). We find that a bank's systemic risk level is a possible reason for CoCo issuance. Contrary to the pecking order theory, earnings management practices play a lesser role, and there is no evidence of banks becoming riskier after issuing CoCos. However, we find systemically riskier banks are more likely to issue CoCos. Thus, riskier banks may be utilising CoCo loss absorption mechanisms to partially internalise the costs of future loan losses. If banks are issuing such instruments without regulatory prompting, then an issuance may signal the need to provide greater oversight. Conversely, if such issuances do result from regulatory prompting, then banks may be engaging in risk management strategies, minimising their cost of equity issuance.

JEL classification: E58, G21, G32

Keywords: Systemic risk, financial intermediation, capital structure, CoCos.

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1. Introduction

The capital structure of banks is complex, often involving contentious debates about regulatory requirements, risk-profiles and earnings management, amongst other key areas (Myers, 1977; Miller, 1995; Berger and Bouwman, 2013). This study seeks to investigate a recent and emerging phenomenon, asking, "Why do banks issue Contingent Convertible bonds (hereafter, CoCos)?"

CoCos were introduced in 2009, after the global financial crisis. They were issued as fixed-income securities, automatically converting to equity if a bank's Common Equity Tier 1 (hereafter, CET1) capital ratio fell below a pre-specified threshold. CoCo holders receive equity holdings in line with a pre-determined conversion ratio. This automatic conversion is the feature principally distinguishing CoCos from other traditional fixed-income securities (Avdjiev et al., 2013). Their unique structure causes uncertainty in terms of balance sheet classification. For accounting purposes, they are treated as debt, with issuers benefiting from tax consequences. The tax treatment of CoCos varies between jurisdictions, but most CoCos are tax-deductible (Avdjiev et al., 2013). However, for prudential regulatory purposes, particularly under Basel III, CoCos may be viewed as quasi-equity, recognised as capital (Bank for International Settlements, 2011).

CoCos are one of the solutions proposed to address the 'too-big-to-fail' phenomenon, as failure of any individual large bank may cause significant negative externalities to the economy (Pitt et al., 2011). However, the counter-argument is that if a number of banks get into trouble at roughly the same time, such instruments may make matters worse (Persaud, 2014; Acharya et al., 2017; Martynova and Perotti, 2018). CoCos have the instant capacity to recapitalise financially distressed banks, as they internalise the costs of distress by converting to CET1. In the interim, they provide an extra layer of confidence to the market for banks continuing to operate as going concerns, reducing the likelihood of a bailout at the taxpayers' expense. Banks were reportedly overleveraged prior to the last financial crisis, so it is no coincidence that Basel III sought to increase banks' capital requirements (Acharya and Richardson, 2009; Berger and Bouwman, 2013; Koziol and Lawrenz, 2012). In particular, CoCos were placed within the regulatory capital mix, structured to absorb losses on an ongoing basis as they may be reclassified as equity. Conversely, gone concern CoCos absorb losses at point of insolvency. Therefore, the timing of such issuances and the associated trigger design and conversion features are critical to the financial stability of markets.

From a corporate's evaluation and a capital structure perspective, equity issuance is expensive, leading to higher minimum required returns demanded from shareholders (Admati et al., 2013; Admati and Hellwig, 2013). The pecking order theory argues that equity may be the most expensive form of security to issue (Myers and Majluf, 1984). Furthermore, equity holders are reluctant to inject equity when they perceive their firm to be financially distressed - the debt overhang problem (Myers, 1977). However, within a banking context, CoCos may be the response to financially distressed banks, as they contribute to the much-needed equity levels when required most. There are obvious concerns about the most appropriate CoCo design, as their effectiveness would be judged against the current market conditions at the point of conversion. Overall, whether these instruments contribute to a safer banking system is still an open question, requiring further empirical analysis. Given this gap within the literature, we are therefore motivated to ask: why do banks issue CoCos?

In our study, we report strong evidence that banks issue CoCos to address their systemic risk levels, rather than to manage earnings. Hence, a bank's decision to issue CoCos seems to be driven by its own inherent risk, overriding the pecking order effect. Banks with higher impaired loans/non-performing loans are more likely to issue CoCos, utilizing them, as potential capital should their loan losses escalate unexpectedly. Furthermore, systemically riskier banks are also more likely to issue CoCos, probably as a safety net should their performance deteriorate. Intuitively, such banks suffer a higher proportion of losses in adverse market conditions; hence, embedding CoCos within the capital structure mix with a view to realigning capital levels is a bonus for most stakeholders. In the absence of regulatory prompting, a bank issuing CoCos may be a signal to regulators that greater regulatory oversight is required. We are unable to ascertain if regulators directly influence a bank's decision to issue CoCos. An issuance may be a result of closer regulatory attention in the first place; regulators identify riskier banks and request them to issue CoCos. In addition, we are also interested in whether globally systemic important banks (hereafter, G-SIBs) are more likely to issue CoCos than other large banks.

Since the introduction of CoCos, the market has not experienced a large number of trigger events. Hence, it is not clear how financial markets would react to CoCo triggers in the foreseeable future. Potential negative market reactions to a trigger may push down bank equity prices overall. However, a trigger also provides useful signals to regulators, suggesting the relevant bank requires more frequent monitoring and guidance. Until a consistent trail of CoCo triggers occur, it is unclear how the market will perceive such events.

This study is one of the first to investigate this recent phenomenon. Furthermore, the link between CoCos and systemic risk has not been clearly articulated in the literature. This study contributes to the literature by determining whether profit targeting and/or systemic risk is related to CoCo issuances. In addition, we also consider whether CoCos cause a shift in risk behaviour ex post issuance, particularly vis-à-vis the larger banks. Given this study's direction, it is fitting to also control for the impact of G-SIBs on CoCo issuances. G-SIBs play a pivotal role in financial markets and therefore any finding clearly adds to the G-SIB literature.

Furthermore, we link CoCos to systemic risk, utilising two relatively new measures: Long Run Marginal Expected Shortfall (LRMES), proposed by Brownlees and Engle (2016) and SRISK, proposed by Acharya et al., (2012) and Brownlees and Engle (2016). Both are global measures of systemic risk tracked in real time and thus detect sudden changes to systemic risk. Finally, the importance of CoCos is growing in the banking industry, with more banks issuing such instruments to satisfy regulatory capital requirements under Basel III. Given the continuous CoCos issuances, this study attempts to provide further information regarding this still under-researched area.

The rest of this study is structured as follows. The next section provides a literature review and develops a set of hypotheses investigating why banks issue CoCos. Section 3 presents an overview of the data and methodology employed in this study. Section 4 discusses the main findings of this study. Finally, the last section concludes the study, discussing policy implications and avenues for future research.

2. Literature review and hypotheses development

Since the initial days of the Basel Accord implementation, changes to the capital adequacy framework were designed to better reflect underlying banking risks, addressing any financial innovations. Over time, some banks sought ways to engage in regulatory capital arbitrage, circumventing certain rules and regulations. Flannery (2002) investigated reverse convertible debentures. Subsequent studies, such as those of Koziol and Lawrenz (2012), Berg and Kaserer (2015), Chan and Wijnbergen (2015) and Jaworski et al., (2017) argued whether CoCos facilitate or diminish a bank's financial soundness, reporting mixed results.

At face value, CoCos are thought to create a more resilient banking system, serving as equity buffers and relieving banks of the debt overhang problem, thus reducing the probability of a government bailout. The literature has endorsed the view that correctly

designed CoCos may reduce the probability of a bank experiencing financial distress and eventual bankruptcy (Berg and Kaserer, 2015; Chen et al., 2013; Hilscher and Raviv, 2014; Jaworski et al., 2017). Recently, Allen and Tang (2016) proposed a dual trigger for CoCos based on the systemic risk within the banking system and banks' individual contribution to overall systemic risk, reducing bailout risk or the probability that a bank would need to be rescued in a crisis.

Furthermore, the implementation of Basel III and the eligibility of CoCos as either Additional Tier 1 or 2 Capital have seen a surge of CoCo issuances by banks. Banks are required to hold a minimum total capital of 10.5% to risk-weighted assets, plus up to 2.5% additional counter-cyclical buffers at the discretion of the national regulator. The majority of this requirement needs to be met by CET1. Additional Tier 1 CoCos can satisfy a maximum of 1.5% of risk-weighted assets and Tier 2 CoCos can satisfy 2% of risk-weighted assets (Bank for International Settlements, 2011). In addition, banks must maintain a minimum leverage ratio of 3%, defined as Tier 1 capital to total assets (Bank for International Settlements, 2014). This limits a bank's incentive to increase capital ratios through a decrease in its density of risk-weighted assets, thus limiting incentives for regulatory capital arbitrage. Equity is traditionally the first line of defence against losses, and insolvency occurs when liabilities significantly exceed assets. In a similar manner, CoCos are ongoing loss-absorbing instruments, but CoCo holders rank lower than equity, the first to absorb such losses when a bank is under financial distress. Hence, it is not yet clear whether systemically riskier banks are more likely to issue CoCos and whether there are any associated risk consequences for banks post issuance.

According to Myers and Majluf (1984), equity is the most expensive security to issue. The cost of equity is higher than the cost of debt due to government subsidies, tax considerations, asymmetric information and agency costs (Jones, 2000). Therefore, banks have every reason to minimise equity holdings. Regulatory capital arbitrage methods such as securitisation erode effective capital ratios, even if nominal capital ratios are satisfied (Jones, 2000). Boyson et al. (2016) found banks preferring low levels of capital and high levels of risk issued trust-preferred securities (TPS), previously classified as Tier 1 Capital, maintaining riskiness.

In addition, when banks are financially distressed, the debt overhang problem causes equity issuance to be expensive and possibly unfeasible (Myers, 1977). This is where the automatic

CoCo conversion to equity addresses the undercapitalisation (debt overhang) problem. By providing an equity buffer, most likely when equity is hardest to issue, these securities are designed to reduce the probability of the bank heading towards bankruptcy. The trade-off for issuing CoCos in a bank solvency scenario is in the higher coupon rate paid on CoCos relative to straight debt, against the recapitalisation of a bank that is in or approaching distress. Using Value-at-Risk (VaR) and Expected Shortfall as proxies for default risk, Jaworski et al., (2017) develop a model to show Additional Tier 1 CoCos may reduce banks' default risk if probability of triggering is higher than the bank's VaR significance level. Furthermore, Ammann et al. (2017) find a reduction in CDS spreads in response to CoCo announcements by banks, corresponding to perceived reduction in the likelihood of a bank's bankruptcy.

From a bank's perspective, CoCos allow an increase in leverage while partially satisfying capital requirements. Thus, banks benefit from tax-deductible interest in good times and equity buffer during bad times. In addition, without defaulting, a bank may suspend coupon payments well before its capital hits the CoCo trigger point. The additional attractiveness of CoCos also stems from the requirement of banks having a minimum leverage ratio of 3%, which CoCos can also partially satisfy. Unlike the past Basel Accords, greater restrictions are now imposed to limit manipulation of lowering risk weights of risk-weighted assets to meet capital requirements.

Empirical papers agree larger banks have a greater tendency to issue CoCos (Avdjiev et al., 2015; Echevarria-Icaza and Sosvilla-Rivero, 2017; Fajardo and Mendes, 2017). Goncharenko and Asad (2016) attribute this to larger banks benefiting from economies of scale when issuing CoCos. Fajardo and Mendes (2017) find that banks in emerging economies with higher leverage (liability/assets) have greater Tier 1 capital, lower total loans and are more likely to issue CoCos. Goncharenko and Asad (2016) also find banks with higher leverage, larger size, higher CET1 ratios in the European Economic Area tend to issue CoCos. Using asset volatility, yearly stock volatility and probability of default as measures of risk, they find less risky banks are more likely to issue CoCos. Combined with findings that riskier banks pay a higher coupon rate, they find evidence that banks issue CoCos to target ROE. In addition, G-SIBs are more likely to issue CoCos, as these banks have higher Tier 1 capital requirements. Similarly, Echevarria-Icaza and Sosvilla-Rivero (2017) find banks tend to improve regulatory capital through a reduction in density of risk-weighted assets and have a higher propensity to use lower-level capital (Additional Tier 1 and Tier 2 Capital). They

find that bank risk increased after Basel III was implemented. They attribute usage of lower quality capital to pecking order effects and ROE targeting. Avdjiev et al. (2015) found large CoCo issuing banks with stronger Tier 1 capital have riskier assets in trading securities.

However, the current literature debates whether CoCo issuances create risk-shifting incentives. The trigger level and conversion ratio are important parameters influencing risk incentives. Berg and Kaserer (2015) develop an option pricing model to show that there is an exacerbation of the asset substitution and debt overhang problems if there is a wealth transfer from CoCo bondholders to equity holders upon conversion. They show that, under this scenario, equity holders are better off being directly under the trigger level than above it, as they can force partial losses onto CoCo bondholders while fully reaping benefits of increases in asset value. They argue that CoCo issuances by major European banks between 2009–2013 demonstrate there is an implied wealth transfer from CoCo bondholders to equity holders on conversion, with equity holders having incentive to increase assets riskiness as well as a disincentive to inject equity in a crisis.

So far, banks in Europe, UK and China have been very active in issuing CoCos, contrary to their U.S. counterparts (Berg and Kaserer, 2015; Von Furstenberg, 2014). This is most likely due to the following: (i) there is no legal certainty that CoCo coupon payments in the U.S. can be tax-deductible; and (ii) under the U.S. General Accepted Accounting Principles (GAAP), CoCos are not allowed to be classified as Additional Tier 1 Capital (Von Furstenberg, 2014). In addition, the surge in popularity of CoCos may be attributable to their classification as Additional Tier 1 Capital in a period of increased capital requirements (Nordal and Stefano, 2014).

Hence, in Switzerland, where the capital requirements are particularly high, UBS and Credit Suisse are heavy issuers of CoCos (Nordal and Stefano, 2014). [2] The significance of CoCos issuance in Swiss banks is compounded by the requirement that these banks can have CoCos equal to 9% of CET1 to risk-weighted assets, with higher trigger levels than Basel III requirements (Allen, 2012; Flannery, 2014). The lack of homogeneity of CoCo regulation treatment, besides the complexity of the securities, is arguably due to the recent introduction of securities to the market. Coverage of these new securities is limited and the literature lacks empirical analysis linking systemic risk to CoCos. This study attempts to fill this gap.

[2] In Switzerland, total regulatory capital may amount to 19% of risk-weighted assets by 2019. In response, Credit Suisse and UBS issued up to 23% of face value of CoCos issued in Europe (Nordal and Stefano, 2014).

2.1: Hypotheses development

For a firm to accept a project or investment, the present value of the investment must create value for equity holders. Thus, performance metrics such as ROE are popular measures of bank performance. In addition, ROE's simplicity attracts investors' attention. Indeed, management often disclose ROE figures in their reports, contributing to short-term approaches to earnings management (European Central Bank, 2010). Hence, it is expected that ROE may be used as a key performance indicator as part of managers' remuneration. Pagratis et al. (2014) find some evidence that large banks actively use leverage to engage in ROE targeting, consistent across different countries. Indeed, bankers argue that higher equity capital may result in an unachievable ROE target (Admati and Hellwig, 2013; Bolton and Samama, 2012). Shen and Chih (2005) argue the following incentives for banks to engage in earnings management: (i) banks are faced with potential deposit runs so they manage earnings to maintain depositor confidence; (ii) to hide asset substitution behaviour; and (iii) as a method of avoiding violating stringent regulation. Out of 48 countries, they find banks in most countries engage in targeting earning levels.

A concern with using ROE as a performance measure is that it can be mechanically inflated. The stringent capital requirements imposed by Basel III increase the required equity creating a downward pressure on ROE. Since this measure is a multiplicative result of ROA and leverage, a bank can either increase its profit or leverage to inflate ROE. Therefore, a bank aiming to target ROE may find CoCo issue a viable mechanism to substitute for more expensive equity. Specifically, if the reduction of equity more than offsets the relatively high coupon rate attached to CoCos (assuming CoCos are tax deductible) then banks may issue these securities as a method of earnings management. Furthermore, Additional Tier 1 CoCos are perpetual instruments, so at a minimum, banks only need to pay interest, which is initially tax-deductible. Coupon payments can be suspended at the discretion of the issuer, without default, even if the bank's capital ratio is above the trigger level (Schmid, 2014). In addition, we extend our consideration of ROE to profitability in general, where the pecking order theory states less profitable firms will issue debt as external financing - thus CoCos. Hence, the first hypothesis is as follows:

H_1: *Banks with lower profitability (ROE) issue CoCos*.

Banks with riskier loans may be inclined to issue CoCos. Berg and Kaserer (2015) provide evidence that CoCos issued by large European banks induce risk-shifting incentives.

As CoCo holders may experience a drop in their investment value if CoCos are converted, banks with higher proportions of bad debts and expected losses may be issuing these securities to mitigate losses to equity holders. As impaired and non-performing loans increase, the need for more capital increases as well. This is where CoCos may be useful, as an increase in loan riskiness may induce a bank to issue CoCos. In addition, regulators observing higher non- performing loans may prompt banks to issue more capital. Therefore, the driving factor of CoCos can be a response to limit their risk exposures in line with prudential regulation, rather than profitability targeting. For large banks, especially the too-big-to-fail, there is the expectation of a government bail out to avoid adverse spill-over consequences across the economy. Hence, we argue banks with higher impaired loans, implying higher asset risk, may transfer the risk onto CoCo holders, so we hypothesise:

H_2: *Banks with higher impaired loans issue CoCos.*

As discussed, this study seeks to further understand why banks issue CoCos. Investigating trust-preferred securities (TPS), Boyson et al. (2016) find banks seeking higher risk strategies issue hybrid securities to satisfy regulatory requirements and thus maintain risk profile. They conclude that optimal levels of bank risk are the determinant of regulatory arbitrage usage. In addition, TPS are tax-deductible and are a response to the bank's Tier 1 capital inclusion before the post-crisis regulatory change (Boyson et al., 2016). In this sense, these securities share some characteristics with CoCos. Therefore, riskier banks may issue CoCos to maintain risk without sacrificing their Tier 1 capital ratios.

Importantly, there is a missing link in the current empirical analysis with respect to systemic risk and CoCo issuance. Though systemic risk can be difficult to define, the literature largely relates systemic risk to the following: (i) correlation of assets, (ii) spillover from one part of the financial system to another and (iii) amplification of small shocks to large impacts (Benoit et al., 2017). Banks susceptible to these factors suffer higher losses during periods of market stress. Thus, banks with higher expected equity losses during extreme market falls (systemically risky) may find the CoCos loss absorption/equity buffer attractive, forcing some or all of these expected losses onto the CoCo investors. Higher equity losses can be reflected by poorer quality assets, lower profitability and higher reliance of wholesale funding (Idier et al., 2013). Banks with higher systemic risk are more likely to hit the CoCo trigger threshold in the event of adverse market circumstances.

Large banks are also granted a subsidy to effectively borrow at a lower rate due to market expectation of governments' willingness to bail out big banks. The Financial Stability Board's attempt to resolve the too-big-to-fail phenomena marks a set of banks, updated yearly, which are classified as such. Though these banks are subject to additional capital requirements, their mere classification can further make debt financing cheaper. In addition, the stringent capital requirements imposed on systemically riskier banks may provide extra incentives to avoid equity, and issue CoCos. In their global framework, the Bank for International Settlements (2011) states banking supervisory authorities may encourage systemically riskier banks to include capital surcharges, contingent capital and bail-in debt as part of an integrated approach to systemically important financial institutions. Regulators therefore may prompt systemically risky banks to issue CoCos as preparation for future financial distress events. Therefore, the third and final hypothesis to be tested is:

H_3: *Banks with higher systemic risk issue CoCos.*

3. Data and methodology

We focus on the world's largest 150 banks (ranked by assets), as the larger banks are more likely to issue CoCos (Avdjiev et al., 2015, Echevarria-Icaza and Sosvilla-Rivero, 2017; Fajardo and Mendes, 2017; Goncharenko and Asad, 2016), exploiting the too-big-to-fail phenomenon (Jones, 2000; Houston et al., 2012). Intuitively, systemic risk is relevant to large banks, as they have the capacity to inflict significant losses on the financial system. Therefore, we collect data on the largest 150 commercial banks and bank holding companies. Furthermore, the Financial Stability Board updates the G-SIB list annually, with Table 1 listing the banks identified as G-SIBs, totalling 34. Most of these banks have remained as G-SIBs since the start of their classification, with only 4 out of the 34 banks de-classified. The rest of the table lists the remaining 116 out of a total of 150 banks.

Table 1: Top 150 banks split by geographical area and CoCo Issuance

Geographical Area	Countries	Number of Banks that issued CoCos			Number of Banks that did not issue CoCos			Total
		G-SIB	Non G-SIB	Total	G-SIB	Non G-SIB	Total	
Asia	China/HK	4	8	12	0	8	8	20
	India	0	1	1	0	1	1	2
	Japan	0	0	0	3	17	20	20
	Korea	0	0	0	0	4	4	4
	Kuwait	0	0	0	0	1	1	1
	Singapore	0	0	0	0	1	1	1
	Thailand	0	0	0	0	3	3	3
	Turkey	0	0	0	0	3	3	3
	Total	4	9	13	3	38	41	54
Europe	Austria	0	2	2	0	0	0	2
	Belgium	0	1	1	1	1	2	3
	Denmark	0	3	3	0	0	0	3
	France	3	0	3	1	2	3	6
	Germany	1	2	3	1	0	1	4
	Greece	0	0	0	0	1	1	1
	Italy	1	1	2	0	2	2	4
	Netherlands	1	2	3	0	1	1	4
	Norway	0	1	1	0	0	0	1
	Russia	0	2	2	0	0	0	2
	Spain	2	2	4	0	2	2	6
	Sweden	1	2	3	0	1	1	4
	Switzerland	2	1	3	0	2	2	5
	Ireland	0	2	2	0	0	0	2
	Total	11	21	32	3	12	15	47
Other	Australia	0	2	2	0	3	3	5
	Brazil	0	1	1	0	2	2	3
	Canada	0	0	0	0	7	7	7
	U.S.	0	0	0	8	19	27	27
	U.K.	5	0	5	0	0	0	5
	South Africa	0	0	0	0	2	2	2
	Total	5	3	8	8	33	41	49
	Grand Total	**20**	**33**	**53**	**14**	**83**	**97**	**150**

Largest 150 banks split by geographical region, CoCo issuance and G-SIB classification. CoCo issuances by banks are from 2009 to 2016. We label a bank as a G-SIB if the Financial Stability Board at any point classified it as a G-SIB. Data is collected from Bloomberg.

We are interested in large parent banks, as the Basel Accord is applied on a fully consolidated basis and the systemic risk measures are focused on large banks. Financial ratios are collected through Orbis (formerly known as Bankscope). Systemic risk measures are acquired from the Volatility Laboratory (V-Lab) situated at the New York University Stern School of Business. Data on CoCo issuances and characteristics are downloaded from Bloomberg. Since the first CoCo issuance occurred after the GFC, the sample period covers from 2009 to 2016. However, we lag financial ratios by one year. Country-specific economic data, such as Gross Domestic Product and Consumer Price Index are downloaded from Datastream.

The main dependent variable represents whether a bank issued CoCos in year *t*. Table 1 displays CoCo issuances by the top 150 banks in their respective geographical regions, showing Chinese banks in the Asian region predominantly using CoCos. Hardly any other large banks in Asian countries issued CoCos. The European region clearly consists of a healthy spread of banks issuing CoCos. For other regions, banks in Australia, Brazil and the U.K. have also issued CoCos, unlike their U.S. and Canadian counterparts. This supports the claim that the lack of tax-deductibility treatment of CoCos and their ineligibility to satisfy capital requirements in the U.S. are reasons for the lack of issuance (Von Furstenberg, 2014).

Table 2: Number and size of CoCo issuances in each country

Geographical Area	Country	No. of CoCo issuances	Total size of Issuance (USD mn)
Asia	China and Hong Kong	22	76,174
	India	2	676
	Japan	0	0
	Korea	0	0
	Kuwait	0	0
	Singapore	0	0
	Thailand	0	0
	Turkey	0	0
	Total	24	76,850
Europe	Switzerland	25	39,380
	Spain	17	21,538
	France	16	20,685
	Netherlands	9	13,175
	Italy	7	7,442
	Germany	10	7,250
	Sweden	9	6,015
	Ireland	4	5,030
	Denmark	7	3,358
	Belgium	2	2,948
	Russia	3	2,388
	Norway	4	1,944
	Austria	4	665
	Greece	0	0
	Total	117	131,818
Other	United Kingdom	64	65,949
	Brazil	3	6,250
	Australia	3	2,000
	U.S.	0	0
	South Africa	0	0
	Canada	0	0
Grand Total		**211**	**282,867**

Frequency of CoCo issuances by largest 150 banks, split by geographical area, from 2009 to 2016. Monetary values are in USD millions. Source: Bloomberg.

In addition, Table 2 lists the frequency of CoCo issuances by the top 150 banks in each country and their respective dollar value. Consistent with the previous table, it can be observed that banks operating in China and Europe are the most active issuers of CoCos. Chinese banks have issued the highest value of CoCos in nominal terms, while banks in the

European countries have the highest frequency issuances. The relatively active CoCo issuance in the U.K. is partly driven by Lloyds Bank in 2009, when the bank withdrew from the Government Asset Protection Scheme program and raised new capital via CoCos (Schmidt and Azarmi, 2015). This accounted for 34 CoCo issuances with a corresponding value over 14 billion USD. This is also displayed in Table 3, where Lloyds Bank tops the G-SIBs group regarding number of CoCos and total value issued. Credit Suisse and UBS also top the G-SIB list issuing CoCos. Comparing Tables 2 and 3, G-SIBs account for over 70% of the amount issued for the top 150 banks.

Table 3: CoCo issuance by G-SIBs

Bank Name	No. of CoCo issuances	Total Size of Issuance (USD mn)
Lloyds Banking Group	40	23,560
Credit Suisse	10	19,623
UBS	11	18,546
HSBC	9	16,775
Bank of China	3	16,227
Barclays	10	15,813
Agricultural Bank of China	2	12,931
Ind. and Comm. Bank of China Limited	4	12,674
Banco Santander	7	9,737
Société Générale	6	8,624
Groupe Crédit Agricole	6	7,466
Banco Bilbao Vizcaya Argentaria	5	6,591
Deutsche Bank	4	6,224
Royal Bank of Scotland	3	5,800
BNP Paribas	4	4,595
Standard Chartered	2	4,000
Unicredit Group	4	3,702
ING Bank	3	3,250
China Construction Bank	1	3,050
Nordea	5	2,465
Total	99	201,653

List of G-SIBs that issued CoCos, with frequency and value of issuances. Monetary values are in USD (millions). CoCo issuances are from 2009 to 2016. Lloyds Banking Group has 40 CoCo issuances. In the regression models, issuances by Lloyds Banking Group that are related to the withdrawal from Government Asset Protection Scheme (GAPS) program only contribute to one observation, as these issuances occurred in 2009. Source: Bloomberg.

Therefore our specified model lists the following variables in Table 4. Leverage (equity/assets), net-loan-to-total-assets and Tier 1 capital are winsorised at the 99th percentile, removing extreme values.

Table 4: List of variables used in the model specification

	Variable	Definition	Description
Dependent variable	Issue (0,1)	Dummy variable for CoCo issuance. 1 if a bank issued CoCos in year *t*, 0 otherwise.	Dependent variable. We want to see if riskier banks are more likely to issue CoCos.
Independent variables of Interest	Return on Average Equity (*ROAE*) [H_1]	Net income divided by Average Shareholders' Equity	Used as a proxy for profitability, and to test *ROE* targeting.
	Return on Average Assets (*ROAA*) [H_1]	Net income divided by Average Assets	Used as a proxy for profitability. Robustness for *ROAE*.
	Net Interest Margin (*NIM*) [H_1]	(Interest Income – Interest Paid) / Interest Earning Assets	Used as a proxy for profitability. Also, Ho and Saunders (1981) attribute a higher NIM to greater deposit and loan transaction uncertainty, hence also a proxy for risk.
	Impaired loans to Gross Loans (*IMPL*) [H_2]	Impaired loans / gross loans	Impaired loans are loans that have defaulted or are close to being in default. Used as proxy for financial distress.
	Loan loss reserve to gross loans (*LLRL*) [H_2]	Loan loss reserve / gross loans	Loan loss reserves are estimated losses for loan defaults and non-payment. Used as proxy for financial distress.
	Impaired loans to Total Assets (*IMPA*) [H_2]	Impaired loans/Assets	Used as proxy for financial distress. Robustness test for impaired loans to gross loans.
	Long Run Marginal Expected Shortfall (*LRMES*) [H_3]	The expected average fractional equity loss of a bank when the market (MSCI World Index) falls by more than 40% in the next six months. LRMES is the bank average LRMES of the year.	Used as a proxy for systemic risk (Acharya et al.,2012; Brownlees and Engle, 2016).
	SRISK [H_3]	A combination of LRMES and leverage, SRISK is the expected capital shortfall of a financial institution in a financial crisis. SRISK is the bank average SRISK of the year.	Used as a proxy for systemic risk (Acharya, 2003; Acharya, et al., 2012; Brownlees and Engle, 2016).
Control variables	Global Systemically Important Banks (*G-SIB*)	Dummy variable. 1 for banks that are classified as G-SIBs in year *t*, 0 otherwise.	G-SIBs are identified as banks that may impose extreme cross-border negative externalities. These banks are regarded as systemically important and considered too-big-to-fail (Financial Stability Board, 2016).
	Size (*Assets*)	Total Assets	Used as a control variable for bank size
	Equity-to-Assets (*ETA*)	Equity/Asset	Used as a control variable for leverage.
	Loans-to-Asset (*LTA*)	Loans/Total Assets	Used as a control variable for loan activities.
	Tier 1 Capital (*Tier 1*)	Tier 1 capital / Risk-weighted Assets	Used as a control variable for Tier 1 capital.

	GDP	Gross Domestic Product	Used as a control variable to eliminate the effect of economic factors.
	CPI	Consumer Price Index	Used as a control variable to eliminate the effect of economic factors.

Regarding systemic risk measures, Long Run Marginal Expected Shortfall (*LRMES*) and *SRISK* are obtained from V-Lab. *LRMES* is calculated as the fractional expected equity loss when the market declines by 40% in a six-month period using the MSCI index. Therefore, a higher *LRMES* indicates greater systemic risk for a bank. *SRISK* incorporates *LRMES*, as well as leverage and size of the firm (Brownlees and Engle, 2011). *SRISK* uses a 5.5% prudential capital ratio for European firms and an 8% prudential capital ratio for others due to differences in dividend accounting.

The *G-SIBs* parameter is a control variable as we are interested in investigating whether such a cohort is more likely to issue CoCos. As CoCos carry higher coupon rates than other fixed income counterparts but cost less than equity funding, larger banks should find these instruments attractive, as they can obtain an overall lower cost of funding (Ueda and Weder di Mauro, 2011). We use leverage (equity/assets) as a control variable as we expect banks with lower leverage in the previous year to issue CoCos, since such banks may be close to breaching their minimum capital requirements (Fajardo and Mendes (2017) and Goncharenko and Rauf (2016)). Also, banks with lower loans-to-assets ratios and higher Tier 1 Capital ratios are more likely to issue CoCos (Fajardo and Mendes, 2017). The evidence to date largely agrees that larger banks issue CoCos.

Table 5 provides the descriptive statistics of the variables employed in the study. Overall, banks that issued CoCos have higher systemic risk, proxied by *LRMES* and *SRISK*. Also, banks issuing CoCos have consistently lower profitability measures compared to banks that did not. Banks that issued CoCos also are more financially distressed as impaired loans and loan loss reserves measures are higher than for those banks, which did not issue. Additionally, banks that issued CoCos are larger, have lower leverage (equity/assets), more Tier 1 capital and lower proportions of loans in their assets.

Table 5: Descriptive statistics of the variables employed

	Mean	Std. Dev.	Minimum	Maximum	Skewness	Kurtosis	N
Issue	0.096	0.294	0	1	2.749	5.569	1200
Panel A: Bank characteristics that issued CoCos in year *t* (N = 115)							
	Mean	Std. Dev.	Minimum	Maximum	Skewness	Kurtosis	N
LRMES	0.452	0.135	0.120	0.743	-0.898	0.379	88
SRISK	32569.20	29905.23	-9785.87	119214.45	1.121	0.587	88
ROAE	7.556	9.213	-40.183	24.061	-1.816	7.692	112
ROAA	0.448	0.858	-6.36	2.683	-4.495	35.942	112
NIM	1.922	1.149	0.649	6.346	1.766	3.778	112
IMPL	4.58	4.545	0.18	25.45	1.897	4.566	111
IMPA	0.025	0.030	0.001	0.206	2.974	12.757	111
LLRL	2.920	2.282	0.141	10.907	1.271	1.639	111
Assets	20.398	0.947	17.845	21.938	0.939	-0.108	112
ETA	6.115	1.552	2.224	10.801	0.546	1.100	112
Tier1	13.386	3.658	6.31	23.06	0.780	0.036	110
LTA	49.053	14.064	18.806	83.369	-0.024	-0.601	112
Panel B: Bank characteristics that did not issue CoCos in year *t* (N = 1085)							
	Mean	Std. Dev.	Minimum	Maximum	Skewness	Kurtosis	N
LRMES	0.392	0.127	-0.112	0.747	-0.561	0.935	785
SRISK	16021.61	33999.83	-296317.63	168047.14	0.865	12.664	785
ROAE	8.549	10.618	-40.183	28.457	-1.797	6.031	988
ROAA	0.645	0.964	-10.830	4.092	-2.920	29.330	988
NIM	2.256	1.519	0.111	9.230	2.031	6.008	987
IMPL	3.224	3.773	0.180	25.450	3.270	13.782	948
IMPA	0.019	0.028	0.000	0.261	4.764	29.315	948
LLRL	2.361	2.027	0.083	10.907	1.847	4.068	977
Asset	19.518	1.087	17.407	22.032	1.990	3.320	996
ETA	7.351	3.158	1.618	17.370	0.888	0.616	997
Tier1	11.836	3.018	6.310	23.060	0.970	1.681	880
LTA	51.578	18.529	0.941	83.369	-0.956	0.526	994

Descriptive statistics are split for banks that issued CoCos in and banks that did not issue CoCos in year *t*. The sample period is from 2009 to 2016. *Issue* takes a value of 1 if a bank issues CoCos in year *t*. *LRMES* and *SRISK* are measures of systemic risk, *ROAE* and *ROAA* are return on average equity and return on average assets respectively, *NIM* is net interest margin, *IMPL* is impaired loans to gross loans, *IMPA* is impaired loans to assets, *LLRL* is loan loss reserves to gross loans, *ETA* is equity to assets, *Tier1* is Tier 1 capital of a bank and *LTA* is loans to assets. All variables besides *Issue* are lagged one year.

We also calculate a correlation matrix between all variables and measure Variance Inflation Factors (VIF) for the main regressions. Due to moderate to high correlation between numerous variables, correlations greater than 50% or VIF greater than 5 are considered to

indicate multicollinearity issues. Some interesting observations follow from the correlation matrix. There is a positive correlation between total assets and all measures of systemic risk, implying larger banks are systemically riskier (Acharya, 2009). This is also true for banks that are classified as G-SIBS, where a positive correlation between G-SIBs and systemic risk is reported. Total asset (*Asset*) is also negatively correlated to leverage (*LTA*), implying larger banks are riskier. Interestingly, G-SIBs are negatively correlated with leverage, even though these banks are subject to higher capital requirements.

The data sample covers 2009 to 2016, lagging the data by one year for their respective independent variables, as we take the view that banks decide whether to issue CoCos based on observations from the previous year. We deal with multiple CoCo issues in each year by accumulating all issues in that year and therefore report one observation per year. As our dependent variable is binary, we employ a logit model. The dependent variable is a dummy for CoCo issuance. Each bank is assigned a 1(0) each year if it issued (did not issue) CoCos in year *t*.

The first model tests the first hypothesis, determining whether banks issuing CoCos are doing so to target earnings. Profitability is proxied by Return on Average Equity, Return on Average Asset and Net Interest Margin respectively.

$$Issue_{i,t} = \alpha + \beta_1 ROAE_{i,t-1} + \beta_2 Assets_{i,t-1} + \beta_3 ETA_{i,t-1} + \beta_4 LTA_{i,t-1} + \beta_5 Tier1_{i,t-1} + \beta_6 GDP_{i,t-1} + \beta_7 CPI_{i,t-1} + \varepsilon_{i,t-1} \quad \ldots(1)$$

To test whether banks issue CoCos as a method of controlling for risk, the second model incorporates measures of financial distress, in particular the use of impaired loans and loan loss reserves. As hypothesised, a positive coefficient indicates banks with higher losses issue these securities.

$$Issue_{i,t} = \alpha + \beta_1 IMPL_{i,t-1} + \beta_2 Assets_{i,t-1} + \beta_3 ETA_{i,t-1} + \beta_4 LTA_{i,t-1} + \beta_5 Tier1_{i,t-1} + \beta_6 GDP_{i,t-1} + \beta_7 CPI_{i,t-1} + \varepsilon_{i,t-1} \quad \ldots(2)$$

Next, we incorporate systemic risk and use *LRMES* and *SRISK* to determine whether systemically riskier banks issue CoCos. A positive coefficient for systemic risk measures will provide further evidence that banks do indeed issue CoCos as a method of risk management.

$$Issue_{i,t} = \alpha + \beta_1 LRMES_{i,t-1} + \beta_2 Assets_{i,t-1} + \beta_3 ETA_{,t-1} + \beta_4 LTA_{i,t-1} + \beta_5 Tier1_{i,t-1} + \beta_6 GDP_{i,t-1} + \beta_7 CPI_{i,t-1} + \varepsilon_{i,t-1} \quad \ldots(3)$$

4. Results

4.1 Profitability measures (H1)

Overall, Table 6 reports the prior year's *ROAE* having no significant effect on a bank's decision to issue CoCos. Therefore, within this context, it is less likely that banks are using CoCos for ROE targeting purposes. In other words, optimizing the trade-off between higher CoCo coupon rate and reduction of equity does not seem to drive CoCo issuances. For robustness, we also look at *ROAA* and *NIM*. *ROAA* is also not significant, suggesting banks do not use CoCos as a method of earnings management. The *NIM* coefficient in model (5) is positive at the 5% statistical significance level. Thus, overall, there is evidence suggesting banks with a higher net interest margin, implying higher interest earning spreads, are more likely to issue CoCos. This may indicate banks with larger loan portfolios are more likely to issue CoCos. Higher net interest margins can also indicate higher risk; Ho and Saunders (1981) find transaction uncertainty a determinant of higher net interest margin. Hence, based on the results reported in Table 6, we reject the hypothesis that banks with lower profitability are more likely to issue CoCos.

Table 6: Results of Logit Model testing Hypothesis 1 (Profitability Measures)

Model

$Issue_{i,t} = \alpha + \beta_1 Profitability_{i,t-1} + \beta_2 Assets_{i,t-1} + \beta_3 ETA_{i,t-1} + \beta_4 LTA_{i,t-1} + \beta_5 Tier1_{i,t-1} + \beta_6 GDP_{i,t-1} + \beta_7 CPI_{i,t-1} + \varepsilon_{i,t-1}$

This table reports regression results from models 1 to 6, where the dependent variable takes a value of 1 if the bank issues CoCos in year *t*, from 2009 to 2016. The independent variables of interest proxies for profitability: Return on Average Equity (*ROAE*), Return on Average Assets (*ROAA*) and Net Interest Margin (*NIM*), all measured as percentages. The control variables are as follows: *G-SIBs*, which takes value of 1 if the bank is classified as Global Systemically Risky Banks by the Financial Stability Board in year *t-1*; Assets; Equity-to-Assets (*ETA*); Loans-to-Assets (*LTA*); Tier 1 Capital (*Tier 1*); *CPI*; *GDP*. All independent variables are lagged one year. Coefficients are shown with t-statistics in parentheses.

		Predicted Sign	(1)	(2)	(3)	(4)	(5)	(6)
Variables of Interest (H_1)	$ROAE_{t-1}$	-	0.001 (0.68)	0.001 (0.18)				
	$ROAA_{t-1}$	-			-0.001 (-0.02)	-0.006 (-0.54)		
	Net interest margin$_{t-1}$	+/-					0.024 (2.44)**	0.015 (1.43)
Control variables	$G\text{-}SIBs_{t-1}$	+	0.262 (8.92)***		0.261 (8.88)***		0.267 (9.09)***	
	$Assets_{t-1}$	+		0.001 (6.34)***		0.001 (6.35)***		0.001 (6.30)***
	ETA_{t-1}	-	-0.016 (-4.09)***	-0.011 (-2.68)***	-0.016 (-3.87)***	-0.010 (-2.42)**	-0.022 (-4.72)***	-0.015 (-3.02)***
	LTA_{t-1}	+	0.002 (3.63)***	0.002 (2.62)***	0.002 (3.62)***	0.002 (2.62)***	0.002 (3.15)***	0.002 (2.26)***
	$Tier1_{t-1}$	+	0.018 (5.39)***	0.022 (6.38)***	0.018 (5.35)***	0.022 (6.38)***	0.020 (5.86)***	0.023 (6.52)***
	CPI_{t-1}	-/+	0.001 (1.33)	0.001 (1.20)	0.001 (1.38)	0.001 (1.25)	0.001 (0.44)	0.001 (0.62)
	GDP_{t-1}	-/+	-0.001 (-1.59)	-0.001 (-1.81)*	-0.001 (-1.59)	-0.001 (-1.79)	-0.001 (-1.49)	-0.001 (-1.75)
	Intercept		-0.150 (-2.51)**	-0.214 (-3.24)***	-0.145 (-2.44)**	-0.214 (-3.26)***	-0.166 (-2.77)***	-0.222 (-3.37)***
	Pseudo R^2 (%)		11.94	8.50	11.89	8.52	12.43	8.69
	LR chi^2		19.86	13.92	19.78	13.96	20.76	14.24
	Prob > chi^2		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	N		975	975	975	975	975	975

***, ** and * denote significance level of 1%, 5% and 10% respectively.

Control variable signs are in line with the previous evidence. *G-SIBs* is positive at the 1% level, indicating banks with higher capital requirements are more likely to issue CoCos. *Assets* is positive at the 1% level, indicating that larger banks tend to issue CoCos. *ETA* is negative at the 1% level indicating banks with lower proportions of equity are more likely to issue CoCos to meet capital requirements. *LTA* is positive at the 1% level, indicating banks with more focus on loans in their portfolio are more likely to issue CoCos and Tier 1 capital is positive at the 1% level. Neither *CPI* nor *GDP* are significant.

4.2 Financial distress measures (H2)

Table 7 displays the regression results for measures of financial distress. There is strong evidence suggesting banks with higher loan losses are more likely to issue CoCos. Measures of loan losses are positive and significant mainly at the 1% level. Banks with a higher percentage of impaired loans to gross loans (and to assets) are more likely to issue CoCos. These are banks with a higher proportion of bad loans, unlikely to be recovered. Thus, there is strong evidence to suggest that such financially distressed banks are more likely to issue CoCos. In addition, banks with higher estimated loan losses, proxied by loan loss reserves, are also more likely to issue CoCos. As impaired loans increase, the need for more capital increases as well. Since more impaired loans and loan loss reserves implies poorer asset quality, riskier investments suggests riskier banks are more likely to issue CoCos. Similar to the previous table, *G-SIBs*, *Assets*, *LTA* and *Tier1* are positive and significant. Leverage represented as *ETA* is negative at the 1% level. *CPI* and *GDP* are also not significant.

Table 7: Results of Logit Model testing Hypothesis 2 (Financial Distress Risk Measures)

Model

$$Issue_{i,t} = \alpha + \beta_1 FinancialDistress_{i,t-1} + \beta_2 Assets_{i,t-1} + \beta_3 ETA_{i,t-1} + \beta_4 LTA_{i,t-1} + \beta_5 Tier1_{i,t-1} + \beta_6 GDP_{i,t-1} + \beta_7 CPI_{i,t-1} + \varepsilon_{i,t-1}$$

This table reports regression results from models 7 to 12, where the dependent variable takes a value of 1 if the bank issues CoCos in year *t*, from 2009 to 2016. The independent variables of interest proxies for financial distress: Impaired loans to Gross loans (*IMPL*), Impaired loans to Assets (*IMPA*) and Loan Loss Reserve to Gross Loans (*LLRL*) all measured as percentages. The control variables are as follows: *G-SIBs*, which takes value of 1 if the bank is classified as Global Systemically Risky Banks by the Financial Stability Board in year *t-1*; Assets; Equity-to-Assets (*ETA*); Loans-to-Assets (*LTA*); Tier 1 Capital (*Tier 1*); *CPI*; *GDP*. All independent variables are lagged one year. Coefficients are shown with t-statistics in parentheses.

		Predicted Sign	(7)	(8)	(9)	(10)	(11)	(12)
Variables of Interest (H_2)	$IMPL_{t-1}$	+	0.008 (3.06)***	0.009 (3.38)***				
	$IMPA_{t-1}$	+			0.871 (2.41)**	1.020 (2.77)***		
	$LLRL_{t-1}$	+					0.022 (4.50)***	0.020 (4.11)***
Control variables	$G\text{-}SIBs_{t-1}$	+	0.257 (8.49)***		0.262 (8.65)***		0.262 (8.97)***	
	$Assets_{t-1}$	+		0.001 (6.01)***		0.001 (6.21)***		0.001 (6.23)***
	ETA_{t-1}	-	-0.016 (-3.91)***	-0.011 (-2.63)***	-0.016 (-3.91)***	-0.011 (-2.61)***	-0.019 (-4.74)***	-0.014 (-3.33)***
	LTA_{t-1}	+	0.002 (2.44)**	0.001 (1.55)	0.002 (2.25)**	0.001 (1.35)	0.002 (3.23)***	0.002 (2.27)**
	$Tier1_{t-1}$	+	0.018 (5.45)***	0.023 (6.59)***	0.018 (5.38)***	0.023 (6.54)***	0.020 (6.02)***	0.024 (7.04)***
	CPI_{t-1}	-/+	0.001 (1.08)	0.001 (0.85)	0.001 (1.26)	0.001 (1.05)	0.001 (0.94)	0.001 (0.78)
	GDP_{t-1}	-/+	-0.001 (-1.12)	-0.001 (-1.35)	-0.001 (-1.24)	-0.001 (-1.48)	-0.001 (-1.26)	-0.001 (-1.51)
	Intercept		-0.150 (-2.42)**	-0.222 (-3.22)***	-0.132 (-2.14)**	-0.207 (-3.00)***	-0.194 (-3.21)***	-0.260 (-3.88)***
Pseudo R^2 (%)			13.01	9.83	12.69	9.48	13.81	10.22
LR chi^2			21.39	15.86	20.80	15.27	23.18	16.77
Prob > chi^2			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
N			955	955	955	955	970	970

***, ** and * denote significance level of 1%, 5% and 10% respectively.

4.3 Systemic Risk and CoCo Issuance (H3)

Table 8 reports regression results using systemic risk measures *LRMES* and *SRISK*. Both variable coefficients are positive at the 5% level, supporting the argument that systemically riskier banks are more likely to issue CoCos. For further robustness, we also use *LRMES* and *SRISK* of the firm's last trading day of the year, where the latter is marginally significant.

Table 8: Results of Logit Model testing Hypothesis 3 (Systemic Risk Measures)

Model

$Issue_{i,t} = \alpha + \beta_1 SystemicRisk_{i,t-1} + \beta_2 Assets_{i,t-1} + \beta_3 ETA_{i,t-1} + \beta_4 LTA_{i,t-1} + \beta_5 Tier1_{i,t-1} + \beta_6 GDP_{i,t-1} + \beta_7 CPI_{i,t-1} + \varepsilon_{i,t-1}$

This table reports regression results from models 13 to 18, where the dependent variable takes a value of 1 if the bank issues CoCos in year *t*, from 2009 to 2016. The independent variables of interest proxies for systemic risk: Long Run Marginal Expected Shortfall of the firm average for year *t* (*LRMES*) and SRISK of the firm average for year *t* (*SRISK*). Long Run Marginal Expected Shortfall of the firm for its last trading day of the year (*LRMES last day*) and SRISK of the firm for its last trading day of the year (*SRISK last day*) are used for robustness. The control variables are as follows: *G-SIBs*, which takes value of 1 if the bank is classified as Global Systemically Risky Banks by the Financial Stability Board in year *t-1*; Assets; Equity-to-Assets (*ETA*); Loans-to-Assets (*LTA*); Tier 1 Capital (*Tier 1*); *CPI*; *GDP*. All independent variables are lagged one year. Coefficients are shown with *t*-statistics in parentheses.

		Predicted Sign	(13)	(14)	(15)	(16)	(17)	(18)
Variables of Interest (H_3)	$LRMES_{t-1}$	+	0.191 (1.99)**	0.247 (2.51)**				
	$SRISK_{t-1}$	+			<0.001 (2.45)**			
	LRMES last day$_{t-1}$	+				0.070 (0.77)	0.105 (1.13)	
	SRISK last day$_{t-1}$	+						<0.001 (1.88)*
Control variables	$G\text{-}SIBs_{t-1}$	+	0.252 (7.75)***			0.261 (8.04)***		
	$Assets_{t-1}$	+		0.001 (4.65)***			0.001 (4.93)***	
	ETA_{t-1}	-	-0.019 (-4.04)***	-0.015 (-3.06)***	-0.014 (-2.85)***	-0.018 (-3.90)***	-0.014 (-2.85)***	-0.015 (-2.97)***
	LTA_{t-1}	+	0.003 (3.11)***	0.002 (2.29)**	<0.001 (1.00)	0.002*** (3.00)	0.002 (2.19)**	<0.001 (0.83)
	$Tier1_{t-1}$	+	0.016 (3.57)***	0.021 (4.49)***	0.019 (4.13)***	0.016*** (3.65)	0.021 (4.64)***	0.019 (4.12)***
	CPI_{t-1}	-/+	0.001 (1.21)	0.001 (0.90)	0.001 (0.97)	0.001 (1.37)	0.001 (1.08)	0.001 (0.95)
	GDP_{t-1}	-/+	-0.001 (-0.51)	-0.001 (-0.55)	-0.001 (-1.51)	-0.001 (-0.98)	-0.001 (-1.09)	-0.001 (-1.50)
	Intercept		-0.181 (-2.12)**	-0.268 (-2.88)***	-0.062 (-0.71)	-0.138 (-1.61)	-0.225 (-2.41)**	-0.047 (-0.53)
Adjusted R^2 (%)			13.17	8.70	5.33	12.76	8.07	5.00
LR chi^2			16.88	10.98	7.87	16.32	10.19	7.44
Prob > chi^2			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
N			734	734	734	734	734	734

***, ** and * denote significance level of 1%, 5% and 10% respectively.

Therefore, there is strong evidence suggesting systemically riskier banks tend to issue CoCos, supporting our hypothesis. Banks with greater asset volatility, higher correlation with the market and higher leverage are expected to have higher equity losses if adverse circumstances occur. In other words, banks with more debt lead to magnification of performance (profits and losses) and banks with higher volatility and correlation with the market experience larger losses during adverse market conditions. Since CoCo conversion forces loan losses onto those investors, the positive coefficients on *LRMES* and *SRISK*

provide evidence that CoCo issuances may be more attractive to such banks. This is supported by evidence that higher *LRMES* and *SRISK* are reflected by riskier assets, lower profitability and higher reliance on wholesale funding—all ingredients of bank fragility (Idier et al., 2013).

Importantly, *G-SIBs* are highly significant across all regressions in Tables 7 and 8. Therefore, G-SIBs are more likely to issue CoCos. This is expected, as these banks are subject to more stringent capital regulations, providing further support to the argument that banks subject to higher equity requirements are more likely to issue CoCos, increasing capital levels without using straight equity. This supports the idea that banks do not issue straight equity as their first choice and view CoCos as a better (cheaper) option.

In addition, other control variables are consistently significant throughout nearly all regressions. Given that G-SIBs are more likely to issue CoCos, this result is not surprising. Leverage is consistently negative and highly significant, indicating banks that have lower levels of equity issue CoCos. This result is intuitive, as these banks need to increase capital to meet minimum regulatory requirements. The proportion of loans in the bank's portfolio is positive and mostly significant in the regressions. Therefore, banks with a higher focus on loans tend to issue CoCos. Tier 1 capital is positively related to CoCo issuance. This may be due to the 2009 demand by the Supervisory Capital Assessment Program that banks increase capital (Federal Reserve System, 2009). Also, since CoCos have a trigger level based on capital ratio (CET1/RWA) banks may need to increase core equity before issuing CoCos, to reach an acceptable CET1/RWA ratio.

Overall, the main results show that profitability is less likely to drive banks' decision to issue CoCos. Net interest margin is positive and significant and this can be attributed to greater risk (Ho and Saunders, 1981). Distress, measured by poor quality of loans, is highly significant. Therefore, it appears the combination of regulation and risk management may be driving the issuance of CoCos. There is evidence that sytemically riskier banks are more likely to issue CoCos. We conclude that banks are not only issuing CoCos to satisfy capital requirements, but riskier banks are utilising the write-down/conversion mechanism as a precaution to absorb future unexpected losses.

4.4 Robustness Tests

Our main regressions so far have focused on determinants on CoCo issuance, including both Additional Tier 1 and Tier 2 CoCos. Most CoCo issuances are classified as

Additional Tier 1 (AT1), and these CoCos are classified as 'Going concern' issues where they are intended to absorb losses while a bank is still solvent. Therefore, as the first robustness test we will run the same logit model as before, except the dependent variable will be a dummy that takes the value of 1 in year *t* if a bank issues AT1 CoCos, from 2009 to 2016.

Our results, as per appendix Tables A1 to A4 are consistent with prior models. Profitability measures remain not significant whilst loan loss measures remain highly and positively significant. Importantly, *SRISK* remains positively significant even though *LRMES* is no longer significant. The coefficient signs are consistent with the prior regressions. Therefore, there is evidence that Additional Tier 1 CoCos are specifically being issued for risk management purposes. As further robustness tests of the main regressions, we run an ancillary test using an OLS approach where the dependent variable will be systemic risk while using the dummy variable CoCo issuance as an independent variable:

$$LRMES_{i,t-1} = \alpha + \beta_1 Issue_{i,t} + \beta_2 Assets_{i,t-1} + \beta_3 ETA_{i,t-1} + \beta_4 LTA_{i,t-1} + \beta_5 Tier1_{i,t-1} + \beta_6 GDP_{i,t-1} + \beta_7 CPI_{i,t-1} + \varepsilon_{i,t-1} \quad \ldots(4)$$

Since CoCo issuances and *Additional issues* are highly correlated (80%), multicollinearity may be a concern; hence we do not employ them in the same regression. From Appendix Tables A1 to A4, it is clear that under both measures of systemic risk, the coefficient of CoCo issue is positive and significant. Hence, banks issuing CoCos were systemically riskier in the previous year. Also, the *G-SIBs* coefficient is positive and highly significant, indicating that G-SIBs are systemically riskier. This is intuitive as the classification of G-SIBs is based on banks that are likely to create great disruption to the banking system in the case of failure. Systemically riskier banks also have more leverage (equity/assets), consistent with the notion that systemically riskier banks are subject to greater capital requirements. In addition, the variable *Additional issues*, which takes a value of 1 each time banks issue CoCos subsequent to the very first issuance, is positive and significant. This provides evidence that banks, which issue multiple CoCos, are systemically riskier.

Finally, an important part of the literature focuses on risk-shifting incentives after a bank has issued CoCos. Himmelberg and Tsyplakov (2012) argue that poorly constructed CoCos may induce higher risk-taking for banks. More pragmatically, Berg and Kaserer (2015) demonstrate through their option-pricing model that CoCos issued by European banks, create perverse risk incentives. Hence, we conduct a model that focuses on systemic risk after a bank issues CoCos.

Results are shown in Appendix Tables A1 to A4, where *LRMES* firm average and *SRISK* on the last trading day of the relevant year are positive at the 5% level, providing some indication that banks become systemically riskier after they issue CoCos. Since the post-issuance bank risk literature is relevant for CoCos converting while a bank is still a going-concern, we further analyse whether banks become systemically riskier after they issue Additional Tier 1 CoCos. Regressions, shown in the tables, provide no evidence that banks become riskier (proxied by loan losses) or systemically riskier after issuing AT1 CoCos. Considering this, we cannot say that banks become riskier as a result of issuing CoCos. Indeed, the positive significance of systemic risk in Appendix Tables A1 to A4 may be related to factors other than CoCos. Therefore, we conclude banks are not issuing these securities to engage in perverse incentives, deliberately imposing losses onto CoCo investors. It appears banks are using CoCos as intended, i.e., contributing to a more resilient banking system.

Coefficients for control variables in regressions in the Appendix Tables are as expected: positive for Assets and Tier 1 capital, and negative for leverage (equity/assets), albeit insignificant. From the results reported in this section, there is sufficient evidence to suggest that banks issue CoCos as a response to higher risk. We cannot determine whether riskier banks issue CoCos prior to regulatory intervention, or whether regulatory authorities prompt riskier banks to issue CoCos. This type of data is not available. However, we do find evidence that managing risk overrides the pecking order effect, as profitability does not feature as a significant determinant. There is no support for the suggestion that banks become systemically riskier subsequent to issuance. This indicates banks are not issuing CoCos as a shield to increase their risk taking activities. Our results are robust to different regression specifications and to subsets of Additional Tier 1 CoCos only.

5. Conclusion

The inclusion of CoCos within banks' capital mix has seen a surge in popularity. It appears that banks issuing CoCos are designed to contain the bank's financial distress at it's early stages. It may also be offering a solution to the Too-Big-To-Fail phenomenon, hence reducing the probability of bail-out at taxpayers' expense. Furthermore, CoCos allow banks to restructure capital with minimal disruption, potentially avoiding transitioning into insolvency. However, these instruments are still relatively new and untested.

Nevertheless, it is important investors fully appreciate the risks of holding CoCos and that banks utilise these securities as intended from the regulators' perspective. With regards to the former, until we gain a clearer picture of how CoCo loss absorption interacts with the financial system in practice, it may be wise to restrict CoCos to certain investors. However, this is beyond the scope of this study. Our results provide evidence of the latter phenomenon, where we suggest banks are issuing CoCos as a response to higher risk. As banks with more impaired loans and expected loan losses have a higher probability of issuing CoCos, the use of CoCos fits perfectly with sound risk management policies, as economic capital is allocated to absorb greater unexpected losses.

Assuming banks issue CoCos without regulatory prompting, an issuance can signal to regulators that a bank needs to be more conservative, requiring more frequent oversight. With regards to stress testing, regulators can possibly focus more on VaR estimates for such banks leading up to loan loss distributions. In this scenario, we propose CoCo issues may be a signal to authorities that such banks warrant further scrutiny. However, CoCo issues can be in response to regulators' requests, where increased levels of bad debt prompted banks to issue more capital.

Our findings suggest systemically riskier banks are also more likely to issue CoCos. Therefore, adverse market reactions of a CoCo trigger for these banks can impose greater negative externalities, subsequently being felt across the entire financial markets. This is evident more so with G-SIBs, as they are highly active CoCo issuers, reinforcing the requirement for greater regulatory oversight if they are using CoCos to cover losses.

Finally, our results show banks are less likely to be engaging in perverse risk incentives subsequent to CoCo issuances. Therefore, banks may be using these instruments to provide buffers against potential losses. Our findings certainly reconcile with the notion CoCos contribute to a safer banking system overall, particularly with respect to large banks - as these banks create negative externalities with which regulators are concerned. The results show that larger and riskier banks tend to issue CoCos, in addition to systemically riskier banks. The fact that larger and systemically riskier banks issue CoCos emphasises the importance to understand why are such banks issuing CoCos. Since CoCo triggers are untested in practice, we emphasise again that CoCo issuing banks need to be more closely monitored.

Furthermore, G-SIBs are significant issuers of CoCos, in both frequency and value. Our results also indicate G-SIBs are more likely to issue CoCos. Given that these banks can cause large negative externalities if they become financially distressed, assessing their motivation for issuing CoCos is important. On one hand, banks issue CoCos to mitigate higher risk so probability of triggering is higher than originally thought. However, G-SIBs hold additional capital, in the form of Common Equity Tier 1, so their probability of being triggered to equity is lowered. Nevertheless, as banks with higher capital requirements are issuing CoCos, it is important to identify whether they are engaging in regulatory arbitrage. Results show no evidence that banks are becoming riskier post-issuance. In view of G-SIBs' importance to the financial system and considering the CoCo advantage of recapitalising a bank when it is hardest to issue equity, we argue that regulators should encourage the use of CoCos. This is even more critical since regulators are interested in internalising the cost of losses, especially for the too-big-to-fail banks. Though G-SIBs are already subject to additional regulation, considering that these banks are the major players in CoCo issuances, regulators may need to provide even more oversight simply because these instruments are untested so far.

The benefits of CoCo issuances permeate from the issuer to the investor. CoCos have a potential loss absorption mechanism to internalise costs and keep a bank continuing as a going concern when equity is hardest to issue. In addition, fixed income investors may be more conservative during periods of financial distress, and trigger events spur less risk-taking by banks, and possibly greater oversight by regulatory authorities. We find evidence that riskier and systemically riskier banks are issuing CoCos. As there is no evidence banks are deliberating imposing losses to CoCo bondholders (becoming riskier) we argue CoCos provide benefits to the financial system overall. Assuming banks issue CoCos without regulatory intervention, an issuance signals that regulators need to provide greater oversight of such banks. However, regulators may prompt CoCo issuances in the first place, especially for CoCos that were issued early in the market.

This study is not without its limitations. Due to lack of observations, we cannot split and analyse CoCo issuances in different regions. Another limitation is the inability to capture the multifaceted nature of banking spread across a number of different jurisdictions with diverse regulatory and prudential regimes. As CoCos are increasing in popularity, there are extensive opportunities for future research. One potential avenue for future research is to analyse whether the timing of the eventual trigger for current CoCos issued can sufficiently

recapitalise a bank as intended. In addition, it would be beneficial to investigate how to further link CoCo design with real time systemic risk measures. Ultimately, as more CoCos are issued, and possibly even triggered, additional avenues will open for empirical analysis. Other research opportunities include analysing how CoCos can be used in bankers' remuneration to reduce bankers' risk-taking incentives.

Appendix A

Table A1: Results of Logit Model for AT1 CoCos

Models

$$AT1Issue_{i,t} = \alpha + \beta_1 ROAE_{i,t-1} + \beta_2 Assets_{i,t-1} + \beta_3 ETA_{i,t-1} + \beta_4 LTA_{i,t-1} + \beta_5 Tier1_{i,t-1} + \beta_6 GDP_{i,t-1} + \beta_7 CPI_{i,t-1} + \varepsilon_{i,t-1}$$

$$AT1Issue_{i,t} = \alpha + \beta_1 IMPL_{i,t-1} + \beta_2 Assets_{i,t-1} + \beta_3 ETA_{i,t-1} + \beta_4 LTA_{i,t-1} + \beta_5 Tier1_{i,t-1} + \beta_6 GDP_{i,t-1} + \beta_7 CPI_{i,t-1} + \varepsilon_{i,t-1}$$

$$AT1Issue_{i,t} = \alpha + \beta_1 LRMES_{i,t-1} + \beta_2 G\text{-}SIBs_{i,t-1} + \beta_3 ETA_{i,t-1} + \beta_4 LTA_{i,t-1} + \beta_5 Tier1_{i,t-1} + \beta_6 GDP_{i,t-1} + \beta_7 CPI_{i,t-1} + \varepsilon_{i,t-1}$$

This table reports regression results from models 19 to 24, where the dependent variable takes a value of 1 if the bank issues Additional Tier 1 CoCos in year *t*, from 2009 to 2016. The independent variables of interest are as follows: Long Run Marginal Expected Shortfall of the firm average for year *t* (*LRMES*); SRISK of the firm average for year *t* (*SRISK*); Impaired loans to Gross loans (*IMPL*); Loan Loss Reserve to Gross loans (*LLRL*); Return on Average Equity (*ROAE*); Net Interest Margin (*NIM*). The control variables are as follows: *G-SIBs*, which takes value of 1 if the bank is classified as Global Systemically Risky Banks by the Financial Stability Board in year *t-1*; Assets; Equity-to-Assets (*ETA*); Loans-to-Assets (*LTA*); Tier 1 Capital (*Tier 1*); *CPI*; *GDP*. All independent variables are lagged one year. Coefficients are shown with t-statistics in parentheses.

		Predicted Sign	(19)	(20)	(21)	(22)	(23)	(24)
Variables of Interest	$ROAE_{t-1}$ (H_1)	-	0.001					
			(0.78)					
	NIM_{t-1} (H_1)	-		0.008				
				(0.87)				
	$IMPL_{t-1}$ (H_2)	+			0.007			
					(3.00)***			
	$LLRL_{t-1}$ (H_2)	+				0.016		
						(3.53)***		
	$LRMES_{t-1}$ (H_3)	+					0.077	
							(0.84)	
	$SRISK_{t-1}$ (H_3)	+						0.001
								(2.19)**
Control variables	$G\text{-}SIBs_{t-1}$	+					0.241	
							(7.76)***	
	$Assets_{t-1}$	+	0.001	0.001	0.001	0.001		
			(5.98)***	(5.94)***	(5.54)***	(5.81)***		
	ETA_{t-1}	-	-0.009	-0.011	-0.009	-0.011	-0.018	-0.014
			(-2.40)	(-2.42)**	(-2.28)**	(-2.88)***	(-3.94)***	(-2.96)***
	LTA_{t-1}	+	0.001	0.001	0.001	0.001	0.002	0.001
			(1.92)*	(1.69)*	(0.81)	(1.56)	(2.75)***	(0.73)
	$Tier1_{t-1}$	+	0.021	0.021	0.021	0.022	0.016	0.018
			(6.40)***	(6.32)***	(6.53)***	(6.88)***	(3.72)***	(4.19)***
	CPI_{t-1}		0.001	0.001	0.001	0.001	0.001	0.001
			(1.10)	(0.79)	(0.82)	(0.80)	(1.33)	(0.95)
	GDP_{t-1}		-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
			(-1.64)	(-1.59)	(-1.24)	(-1.38)	(-0.69)	(-1.26)
	Intercept		-0.197	-0.197	-0.192	-0.227	-0.135	-0.054
			(-3.16)***	(-3.17)***	(-2.94)***	(-3.59)***	(-1.65)*	(-0.65)
Pseudo R^2 (%)			8.00	8.02	9.10	9.22	12.50	5.28
LR chi^2			13.10	13.13	14.64	15.05	15.96	7.81
Prob > chi^2			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
N			970	975	734	955	734	734

***, ** and * denote significance level of 1%, 5% and 10% respectively.

Table A2: Results of OLS regression

Models

$$LRMES_{t-1} = \alpha + \beta_1 Issue_{i,t} + \beta_2 G\text{-}SIBs_{i,t-1} + \beta_3 ETA_{i,t-1} + \beta_4 LTA_{i,t-1} + \beta_5 Tier1_{i,t-1} + \beta_6 GDP_{i,t-1} + \beta_7 CPI_{i,t-1} + \varepsilon_{i,t-1}$$

$$LRMES_{t-1} = \alpha + \beta_1 AT1Issue_{i,t} + \beta_2 G\text{-}SIBs_{i,t-1} + \beta_3 ETA_{i,t-1} + \beta_4 LTA_{i,t-1} + \beta_5 Tier1_{i,t-1} + \beta_6 GDP_{i,t-1} + \beta_7 CPI_{i,t-1} + \varepsilon_{i,t-1}$$

$$SRISK_{t-1} = \alpha + \beta_1 Issue_{i,t} + \beta_2 ETA_{i,t-1} + \beta_3 LTA_{i,t-1} + \beta_4 Tier1_{i,t-1} + \beta_5 GDP_{i,t-1} + \beta_6 CPI_{i,t-1} + \varepsilon_{i,t-1}$$

$$SRISK_{t-1} = \alpha + \beta_1 AT1Issue_{i,t} + \beta_2 ETA_{i,t-1} + \beta_3 LTA_{i,t-1} + \beta_4 Tier1_{i,t-1} + \beta_5 GDP_{i,t-1} + \beta_6 CPI_{i,t-1} + \varepsilon_{i,t-1}$$

This table reports regression results from models 25 to 28, where the dependent variable for regression (25) and (26) is $LRMES_{t-1}$ and the dependent variable for regression (27) and (28) is $SRISK_{t-1}$. The independent variables of interest are: *Issue* which takes value of 1 if the bank issues CoCos in year *t*; *Additional Issues* which takes value of 1 in year *t* if the bank has issued CoCos previously, 0 otherwise. The sample period is from 2009 to 2016. The control variables are as follows: *G-SIBs*, which takes value of 1 if the bank is classified as Global Systemically Risky Banks by the Financial Stability Board in year *t-1*; Equity-to-Assets (*ETA*); Loans-to-Assets (*LTA*); Tier 1 Capital (*Tier1*); *CPI*; *GDP*. All variables other than *Issue* and *Additional Issue* are lagged one year. Coefficients are shown with t-statistics in parentheses.

			Dependent variable			
			$LRMES_{t-1}$		$SRISK_{t-1}$	
		Predicted Sign	(25)	(26)	(27)	(28)
Variables of Interest	$Issue_t$ (H_1)	+	0.028 (1.99)**		8666.423 (2.45)**	
	$Additional\ Issues_t$	+		0.035 (2.13)**		11547 (2.86)***
Control Variables	$G\text{-}SIBs_{t-1}$	+	0.061 (4.71)***	0.059 (4.50)***		
	ETA_{t-1}	-	0.006 (3.14)***	0.006 (3.19)***	-3436.109 (-7.31)***	-3395.656 (-7.22)***
	LTA_{t-1}	-	-0.001 (-2.72)***	-0.001 (-2.81)***	-693.899 (-9.33)***	-698.714 (-9.40)***
	$Tier1_{t-1}$	-	0.002 (1.30)	0.002 (1.18)	-1257.505 (-2.84)***	-1331.284 (-2.99)***
	CPI_{t-1}		0.001 (3.71)***	0.001 (3.64)***	-2.789 (-1.04)	-2.973 (-1.11)
	GDP_{t-1}		-0.001 (-10.44)***	-0.001 (-10.45)***	0.001 (1.18)	0.001 (1.19)
	Intercept		0.374 (12.50)***	0.378 (12.57)***	93957 (12.43)***	94819 (12.56)***
	Pseudo R^2 (%)		18.79	21.15	24.41	24.64
	LR chi^2		29.27	29.09	40.46	40.93
	Prob > chi^2		<0.001	<0.001	<0.001	<0.001
	N		734	734	734	734

***, ** and * denote significance level of 1%, 5% and 10% respectively.

Table A3: Results of Logit Model Post-issuance

Model

$$AT1Issue_{i,t} = \alpha + \beta_1 SystemicRisk_{i,t-1} + \beta_2 Assets_{i,t-1} + \beta_3 ETA_{i,t-1} + \beta_4 LTA_{i,t-1} + \beta_5 Tier1_{i,t-1} + \beta_6 GDP_{i,t-1} + \beta_7 CPI_{i,t-1} + \varepsilon_{i,t-1}$$

This table reports regression results from models 29 to 32, where the dependent variable takes a value of 1 if the bank issues CoCos in year *t*, from 2009 to 2016. The independent variables of interest proxies for systemic risk: Long Run Marginal Expected Shortfall of the firm average for year *t+1* (*LRMES*); SRISK of the firm average for year *t+1* (*SRISK*); Long Run Marginal Expected Shortfall of the firm for its last trading day of year *t+1* (*LRMES last day*) and SRISK of the firm for its last trading day of year *t+1* (*SRISK last day*). The control variables are as follows: Assets; Equity-to-Assets (*ETA*); Loans-to-Assets (*LTA*); Tier 1 Capital (*Tier1*); *CPI*; *GDP*. All independent variables lead by one year. Coefficients are shown with t-statistics in parentheses.

		Predicted Sign	(29)	(30)	(31)	(32)
Variables of Interest	$LRMES_{t+1}$	+	0.201 (2.07)**			
	$SRISK_{t+1}$	+		0.001 (1.59)		
	$LRMES\ last\ day_{t+1}$	+			0.094 (1.04)	
	$SRISK\ last\ day_{t+1}$	+				0.001 (1.99)**
Control variables	$Assets_{t+1}$	+	0.001 (1.92)*		0.001 (2.07)**	
	ETA_{t+1}	-	-0.003 (-0.68)	-0.002 (-0.50)	-0.003 (-0.70)	-0.002 (-0.41)
	LTA_{t+1}		0.001 (1.34)	0.001 (0.90)	0.001 (1.29)	0.001 (1.07)
	$Tier1_{t+1}$	+	0.010 (2.19)**	0.010 (2.21)**	0.010 (2.33)**	0.010 (2.33)**
	CPI_{t+1}		0.001 (1.59)	0.001 (1.75)*	0.001 (1.72)*	0.001 (1.78)*
	GDP_{t+1}		-0.001 (-1.36)	-0.001 (-2.04)**	-0.001 (-1.62)	-0.001 (-2.03)**
	Intercept		-0.153 (-1.66)*	-0.048 (-0.57)	-0.118 (-1.27)	-0.069 (-0.81)
	Pseudo R^2 (%)		2.41	1.54	1.92	1.76
	LR chi^2		3.32	2.72	2.84	2.96
	Prob > chi^2		0.002	0.013	0.001	0.007
	N		659	659	659	659

***, ** and * denote significance level of 1%, 5% and 10% respectively.

Table A4: Results of Logit Model for AT1 CoCos Post-Issuance

Model

$$AT1Issue_{i,t} = \alpha + \beta_1 SystemicRisk_{i,t-1} + \beta_2 Assets_{i,t-1} + \beta_3 ETA_{i,t-1} + \beta_4 LTA_{i,t-1} + \beta_5 Tier1_{i,t-1} + \beta_6 GDP_{i,t-1} + \beta_7 CPI_{i,t-1} + \varepsilon_{i,t-1}$$

This table reports regression results from models 33 to 36, where the dependent variable takes a value of 1 if the bank issues Additional Tier 1 CoCos in year *t*, from 2009 to 2016. The independent variables of interest proxies for systemic risk: Long Run Marginal Expected Shortfall of the firm average for year *t+1* (*LRMES*); SRISK of the firm average for year *t+1* (*SRISK*); Impaired loans to Gross loans (*IMPL*) for year *t+1*, and Loan Loss Reserve to Gross Loans (*LLRL*) for year *t+1*. The control variables are as follows: Assets; Equity-to-Assets (*ETA*); Loans-to-Assets (*LTA*); Tier 1 Capital (*Tier1*); *CPI*; *GDP*. All independent variables lead by one year. Coefficients are shown with t-statistics in parentheses.

		Predicted Sign	(33)	(34)	(35)	(36)
Variables of Interest	$LRMES_{t+1}$	+	0.114			
			(1.28)			
	$SRISK_{t+1}$	+		0.001		
				(0.04)		
	$IMPL_{t+1}$	+			0.003	
					(1.46)	
	$LLRL_{t+1}$	+				0.005
						(1.43)
Control variables	$Assets_{t+1}$	+	0.001	0.001	0.001	0.001
			(1.28)	(0.92)	(1.78)*	(2.01)**
	ETA_{t+1}	-	-0.001	-0.001	0.001	-0.001
			(-0.29)	(0.25)	(0.25)	(-0.07)
	LTA_{t+1}		0.001	0.011	-0.001	-0.001
			(0.55)	(0.44)	(-1.30)	(-0.90)
	$Tier1_{t+1}$	+	0.005	0.005	0.002	0.002
			(1.18)	(1.30)	(0.52)	(0.58)
	CPI_{t+1}		0.001	0.001	0.001	0.001
			(1.74)*	(1.90)*	(1.74)*	(1.81)*
	GDP_{t+1}		-0.001	-0.001	-0.001	-0.001
			(-1.35)	(-1.77)*	(-1.91)*	(-1.92)*
	Intercept		-0.049	-0.008	0.072	0.054
			(-0.58)	(-0.10)	(1.17)	(0.92)
	Pseudo R^2 (%)		0.92	0.67	1.37	1.27
	LR chi^2		1.87	1.63	2.69	2.60
	Prob > chi^2		0.071	0.123	0.009	0.012
	N		659	659	852	869

***, ** and * denote significance level of 1%, 5% and 10% respectively.

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