Bonds for all? Minimum trading units, market quality, and investor participation

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PRELIMINARY DRAFT

ABSTRACT

The requirement to trade in minimum trading units (MTU) constrains investor participation, particularly among retail traders. This paper exploits a unique natural experiment—the reduction of MTU in contingent convertible (CoCo) bonds, thereby aligning the trading rules for CoCo bonds with those for straight corporate bonds. We find that this regulatory change broadened the investor base and exerted upward pressure on prices. Specifically, we find that relative to other corporate bonds, CoCo bonds had a positive and significant CAR of approximately 0.4% surrounding the MTU reduction. This regulatory change also caused a sharp and significant increase in trading volume and liquidity, and a decrease in the yield spread and yield to maturity. To the best of our knowledge, this study is the first to examine the implications of MTU reduction in the bond market.

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1. Introduction

Minimum trading units (MTU) are restrictions that exchanges often impose on trading. This restriction can be imposed either explicitly, by specifying the MTU for a security, or by specifying the minimum size of a traded contract (Banerjee & Banerjee, 2018). Most of the empirical evidence on the impact of MTU reduction focuses on equities (Amihud, Mendelson, & Uno, 1999; Hauser & Lauterbach, 2003; Ahn, Cai, Hamao, & Melvin, 2014; Gozluklu, Perotti, Rindi, & Fredella, 2015), finding that MTU reduction improves liquidity, increases trading volume, and also has a positive price effect. In this paper, we exploit a unique case of MTU reduction in contingent convertible (CoCo) bonds, aligning their trading rules with those of straight corporate bonds. We find that MTU reduction in bonds has similar effects to those documented in equities. To the best of our knowledge, this paper provides the first evidence on the effects of MTU reductions in corporate bond markets.

A CoCo bond is a fixed-income security that can be converted to equity or permanently written off if a trigger event occurs (Galai, Raviv & Wiener, 2007; Hilscher & Raviv, 2014). In November 2015, the Bank of Israel allowed Israeli financial institutions to issue CoCo bonds to meet their capital requirement under the Basel directive.[1] The approval allowed the public offering of contingent capital bonds that will be considered Tier 2 regulatory bank capital.[2] Shortly after, in December 2015, the Tel-Aviv Stock Exchange (TASE) announced that CoCo bonds could be listed for trading in the exchange, similarly to other bonds. The only difference in CoCo trading was a distinctly high MTU. Due to the complexity of these securities, the Israeli Securities Authority (ISA) aspired to restrict retail investors' trading, as do other

[1] https://boi.org.il/en/communication-and-publications/press-releases/the-banking-supervision-department-has-has-for-the-first-time-permitted-a-bank-in-israel-to-raise-regulatory-capital-through-bonds/

[2] Teir 2 terms determine that the trigger for conversion to stocks or deletion of the CoCo bond is the occurrence of either of the following events: the bank's core capital ratio falls below a pre-determined minimum (5% in the case of Israeli regulation), or the Supervisor of Banks issues specific instructions upon a severe deterioration in the bank's condition and concerns for its stability.

regulators worldwide. Therefore, the ISA set an MTU for CoCo bonds at a face value of 50,000 Israeli shekels (ILS), in contrast to the customary MTU of 1 ILS face value applicable to other corporate bonds in auction sessions and a minimal transaction size of 10,000 ILS in continuous trading. While the explicit purpose of the high MTU set for CoCo bonds was to restrict households from trading these bonds, such restrictions may also confine trading by other investor types.

By the end of 2023, the ISA had altered its position, stating that the Israeli banking system is known for its conservatism, stability, and high level of supervision, and has shown impressive resilience during a series of financial crises in recent years. Accordingly, on November 2, 2023, the ISA announced the cancellation of the distinct MTU for CoCo bonds and aligned it with the trading rules for straight corporate bonds.[3] On December 26, 2023, the TASE announced that this change would take effect on January 7, 2024. The TASE stated that due to the high MTU, investing in CoCo bonds was difficult, and consequently the marketability of such bonds was low.[4] Notably, another step the TASE took to improve the CoCo market was to incorporate them in the bond indices, starting from February and April 2024.

We examine the consequences of the MTU reduction in corporate bonds. To analyze it, we focus on CoCo bonds during the period surrounding the announcements regarding the MTU change and its consequences, relative to two control groups: corporate bonds issued by non-banks, matched by rating and duration to the CoCo bond group, and a group of regular bank bonds issued by the same institutions that issued the CoCo bonds. We find a positive and significant abnormal return of CoCo bonds following the MTU reduction. This finding is robust

[3] See https://maya.tase.co.il/reports/details/1556131 (in Hebrew).
[4] See https://maya.tase.co.il/reports/details/1565890, https://www.tase.co.il/he/content/news-lobby/20240125_pr (in Hebrew).

to alternative methodologies and numerous specifications we use for each methodology. First, we employ an event study approach suitable for estimating events that occur at the same calendar time (e.g., Abudy, Mugerman, & Shust, 2022; Campbell, Lo, & MacKinlay, 1997). Using this approach, we document an average daily abnormal return of 0.232% on the two trading days following the MTU reduction. Next, we employ the estimation method of Bessembinder, Kahle, Maxwell, and Xu (2009), who propose an event-study approach for corporate bonds by comparing a bond's return to that of a matched portfolio of bonds with the same rating and maturity. In this approach, the matched portfolio may differ for each bond depending on its properties, and hence, the concern about correlated error terms decreases. In this approach, the CAR for the MTU reduction is 0.431% (0.375%) over the two days following this event, relative to an equally weighted (value-weighted) portfolio of matched bonds. The other events (i.e., the announcements on the MTU reduction and inclusion in the bond indices) do not exhibit abnormal returns.

Next, we examine the effect of MTU reduction on the trading volume of CoCo bonds. The trading volume is examined in several aspects, such as the number of transactions and the number of trading days without trading. We find that CoCo trading volume was lower than that of other bond groups before the MTU reduction. Following this event, the trading volume of CoCos increased significantly, while the trading volume of the other bond groups remained similar throughout the period. For example, the proportion of days without trading decreased from 38.9% before the MTU reduction to 14.3% afterward, and the daily turnover (defined as mean trading volume divided by listed capital) increased from 0.05 to 0.18. Still, even after the MTU reduction, CoCo trading volume remained lower than the other bond groups. We also examine the effect of the MTU reduction on the yield to maturity (YTM) and yield spread (YS) of the bonds. We find that following the MTU reduction, both YTM and YS decreased

significantly relative to their respective control groups. However, CoCo bonds YTM and YS remained higher.

Lastly, we examine the effect of the MTU reduction on CoCo bond liquidity. Using average daily bid-ask spreads as a proxy for liquidity, we find a significant decrease in spreads following the MTU reduction. While the spreads of the other bond groups also decreased, the increase in CoCos' liquidity was much larger. On average, CoCos' half bid-ask spreads decreased from 1.476% before the MTU reduction to 0.653% after the reduction, a decrease of more than 50%.

Previous literature regarding MTU reduction focuses mainly on equities. Amihud, Mendelson, and Uno (1999) argue that MTU reduction is the closest proxy for an increase in the investor base. They argue that a decrease in MTU should expand a security's investor base by including investors who previously did not participate in trading due to lot-size limitations. To demonstrate that, they employ Merton (1987) as a theoretical framework to analyze the implications of an increase in the investor base. The model suggests that investors limit the securities they hold in their portfolios to those they are “aware of” (or “invested in”). This behavior reduces diversification, thus leading investors to demand higher risk premiums. Indeed, their empirical findings regarding MTU reduction in equities support Merton’s predictions: using a sample of MTU reductions in Japan, where firms can determine the MTU of their stocks (subject to the exchange's minimum trading limits), they find that MTU reduction boosted investor participation and stock liquidity. Moreover, this change was associated with a 5% increase in the stock price. Ahn et al. (2014) show additional evidence on the Japanese market, finding that increased retail participation lowers the probability of informed trades and increases liquidity. Hauser and Lauterbach (2003) study equity MTU reduction in Israel and examine the second hypothesis of Merton (1987), which posits that

security prices also respond to changes in security price accuracy, and not just to changes in investor base. They find that reducing the MTU affects stock trading activity, volatility, and value. Moreover, the increase in investor base and the reduction in price volatility positively affect stock value, aligning with Merton's model. Finally, they find that the decrease in MTU may negatively affect thinly traded stocks. Gozluklu et al. (2015) examine the reduction of MTU to one share on Borsa Italiana, finding that it had improved market liquidity (an average decrease of 10.2% in relative spread following the MTU reduction). They also found indications of higher retail participation following the MTU reduction, and that the improvement in liquidity was more pronounced in stocks with tighter MTU constraints prior to the reduction. Finally, Banerjee and Banerjee (2020) examine stock futures in the National Stock Exchange of India. Focusing on the impact of algo traders, they show that the MTU restriction acts as a binding constraint for traders while optimizing trade sizes.

Examining the unique case of MTU reduction in the corporate bond market has important implications for corporate bond markets worldwide. In the US, the minimum trading size for equities is 1 share, and some brokers, such as Robinhood, allow trading in fractions of shares. In corporate bond markets, however, the typical minimum trade size is $ 1,000 in face value, which can prevent small investors and algo traders from trading. Reducing this limit may increase liquidity in US corporate bonds. Investor composition in bond markets also differs from equity markets (Bessembinder, Spatt & Venkataraman, 2020). Thus, our results can shed light on the impact MTUs have on bond markets.

Moreover, CoCo bonds are considered complex financial instruments that pose an inappropriate risk to ordinary retail investors, according to regulators such as the Financial Conduct Authority in the United Kingdom, the European Commission (which issued MiFID II

regulation), and FINRA in the US.[5] These regulators have taken various measures to protect retail investors by limiting their trading in such financial instruments. By setting the MTU to match that of ordinary bonds, the Israeli regulator is effectively the first to remove trading limitations and make CoCo bonds accessible to retail investors. As evidenced by prior literature, lowering MTU in equities has improved market quality. We show that MTU reduction has a similar effect for bonds, thus providing regulators and policymakers with evidence that a lower MTU will enhance bond trading and increase its investor base. Since bonds are often used by shareholders to discipline managers, issuing more liquid and traded Coco bonds can also lower the firm's cost of capital (Merton, 1987). As far as we know, no research discusses the implications of MTU reduction for this asset class.

2. Institutional Background

In November 2015, the Bank of Israel allowed financial institutions in Israel to issue CoCo bonds to meet their capital requirement under the Basel directive.[6] The approval allowed the public offering of contingent capital bonds, which will be treated as Tier 2 regulatory bank capital. Therefore, the trigger for conversion to stocks or deletion of the CoCo bond, as its terms determine, is the occurrence of either of the following two events: the bank's core capital ratio falls below a pre-determined minimum (5% in the case of Israeli regulation), or the Supervisor of Banks issues specific instructions upon a severe deterioration in the bank's condition and concerns for its stability. Shortly after, in December 2015, the TASE announced

[5] See for example, https://www.esma.europa.eu/publications-data/questions-answers/1122 , https://www.fca.org.uk/publication/consultation/cp14-23.pdf , and https://www.finra.org/rules-guidance/notices/22-08 .
[6] https://boi.org.il/en/communication-and-publications/press-releases/the-banking-supervision-department-has-has-for-the-first-time-permitted-a-bank-in-israel-to-raise-regulatory-capital-through-bonds/

that CoCo bonds could be listed for trading, and financial institutions began issuing such bonds gradually.

In Israel, corporate bonds are traded in an exchange similar to stocks: a continuous limit order book, with opening and closing auction trading sessions (Abudy & Wohl, 2018). The Israeli bond market is considered a "deep" and liquid market (Gur-Gershgoren, Hadad & Kedar-Levy, 2020). This mechanism differs from the common practice used worldwide, particularly in the US, of bond trading in OTC markets. In Israel, CoCo bonds began trading on the exchange, like other bonds, from the time of their initial issuance. The only difference between CoCo bond trading and the trading of other corporate bonds was a distinctly high MTU. Due to the complexity of these securities, the Israeli Securities Authority (ISA) aspired to restrict retail investors' trading, as do other regulators worldwide. Therefore, the ISA set a face value of 50,000 Israeli shekels (ILS) as MTU for CoCo bonds, in contrast to the customary face value of 1 ILS applicable for other corporate bonds in auction sessions and a minimum transaction size of 10,000 ILS in continuous trading. The explicit purpose of the high MTU for CoCo bonds was to restrict households' ability to trade them. However, such restrictions may also confine the trading of other investor types.

By the end of 2023, the ISA altered its position, stating that despite their complexity, CoCo bonds are characterized by low risk. The Israeli banking system is known for its conservatism, stability, and high level of supervision, and has shown impressive resilience during a series of financial crises in recent years. Accordingly, on November 2, 2023, the TASE announced that the ISA had approved the cancellation of the distinct MTU for CoCo bonds and aligned it with the trading rules for straight corporate bonds.[7] On December 26, 2023, TASE announced that this change would take effect on January 7, 2024. TASE stated that due to the

[7] See https://maya.tase.co.il/reports/details/1556131 (in Hebrew).

high MTU, the general public had found it difficult to invest in CoCo bonds, and consequently, the marketability of such bonds was low. Thus, the MTU reduction was intended to improve the CoCo market and make it accessible to the public.[8] Notably, another step the TASE took to improve the CoCo market was to incorporate them in the bond indices, starting from February and April 2024. Figure 1 plots the timeline of these events.

[INSERT FIGURE 1]

3. Results

Table 1 reports summary statistics. The bond sample is split into 3 groups: a group of 18 CoCo bonds issued by commercial banks; a control group of 107 corporate bonds issued by non-banks, matched by rating and duration to the CoCo bond group; and a control group of 20 regular bank bonds issued by the same institutions that issued the CoCo bonds.[9] As all CoCos in the sample are linked to the Consumer Price Index (CPI), the matching groups are restricted to bonds with the same linkage (i.e., CPI-linked bonds). According to Table 1, while the matched bond group has a rating and duration similar to the CoCo bond group, it also has a similar market cap. However, while the rating of the matched bond group is higher than that of the CoCo bond group, the yield-to-maturity (YTM) of the CoCos is higher than the YTM of the matched bond group. Since credit ratings are designed to capture risk, the difference between the CoCo's YTM and that of other bonds with the same credit rating may reflect a liquidity premium (Longstaff, Mithal & Neis, 2005; Abudy & Raviv, 2016).

[8] See https://maya.tase.co.il/reports/details/1565890, https://www.tase.co.il/he/content/news-lobby/20240125_pr (in Hebrew).
[9] By January 2024, a total of 23 CoCo bonds had been issued in Israel; four of them were issued shortly before the change in MTU (in September–December 2023). Hence, we exclude them from the sample due to insufficient trading data before the change. In addition, a single CoCo issued by an insurance firm was removed from the sample to avoid the noise involved with a single bond in a different and unique industry.

[INSERT TABLE 1]

3.1. Price reaction to the MTU reduction

We begin by analyzing the price effects of the MTU reduction using cumulative abnormal returns (CARs) around regulatory events related to it. We focus on three events: the announcement of the MTU reduction (ANNOUNCE_MTU), the announcement of the inclusion of CoCo bonds in the exchange bond indices (ANNOUNCE_IND), and the actual implementation of the MTU reduction (MTU_CHANGE). We hypothesize that although the MTU reduction was known, the major price reaction will occur only when the actual MTU takes place, since only then will the possibility of trading in smaller sizes exist.

Specifically, we employ an event-study methodology to assess the market reaction to the MTU reduction. Since the events are clustered in their effect on institutions, the error terms of the bonds might be correlated across firms. Therefore, following the literature (e.g., Campbell, Lo, & MacKinlay, 1997; Abudy, Mugerman, & Shust, 2022), we aggregate all financial institutions into one portfolio and estimate the following regression:

$$R_{p,t} = \alpha + \beta_1 ANNOUNCE\_MTU_t + \beta_2 ANNOUNCE\_IND_t + \beta_3 MTU\_CHANGE_t + \gamma R_{m,t} + \varepsilon_t \quad (1)$$

where $R_{p,t}$ is the return of the bond portfolio p on day t, ANNOUNCE_MTU$_t$ is a dummy variable equal to one for the event window [0,1] of the MTU change announcement, and zero otherwise, ANNOUNCE_IND$_t$ is a dummy variable equal to one for the event window [0,1] of the announcement on the inclusion of CoCo bonds in bond indices, and zero otherwise, and MTU_CHANGE$_t$ is a dummy variable equal to one for the event window [0,1] of the actual MTU reduction, and zero otherwise. $R_{m,t}$ is the Tel-Bond index return on day t. Since the events span two trading days, regression (1) calculates the average abnormal return (AAR) for each event.

Table 3 reports the estimation results. In columns (1) - (4), the dependent variable is a portfolio of CoCo bonds. In column (5) (column (6)), the dependent variable is a portfolio of matched bonds (bank bonds). In Panel A (Panel B), the dependent variable is the equal-weighted (value-weighted) return of the bond portfolio. The sample period is 60 trading days (6 weeks that surround the actual MTU reduction).

The results demonstrate that the CoCo return on the announcement of the MTU reduction (ANNOUNCE_MTU) does not generate a statistically significant abnormal return for CoCo bonds. In contrast, the announcement regarding the index inclusion (ANNOUNCE_IND) is associated with a positive and significant CAR for CoCo bonds. In Panel A, the coefficient is 0.137 (*t*-statistic = 2.59), and in Panel B, the corresponding estimate is 0.135 (*t*-statistic = 1.93), yielding a comparable economic magnitude. This finding is consistent with a standard demand-based index inclusion effect, showing that CoCo bond prices respond to shocks affecting investor demand (e.g., Dbouk & Kryzanowski, 2009). However, the most significant and positive effect is documented on the implementation date of the MTU reduction. The coefficient is 0.211 (*t*-statistic = 2.66) in Panel A and has a comparable magnitude in Panel B. The economic magnitude of the coefficient is higher than the coefficient of the announcement of index inclusion. Referring to the group of matched bonds and bank bonds, we find that during all events, the coefficients are insignificant in both Panels. This indicates that the abnormal returns are concentrated among CoCo bonds.

[INSERT TABLE 2]

As an additional examination, we employ the estimation method of Bessembinder, Kahle, Maxwell, and Xu (2009), who propose an event study approach for corporate bonds by comparing the bond's return relative to a matched portfolio of bonds with the same rating and maturity (see also Ederington, Guan & Yang, 2015). In this approach, the matched portfolio

may differ for each bond depending on its properties, and hence, the concern about correlated error terms decreases. We employ this method to examine the price changes during the events associated with the MTU reduction. Formally, for each bond in the sample, we calculate the abnormal return (AR) during the event window [0,1] as

$$AR_{i,[t,\,t+1]} = R_{i,[t,\,t+1]} - R_{p,[t,\,t+1]} \qquad (2)$$

where $R_{i,[t,t+1]}$ is the bond return on day t and $t+1$ (i.e., it's either a CoCo bond or bank bond) and $R_{p,[t,t+1]}$ is the return of the matched bonds portfolio on day t and $t+1$, either equally weighted or value weighted (according to Bessembinder, Kahle, Maxwell & Xu, 2009, the value-weighted approach increases the statistical tests' power).

Table 3 presents the cumulative abnormal return (CAR) for the CoCo bonds and the non-CoCo bank bonds relative to the portfolio of matched bonds. The results are similar to those in Table 2: a positive and significant price increase (relative to the matched-bond portfolio) on the implementation date of the MTU reduction and on the announcement day regarding the index inclusion.[10] The CAR of the MTU reduction is 0.431% (0.375%) for the two days following this event relative to an equally weighted (value-weighted) portfolio of matched bonds. The estimates on the announcement day on the MTU reduction are marginally significant. Regarding the bank bonds, most estimates are insignificant. Thus, the results in Table 3 reinforce the finding that the positive price effect is concentrated in CoCo bonds and is due to the MTU reduction.

[INSERT TABLE 3]

3.2. Trading volume reaction to the MTU reduction

[10] Note that the effect documented in Table 2 is the daily average, while Table 3 presents the cumulative average effect for two trading days.

In this subsection, we examine whether the MTU reduction increased the trading volume of CoCo bonds. Table 4 reports trading activity measures before and after the MTU decrease, separately for CoCo bonds, the control group of matched non-financial corporate bonds, and regular bank bonds (non-CoCo). The reported statistics include mean daily trading volume (in ILS), mean transaction size, mean daily number of transactions, the fraction of trading days with no transactions, and mean trading volume relative to listed capital. For CoCo bonds, trading activity increases sharply following the MTU change. Mean daily volume rises from approximately 0.365 million ILS in the pre-period to about 1.24 million ILS in the post-period, representing an increase of 241%. This increase in trading volume is accompanied by a substantial rise in trading frequency: the mean daily number of transactions increases from 2.6 to 10.3. As expected, the mean transaction size declines sharply, falling by 49%, from about 172 thousand ILS to 88 thousand ILS. Consistent with the increase in trading frequency, the percentage of trading days without transactions declines from 38.9% to 14.3%. The mean trading volume relative to listed capital also increases substantially, from 0.05% to 0.18%.

In contrast, the matched group of non-financial corporate bonds and the group of regular bank bonds (non-CoCo) demonstrate very limited changes in trading volume following the MTU decrease. Mean daily volume of the matched non-financial corporate bonds increases marginally, by 1.6%, while the mean number of daily transactions remains virtually unchanged. Mean transaction size is stable, and the fraction of days with no transactions increases slightly from 1.0% to 1.1%. Mean trading volume relative to listed capital declines modestly, from 0.22% to 0.20%. With respect to regular bank bonds (non-CoCo), the mean daily volume increases slightly (by 1.6%), and the fraction of days with no transactions remains zero in both periods. Mean trading volume relative to listed capital increases moderately, from 0.19% to 0.21%.

Overall, the changes documented in Table 4 indicate that the MTU decrease is associated with a pronounced increase in trading activity for CoCo bonds, reflected in higher trading volume, more frequent transactions, and fewer non-trading days, while trading patterns of the matched bonds and regular bank bonds remain largely unchanged.

[INSERT TABLE 4]

Table 5 reports the results of a regression analysis examining whether trading volume (in ILS) increases following the MTU reduction. Formally, we run the following regression:

$$Ln(Vol)_{i,t} = \alpha + \beta_1 CoCo_{i,t} + \beta_2 CoCo_{i,t} * POST_t + \beta_3 Bank_{i,t} + \beta_4 Bank_{i,t} * POST_t + \beta_5 POST_t + \beta_6 MarketCap_{i,t} + \beta_7 Duration_{i,t} + \beta_8 YTM_{i,t+} \beta_9 Rating_{i,t} + \varepsilon_t, \quad (3)$$

where *Ln(Vol)* is the natural log of the bond's daily trading volume, *CoCo* is a dummy variable that equals 1 if the bond is a CoCo bond and 0 otherwise; *Bank* is a dummy variable that equals 1 if the non-CoCo bond was issued by a bank and 0 otherwise; *POST* is a dummy variable that equals 1 for the period following the MTU change and 0 otherwise; *MarketCap* is the monetary value of the bond series, *Duration* is the duration for each bond and Rating is the credit rating for each bond, *YTM* is the yield to maturity of the bond and *Rating* is the bond's credit rating of bond *i* on day *t*. This Panel analysis includes 8,700 bond-day observations. The table includes two specifications: one comparing CoCo bonds with the other two bond groups, and another examining each bond group separately.

According to the Table, CoCo bond trading volume increased significantly following the MTU reduction, while both the bonds' control group and the non-CoCo bank bonds had similar trading volumes before and after the event. The coefficient on CoCo, which compares the CoCo bond to the control group, is positive and highly significant (-6.036, *t*-stat = -10.31).

However, the interaction between CoCo and POST, which relates to CoCo bonds after the MTU reduction, is positive and significant (3.179, *t*-stat = 7.66). This implies that the trading volume of CoCo bonds increased following the MTU reduction. The comparison between CoCo bonds before and after the MTU reduction reveals that they are still traded significantly less than their control group (as indicated by the joint test $\beta_1+\beta_2=0$). The conclusion is that, relative to the control groups, CoCo bond trading volume increased following the MTU reduction. However, it still remained lower relative to the control groups.

[INSERT TABLE 5]

3.3. Yield reaction to the MTU reduction

An additional approach to examining the effect of the MTU reduction on CoCo bonds is to analyze changes in the bond's YTM and yield spread (YS). If the price increase occurs only in the CoCo bonds, we should expect their YTM and YS to decrease. We rely on the estimation results of the previous subsection and divide the sample period into two periods: before and after the MTU reduction. Consistent with our hypothesis of a positive price effect following the MTU decrease, we expect that, after the MTU reduction, the YTM and YS of the CoCo bonds will decrease relative to those of the other bonds in the exchange. To explore this hypothesis, we run the following Panel regression:

$$Yield_{i,t} = \alpha + \beta_1 CoCo_{i,t} + \beta_2 CoCo_{i,t} * POST_t + \beta_3 Bank_{i,t} + \beta_4 Bank_{i,t} * POST_t + \beta_5 POST_t + \beta_6 MarketCap_{i,t} + \beta_7 Duration_{i,t} + \beta_8 Rating_{i,t} + \varepsilon_t, \quad (4)$$

where the dependent variable, *Yield*, is either the YTM or the YS of bond *i* on day *t*. This Panel analysis includes 8,700 bond-day observations.

The estimation results are presented in Table 6. According to the table, CoCo bonds have a significantly higher YTM and YS than other bank bonds and the matched-bond sample. Relative to the matched bonds, CoCo bonds have a significantly higher YTM (YS) of 0.496 (0.505). However, reducing the MTU significantly decreased this gap, and the difference in YTM (YS) decreases by 0.243 (0.245). Focusing on other bank bonds, we find that their YTM and YS are not significantly different from those of the matched-bond group and the CoCo bonds. Moreover, after the CoCo's MTU reduction, the YTM and YS of other bank bonds significantly increased, whereas across the entire bond sample, the YTM and YS decreased (i.e., they appear as negative values in POST). Taken together, these findings provide additional evidence that the MTU reduction led to a price increase concentrated in CoCo bonds.

[INSERT TABLE 6]

3.4. Liquidity reaction to the MTU reduction

In this subsection, we examine whether events associated with MTU reduction in CoCo bonds improved their liquidity. We hypothesize that following the MTU reduction, the liquidity of CoCo bonds will increase, similar to the increase in their tradability as documented above. Since in Israel corporate bonds are traded in a limit order book on an exchange, similar to stocks (Abudy & Wohl, 2018), we estimate the hourly percentage half-bid-ask spread for each bond in the sample and use it to calculate a daily bid-ask spread. The hourly percentage half-bid-ask spread is calculated from 11:00 to 17:00 daily, and from 11:00 to 15:00 on Sundays.[11] For each bond group (i.e., CoCos, other bank bonds, and the matched-bonds sample), we

[11] Until the end of 2025 the TASE trading days were from Sunday to Thursday. On January 2026, the TASE switched to trade from Monday to Friday.

estimate the value-weighted average using each bond's market cap to obtain the group's average bid-ask spread.

Table 7 presents the results. Panel A presents the weekly bid-ask spread throughout the sample period. One can notice a sharp decrease in the bid-ask spread of CoCo bonds: from 1.44% to 0.348% by the end of the sample period, a decrease of approximately 75%. The majority of this decrease occurred around the MTU reduction: the week before the MTU reduction, the spread was 1.58%, and it then sharply decreased to 1.22%. In the second week after the MTU reduction, the spread continued to decline sharply to 0.7%.

In contrast, the other bank bond group and the matched bond sample did not exhibit a similar decrease in spreads. In the matched bonds, there was also a decrease in spreads, but to a much smaller extent. The same applies to the group of other bank bonds, which decreased from an average half spread of 0.09% to 0.07% by the end of the sample period. Thus, while the other bond groups also showed an increase in liquidity, the increase in CoCo bond spreads is much greater.

[INSERT TABLE 7]

4. Summary

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Figure 1: Events timeline

The figure plots the timeline of the CoCo bond minimum trading unit (MTU) reduction.

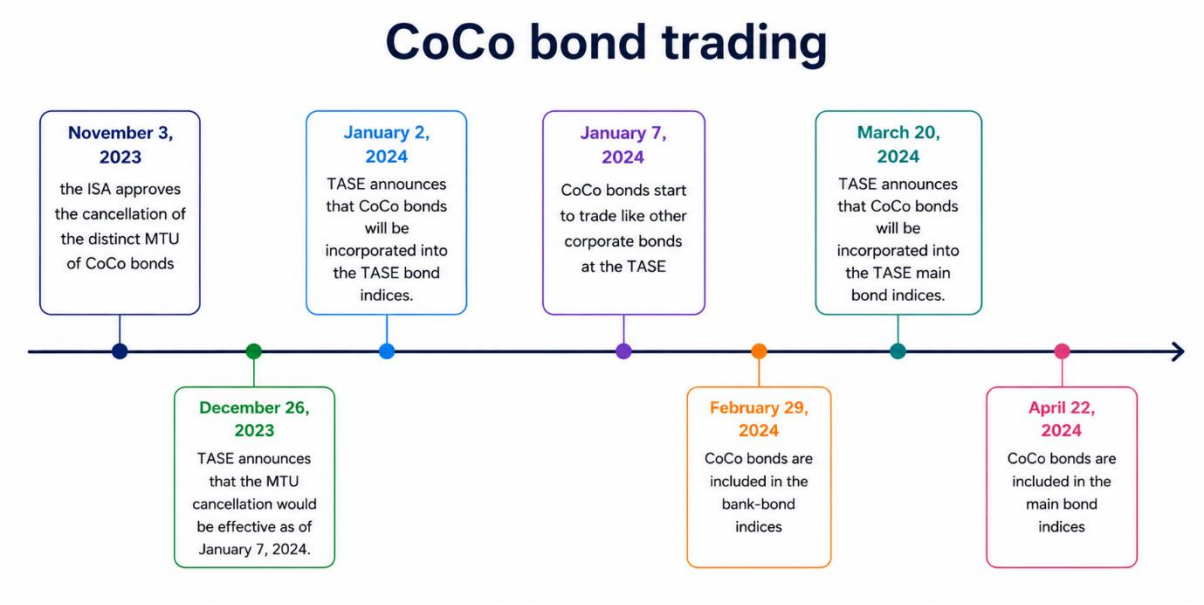

Table 1: Descriptive statistics

This table reports summary statistics for three groups of corporate bonds: (1) Contingent Capital (CoCo) bonds issued by banks; (2) corporate bonds issued by non-banks, matched by rating and duration to the CoCo bond group; and (3) regular bank bonds issued by the same institutions that issued the CoCo bonds. As all CoCos in the sample are linked to the Consumer Price Index (CPI), the matching groups are restricted to bonds with the same linkage (i.e., CPI-linked bonds). Furthermore, the sample is limited to bonds that were publicly traded for the entire sample period. The sample period includes all trading days from November 26, 2023, to February 15, 2024. *Listed capital* is the total volume of bond issuance (in millions). *Market cap* is the market value of each bond issuance (in millions ILS). *Duration* is the duration for each bond group. *Rating* is the credit rating for each bond group. *Yield* is the average yield-to-maturity (YTM) for each bond group. *Return* is the average daily return for each bond group.

	CoCo	Matched bonds	Non-CoCo bank bonds
Number of bonds	18	107	20
Listed capital (in Millions)	830.44	775.62	1,810.61
Market cap (in Millions ILS)	890.08	851.86	1,887.01
Rating	4.75	5.06	2.38
Duration	3.12	3.09	3.11
YTM (%)	2.98	2.69	2.03
Return (%)	0.07	0.04	0.03

Table 2: Regression analysis of AAR for CoCo-related events

The table presents the results from Equation (1), estimated separately for each bond group. The sample and the sample period are described in Table 1. *ANNOUNCE_MTU* is a dummy variable equal to one for the event window [0,1] of the MTU change announcement, and zero otherwise. *ANNOUNCE_IND* is a dummy variable equal to one for the event window [0,1] of the announcement on the inclusion of CoCo bonds in bond indices, and zero otherwise. *MTU_CHANGE* is a dummy variable equal to one for the event window [0,1] of the actual MTU reduction, and zero otherwise. *Tel_bond_index* is the daily return on the Tel Bond index. T-statistics are in parentheses. In Panel A (Panel B), the dependent variable is the return of an equally-weighted (value-weighted) portfolio of the CoCo bonds.

Panel A: Value-weighted portfolio

	CoCo bonds				**Matched bonds**	**Bank bonds**
	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	0.039**	0.035**	0.032**	0.025	0.004	-0.002
	(2.42)	(2.21)	(2.13)	(1.54)	(0.78)	(-0.28)
ANNOUNCE_MTU	0.023			0.040	0.016	0.024
	(0.57)			(1.08)	(0.65)	(0.45)
ANNOUNCE_IND		0.137**		0.149**	0.016	-0.019*
		(2.59)		(2.80)	(1.19)	(-1.60)
MTU_CHANGE			0.211**	0.220**	0.011	0.032*
			(2.66)	(2.77)	(0.72)	(1.62)
Tel_bond_index	0.428***	0.441***	0.442***	0.463***	0.813***	0.604***
	(7.53)	(7.76)	(7.73)	(7.67)	(31.29)	(19.94)
Adj. R^2	0.365	0.390	0.428	0.441	0.959	0.889
Obs.	60	60	60	60	60	60

Panel B: Equally-weighted portfolio

	CoCo				Matched bonds	Bank bonds
	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	0.050***	0.046***	0.042	0.035**	0.007	-0.001
	(3.21)	(3.04)	(2.95)	(2.35)	(1.07)	(-0.09)
ANNOUNCE_MTU	0.020			0.039	-0.003	0.021
	(0.69)			(1.48)	(-0.09)	(0.30)
ANNOUNCE_IND		0.135*		0.148**	0.027*	-0.011
		(1.93)		(2.11)	(1.89)	(-1.54)
MTU_CHANGE			0.232***	0.241***	0.002	0.024
			(4.09)	(4.26)	(0.13)	(0.88)
Tel_bond_index	0.374***	0.387***	0.390***	0.410***	0.760***	0.561***
	(6.50)	(6.71)	(6.78)	(6.82)	(25.47)	(19.61)
Adj. R^2	0.302	0.330	0.386	0.401	0.921	0.879
Obs.	60	60	60	60	60	60

Table 3: Portfolio-matched CAR for CoCo-related events

The table presents the cumulative abnormal return (CAR) for the CoCo bond group and non-CoCo bank bonds using the portfolio-matching approach defined in Equation (2). For each bond, the abnormal return is calculated relative to a portfolio of non-bank corporate bonds matched by rating and duration. The portfolio CAR is computed using either value-weighted or equal-weighted schemes. The sample and the sample period are described in Table 1. The CoCo bond group consists of 18 bonds, and the non-CoCo bank bond group consists of 19 bonds (excluding one bank bond for which no matching non-bank bonds were available). *ANNOUNCE_MTU*, *ANNOUNCE_IND*, and *MTU_CHANGE* are defined in Table 3.

		CoCo bonds		Non-CoCo bank bonds	
		VW portfolio	EW portfolio	VW portfolio	EW portfolio
ANNOUNCE_MTU	CAR	0.123	0.156	0.109	0.088
	(*t*-stat)	(1.82)	(1.97)	(2.74)	(1.87)
ANNOUNCE_IND	CAR	0.375	0.431	0.013	0.029
	(*t*-stat)	(1.96)	(2.17)	(0.56)	(1.12)
MTU_CHANGE	CAR	0.465	0.554	0.046	0.033
	(*t*-stat)	(2.44)	(2.48)	(1.89)	(1.47)

Table 4: Trading statistics surrounding the MTU change

The table reports trading statistics for each bond group, partitioned into sub-periods before and after the MTU change. The sample and sample period are described in Table 1.

	CoCo	Matched bonds	Non-CoCo bank bonds
Mean daily volume (ILS)			
Pre	364,670.74	1,570,638.49	3,323,272.57
Post	1,243,768.88	1,595,948.00	3,376,036.58
Difference	879,098.14	25,309.52	52,764.02
%Difference	241.1%	1.6%	1.6%
Mean transaction size			
Pre	171,903.29	11,906.44	18,359.27
Post	87,685.18	11,881.91	22,795.12
Difference	-84,218.11	-24.53	4,435.86
%Difference	-49.0%	-0.2%	24.2%
Mean daily number of transactions			
Pre	2.59	112.70	155.44
Post	10.26	113.34	147.78
Difference	7.66	0.64	-7.66
%Difference	295.3%	0.6%	-4.9%
% trading days with no transaction			
Pre	38.9%	1.0%	0.0%
Post	14.3%	1.1%	0.0%
Difference	-24.6%	0.1%	0.0%
%Difference	-63.3%	9.7%	NA
Mean daily volume/listed capital (%)			
Pre	0.05	0.22	0.19
Post	0.18	0.20	0.21
Difference	0.13	-0.02	0.02
%Difference	259.7%	-10.9%	10.0%

Table 5: Trading volume reaction to the MTU change

The table presents the estimation results of Equation (3). The dependent variable is the natural log of the daily trading volume (in ILS). *CoCo* is a dummy variable that equals 1 if the bond is a CoCo bond and 0 otherwise. *Bank* is a dummy variable that equals 1 if the non-CoCo bond was issued by a bank and 0 otherwise. *POST* is a dummy variable that equals 1 for the period following the MTU change and 0 otherwise. The sample, sample period, and all other variables are defined in Table 1. Standard errors are clustered by bond. *T*-statistics are in parentheses.

	(1)	(2)
Intercept	11.438***	11.213***
	(19.77)	(16.89)
CoCo	-6.036***	-5.977***
	(-10.31)	(-10.18)
*CoCo*POST*	3.179***	3.152***
	(7.66)	(7.59)
BANK		0.415
		(1.49)
POST*BANK		-0.175**
		(-1.69)
POST	0.055	0.082
	(0.76)	(1.06)
MarketCap	1.181***	1.166***
	(8.10)	(8.40)
Duration	-0.182**	-0.182**
	(-2.56)	(-2.54)
YTM	0.454**	0.454**
	(2.36)	(2.38)
Rating	0.039	0.077
	(0.43)	(0.75)
Adj-R^2	0.382	0.382
Observations	8,700	8,700

	(1)	(2)
H_0: $\beta_1+\beta_2=0$	-2.856	-2.825
p-value	<.0001	<.0001

Table 6: Regression analysis of yields to maturity and yield spreads

The table presents the estimation results of Equation (4). Dependent variables are yield to maturity (YTM; column 1) or yield spread (YS; column 2). The sample, sample period, and all other variables are defined in Table 1 and Table 5. Standard errors are clustered by bond. *T*-statistics are in parentheses.

Dependent variable	*YTM*	*YS*
	(1)	(2)
Intercept	0.539**	-0.517**
	(2.30)	(-2.23)
CoCo	0.496***	0.505***
	(6.78)	(6.83)
*CoCo*POST*	-0.243***	-0.245***
	(-5.21)	(-5.16)
BANK	-0.030	-0.028
	(-0.26)	(-0.24)
POST*BANK	0.109**	0.102**
	(3.10)	(3.15)
POST	-0.280***	-0.1770***
	(-11.51)	(-7.90)
MarketCap	0.119**	0.122**
	(2.55)	(2.59)
Duration	0.213***	0.134***
	(6.57)	(4.12)
Rating	0.302***	0.303***
	(10.30)	(10.44)
Adj-R^2	0.561	0.522
Observations	8,700	8,700

Table 7: Bid-Ask Spreads surrounding the MTU change

The table presents value-weighted half percentage bid-ask spreads before and after the MTU reduction for three groups of corporate bonds: CoCo bonds, matched non-bank bonds, and regular bank bonds. The daily half percentage bid-ask spread is the bid price minus the ask price, divided by the mid-quote, and then divided by two. The daily bid-ask spreads are calculated as the average of hourly spreads from 11:00 to 17:00 (11:00 to 15:00 on Sundays). Panel A reports weekly average spreads. Panel B compares spreads before and after the MTU reduction. The sample and the sample period are described in Table 1.

Panel A

Week	CoCo	Matched bonds	Banks non-CoCo
-6	1.444	0.189	0.092
-5	1.542	0.161	0.084
-4	1.330	0.148	0.076
-3	1.749	0.150	0.069
-2	1.204	0.135	0.066
-1	1.585	0.157	0.100
1	1.225	0.126	0.065
2	0.702	0.152	0.069
3	0.598	0.119	0.065
4	0.566	0.118	0.070
5	0.480	0.127	0.064
6	0.348	0.103	0.072

Panel B

Period	CoCo	Matched bonds	Banks non-CoCo
Pre	1.476	0.157	0.081
Post	0.653	0.124	0.068
Difference	-0.823	-0.032	-0.014
T-Stat	(11.64)	(5.29)	(4.12)