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**Working Paper**

## On the preferences of CoCo bond buyers and sellers: a logistic regression analysis

CESifo Working Paper, No. 7551

**Provided in Cooperation with:**

Ifo Institute – Leibniz Institute for Economic Research at the University of Munich

*Suggested Citation:* Caporale, Guglielmo Maria; Kang, Woo-Young (2019) : On the preferences of CoCo bond buyers and sellers: a logistic regression analysis, CESifo Working Paper, No. 7551, Center for Economic Studies and ifo Institute (CESifo), Munich

This Version is available at:

<https://hdl.handle.net/10419/198911>

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## **Impressum:**

CESifo Working Papers

ISSN 2364-1428 (electronic version)

Publisher and distributor: Munich Society for the Promotion of Economic Research - CESifo GmbH

The international platform of Ludwigs-Maximilians University's Center for Economic Studies and the ifo Institute

Poschingerstr. 5, 81679 Munich, Germany

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Editor: Clemens Fuest

[www.cesifo-group.org/wp](http://www.cesifo-group.org/wp)

An electronic version of the paper may be downloaded

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# On the preferences of CoCo bond buyers and sellers: a logistic regression analysis

## Abstract

This paper estimates the preference scores of CoCo bond buyers and sellers by running logistic regressions taking into account both bond and issuing bank's characteristics, and also considers the role of country-specific CoCo bond market competitiveness. Buyers are found to be characterised by stronger preference responses to CoCo bond coupons and credit ratings, while sellers are more sensitive to CoCo bond issue size and financial characteristics including return on common equity, price-to-book ratio and total regulatory capital to risk-weighted asset ratio. Further, sizeable responses to CoCo bond and issuing bank's characteristics are found in most European countries, Brazil, Mexico and China, the strongest responses being estimated in the case of the UK and China.

JEL-Codes: C250, C390, F390, G110, G210, G240, G280.

Keywords: CoCo bonds, buyers and sellers, preference scores, logistic regressions.

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March 2019

## 1. Introduction

A contingent convertible (CoCo) bond is a fixed-income security that provides coupon payments to investors until it converts into equity or suffers a write-down of its face value when the bank's capital level falls below a predetermined lower trigger threshold (De Spiegeleer et al., 2014). CoCo bonds have recently become one of the most commonly used financial instruments for satisfying the more stringent financial regulations imposed by the Bank of International Settlements (BIS) and for protecting banks from insolvency. Consequently, CoCo bond issuance has been steadily increasing, with banks issuing \$450 billion in CoCo bonds globally from January 2009 to September 2015. In addition, the European Central Bank's October 2014 asset quality review (AQR) reported that CoCo bonds accounted for 32 billion Euros of the total of 92 billion Euros in new security issues from July 2013 to August 2014 (Avdjiev et al., 2015).

CoCo bonds add flexibility to the capital structure of banks. Since they are typically treated as debt, they allow banks to take advantage of the benefits of debt financing. Then, when capital falls below the lower trigger threshold during a crisis period, banks can quickly, easily and effectively convert these bonds into equity or write down their principles (Raviv, 2004; Flannery, 2005, 2009; Squam Lake Working Group, 2009; McDonald, 2013, Pennacchi et al., 2014; Avdjiev et al., 2015); thus, CoCo bonds act as automatic bankruptcy protection devices. Regulators have advocated the use of CoCo bonds because they absorb losses without using taxpayers' money (De Spiegeleer et al., 2014). In addition, they constitute banks' Tier 2 capital and add to their Tier 1 capital for meeting the Basel III requirements. For all of these reasons, banks are increasingly issuing CoCo bonds.

However, one of their main disadvantages for the issuing firm is the high coupon rate; also, the loss-absorbing capacity of Coco bonds is insufficient (Admati et al., 2013; Avdjiev et al., 2015), they suffer from pricing complexities, a high correlation with systematic economic events (Avdjiev et al., 2015) and potential shareholder dilution. Therefore, it is important to understand how equity markets react to the issuance of CoCo bonds and the role played by their characteristics and those of the issuing banks.

To date there have only been a few market analyses based on CoCo bond issuance, most of them being event studies focusing on general equity investors. This paper examines instead the preferences of CoCo bond investors (buyers) and issuers (sellers) between May 11, 2009 and March 19, 2018. These are measured by the ratio of the CoCo bond yield-to-maturity (YTM) to the credit default swap (CDS) spread, which represent the return and risk of CoCo bonds, respectively. Buyers and sellers are assumed to prefer CoCo bonds

with high return-to-risk ratios calculated as  $\frac{\text{CoCo Bond Bid YTM} - \text{CoCo Bond Ask YTM}}{\text{CDS Spread}}$  and  $\frac{\text{CoCo Bond Ask YTM} - \text{CoCo Bond Bid YTM}}{\text{CDS Spread}}$ , respectively, relative to their median for all CoCo bonds issued. Specifically, they prefer to buy or sell CoCo bonds if this ratio is higher than the corresponding median – it will take value one in this case and zero otherwise. We analyse how these preferences are related to CoCo bond characteristics (coupon, maturity, amount issued, trigger level, conversion mechanism and credit rating) and issuing bank's characteristics (return on common equity, firm size, price-to-book ratio (P/B), regulatory capital condition (total regulatory capital to risk-weighted asset) and leverage (total debt to total asset)) while controlling for the underlying economic conditions (real GDP, inflation and unemployment rate).

We find that the preferences of CoCo bond buyers (sellers) are significantly affected by CoCo bond coupons, issue size, credit rating and issuing bank's return on common equity, price-to-book ratio and total regulatory capital ratio compared to risk-weighted assets, while there is no significant effect of economic conditions. Buyers prefer CoCo bonds with high coupons, since they generate a higher income, and a small issuance, since their ownership is diluted with a large number of CoCo bond investors. They also prefer CoCo bonds to have high credit ratings since their conversion can force them to internalise the losses resulting from the poor performance of the bank issuing the CoCo bonds (Flannery, 2015; Ammann et al., 2017). Finally, they prefer the issuing banks to be sound (with a high total regulatory capital to risk-weighted asset ratio), profitable (with a high return on common equity) and undervalued (with a low price-to-book ratio).

On the other hand, CoCo bond sellers have opposite preferences, namely they prefer CoCo bonds with low coupons (to lessen their burden as coupon payers) and a large issue size (to ensure sufficient bankruptcy protection and satisfy financial regulations, which is the main purpose of issuing CoCo bonds). They have a preference for CoCo bonds particularly when they perceive themselves to have less regulatory capital protection (a low total regulatory capital to risk-weighted asset ratio) and a less promising financial outlook (a low return on common equity and high price-to-book ratio). Therefore, they prefer to issue CoCo bonds with low credit ratings.

CoCo bond buyers are found to exhibit stronger preference responses to CoCo bond's coupons and credit ratings, and sellers to CoCo bond issue size and the issuing bank's characteristics including return on common equity, price-to-book ratio and total regulatory capital to risk-weighted asset ratio. We then use the bank-specific CoCo bond issue size,

which represents the bank's CoCo bond market share, to measure competitiveness in the CoCo bond market using the inverse of the Herfindahl index for each country, the assumption being that both buyers and sellers to prefer more competitive market conditions. In other words, they prefer lower CoCo bond prices and less monopolistic CoCo bond markets, which give them more trading power. We find strong preference responses to CoCo bond and issuing bank characteristics in most European countries, Brazil, Mexico and China, the strongest responses being estimated in the case of the UK and China.

The layout of the paper is the following: Section 2 reviews the relevant literature; Section 3 develops our hypotheses; Section 4 outlines the methodology; Section 5 describes the data and presents the empirical findings; Section 6 offers some concluding remarks.

## **2. Literature Review**

The extant literature on CoCo bonds is limited, but rapidly expanding. It includes four main strands analysing CoCo bond developments, properties, designs and effects on firms and investors. The first discusses previous versions that highly resemble CoCo bonds. Flannery (2005) proposed a reverse convertible debenture (RCD) that automatically converts into common equity when the market capital ratio falls below a certain threshold, which is determined by the current share price. His work provides critical insights into market triggers as a mandatory conversion method, using stock prices as a tool for converting from bond to equity. Flannery (2009) proposed a contingent capital certificate that also uses the market trigger to convert debt into equity.

Raviv (2004) introduced a debt-for-equity swap (DES) contract that pays its holder a fixed payment upon maturity unless the bank's asset falls below a certain pre-determined conversion threshold; otherwise, it converts into common equity. Squam Lake Working Group (2009) suggested a regulatory hybrid security type that remains long-term debt during normal periods and converts into equity when both financial markets and the issuing bank suffer financial distress. Glasserman and Nouri (2012) proposed a contingent capital concept with a capital-ratio trigger with partial and ongoing conversion. The capital ratio is based on accounting or book values designed to approximate regulatory capital requirements. The partial and ongoing conversion process enables firms to convert just enough debt into equity to meet the regulatory capital requirements each time the capital ratio falls below the minimum threshold. Finally, Pennacchi et al. (2014) suggested the call option-enhanced reverse convertible (COERC) approach, which resembles a CoCo bond except that

shareholders have the option to buy back converted shares from COERC investors at the bonds' par values.

Subsequently, Albul et al. (2013) presented the formal model for CoCo bonds, which started the discussion about their properties. They maintained that CoCo bonds provide most tax benefits as a straight debt, while offering the same protection as equity. This protection increases as the bond's conversion trigger level increases. The Squam Lake Group (Baily et al. 2013) stressed that financial authorities should encourage banks to issue CoCo bonds. In the Bank for International Settlements' (BIS) Quarterly Review, Avdjiev et al. (2013) provided an official explanation of CoCo bonds. They emphasised the importance of the trigger level (mechanical or discretionary) and the loss-absorbing mechanism (conversion to equity or principal write down).

As for research on the design of CoCo bonds, Pennacchi (2010) argued that early conversion during financial distress minimises the default risk at a lower cost. Himmelberg and Tsyplakov (2012) found that the principal write-down conversion method generates incentives for banks to have high leverage, increasing the cost of financial distress and the cost of capital compared to the equity conversion method. Koziol and Lawrenz (2012) suggested using other devices together with CoCo bonds to control risk-shifting incentives to prevent manipulations of the bonds' risk control technologies and/or contracts. Calomiris and Herring (2013) argued instead that banks should hold significant quantities of CoCo bonds and use market value triggers with 90-day moving average equity market values. Davis et al. (2014) tested hypothetical CoCo bond data under three different trigger regime scenarios: a fixed-trigger regime, a regulator regime and a prediction-market regime. They concluded that CoCo bonds have fewer conversion errors and are less subject to manipulation under fixed-trigger and prediction-market regimes than under regulator regimes. McDonald (2013) suggested that CoCo bonds should use a dual trigger incorporating the firm's stock price and the financial institution's index as the determinants for its threshold. This approach considers simultaneously both micro and macro financial conditions. As another enhancement, Corcuera et al. (2014) proposed a coupon cancellable contingent capital (Coca CoCo) bond, which cancels its coupon when a pre-defined barrier higher than the conversion barrier is broken through. This discourages speculative short-selling activities and significantly reduces the death spiral effect. Hilscher and Raviv (2014) argued that there is a conversion point at which shareholders become indifferent towards risk-taking.

Yang and Zhao (2014) introduced contingent capital, a contingent convertible security (CCS) that repeatedly converts between debt and equity depending on the firm's financial



situation: that is, if the firm falls into (recovers from) recession, it converts from debt (equity) to equity (debt). Yang and Zhao (2015) enhanced this CCS by incorporating an asset jump risk. This new type of CCS dynamically adjusts the firm's capital structure without incurring adjustment costs and does not suffer from debt overhang or risk-shifting incentive problems. Sundaresan and Wang (2015) proved that using market triggers is inappropriate because such triggers involve price uncertainty, market manipulation, inefficient capital allocation and frequent conversion errors with no unique equilibrium. Thus, regulators reacting to market prices may not gain the financial information they need, since their interventions themselves may affect firms' security prices (Birchler and Facchinetti, 2007; Bond et al., 2010; Davis et al., 2011).

Chen et al. (2013) investigated the effects of CoCo bonds. They argued that they benefit the issuing firm if the conversion trigger is not set too low. However, when the CoCo bond-issuing firm takes excessive risk, causing a debt-induced collapse, CoCo bonds can become junior straight debt and the equity value may suddenly drop. Avdjiev et al. (2015) claimed that the contract design of a CoCo bond and the characteristics of the issuing firm are important determinants of its effects. However, in their opinion the beneficial effects of such bonds on loss absorbency and risk-taking incentives are rather weak. On the other hand, Gründl and Niedrig (2015) highlighted the benefits of CoCo bonds, arguing that they are effective in reducing risk-shifting towards taxpayers and enhancing banks' stability. They added that the current Solvency II standard formula for market risk, which relies on highly crude risk weights, needs to improve because it fails to estimate the full risk of CoCo bonds. Song and Yang (2016) found that the risk-taking incentives and agency cost of debt increase if shareholders are allowed to choose their optimal CoCo bond conversion barriers by themselves. They also stressed that the risk-taking incentives and agency cost of debt decrease if CoCo bonds have an exogenously imposed conversion barrier.

Numerous studies have analysed the effects of convertible bonds, straight bonds etc. on financial markets. However, to the best of our knowledge, there are only four previous studies on market reactions to CoCo bond issuances. Avdjiev et al. (2015) and Vallee (2016) found that the reaction of credit default swap (CDS) spreads is significantly negative, whilst that of equity markets is not significant; however, they did not investigate the CoCo bond issue announcement periods. In a subsequent study, Ammann et al. (2017) found significant reductions in CDS spreads in response to CoCo bonds' post-issue announcements and a positive reaction of the equity market. By contrast, Liao et al. (2017) reported a negative reaction, but also detected differences across countries.

### 3. Hypothesis Development

The studies above show that the design of CoCo bonds and the financial situation of the issuing bank determine their effects on investors. We focus on the coupon, maturity, issue size, trigger level, credit rating and conversion method as CoCo bond characteristics.

According to the BIS Quarterly Review by Avdjiev et al. (2013), approximately 64% of CoCo bonds have tax-deductible coupons, while around 20% do not. The tax treatment of the remaining 16% of CoCos is currently under review. Therefore, although high coupon rates are not beneficial to issuers, this negative effect is somewhat mitigated by the favourable tax treatment. On the other hand, insurers clearly benefit from buying CoCo bonds owing to the high coupon rates compensating for the high issuing bank's risk (Gründl and Niedrig, 2015), which has proven to be very attractive in the current low-yield environment (Jaworski et al., 2017). Accordingly, our first hypothesis is the following:

*H1: A CoCo bond's coupon rate is positively (negatively) associated with its buyer's (seller's) preferences.*

In the Basel III framework, all Additional Tier 1 instruments must be perpetual. Therefore, approximately one third of CoCo bonds issued have no maturity date. The rest of the existing CoCo bonds with finite maturity dates are only eligible to obtain Tier 2 capital status under Basel III. Most of them have an original maturity of approximately 10 years (Avdjiev et al., 2013). With a longer or perpetual maturity, CoCo bond investors are likely to enjoy (generally higher) coupon payments than for other debt instruments over a long period, while the opposite holds for CoCo bond issuers. Thus, we formulate our second hypothesis as:

*H2: A CoCo bond's maturity is positively (negatively) associated with its buyer's (seller's) preferences.*

CoCo issuance patterns are largely driven by the way Basel III is applied, or supplemented, by national regulators and the tax treatment in different jurisdictions. Banks are motivated to issue CoCo bonds by their need to satisfy the loss-absorbing capital requirements, especially in the UK. Approximately 64% of CoCo bonds have tax-deductible coupons and the rest are either not so or are still under review depending on different countries' jurisdictions (Avdjiev et al., 2013). Asset managers, hedge funds and other banks

usually purchase a significant amount of CoCo bonds. Investors from the UK, Europe, and the US are among the largest holders (Avdjiev et al., 2015). When the CoCo bond issue size is large, it leads to large equity conversions which can exceed what would be required to eliminate all risk shifting incentives. Instead, it can cause an excessive dilution effect among the existing shareholders (Martynova and Perotti, 2014). This leads to our third hypothesis, namely:

*H3: A CoCo bond's issued amount is negatively (positively) associated with its buyer's (seller's) preferences.*

From the CoCo bond issuer's perspective, the trigger level selection is largely determined by the trade-off between regulatory capital eligibility and cost of issuance. CoCo bonds with low triggers have lower loss-absorbing capacity. They tend to be less expensive to issue and are usually used to boost Tier 2 capital in a cost efficient manner while not being eligible to qualify as Additional Tier 1 capital which is relatively more expensive to raise. Over time, however, there has been increasing financial regulatory pressure for banks to boost their Tier 1 capital which requires trigger levels ( $= \frac{\text{Common Equity Tier 1 Capital}}{\text{Risk Weighted Assets}} \geq 5.125\%$ ) higher than those for Tier 2 capital (Avdjiev et al., 2013).

On the other hand, investors may perceive the trigger level of CoCo bonds as too low to spark a conversion, which may be seen as simply more leverage. Therefore, as the CoCo bond's trigger level increases and the likelihood of an early conversion rises, the issuing banks will experience an increase in bankruptcy protection (Ammann et al., 2017), despite the increase in the cost of issuance (Avdjiev et al., 2013), owing to the ongoing regulatory pressure. However, CoCo bond investors are assumed to be primarily fixed-income security investors who are less equipped to manage large losses than equity holders and may want to avoid equity conversions (Avdjiev et al., 2015). Otherwise, they can be forced to internalise the negative consequences of the poor performance of companies which induces CoCo bonds to convert (Ammann et al., 2017). Hence, our fourth hypothesis is the following:

*H4: A CoCo bond's trigger level is negatively (positively) associated with its buyer's (seller's) preferences.*

The current equity–capital eligibility regulations do not distinguish between CoCo bonds with different loss absorption mechanisms, i.e. mechanical equity conversion and principal write–down. CoCo bonds with mechanical equity conversion have been dominating over the principal write–down ones but the demand for the latter has been increasing over time for two possible reasons. First, fixed–income investors have mandates which often restrict them from holding CoCo bonds with mechanical equity conversions, while CoCo bonds using principal write–down mechanism do not fall into this category. Second, CoCo bonds with the principal write–down feature involve less uncertainty about the payoff after the trigger level is broken through, which may facilitate their pricing and risk management (Avdjiev et al., 2015). On the other hand, CoCo bond issuers may prefer those with mechanical equity conversion feature since they are cheaper to use than those with the principal write–down feature and still satisfy the necessary condition for regulatory capital eligibility under Basel III (Avdjiev et al., 2013). This leads to the following fifth hypothesis:

*H5: A CoCo bond's mechanical equity conversion feature is negatively (positively) associated with its buyer's (seller's) preferences.*

Providing CoCo bonds' credit ratings has been a challenge for the credit rating agencies for three main reasons. First, the different regulatory treatment of CoCo bonds across jurisdictions makes it difficult to have consistent rating methodologies. Second, high–trigger CoCo bonds have the potential to cause more losses for CoCo bond holders ahead of the issuing bank's equity holders, which inverts the traditional hierarchy of investors and is an additional possibility the credit rating agencies need to consider. Third, the existence of the principal write–down feature (the discretionary trigger) creates valuation uncertainty, further complicating the rating process (Avdjiev et al., 2013).

For the CoCo bonds not to convert, these should have high credit ratings which their investors would prefer to avoid internalising possible losses from the issuing companies. On the other hand, banks prefer issuing CoCo bonds when they feel a strong need to increase their bankruptcy protection, especially when their credit ratings are low. Therefore, our sixth hypothesis is the following:

*H6: A CoCo bond's credit rating is positively (negatively) associated with its buyer's (seller's) preferences.*

Therefore we control for the issuing bank's characteristics (size, price-to-book ratio, regulatory capital ratio ( $\frac{\text{total regulatory capital}}{\text{total risk weighted assets}}$ ) and leverage ( $\frac{\text{total debt}}{\text{total asset}}$ ) and underlying economic conditions (real GDP, inflation and unemployment rate).

#### 4. Methodology

We assume that CoCo bond buyers prefer a higher bid YTM (yield-to-maturity) than the corresponding ask YTM and that the opposite holds for sellers. Both buyers and sellers dislike risk, the CDS spread being the most appropriate risk measure for CoCo bonds according to the existing literature. Therefore logistic regressions can be run, where the dependent variables  $P_{\text{buyer}}$  (CoCo bond buyers' preference score) and  $P_{\text{seller}}$  (CoCo bond sellers' preference score) are defined as  $\frac{\text{CoCo Bond Bid YTM} - \text{CoCo Bond Ask YTM}}{\text{CDS Spread}}$  and  $\frac{\text{CoCo Bond Ask YTM} - \text{CoCo Bond Bid YTM}}{\text{CDS Spread}}$  respectively; these are compared to the corresponding median values for buyers and sellers, and take value one if greater than the median and zero otherwise. The estimated regressions are the following:

$$P_{\text{buyer}} \left( \frac{y_{\text{CoCo Bond Bid YTM} - \text{CoCo Bond Ask YTM}}{\text{CDS Spread}} \right) = \frac{e^{\beta_0 + \beta_1 \times \text{CoCo\_Char} + \beta_2 \times \text{Firm\_Control} + \beta_3 \times \text{Economic\_Control}}}{1 + e^{\beta_0 + \beta_1 \times \text{CoCo\_Char} + \beta_2 \times \text{Firm\_Control} + \beta_3 \times \text{Economic\_Control}}} \quad (1)$$

$$P_{\text{seller}} \left( \frac{y_{\text{CoCo Bond Ask YTM} - \text{CoCo Bond Bid YTM}}{\text{CDS Spread}} \right) = \frac{e^{\beta_0 + \beta_1 \times \text{CoCo\_Char} + \beta_2 \times \text{Firm\_Control} + \beta_3 \times \text{Economic\_Control}}}{1 + e^{\beta_0 + \beta_1 \times \text{CoCo\_Char} + \beta_2 \times \text{Firm\_Control} + \beta_3 \times \text{Economic\_Control}}} \quad (2)$$

The CoCo bond characteristics considered are coupon (%), maturity (this is a binary variable equal to one if permanent and zero otherwise), the amount issued (million US\$), the trigger level (%), conversion (this is a binary variable that equals one in the event of mechanical equity conversion and zero in the event of a permanent write-down, a partial permanent write-down and a temporary write-down) and credit rating (the average credit rating among Moody, S&P and Fitch ratings where each credit rating increment is 1, and the highest (Aaa, AAA) and lowest (Ca, CCC and below) credit ratings are 19 and 0 respectively). As for the CoCo bond issuing firm characteristics, these include return on common equity (ROE), firm

size (the natural logarithm of the firm's total assets), price-to-book value ratio (P/B ratio), total regulatory capital to risk-weighted asset (TRC/RWA) and total debt to total asset (TD/TA). Finally, the economic control variables added to the regressions are real GDP (%), consumer price index (CPI) and unemployment rate (%).

We estimate preference scores for CoCo bonds taking into account country-specific market competitiveness using the Herfindahl index and the issuing or holding CoCo bond amount for each financial firm. We first derive the Herfindahl indices for CoCo bond buyers and sellers in each country assuming that the total number of firms within a country is  $N$  as shown in equation (3) and (4) below. High (low) values of (3) and (4) indicate high (low) concentration (degree of competition) of the CoCo bond market in country  $j$ .

$$S_{\text{country } j}^{\text{buyer}} = \sum_{i=1}^N \left( \frac{\text{holding CoCo bond amount}_{\text{firm } i, \text{country } j}}{\text{holding CoCo bond amount}_{\text{country } j}} \right)^2 \quad (3)$$

$$S_{\text{country } j}^{\text{seller}} = \sum_{i=1}^N \left( \frac{\text{issued CoCo bond amount}_{\text{firm } i, \text{country } j}}{\text{issued CoCo bond amount}_{\text{country } j}} \right)^2 \quad (4)$$

We assume that in a highly competitive CoCo bond market both buyers and sellers have stronger trading power. We use the total CoCo bond issue size for all  $N$  firms in country  $j$  as a measure for the CoCo bond market concentration (or degree of competition) in that country as in equation (3) and (4) above; the inverse of the Herfindahl index increases with the degree of competition of the CoCo bond market in country  $j$ . The preference scores are then rescaled using the CoCo bond market size of each country relative to the world's by dividing the CoCo bond stock issued by country  $j$  by that of the world,  $\frac{\text{Coco bond issued amount}_{\text{country } j}}{\text{Coco bond issued amount}_{\text{world}}}$ . The newly calculated CoCo bond preference scores are therefore those specified in equation (5) and (6):

$$P_{\text{buyer, country } j}^{\text{preference score}} = P_{\text{buyer}} \left( \frac{y_{\text{CoCo Bond Bid YTM}} - \text{CoCo Bond Ask YTM}}{\text{CDS Spread}} \right) \times \underbrace{\frac{1}{S_{\text{country } j}^{\text{buyer}}} \times \frac{\text{Coco bond issued amount}_{\text{country } j}}{\text{Coco bond issued amount}_{\text{world}}}}_{\text{buyers' market power score for country } j} \quad (5)$$

$$P_{\text{seller, country } j}^{\text{preference score}} = P_{\text{seller}} \left( \frac{y_{\text{CoCo Bond Ask YTM}} - \text{CoCo Bond Bid YTM}}{\text{CDS Spread}} \right) \times \underbrace{\frac{1}{S_{\text{country } j}^{\text{seller}}} \times \frac{\text{Coco bond issued amount}_{\text{country } j}}{\text{Coco bond issued amount}_{\text{world}}}}_{\text{sellers' market power score for country } j} \quad (6)$$

It should be immediately apparent that a country's CoCo bond preference scores are higher when its markets are highly competitive and its average trading volumes are higher than the world's.

## 5. Data and Empirical Results

### 5.1 Data Sources and Description

We collect CoCo bond data from Bloomberg between May 11, 2009 and March 19, 2018 using the SRCH@COCO command. We exclude the matured and cancelled ones, which yields an initial sample of 545 CoCo bonds from all over the world. Then we select those with the loss-absorbing property, which leaves 519 CoCo bonds from 29 countries including their corresponding issuing firm tickers. The CoCo bond's characteristics considered are: coupon (CPN in %), maturity (MAT: a binary variable showing one if permanent and zero otherwise), amount issued (AMT in million US \$), trigger level (TRI in %), conversion (CON: a binary variable that equals one in the event of mechanical equity conversion and zero in the event of principal write-down including permanent write-down, partial permanent write-down and temporary write-down) and credit rating (CRD: the average credit rating among Moody, S&P and Fitch ratings where each credit rating increment is 1, with 19 being the highest (Aaa, AAA) and 0 the lowest (Ca, CCC or below)). As for the CoCo bond issuing firm characteristics and economic control variables, we also collect the data from Bloomberg and use the 6 months lagged ones vis-à-vis the CoCo bond data to avoid hindsight bias. The CoCo bond characteristics considered are: return on common equity (ROE), firm size (SIZE: the natural logarithm of the firm's total asset), price-to-book value ratio (P/B), total regulatory capital to risk-weighted asset (TRC/RWA) and total debt to total asset (TD/TA). The economic control variables used are real GDP (RGDP in yearly percentage change), the consumer price index (CPI in yearly percentage change) and the unemployment rate (UEM in %); the dependent variables in equations (1), (2), (5) and (6) are  $\frac{\text{Bid Yield to Maturity} - \text{Ask Yield to Maturity}}{\text{CDS Spread}}$  and  $\frac{\text{Ask Yield to Maturity} - \text{Bid Yield to Maturity}}{\text{CDS Spread}}$  for the CoCo bond buyer (BUY\_SCORE) and seller's (SELL\_SCORE) preference scores, respectively, where the score is one if greater or equal to the median for all CoCo bonds and zero otherwise. Table 1 shows summary statistics for the variables used for the analysis.

[Insert Table 1]

Most CoCo bonds have coupon rates between 6% and 7%, permanent maturities (about 81%), a trigger level around 5% and 6%, credit ratings between Ba2/BB/BB and Ba1/BB+/BB+ according to Moody/S&P/Fitch credit ratings, and 32% have the equity conversion property, while the remaining 68% have principal write-down features. Most of the variables in our sample do not exhibit a large difference between the mean and the median and have relatively non-skewed distributions, except for CPI and the preference scores of CoCo bond buyers and sellers. The mean of CPI (5.05) is much larger than its median (0.30), there is a clustering of low CPI values, and the distribution is right-skewed. On the other hand, the preference scores of buyers and sellers have mean values of 0.50 that are only half of their medians (1.00), exhibit clustering of high preference score values, and the distribution is left-skewed.

## 5.2 Empirical Results

CoCo bonds generally have higher coupons than other types of bonds (Avdjiev et al., 2015) since they provide a tax shield benefit that reduces funding costs and provides a cost advantage over common equity (Ammann et al., 2017). Table 2 displays the results from the preference score logistic regression analysis.<sup>1</sup> It appears that CoCo bond buyers prefer higher coupons (CPN = 0.51), whilst sellers do not (CPN = -0.501), which is consistent with our hypothesis H1. Further, the impact of the coupon is stronger for buyers compared to sellers as implied by the absolute values of the respective coefficients (Table 3). This indicates that it is still worthwhile for sellers to consider increasing the coupon rates since CoCo bond buyers are more sensitive to an increase compared to sellers.

Buyers prefer no additional CoCo bonds to be issued since their ownership is diluted with an increased number of CoCo bond investors, who are potential shareholders when CoCo bonds are converted into common equity. In fact, we find a negative impact of the CoCo bond amount issued (AMT = -0.00164) on the buyers' preference score (Table 2). On the other hand, CoCo bond sellers prefer more CoCo bonds (AMT = 0.0017) to be issued despite the high coupon rates, because they have a cost advantage over equity owing to their tax shield, can avoid debt overhang, reduce a bank's default probability, and represent a positive signal for equity holders according to the pecking order theory (Ammann et al., 2017). Therefore, we find that the effect of the issued amount on buyers and sellers' preferences is consistent with H3. Moreover, the CoCo bond issue size appears to affect

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<sup>1</sup> The variance inflation factor (VIF) test reported in Appendix I indicates that the logistic regressions are not affected by multi-collinearity.



sellers slightly more than buyers as shown by the absolute value of the AMT coefficients in Table 3.

A high credit rating of CoCo bonds is preferred by buyers ( $CRD = 0.89$ ) since CoCo bonds force shareholders to internalise the negative consequences of their company's poor performance when they convert (Flannery, 2015; Ammann et al., 2017). By contrast, sellers do not prefer a high credit rating for their CoCo bonds ( $CRD = -0.824$ ) because it might be unnecessary to issue CoCo bonds if their financial condition is already stable enough. Thus, our results are consistent with H6. Overall, buyers seem to be more sensitive than sellers to the credit rating. Therefore, it may be worthwhile for the CoCo bond-issuing firms (the sellers) to consider increasing their CoCo credit rating since buyers may react more than sellers (Table 3). On the other hand, other CoCo bond characteristics including maturity, trigger level and conversion mechanism do not have a significant impact on the preference scores (Table 2), consistently with H2, H4 and H5, respectively.

As for the issuing firm characteristics, we find that buyers prefer the CoCo bond issuing banks to be sound ( $TRC/RWA = 0.208$ ), profitable ( $ROE = 0.121$ ) and undervalued ( $P/B = -3.482$ ), whilst the opposite holds for sellers ( $TRC/RWA = -0.232$ ,  $ROE = -0.143$ ,  $P/B = 3.61$ ). In other words, buyers perceive CoCo bonds primarily as a bankruptcy protection device which satisfies financial regulations and prefer the issuing bank to be financially sound and profitable. On the other hand, sellers (the issuing banks) prefer to issue CoCo bonds when they have less regulatory capital to protect themselves from bankruptcy and their financial outlook is less promising. By contrast, the underlying economic conditions (RGDP, CPT and UEM) generally do not have a significant effect on the preference scores of buyers and sellers (Table 2). The issuing bank characteristics and CoCo bond issued amount have a stronger impact on sellers than on buyers and the opposite holds for the coupon and credit rating of CoCo bonds (Table 3).

[Insert Table 2]

[Insert Table 3]

In Figure 1, we show the incremental effect of the significant factors from Table 2 including CPN, AMT, CRD, ROE, P/B and TRC/RWA on the CoCo bond buyer and seller's preference scores. In general, we find a diminishing marginal impact of these factors (in particular in the case of CPN, CRD, P/B and TRC/RWA). The buyer and seller graphs have

almost symmetric shapes, but there are slight differences reflecting those in the absolute values shown in Table 3.

[Insert Figure 1]

In Table 4, we analyse for each country the CoCo bond average preference responses to the increments of the significant factors (CPN, AMT, CRD, ROE, P/B and TRC/RWA) by considering country-specific CoCo bond market competitiveness using equations (5) and (6). We show this for buyers (Panel A), sellers (Panel B), and buyers plus sellers (Panel C). We find that the country average preference responses are non-positive for buyers and non-negative for sellers, and for buyers as well as sellers the most important factor is the price-to-book ratio (P/B). In other words, both buyers and sellers are most sensitive to the valuation of the issuing banks. The credit rating (CRD) of CoCo bonds appears to be the second most important factor after the country average preference responses to CoCo bonds. The CRD has the opposite impact on the preference scores compared to P/B. The large impact of P/B and CRD implies that the soundness of the issuing bank is the most important factor affecting the preferences of CoCo bond buyers and sellers. Geographically, we find that most European countries (France, Ireland, Luxemburg, Netherlands and Switzerland, Italy and Spain, Denmark, Sweden and United Kingdom), Brazil, Mexico and China have relatively high CoCo bond buyer and seller's preference scores given the significant CoCo bond (CPN, AMT and CRD) and issuing bank (ROE, P/B and TRC/TWA) characteristics. In particular, the UK and China are the two countries with the strongest responses of both buyers and sellers (see Table 4, Appendix II, III and IV).

[Insert Table 4]

## 6. Conclusions

This paper estimates the preference scores of CoCo bond buyers and sellers by running logistic regressions taking into account both bond and issuing bank's characteristics, unlike the few existing CoCo bond event studies that only focus on general equity holders. It also provides evidence on the role of country-specific CoCo bond market concentration.

More specifically, we use CoCo bond data between May 11, 2009 and March 19, 2018 excluding the matured and cancelled ones. We find that buyers (sellers) prefer CoCo bonds with high (low) coupons, small (large) issuance and high (low) credit ratings, and also

issuing banks with high (low) total regulatory capital to risk-weighted asset ratio, high (low) return on common equity and low (high) price-to-book ratio. In other words, buyers prefer CoCo bonds to be less likely to convert into equity, since this would force them to internalise the poor performance of the issuing banks. Therefore, they prefer the latter to be sound, profitable and undervalued. On the other hand, sellers prefer to issue CoCo bonds when they need bankruptcy protection given their low regulatory capital and less promising financial outlooks. Coupons and credit ratings are the main variables affecting the preferences of CoCo bond buyers, while the issue size and the issuing bank's ROE, P/B ratio and total regulatory capital to risk-weighted asset ratio have the most significant impact on the preferences of sellers.

We also consider the country-specific CoCo bond market concentration (by calculating Herfindahl indices for each country using the CoCo bond issue size for each bank) assuming that higher market competition yields stronger trading power for both buyers and sellers. We find that both categories are very responsive to CoCo bond and issuing bank's characteristics in most European countries, Brazil, Mexico and China, especially in the UK and China. These findings are relevant to both regulators and investors interested in understand the conflicting preferences of CoCo bond buyers and sellers, their determinants, and their geographical features.

## References

Abhyankar, A. and A. Dunning, 1999, Wealth effects of convertible bond and convertible preference share issues: An empirical analysis of the UK market, *Journal of Banking and Finance*, 23 (7), 1043–1065.

Admati, A. R., P.M. DeMarzo, M.F. Hellwig, M.F. and P.C. Pfleiderer, 2013, Fallacies, Irrelevant Facts, and Myths in the Discussion of Capital Regulation: Why Bank Equity is Not Socially Expensive [Research Paper 13-7], Stanford University Graduate School of Business.

Albul, B., D.M. Jaffee, and A. Tchisti, 2013, Contingent capital debt and capital structure decisions [Working paper], UC Berkeley: Hass School of Business.

Ammann, M., K. Blickle, and C. Ehmann, 2017, Announcement Effects of Contingent Convertible Securities: Evidence from the Global Banking Industry, *European Financial Management*, 23, 127–152.

Ammann, M., M. Fehr, and R. Seiz, 2006, New evidence on the announcement effect of convertible and exchangeable bonds, *Journal of Multinational Financial Management*, 16, 43–63.

Avdjiev, S., A. Kartasheva, and B. Bogdanova, 2013, CoCos: A primer. *BIS Quarterly Review*.

Avdjiev, S., P. Bolton, W. Jiang, A. Kartasheva, and B. Bogdanova, 2015, CoCo bond issuance and bank funding costs [Working paper], BIS and Columbia University.

Baily, M.N., J.Y. Campbell, J.H. Cochrane, D.W. Diamond, D. Duffie, K.R. French, A.K. Kashyap, F.S. Mishkin, R. Rajan, D.S. Scharfstein, R.J. Shiller, M.J. Slaughter, H.S. Shin, J. Stein, and R.M. Stulz, 2013, Aligning incentives at systemically important financial institutions: A proposal by the Squam Lake Group, *Journal of Applied Corporate Finance*, 25 (4), 37–40.

Bechmann, K.L., A. Lunde, and A.A. Zebedee, 2014, In- and out-of-the-money convertible bond calls: Signaling or price pressure, *Journal of Corporate Finance*, 24, 135–148.

Birchler, U.W. and M. Facchinetti, 2007, Self-destroying prophecies? The endogeneity pitfall in using market signals as triggers for prompt corrective action [Task force paper], BIS Research.

Bond, P., I. Goldstein, and E. Prescott, 2010, Market-based corrective actions, *Review of Financial Studies*, 23 (2), 781–820.

Brick, I.E., O. Palmon, and D.K. Patro, 2007, Stock Price Response to Calls of Convertible Bonds: Still a Puzzle? *Financial Management*, 36, pp. 1–21.

Burlacu, R., 2000, New evidence on the pecking order hypothesis: the case of French convertible bonds, *Journal of Multinational Financial Management*, 10, 439–459.

Calomiris, C.W. and R.J. Herring, 2013, How to design a contingent convertible debt requirement that helps solve my too-big-to-fail problem, *Journal of Applied Corporate Finance*, 25 (2), 39-62.

Chandra, U. and N. Nayar, 2008, The information content of private debt placements, *Journal of Business Finance and Accounting*, 35 (9-10), 1164–1195.

Chen, N., P. Glasserman, B. Nouri, and M. Pelger, 2013, CoCos, bail-in, and tail risk [Working paper #0004], Office of Financial Research.

Christensen, D.G., H.J. Faria, C.C.Y. Kwok, and M. Bremer, 1996, Does the Japanese stock market react differently to public security offering announcements than the US stock market? *Japan and the World Economy*, 8 (1), 99–119.

Corcuera, J.M., J. De Spiegeleer, J. Fajardo, H. Jönsson, W. Schoutens, and A. Valdivia, 2014, Close form pricing formulas for coupon cancellable CoCos, *Journal of Banking and Finance*, 42, 339–351.

Dann, L.Y. and W.H. Mikkelson, 1984, Convertible debt issuance, capital structure change and financing-related information. Some new evidence, *Journal of Financial Economics*, 13 (2), 157–186.

Davis, D., O. Korenok, and E.S. Prescott, 2014, An experimental analysis of contingent capital with market-price triggers, *Journal of Money, Credit and Banking*, 46 (5), 999–1033.

Davis, D., E. Prescott, and O. Korenok, 2011, Market-based corrective actions: An experimental investigation [Working paper 11-01], Federal Reserve Bank of Richmond.

J. De Spiegeleer, W. Schoutens, and C. Van Hulle, 2014, *The handbook of hybrid securities. Convertible bonds, CoCo bonds, and bail-in*, John Wiley & Sons Ltd.

Dong, M., D. Hirshleifer, and S.H. Teoh, 2012, Overvalued equity and financing decisions, *Review of Financial Studies*, 25, 3645–3683.

Duca, E., M. Dutordoir, C. Veld, and P. Verwijmeren, 2012, Why are convertible bond announcements associated with increasingly negative issuer stock returns? An arbitrage-based explanation, *Journal of Banking and Finance*, 36, 2884–2899.

Dutordoir, M., H. Li, F.H. Liu, and P. Verwijmeren, 2016, Convertible bond announcement effects: Why is Japan different? *Journal of Corporate Finance*, 37, 76–92.

Dutordoir, M., N. Strong, and M.C. Ziegan, 2014, Does corporate governance influence convertible bond issuance? *Journal of Corporate Finance*, 24, 80–100.

Dutordoir, M. and L. Van de Gucht, 2007, Are there windows of opportunity for convertible debt issuance? Evidence for Western Europe, *Journal of Banking and Finance*, 31 (9), 2828–2846.

Eckbo, B.E., 1986, Valuation effects of corporate debt offerings, *Journal of Financial Economics*, 15 (1-2), 119–151.

Fields, L.P. and E.L. Mais, 1991, The valuation effects of private placements of convertible debt, *The Journal of Finance*, 46 (5), 1925–1932.

Flannery, M.J., 2005, No pain, no gain? Effecting market discipline via “reverse convertible debentures, in Scott, H.S. (ed.) *Capital adequacy beyond Basel: Banking, securities, and insurance*. Oxford University Press.

Flannery, M.J., 2009, Stabilizing large financial institutions with contingent capital certificates [Research paper 04], CAREFIN.

Fox, J. and S. Weisberg, 2013, Robust regression, Available at: <http://users.stat.umn.edu/~sandy/courses/8053/handouts/robust.pdf>, (Accessed: 12 May 2017)

Glasserman, P. and B. Nouri, 2012, Contingent capital with a capital-ratio trigger, *Management Science*, 58 (10), 1816–1833.

Gründl, H. and T. Niedrig, 2015, The effects of contingent convertible (CoCo) bonds on insurers’ capital requirements under Solvency II, *The Geneva Association’s Insurance and Finance Newsletter*.

Grundy, B.D., C. Veld, P. Verwijmeren, and Y. Zabolotnyuk, 2014, Why are conversion-forcing call announcements associated with negative wealth effects? *Journal of Corporate Finance*, 24, 149–157.

Himmelberg, C.P. and S. Tsyplakov, 2012, Pricing contingent capital bonds: Incentives matter [Working paper], University of South Carolina.

Howton, S.D., S.W. Howton, and S.B. Perfect, 1998, The market reaction to straight debt issues: The effects of free cash flow, *The Journal of Financial Research*, 21 (2), 219–228.

Jaworskia, P., K. Liberadzki, M. Liberadzki, 2017, How does issuing contingent convertible bonds improve bank's solvency? A Value-at-Risk and Expected Shortfall approach, 60, 162–168.

Johnson, S.A., 1995., Dividend payout and the valuation effects of bond announcements, *Journal of Financial and Quantitative Analysis*, 30 (3), 407–423.

Kang, J.K., Y.C. Kim, J. Park, and R.M. Stulz, 1995, An analysis of the wealth effects of Japanese offshore dollar denominated convertible and warrant bond issues, *The Journal of Financial and Quantitative Analysis*, 30 (2), 257–270.

Koziol, C. and J. Lawrenz, 2012, Contingent convertibles. Solving or seeding the next banking crisis? *Journal of Banking and Finance*, 36 (1), 90–104.

Li, H., H. Liu, and A. Siganos, 2016, A comparison of the stock market reactions of convertible bond offerings between financial and non-financial institutions: Do they differ?, *International Review of Financial Analysis*, 45, 356–366.

Liao, Q., S. Mehdian, and R. Rezvanian, 2016, An examination of investors' reaction to the announcement of CoCo bonds issuance: A global outlook, *Finance Research Letters*, (In Press, Corrected Proof, available online December 31 2016).

MacKinlay, A.C., 1997, Event Studies in Economics and Finance, *Journal of Economic Literature*, 35 (1), 13–39.

Magennis, D., E. Watts, E. and S. Wright, 1998, Convertible notes: The debt versus equity classification problem, *Journal of Multinational Financial Management*, 8, 303–315.

Martynova, N. and E. Perotti, 2012, Convertible bond and bank risk-taking, Working paper, Available on SSRN.

McDonald, R., 2013, Contingent capital with a dual price trigger, *Journal of Financial Stability*, 9 (2), 230–241.

Mikkelson, W.H. and M.M. Partch, 1986, Valuation effects of security offerings and the issuance process, *Journal of Financial Economics*, 15 (1-2), 31–60.

Pennacchi, G., 2010, A Structural Model of Contingent Bank Capital [Working Paper 10-04], Federal Reserve Bank of Cleveland.

Pennacchi, G., T. Vermaelen, and C.C.P. Wolff, 2014, Contingent capital: The case for COERCS, *Journal of Financial and Quantitative Analysis*, 49 (3), 541–574.

Raviv, A., 2004, Bank stability and market discipline: Debt-for-equity swap versus subordinated notes [Working paper], Hebrew University Business School.

Shyam-Sunder, L., 1991, The stock price effect of risky versus safe debt', *Journal of Financial and Quantitative Analysis*, 26 (4), 549–558.

Song, D. and Z. Yang, 2016, Contingent capital, real options, and agency costs, *International Review of Finance*, 16 (1), 3–40.

Squam Lake Working Group, 2009, An expedited resolution mechanism for distressed financial firms: Regulatory hybrid securities, Council on Foreign Relations.

Sundaresan, S. and Z. Wang, 2015, On the design of contingent capital with a market trigger, *The Journal of Finance*, 70 (2), 881–920.

Vallee, B., 2016, Call me maybe? The effect of exercising contingent capital [Working paper], Harvard Business School.

Yang, Z. and Z. Zhao, 2015, Valuation and analysis of contingent convertible securities with jump risk, *International Review of Financial Analysis*, 41, 124–135.

Yang, Z. and Z. Zhao, 2014, Contingent capital with repeated interconversion between debt and equity. Available at: <https://ssrn.com/abstract=2200883>, (Accessed: 8 September 2014).



**Table 1. Summary statistics**

The following table shows the summary statistics for the CoCo bonds in the sample (between May 11, 2009 and March 19, 2018 excluding the matured and cancelled ones), their issuing firms and the underlying economic characteristics. The CoCo bond characteristics considered are: coupon (CPN in %), maturity (MAT: a binary variable showing one if permanent and zero otherwise), amount issued (AMT in million US \$), trigger level (TRI in %), conversion (CON) and credit rating (CRD). The CoCo bond issuing firm characteristics included are: return on common equity (ROE), firm size (SIZE), price-to-book value ratio (P/B), total regulatory capital to risk-weighted asset (TRC/RWA) and total debt to total asset (TD/TA). The economic control variables are real GDP (RGDP in yearly percentage change), consumer price index (CPI in yearly percentage change) and unemployment rate (UEM in %). For our dependent variables, we use  $\frac{\text{Bid Yield to Maturity} - \text{Ask Yield to Maturity}}{\text{CDS Spread}}$  and  $\frac{\text{Ask Yield to Maturity} - \text{Bid Yield to Maturity}}{\text{CDS Spread}}$  for CoCo bond buyer (BUY\_SCORE) and seller's (SELL\_SCORE) preference scores, respectively; these are equal to one if greater or equal to the medians of the overall CoCo bonds and zero otherwise. We report the mean, median, standard deviation (Std.), 75<sup>th</sup> percentile, 25<sup>th</sup> percentile and total number of observations (*N*).

	Mean	Median	Std.	75 <sup>th</sup> Percentile	25 <sup>th</sup> Percentile	<i>N</i>
Coupon (CPN)	6.61	6.25	2.36	8.00	5.00	517
Maturity (MAT)	0.81	1.00	0.40	1.00	1.00	519
Amount issued (AMT)	827.82	500.00	1047.53	1250.00	80.39	519
Trigger level (TRI)	5.41	5.13	1.15	5.50	5.13	519
Credit rating (CRD)	8.48	9.00	2.22	10.00	7.50	519
Conversion (CON)	0.32	0.00	0.47	1.00	0.00	519
ROE	7.25	7.12	7.11	10.89	3.17	519
Firm size (SIZE)	12.43	12.99	2.15	13.94	11.34	519
P/B ratio (P/B)	1.03	0.86	0.64	1.22	0.72	519
TRC/RWA	16.03	15.63	3.63	18.20	13.35	519
TD/TA	30.62	30.51	16.17	37.16	18.31	519
Real GDP (RGDP)	1.88	1.90	3.36	3.00	0.90	519
CPI	5.05	0.30	23.05	0.70	0.00	515
Unemployment rate (UEM)	6.99	6.30	4.00	8.00	4.20	519
Buyer's preference score (BUY_SCORE)	0.50	1.00	0.50	1.00	0.00	519
Seller's preference score (SELL_SCORE)	0.50	1.00	0.50	1.00	0.00	519

**Table 2. CoCo bond buyer and seller's preference score logistic regression analysis**

The following table presents the logistic regression analyses with CoCo bond buyer and seller's preference scores as dependent variables and CoCo bond (between May 11, 2009 and March 19, 2018 excluding the matured and cancelled ones), its issuing bank and economic characteristics as independent variables. The CoCo bond characteristics we consider are coupon (CPN in %), maturity (MAT: a binary variable showing one if permanent and zero otherwise), amount issued (AMT in million US \$), trigger level (TRI in %), conversion (CON) and credit rating (CRD). The CoCo bond-issuing firm characteristics included are return on common equity (ROE), firm size (SIZE), price-to-book value ratio (P/B), total regulatory capital to risk-weighted asset (TRC/RWA) and total debt to total asset (TD/TA). The economic control variables are real GDP (RGDP in yearly percentage change), consumer price index (CPI in yearly percentage change) and unemployment rate (UEM in %). For our dependent variables, we use  $\frac{\text{Bid Yield to Maturity} - \text{Ask Yield to Maturity}}{\text{CDS Spread}}$  and  $\frac{\text{Ask Yield to Maturity} - \text{Bid Yield to Maturity}}{\text{CDS Spread}}$  for CoCo bond buyer (BUY\_SCORE) and seller's (SELL\_SCORE) preference scores, respectively; these are equal to one if greater or equal to the medians of the overall CoCo bonds and zero otherwise. We report  $\chi^2$  and  $R^2$  as our goodness-of-fit measures and  $N$  as the total number of observations. \* stands for significance at the 10% level, \*\* at the 5% level and \*\*\* represents at the 1% level.

		Buyer's preference score	Seller's preference score
	(Intercept)	-4.136 (-0.75)	3.51 (0.633)
	CPN	0.51** (2.226)	-0.501** (-2.167)
	MAT	0.781 (0.545)	-0.454 (-0.311)
CoCo bond characteristics	AMT	-0.00164*** (-3.15)	0.0017*** (3.206)
	TRI	-0.302 (-0.781)	0.25 (0.63)
	CON	-0.828	0.68

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		(-1.19)	(0.968)
	CRD	0.89 <sup>***</sup>	-0.824 <sup>***</sup>
		(3.657)	(-3.409)
	ROE	0.121 <sup>*</sup>	-0.143 <sup>**</sup>
		(1.937)	(-2.229)
	SIZE	-0.341	0.375
		(-1.12)	(1.222)
Issuing bank characteristics	P/B	-3.482 <sup>***</sup>	3.61 <sup>***</sup>
		(-3.656)	(3.701)
	TRC/RWA	0.208 <sup>**</sup>	-0.232 <sup>***</sup>
		(2.384)	(-2.608)
	TD/TA	-0.013	0.009
		(-0.59)	(0.408)
	RGDP	0.073	-0.061
		(0.361)	(-0.296)
Economic characteristics	CPI	0.006	-0.006
		(0.312)	(-0.307)
	UEM	0.021	-0.015
		(0.302)	(-0.208)

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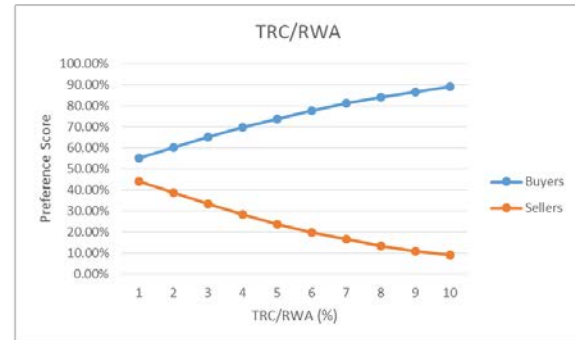
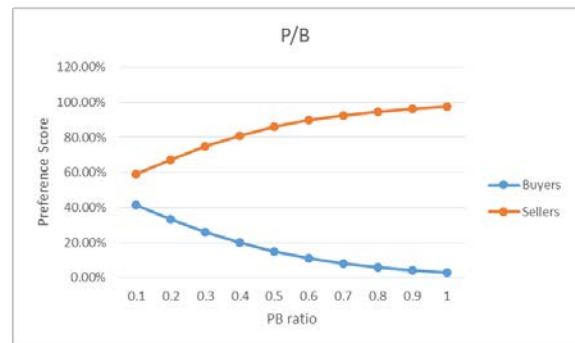
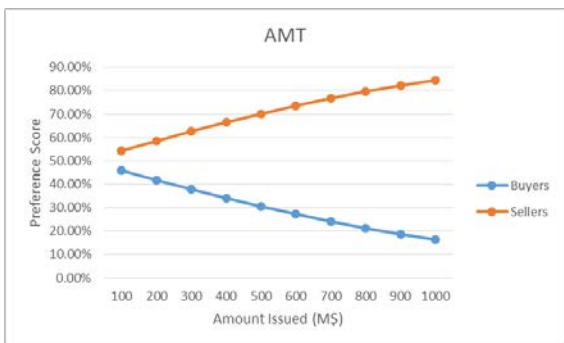
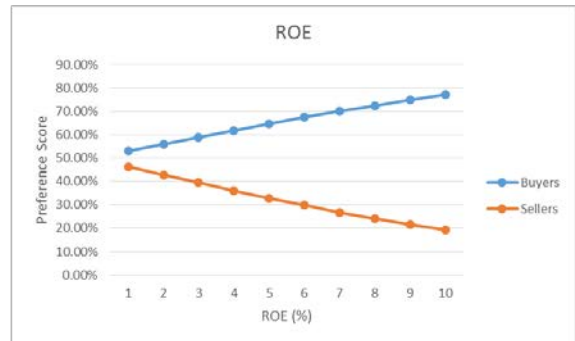
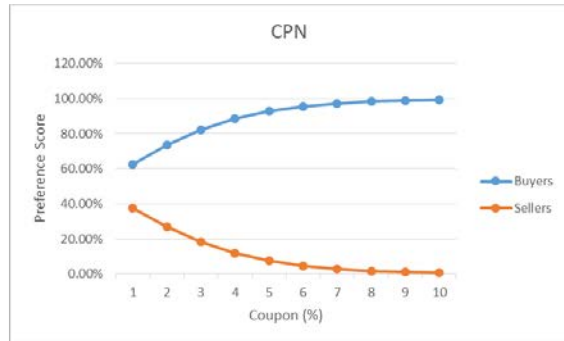
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$\chi^2$	61.11 <sup>***</sup>	61.00 <sup>***</sup>
$R^2$	0.34	0.34
$N$	519	519

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**Figure 1. CoCo bond buyer and seller's preference scores with incremental factor change**

The figures below show the CoCo bond buyer and seller's preference scores with incremental changes in coupon (Figure 1.1), amount issued (Figure 1.2), credit rating (Figure 1.3), return on common equity (Figure 1.4), price to book ratio (Figure 1.5) and total regulatory capital over risk weighted asset ratio (Figure 1.6) based on Table 2 figures.



**Table 3. Relative impact of significant factors on the CoCo bond buyer and seller's preference scores**

The following table shows the relative impact of the significant factors from Table 2 on the CoCo bond buyer and seller's preference scores. These factors include coupon (CPN), amount issued (AMT), credit rating (CRD), return on common equity (ROE), price-to-book value ratio (P/B) and total regulatory capital to risk-weighted asset (TRC/RWA) ratio. The relative impacts of factors are calculated by subtracting the absolute value of each factor's coefficients (from Table 2) of sellers from those of buyers which we show as '|BUY\_SCORE| - |SELL\_SCORE|' in the second column. If '|BUY\_SCORE| - |SELL\_SCORE|' is positive (negative) in certain factor, we report that factor to have stronger impact on the CoCo bond buyer (seller) which we show as 'Stronger impact' in the third column.

Factors	BUY_SCORE  -  SELL_SCORE	Stronger impact
CPN	0.009	Buyers
AMT	-0.00006	Sellers
CRD	0.066	Buyers
ROE	-0.022	Sellers
P/B	-0.128	Sellers
TRC/RWA	-0.024	Sellers

**Table 4. Global CoCo bond buyers and sellers' preference scores with incremental factor change**

The following tables present the incremental change in CoCo bond buyer (Panel A), seller (Panel B), and combined buyer and seller's (Panel C) global preference scores with the incremental changes in significant factors in Table 2. The CoCo bond buyer and seller's preference scores are scaled by the market power score for each country to provide country specific preference scores as in our equation (5) and (6). We report the country and factor average preference responses which are the average values across each row and column, respectively.

<b>Panel A. <math>\Delta P_{Buyer}</math></b> <b>(Preference response for the CoCo bond buyer)</b>							
Country	CPN	AMT	CRD	ROE	P/B	TRC/ RWA	Country average
Australia	3.12%	-0.01%	5.45%	0.74%	-21.33%	1.27%	<b>-1.79%</b>
Austria	1.32%	0.00%	2.30%	0.31%	-9.00%	0.54%	<b>-0.76%</b>
Belgium	1.14%	0.00%	2.00%	0.27%	-7.82%	0.47%	<b>-0.66%</b>
Brazil	31.47%	-0.10%	54.92%	7.47%	-214.86%	12.83%	<b>-18.04%</b>
China	292.45%	-0.94%	510.36%	69.39%	-1996.71%	119.28%	<b>-167.70%</b>
Colombia	0.09%	0.00%	0.16%	0.02%	-0.61%	0.04%	<b>-0.05%</b>
Cyprus	0.08%	0.00%	0.14%	0.02%	-0.56%	0.03%	<b>-0.05%</b>
Czech	0.02%	0.00%	0.04%	0.00%	-0.14%	0.01%	<b>-0.01%</b>
Denmark	4.93%	-0.02%	8.60%	1.17%	-33.65%	2.01%	<b>-2.83%</b>
Estonia	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	<b>0.00%</b>
Finland	0.05%	0.00%	0.10%	0.01%	-0.37%	0.02%	<b>-0.03%</b>
France	120.52%	-0.39%	210.32%	28.59%	-822.86%	49.15%	<b>-69.11%</b>
Germany	5.53%	-0.02%	9.66%	1.31%	-37.78%	2.26%	<b>-3.17%</b>
India	4.82%	-0.02%	8.42%	1.14%	-32.92%	1.97%	<b>-2.77%</b>
Indonesia	0.00%	0.00%	0.00%	0.00%	-0.01%	0.00%	<b>0.00%</b>
Ireland	23.75%	-0.08%	41.44%	5.63%	-162.12%	9.68%	<b>-13.62%</b>
Israel	0.61%	0.00%	1.07%	0.15%	-4.19%	0.25%	<b>-0.35%</b>
Italy	24.05%	-0.08%	41.96%	5.71%	-164.18%	9.81%	<b>-13.79%</b>
Luxembou -rg	7.72%	-0.02%	13.47%	1.83%	-52.71%	3.15%	<b>-4.43%</b>
Malaysia	1.06%	0.00%	1.85%	0.25%	-7.25%	0.43%	<b>-0.61%</b>

Mexico	9.61%	-0.03%	16.78%	2.28%	-65.64%	3.92%	<b>-5.51%</b>
Netherlands	17.16%	-0.06%	29.95%	4.07%	-117.19%	7.00%	<b>-9.84%</b>
New Zealand	0.01%	0.00%	0.02%	0.00%	-0.09%	0.01%	<b>-0.01%</b>
Norway	2.75%	-0.01%	4.79%	0.65%	-18.74%	1.12%	<b>-1.57%</b>
Portugal	0.06%	0.00%	0.11%	0.02%	-0.43%	0.03%	<b>-0.04%</b>
Spain	40.47%	-0.13%	70.62%	9.60%	-276.28%	16.50%	<b>-23.20%</b>
Sweden	14.12%	-0.05%	24.63%	3.35%	-96.38%	5.76%	<b>-8.09%</b>
Switzerland	129.91%	-0.42%	226.71%	30.82%	-886.96%	52.98%	<b>-74.49%</b>
United Kingdom	603.98%	-1.94%	1054.01%	143.30%	-4123.68%	246.33%	<b>-346.33%</b>
<b>Factor average</b>	<b>46.24%</b>	<b>-0.15%</b>	<b>80.69%</b>	<b>10.97%</b>	<b>-315.67%</b>	<b>18.86%</b>	



<b>Panel B. <math>\Delta P_{Seller}</math></b>							
<b>(Preference response for the CoCo bond seller)</b>							
Country	CPN	AMT	CRD	ROE	P/B	TRC/ RWA	Country average
Australia	-3.07%	0.01%	-5.05%	-0.88%	22.11%	-1.42%	<b>1.95%</b>
Austria	-1.29%	0.00%	-2.13%	-0.37%	9.33%	-0.60%	<b>0.82%</b>
Belgium	-1.12%	0.00%	-1.85%	-0.32%	8.10%	-0.52%	<b>0.72%</b>
Brazil	-30.91%	0.10%	-50.84%	-8.82%	222.75%	-14.32%	<b>19.66%</b>
China	-287.29%	0.97%	-472.51%	-82.00%	2070.11%	-133.04%	<b>182.71%</b>
Colombia	-0.09%	0.00%	-0.14%	-0.02%	0.63%	-0.04%	<b>0.06%</b>
Cyprus	-0.08%	0.00%	-0.13%	-0.02%	0.58%	-0.04%	<b>0.05%</b>
Czech	-0.02%	0.00%	-0.03%	-0.01%	0.15%	-0.01%	<b>0.01%</b>
Denmark	-4.84%	0.02%	-7.96%	-1.38%	34.88%	-2.24%	<b>3.08%</b>
Estonia	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	<b>0.00%</b>
Finland	-0.05%	0.00%	-0.09%	-0.02%	0.39%	-0.02%	<b>0.03%</b>
France	-118.39%	0.40%	-194.73%	-33.79%	853.10%	-54.83%	<b>75.29%</b>
Germany	-5.44%	0.02%	-8.94%	-1.55%	39.16%	-2.52%	<b>3.46%</b>
India	-4.74%	0.02%	-7.79%	-1.35%	34.13%	-2.19%	<b>3.01%</b>
Indonesia	0.00%	0.00%	0.00%	0.00%	0.01%	0.00%	<b>0.00%</b>
Ireland	-23.33%	0.08%	-38.36%	-6.66%	168.08%	-10.80%	<b>14.83%</b>
Israel	-0.60%	0.00%	-0.99%	-0.17%	4.34%	-0.28%	<b>0.38%</b>
Italy	-23.62%	0.08%	-38.85%	-6.74%	170.22%	-10.94%	<b>15.02%</b>
Luxembou -rg	-7.58%	0.03%	-12.47%	-2.16%	54.65%	-3.51%	<b>4.82%</b>
Malaysia	-1.04%	0.00%	-1.72%	-0.30%	7.52%	-0.48%	<b>0.66%</b>
Mexico	-9.44%	0.03%	-15.53%	-2.70%	68.05%	-4.37%	<b>6.01%</b>
Netherlan -ds	-16.86%	0.06%	-27.73%	-4.81%	121.50%	-7.81%	<b>10.72%</b>
New Zealand	-0.01%	0.00%	-0.02%	0.00%	0.09%	-0.01%	<b>0.01%</b>

Norway	-2.70%	0.01%	-4.44%	-0.77%	19.43%	-1.25%	<b>1.71%</b>
Portugal	-0.06%	0.00%	-0.10%	-0.02%	0.45%	-0.03%	<b>0.04%</b>
Spain	-39.75%	0.13%	-65.38%	-11.35%	286.44%	-18.41%	<b>25.28%</b>
Sweden	-13.87%	0.05%	-22.81%	-3.96%	99.92%	-6.42%	<b>8.82%</b>
Switzerland	-127.62%	0.43%	-209.89%	-36.43%	919.56%	-59.10%	<b>81.16%</b>
United Kingdom	-593.33%	2.01%	-975.85%	-169.35%	4275.26%	-274.75%	<b>377.33%</b>
<b>Factor average</b>	<b>-45.42%</b>	<b>0.15%</b>	<b>-74.70%</b>	<b>-12.96%</b>	<b>327.27%</b>	<b>-21.03%</b>	



Norway	0.05%	0.00%	0.36%	-0.12%	0.69%	-0.13%	<b>0.14%</b>
Portugal	0.00%	0.00%	0.01%	0.00%	0.02%	0.00%	<b>0.00%</b>
Spain	0.71%	0.00%	5.24%	-1.75%	10.16%	-1.90%	<b>2.08%</b>
Sweden	0.25%	0.00%	1.83%	-0.61%	3.54%	-0.66%	<b>0.72%</b>
Switzerland	2.29%	0.02%	16.81%	-5.60%	32.60%	-6.11%	<b>6.67%</b>
United Kingdom	10.66%	0.07%	78.16%	-26.05%	151.59%	-28.42%	<b>31.00%</b>
<b>Factor average</b>	<b>0.82%</b>	<b>0.01%</b>	<b>5.98%</b>	<b>-1.99%</b>	<b>11.60%</b>	<b>-2.18%</b>	

**Appendix I. Variance inflation factor (VIF) test**

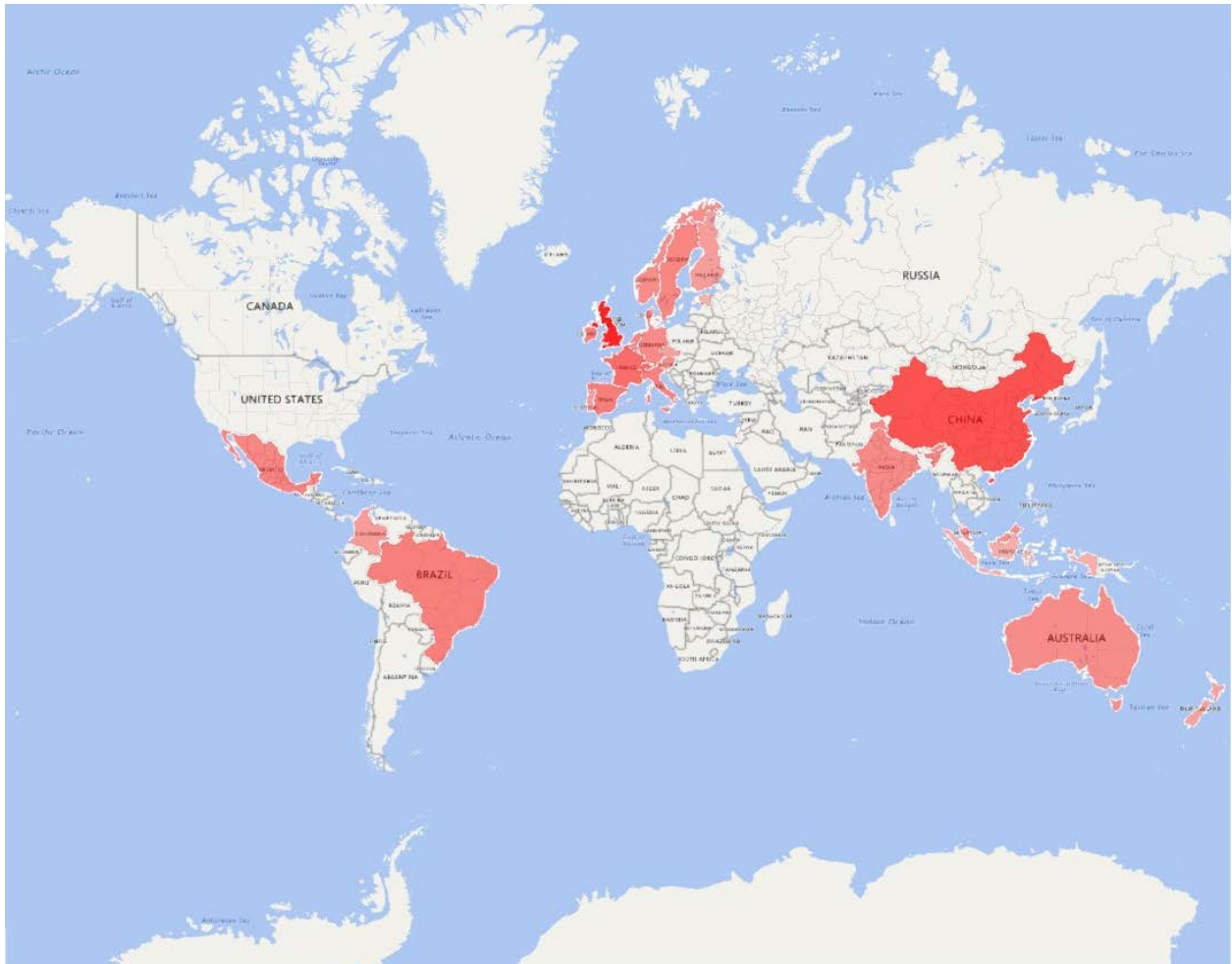
This table presents the Variance inflation factor (VIF) test results for the independent variables used in the regressions in Table 2 to identify multicollinearity problem. As a rule of thumb, the VIF values below at least 10 or 5 are assumed to be safe from problems of multicollinearity.

Variables	Buyer's preference score	Seller's preference score
CPN	1.71	1.73
MAT	1.33	1.33
AMT	1.57	1.59
TRI	2.39	2.48
CRD	2.17	2.13
CON	2.25	2.29
ROE	2.52	2.64
SIZE	1.75	1.77
P/B	3.02	3.15
TRC/RWA	1.61	1.65
TD/TA	1.48	1.48
RGDP	1.51	1.54
CPI	1.26	1.28
UEM	2.49	2.51

## Appendix II

### Country average response of the CoCo bond buyer's preference score: $\Delta P_{buyers}$

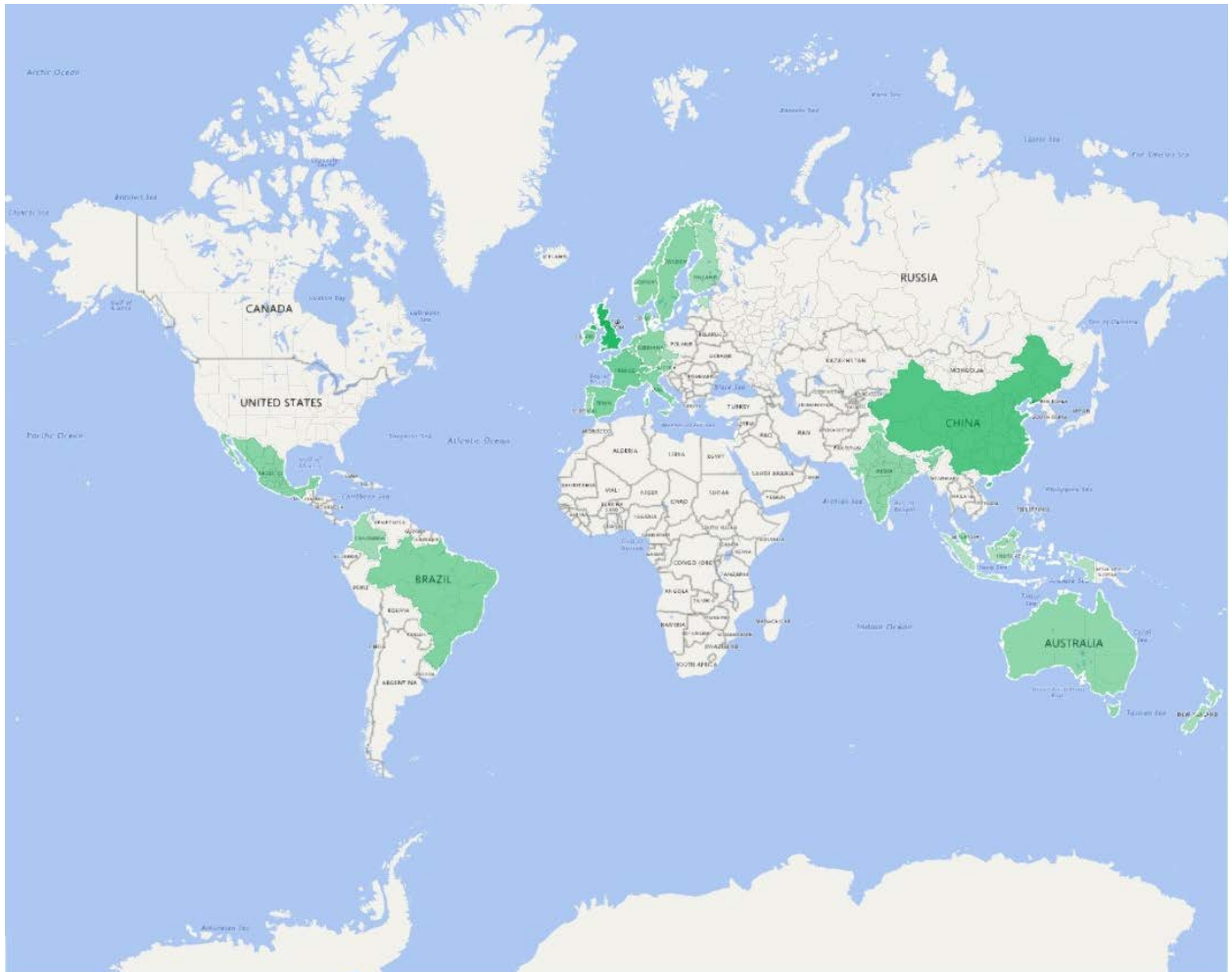
The following figure shows the country average preference responses for CoCo bond buyers and sellers in Table 3 Panel A. The darker red shade indicates larger absolute values of the country average preference response.



### Appendix III

#### Country average response of the CoCo bond seller's preference score: $\Delta P_{sellers}$

The following figure shows the country average preference response for CoCo bond buyers and sellers in Table 3 Panel B. The darker green shade indicates larger absolute values of the country average preference response.



## Appendix IV

Country average response in CoCo bond buyer and seller's combined preference score:  $\Delta P_{Buyers} + \Delta P_{Sellers}$

The following figure shows the country average preference response for both CoCo bond buyers and sellers in Table 3 Panel C. The darker purple shade indicates larger absolute values of the country average preference response.

