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Market timing in open market bond repurchases [1]

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Abstract

Bond repurchases are widespread in the US and other markets but data limitations have thus far prevented market-timing analysis. We fill this gap using unique daily data from Israel and show that firms time the market in their actual open-market bond repurchases. Firms repurchase their bonds following a decline in bond prices. The disclosure of bond repurchases results in significantly positive abnormal returns on the repurchased bonds and is followed by a positive drift in subsequent 5 trading days. The market reaction to actual bond repurchases is timelier when conducted within a pre-announced repurchase program, and the impact is stronger when the firm repurchases high-yield bonds. Insiders' net purchases increase prior to bond repurchases, and the abnormal return following a bond repurchase tends to be higher when it is preceded by positive net insider purchases. The results lend support to the information motive for bond repurchases.

Key words: Fixed income securities; Capital structure; Financial policy; Payout policy; Event studies; Information and disclosure

תזמון שוק ברכישות חוזרות של אגרות חוב קונצרניות

נדב שטינברג ואבי וואהל

תקציר

רכישות חוזרות של אגרות חוב על-ידי החברות שהנפיקו אותן הן תופעה נפוצה בארצות הברית ובשווקים נוספים, אבל עד-היום לא התבצע מחקר מקיף של תגובת השוק לרכישה חוזרת של אגרות חוב וזאת בשל היעדר נתונים מספקים. אנחנו משלימים פער זה באמצעות שימוש בנתונים ייחודיים בתדירות יומית מהשוק הישראלי, ומראים שחברות מצליחות לתזמן את השוק כאשר הן מבצעות רכישות חוזרות של אגרות חוב.

חברות נוטות לרכוש את אגרות החוב שלהן לאחר ירידה במחירן; הדיווח לציבור על הרכישה החוזרת מוביל לתשואה עודפת חיובית ומובהקת מבחינה סטטיסטית של אגרות החוב שנרכשו, והעליה במחירי האגרות הנרכשות נמשכת גם ב-5 ימי המסחר שלאחר הדיווח. תגובת השוק לרכישה חוזרת של אגרות חוב היא מהירה יותר כאשר הרכישה מתבצעת במסגרת תכנית רכישה שהוכרזה מבעוד-מועד, והתגובה חזקה יותר כאשר הרכישה היא של אגרות חוב עם דירוג אשראי נמוך. אנשי פנים בחברות (בעל השליטה ובכירים בחברה) נוטים לרכוש מניות של החברות בחודשים שלפני ביצוע רכישה חוזרת של אגרות החוב; רכישת מניות על-ידי אנשי פנים בחברה בחודשים שלפני הרכישה החוזרת של אגרות החוב מובילה בתורה לתגובה חיובית יותר של מחירי אגרות החוב לרכישה החוזרת.

ממצאי המחקר תומכים בהשערה כי רכישה חוזרת של אגרות חוב מהווה אינדיקציה לכך שלהנהלת החברה יש אינפורמציה חיובית על מצב החברה שאינה משתקפת במלואה במחירי אגרות החוב.

1. Introduction

This paper examines whether firms time the market in their actual open-market bond repurchases.[1] Bond repurchases are prevalent among firms in the US and elsewhere and their share of outstanding bonds is comparable to the ratio of stock repurchases to outstanding stocks. [2] Nevertheless, there are many papers that examine open market stock repurchases, but only a handful of papers studying open market bond repurchases. The stock repurchase literature show that they can result in wealth transfers between better and less informed stakeholders in the repurchasing firms. Whether this is also true for bond repurchases, given that bonds are less informationally sensitive than stocks (Holmstrom, 2015), is an open question. We address this question using unique data from Israel on actual daily bond repurchases that allows us to look at a wide range of firms and at different time intervals following the repurchase.

Security repurchases may be motivated by firms attempting to exploit underpricing of these securities in order to repurchase them below their true value and thereby benefit ongoing stakeholders at the expense of the security sellers. Indeed, there is ample evidence that firms time the market in their share repurchases, for the benefit of long-term shareholders (e.g. Dittmar and Field, 2015) (henceforth DF). Levy and Shalev (2017) (henceforth LS) is the only paper that we are aware of that examine market timing in open market bond repurchases. They provide evidence of long-term market timing in open-market bond repurchases. Using a sample of 38 actual open market bond repurchase in the US between 1998 and 2013, they report a one-year average abnormal return of 2.3% following the end of the repurchase quarter. In this paper we complete and add to their long-horizon analysis, by examining the short-term impact of bond repurchases, using a very large sample of actual open market bond repurchases in Israel between 2008 and 2020.

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[1] In open-market bond repurchases, the firm executes actual bond repurchases via the market (usually the exchange), buying back bonds it previously issued, rather than using tender offers or announcing a repurchase program.

[2] Julio (2013) reports that cash repurchases of publicly traded debt by US industrial firms totaled $88 billion in 2010. This figure represents 2. 4% of total nonfinancial corporates debt securities at the beginning of that year, according to data from FRED (https://fred.stlouisfed.org/series/NCBDBIA027N). As a comparison, stock repurchases totaled $250 billion in 2010 (Dittmar and Field, 2015), representing 2.4% of total market value of U.S. domestic nonfinancial corporations at the beginning of that year, according to data from FRED (https://fred.stlouisfed.org/graph/?g=12lW). Thus, total bond repurchases in the US are smaller than total stock repurchases in absolute terms, but very similar as a share of the relevant outstanding amount.

We use unique daily data on thousands of open-market bond repurchases in Israel, to explore whether firms time the market (i.e., earn abnormal returns) when repurchasing their bonds in the open market. In order to examine if bond repurchases are followed by abnormal returns on the repurchased bonds, we apply a regression estimation that controls for the relevant bond characteristics. The regression takes advantage of all the available bond-date observations (~1 million observations) and enables us to control for all the relevant bond characteristics, for day and firm fixed effects, for the impact of the bond repurchase, and for interactions of the bond repurchase dummy variables and relevant bond/repurchase attributes. thereWe note, however, that our main results are robust to using the standard Cumulative Abnormal Returns (CAR) method.

Combining data on the exact date of the bond repurchase and its disclosure with daily trading data enables us to disentangle the price effect of the repurchase itself from the effect of its disclosure and any future drift. Accordingly, in order to examine abnormal returns around bond repurchases, we divide the analysis into four distinct periods as follows. (1) The 10 trading days preceding the bond repurchase day, ending on the last trading day prior to the bond repurchase date. Abnormal returns during this period suggest that the timing of the bond repurchase relates to its recent performance. Specifically, firms may repurchase their bonds following a drop in their prices. Alternatively, a surge in the repurchased bond prices during this period may stem from an information leakage about the upcoming repurchase. (2) The repurchase period, beginning from the end of the last trading day prior to the bond repurchase date and ending on the last trading day prior to the repurchase disclosure date. Abnormal returns in this period may be due to the price impact of the repurchase itself, though information leakage about the repurchase may also play a role.[3] (3) The repurchase disclosure day, beginning from the end of the last trading day prior to the repurchase disclosure date and lasting for one trading day (this is usually the date of the repurchase disclosure if the bond repurchase was disclosed during trading hours, or the following trading day if the repurchase was disclosed after trading hours). Abnormal returns in this period may be due to the effect of the bond repurchase disclosure. (4) The 10 trading days following

[3] Other papers such as Ellul, Jotikasthira, and Lundblad (2011) and Dick-Nielsen and Rossi (2018) present evidence of price pressure in the corporate bond market. In line with these papers, Cai, Han, Li, and Li (2019) find that sell herding by institutional investors applies transitory pressure on bond prices, driving them below their fundamental value; by contrast, they find that buy herding facilitates the price discovery of corporate bonds.

the repurchase disclosure, beginning on the end of the repurchase disclosure day. Abnormal returns in this period may be due to under-reaction of the market to the disclosure of the bond repurchase. In the empirical analysis we will further divide each of the periods (1) and (4) into two equal periods of 5 days each, to allow for different effects for the 5 trading days immediately before (after) the repurchase (disclosure) and the prior (following) 5 trading days.

We find that firms tend to repurchase their bonds after the prices of these bonds fall, and that repurchased bonds enjoy positive abnormal returns following the repurchase. Beginning with the days preceding the bond repurchase (period (1)), our regression method, though not the CAR estimation, shows negative abnormal returns in the 10 trading days prior to the bond repurchase date, in line with the underpricing motive for bond repurchase and in contrast to the information leakage hypothesis. The actual repurchase (period (2)) results in a positive abnormal return. Further analysis shows that this abnormal return doesn't stem from the price pressure of the repurchase, as the actual repurchase price does not significantly differ from the bond price at the beginning of the trading day. Instead, it is driven by an increase in the bond price in the hours following its repurchase. The disclosure of the bond repurchase to the public (period (3)) results in significantly positive abnormal returns on the repurchased bonds, suggesting that bond repurchases send a positive signal to the market about the firm's ability to repay its debt. The abnormal return on the disclosure date is followed by a significant drift in the following trading days (period (4)) that accumulates to about 80 basis points in the subsequent 5 trading days. The bond repurchase effect on subsequent bond returns is not only statistically but also economically significant, with total post-repurchase abnormal return of about 1 percent in most specifications. An implementable investment strategy that sells short the general corporate bond index and uses the proceeds to invest in a portfolio of recently repurchased bonds (after the repurchase has been disclosed to the public) earns an annual return of 16%.[4]

The comprehensive sample of actual bond repurchases allows us to explore the cross-sectional and time-varying heterogeneity in firms' abilities to time the market. In Israel, securities regulations permit the actual repurchase of bonds either under a

[4] That is, on each trading date selling short the index and using the intakes to purchase an equal share of all the bonds whose repurchase was disclosed in the previous five trading days. Thus, each bond remains in the portfolio for the 5 trading days following the disclosure of its repurchase. If no bond repurchases have been disclosed in the previous 5 trading days, we assign a return of zero to the examined date.

preannounced repurchase program or on an ad-hoc basis. We find that the market reacts very positively to the announcement of a bond repurchase program. Distinguishing between abnormal returns following ad-hoc actual bond repurchases and abnormal returns following actual repurchases conducted within bond repurchase programs, we find positive market reaction to both types of bond repurchases. The impact of the actual execution of pre-announced bond repurchases is much faster than the impact of ad-hoc repurchases. Thus, a pre-announced repurchase program serves to mitigate the potential for market timing, as investors that are aware of the program understand that the firm is repurchasing its bonds even before the formal disclosure and adjust the price accordingly. It seems that many firms choose to exploit their informational advantage to time the market through ad-hoc bond repurchases, but few of their counterparts prefer to signal their high quality to the market in advance through a bond repurchase program. Turning to the credit quality of the firms, we find that high-yield corporate bonds are more affected by repurchases than their investment-grade counterparts, in line with the literature that shows riskier bonds to be more informationally sensitive (Holmstrom, 2015; Benmelech and Bergman, 2018).

The literature on share repurchases finds a positive correlation between insiders' net purchases and share repurchases and suggests that higher net purchases of insiders before a repurchase announcement or an actual repurchase are correlated with higher post-repurchase returns (e.g. Cziraki, Lyandres, and Michaely's, 2021). Following this literature, we examine the development of insider trading around actual open-market bond repurchases and find that insiders turn from net sellers into net buyers of the firm shares about a year before an open-market bond repurchase. We further analyze the impact of prior insider trading on the market reaction to the bond repurchase and find that bonds of firms whose insiders have been net buyers of their shares in the months preceding the bond repurchase are more affected by repurchases than bonds of firms whose insiders sold their shares in the preceding months. These results are in accordance with the findings in the share repurchase literature, and they lend further support to the information motivation for bond repurchases.

This study contributes to a very scant body of papers examining corporate bond repurchases. It focuses on market timing in open-market debt repurchases, in which the selling bondholders are not aware that the firm is the buyer of the bonds. Hence, it differs from bond tender and exchange offers in which the firm approaches the bondholders with an offer to repurchase their bonds or replace them with new bonds.

While a few papers have studied the latter type of bond repurchases (Daniels and Ramirez 2007; Mann and Powers, 2007; Kruse, Nohel, and Todd, 2014; Mao and Tserlukevich, 2014), the only paper that touches upon actual open-market bond repurchases is Levy and Shalev (2017). LS (2017) focus on the distinction, largely absent in previous papers, between bond tender offers and open-market repurchases. The authors examine 325 tender offer repurchases and 167 open-market repurchases in the US between 1998 and 2013 based on the Mergent database. They find that bonds repurchased in the open market earn abnormal positive returns in the year following the repurchase quarter, and such repurchases are accompanied by an increase in insiders' net stock purchases.

To the best of our knowledge, LS (2017) is the only paper prior to this one that studies market timing in actual open-market bond repurchases. Yet, due to data limitations, they examine market timing only at the 1 year horizon, beginning at the end of the bond repurchase quarter.[5] Our study circumvents these limitations, as the timely and detailed disclosure requirements in Israel enable us to study market timing in the short-term, in the days surrounding the actual bond repurchase. We use the exact time of each bond repurchase and the exact time of the repurchase disclosure to the public in order to separately analyze the short-term impacts of the actual bond repurchase and of its disclosure on the repurchasing firm's bonds. In addition, lax disclosure requirements in the US regarding open market bond repurchases result in a relatively small sample of actual bond repurchase announcements, and a potential selection bias as some firms choose not to disclose their bond repurchases to the public.[6] In contrast, we use data from Israel, where securities regulations require full and comprehensive disclosure of actual open-market bond repurchases. The stringent disclosure requirements in Israel alleviate concerns of selection bias in bond repurchase disclosure and supply us with a large sample of actual open market bond repurchases.

As opposed to the case of bond repurchases, market timing has been widely investigated in the context of share repurchases.[7] The two papers most relevant to this paper in this strand of the literature are Ben-Rephael, Oded, and Wohl (2014)

[5] LS's (2017) bond repurchase data is at a quarterly frequency and includes neither the exact date of the repurchase nor the price at which it was executed.

[6] As LS (2017) note, "Firms sometimes disclose the repurchase ex-post, depending on the repurchase magnitude, in the notes to financial reports or in conference calls."

[7] See, e.g., Ikenberry, Lakonishok, and Vermaelen (1995), Brav, Graham, Harvey, and Michaely (2005), Peyer and Vermaelen (2009), Almeida, Fos, and Kronlund (2016) and Manconi, Peyer, and Vermaelen (2019).

(henceforth BOW) and DF (2015). Both papers use new data from SEC filings detailing open-market repurchases on a monthly basis in order to study firms' market timing in actual share repurchases, and show that firms repurchase at a low price relative to the average market price during the month of the repurchase.[8] BOW (2014) find positive abnormal returns concentrated around the disclosure of the repurchase and the month afterwards. DF (2015) use a more comprehensive sample and corroborate BOW's (2014) main results. They further find that the average firm produces positive abnormal returns up to three years after a repurchase. Furthermore, BOW (2014) find a positive correlation between insider trading and repurchases, and DF (2015) show that net insider trading is correlated with better repurchase prices. The results of both papers lend support to the interpretation that firms' share repurchases are driven by managers' efforts to time the market for the benefit of the firms' current shareholders and themselves. This paper is the first to conduct similar analysis on bond repurchases, and to provide evidence of short-term market timing in bond repurchases.

The paper's main contribution is in providing robust empirical evidence that firms repurchase bonds at prices beneficial to their ongoing stakeholders and detrimental to their selling bondholders. The strong reaction to the disclosure of actual bond repurchases highlights the importance of this information for investors. Hence it may suggest that more stringent disclosure requirements on actual bond repurchases in other markets, such as the US, can improve market efficiency and limit the potential for wealth transfers from selling bondholders to ongoing stakeholders via bond repurchases.

The remainder of the paper is organized as follows. Section 2 describes the Israeli corporate bond market and bond-repurchase regulation and the data used in the study. Section 3 discusses the proposed methodology. Section 4 presents the main results of the paper and Section 5 offers several robustness tests. Finally, Section 6 concludes.

[8] Prior research on share repurchases is mostly limited to the investigation of repurchase program announcements, due to data limitations. However, Stephens and Weisbach (1998) show that actual share repurchases may differ significantly from announced programs.

2. Setting and Data

4.1 The Israeli Corporate Bond Market and Bond-Repurchase Regulation

As opposed to the situation in most countries, whereby corporate bonds are usually traded over-the-counter (OTC), corporate bonds in Israel are mostly traded on the exchange. Specifically, they are traded on the Tel Aviv Stock Exchange (TASE), which is the only exchange on which securities are traded in Israel. As of the end of 2020, 247 firms have 659 corporate bond issues (including convertible bonds and commercial papers) trading on the TASE (according to data from the Bank of Israel). According to the TASE's 2020 Annual Review, the market cap of all traded corporate bonds totaled NIS 347 billion ($107.9 billion) in December 2020 and their average daily trading volume was NIS 945 million ($293.9 million) in 2020.[9] Abudy and Wohl (2018) examine the liquidity of the Israeli corporate bond market and find it to be very liquid with high volume and low spreads relative to the US corporate bond market.[10] They attribute the high liquidity of the Israeli corporate bond market to the use of a limit order book, which stands in contrast to the worldwide prevalence of OTC trading in corporate bond markets.

As in the US, Israeli corporate law does not limit the repurchase of bonds by the firm that issued them, or by a firm under its control, unless it was restricted within the bond's prospectus.[11] Furthermore, bond repurchase is permissible in Israel on all dates, including those around the financial report publication. However, a firm is liable to any misuse of inside information: a firm trading its securities while in possession of non-public information is illegal under Israeli securities regulations. Indeed, looking at the distribution of bond repurchases relative to quarterly financial reports publication dates, it is noticeable that firms prefer to repurchase their bonds subsequent rather than prior to their financial reports, with half of the repurchases concentrated in the month following the report (Figure 1).[12]

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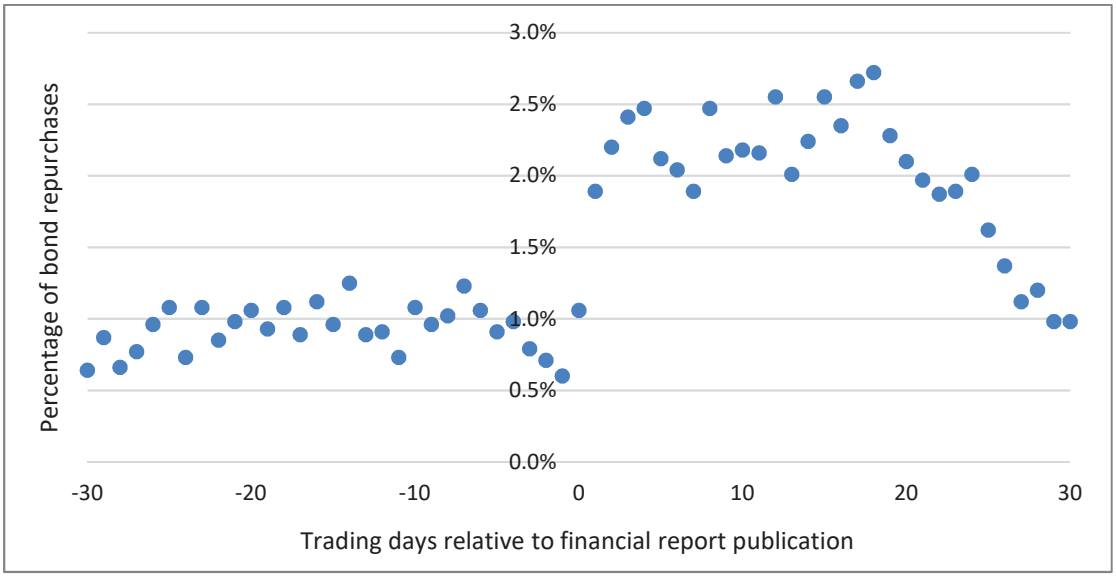
[9] The US dollar figures are calculated according to the dollar-shekel exchange rate as of December 31, 2020, which was $1 = NIS 3.215.

[10] The researchers report an average transaction's half spread of 0.078% for corporate bonds with a market cap above $28 million (approximately 60% of corporate bonds, representing 95% of total corporate bond market cap) that were traded on the TASE during 2014.

[11] When a firm repurchases its bonds the bonds are cancelled, but when a controlled firm repurchases the bonds of its controlling firm it becomes a bondholder and the bonds continue to trade.

[12] We are grateful to Menachem (Meni) Abudy for the quarterly financial reports publication dates.

Figure 1: Bond repurchase distribution relative to financial reporting dates



This figure describes the (%) distribution of trading days between bond repurchases and the repurchasing firms' financial reports publication dates.

Bonds can be repurchased under a preannounced repurchase program or on an ad-hoc basis.[13] Furthermore, firms can use a narrowly-defined bond repurchase program, in the spirit of US rule 10b5-1, to secure safe haven protection for securities repurchases and avoid the risk of informed trading allegations by the Israel Securities Authority (ISA). According to a legal opinion published by the ISA, a repurchase program qualifies for safe haven protection if the repurchase conditions are fixed in advance, to impede firms from using their private information to time the market. However, a careful reading of all the bond repurchase programs in our sample period indicates that only one such program completely complies with this requirement. This may suggest that firms are not inclined to forgo the flexibility to time their bond repurchases even to avoid potentially burdensome litigation costs. The adoption or amendment of a repurchase program requires the firm's board's approval, while the execution of actual bond repurchases, either as part of a preannounced repurchase program or on an ad-hoc basis, is at management's discretion.

Israeli securities regulations require firms to disclose actual open-market bond repurchases (as well as insider trading). A firm that executes an open-market bond repurchase (whether in the stock exchange or over the counter), or whose controlled

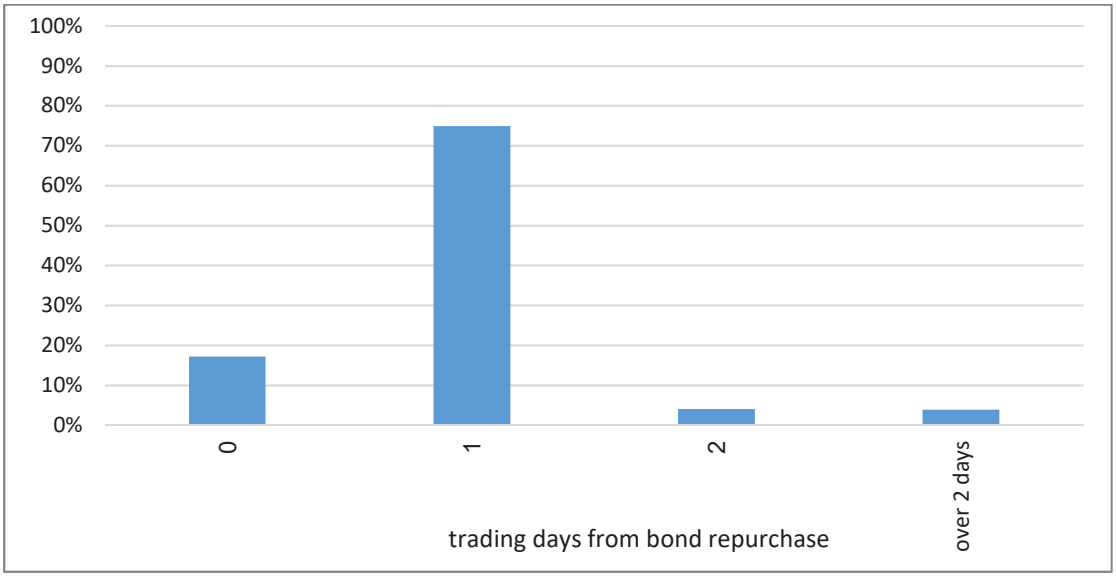
[13] In the US as well, bond repurchases are not necessarily preannounced, as opposed to share repurchases (Levy and Shalev, 2017).

firm executes an open-market bond repurchase or resale, is required to publish a current report to the public, disclosing the main attributes of the repurchase using ISA form 86 for "repurchase/re-issue of a security." As with other current reports, firms are required to report an open-market bond repurchase on the same day the event became known to the firm or on the next trading day, depending upon the hour at which it became known to the firm:

Time of the event[14]	Time of the report
00-9:30	Until 13:00 on the same trading day
9:30-17:00	Until 9:30 on the next trading day
After 17 or on a non-trading day	Until 13:00 on the next trading day

In our sample of bond repurchases, the median report occurs within a day of the actual repurchase date and less than 4% of the reports occur after the second trading day following the repurchase date (Figure 2).

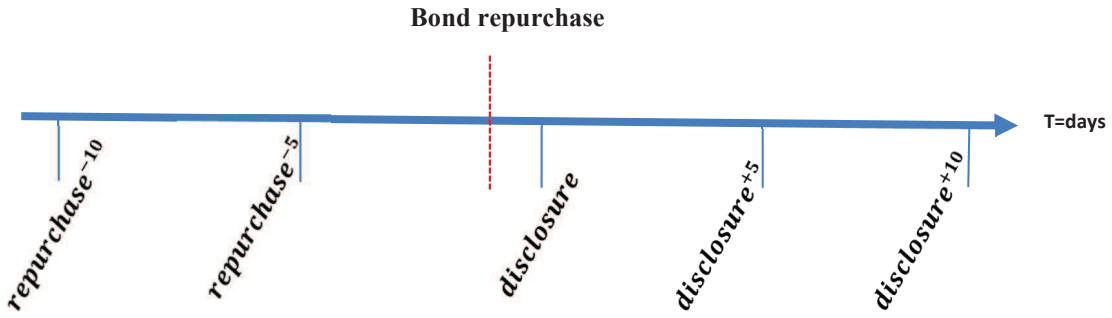
Figure 2: The distribution of days from bond repurchase to its disclosure



This figure describes the distribution of trading days between bond repurchases and their respective disclosure to the public. All disclosure occurring more than 2 trading days after the actual bond repurchase are grouped together under the label 'over 2 days'.

[14] According to Israeli securities regulation number 30, the relevant hour is defined as the hour at which the firm first became aware of the event.

We will examine if and when bond repurchases are accompanied by abnormal returns, according to the following timeline:



4.2 Data and Sample Design

The data on bond repurchases was gathered from MAYA, TASE's website for firm disclosures. The sample begins in 2008, as prior to this year there were very few reported bond repurchases. Some of the bond repurchase reports represent repeated reporting due to updates (error corrections). In such cases, we preserve the most recent data, together with the original reporting date and time, and dispose of the recurring reports. We exclude convertible bond repurchases and non-open market bond repurchases (option executions, redemptions, etc.).[15] In addition, we exclude bond repurchases executed by financial firms, since their capital structure, financing decisions, and regulatory regime, commonly differ from those of non-financial firms.[16] In line with common practice, we also exclude reports of utility firms since they tend to be heavily regulated.[17] Finally, we exclude dually listed firms since these firms are subject to the disclosure requirements of the other market in which they are traded (NYSE, NASDAQ, AMEX, or LSE's main market), and hence are not required to report bond repurchases.

As our data is based on firms' reports, the repurchase price data is susceptible to typing errors, thus we dispose reports that lack the repurchase price and omit the top and bottom 0.1 percent of the repurchase price distribution to exclude very extreme

[15] In other words, we keep only open market bond repurchases of corporate bonds and commercial papers.

[16] We identify financial firms according to the ISIC classification: Division 65 (insurance, reinsurance, and pension funding, except for compulsory social security) and Division 66 (activities auxiliary to financial services and insurance activities). Section K of the ISIC (financial and insurance activities) includes Division 64 (financial service activities, except for insurance and pension funding). However, a thorough examination of the activities of the firms in our dataset belonging to this division reveals that the nature of their activities is mostly non-financial (e.g., real-estate conglomerates classified as holding companies [ISIC 6420]); therefore, we do not exclude them from the data.

[17] See ISIC Division 49 (land transport and transport via pipelines).

outliers.[18] Since the empirical analysis will be carried out at the daily frequency, we combine different reports regarding the same bond on the same date into a single observation, leaving us with a total of 5,588 bond-day observations of 377 different bonds of 199 firms.[19]

We supplement the bond repurchase data with financial data gathered by the bank of Israel from the Tel Aviv Stock Exchange, which includes bond characteristics, prices, and liquidity measures. We also use corporate bond ratings as per the two rating agencies active in Israel, namely, 'Maalot' (a fully owned subsidiary of Standard & Poor's rating agency) and 'Midroog' (a partially owned [51 percent] subsidiary of Moody's rating agency), and firm industry classification as per the Israeli Central Bureau of Statistics, adjusted to international scale (ISIC). Insider trading data was gathered from MAYA, using all reports filed under ISA form 76 from January 2008 to December 2020.

Table 1 describes the cross-section distribution of bond repurchases across 199 repurchasing firms (firms that conducted at least 1 bond repurchase during the sample period). Of the firms in the sample that repurchased bonds, the median firm executed 9 bond repurchases between 2008 and 2020. Among the repurchasing firms, the median total amount repurchased was NIS 10.6 million. There was a lot of heterogeneity regarding the repurchases time-span, with firms in the 25th percentile of the distribution conducting all their bond repurchases within approximately one month, and firms in the 75th percentile of the repurchasing firms sample spreading their bond repurchases over more than 3 years. Finally, a median firm that repurchased bonds in a given year retired 3.1% of its outstanding bonds during that year via open market bond repurchases (median among firm-years with at least one bond repurchase, not in the table).

[18] The results of the empirical analyses are robust to the inclusion of these observations.

[19] 3.7% of bond repurchases are reported to have been executed outside TASE, while the "type of transaction" field of another 0.3% of bond repurchases is reported as "other".

Table 1: Bond repurchases across firms

	# Repurchases	Monthly repurchase frequency	Days between first and last repurchase	Total repurchase (NIS Millions)
25th Percentile	3	2.2%	32	3.7
Median	9	4.5%	230	10.6
75th Percentile	27	8.9%	1164	27.6
N	199	199	199	199

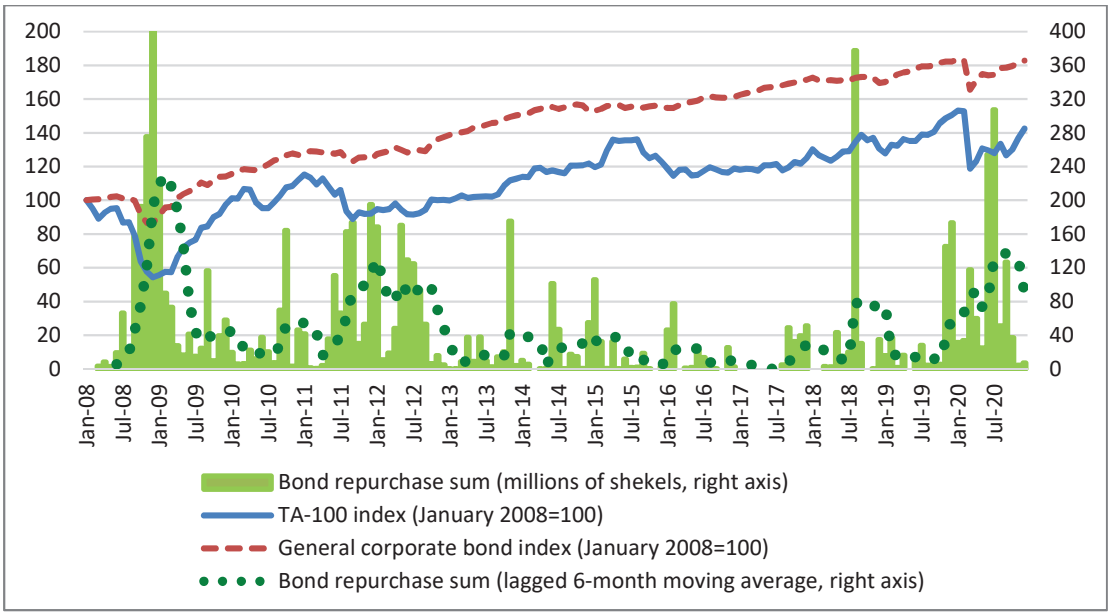
The table presents a cross-section distribution of bond repurchase characteristics across repurchasing firms, i.e., 199 firms that executed at least one bond repurchase during the sample period (that is, between 2008 and 2020). The first column shows the distribution of the number of bond repurchases. The second column shows the distribution of the percentage of repurchase months out of all the months in which the firm had at least one traded corporate bond during the sample period. The third column shows the distribution of the gap in calendar days between the first date on which a firm executed a bond repurchase and the last date on which that firm executed a bond repurchase during the sample. The fourth column shows the distribution of the total bond repurchase sum in NIS millions over the sample period.

Figure 3 depicts the development of total bond repurchases through time, relative to the development of the TA-100 stock index and TASE's general corporate bond index. The figure shows that bond repurchase sums surge in times of severe market downturns, most notably in the midst of the global financial crisis (2008–2009), the European sovereign debt crisis (2011–2012), and the COVID-19 crisis (2020).[20] Similarly, bond repurchase sums are highly positively correlated over time with 3 different measures for market uncertainty: the monthly (yearly) correlations of bond repurchases with the Israeli VIX (Eldor, Hauser, and Libel 2008), with the median bid-ask spread of corporate bonds on the TASE, and with the median standard deviation of corporate bond yield spreads within each industry are 49.8% (90.6%), 55.1% (73.3%), and 17.9% (30.1%), respectively. This suggests that firms tend to repurchase their bonds in the open market when there is a lot of uncertainty in the markets, in accordance with the findings of LS (2017) who use the VIX as a measure of market uncertainty.[21]

[20] The other noticeable peaks in the figure occur in November 2013 and August 2018, but each of these peaks is driven by one large bond repurchase. Hence, they seem to stem from idiosyncratic motives and not to represent a general trend.

[21] The ratio of market price to face value of the median repurchased bond in the sample was 89.5% on the trading day preceding the repurchase, supporting the notion that firms repurchase their bonds when their prices drop.

Figure 3: Bond repurchase sums and TASE's stocks and bonds indices over time



This figure describes the monthly development of the total sum of bond repurchases and the monthly averages of the TA-100 stock index and the Tel Aviv Stock Exchange general corporate bond index. The green columns show the total monthly sums of bond repurchases (in millions of shekels). The dark green dotted line shows the lagged 6-month moving average of these monthly sums. The blue line shows the monthly average of the TA-100 stock index, where January 2008 = 100. The red line shows the monthly average of the Tel Aviv Stock Exchange general corporate bond index, where January 2008 = 100.

Finally, Table 2 reports median firm characteristics for firms that repurchased their bonds at least once during the sample period (repurchasing firms) and for firms that had outstanding bonds during the sample period, but never executed a bond repurchase (non-repurchasing firms). The two groups seem similar in most financial aspects, though the median repurchasing firm use more leverage and more bond debt than its non-repurchasing firm counterpart. Therefore, firms that have more bond debt to begin with are also those that tend to buy-back their debt. In addition, the median bid-ask spread of the repurchasing firms' bonds is higher than the median bid-ask spread of the non-repurchasing firms' bonds. The lower liquidity of the repurchasing firms' bonds could result from informational costs of the bond repurchases, as other market players internalize the informational advantage of the repurchasing firms.

Table 2: Firm characteristics by repurchase activity (medians across firms and months)

	Repurchasing Firms	Non-Repurchasing Firms
Current Assets/Total Assets	31.8%	27.4%
Cash/Total Assets	4.0%	4.2%
Leverage	48.6%***	27.3%
Current Ratio	109.6%	116.5%
Total Debt (NIS Millions)	315.5	236.6
Face Value of Bonds Debt (NIS Millions)	79.9***	45.0
Half Bid-Ask Spread	0.54%***	0.34%
Number of Firms	199	243

The table compares median firm characteristics of the repurchasing firms (i.e., 199 firms that executed at least one bond repurchase during the sample period of 2008–2020) with median firm characteristics of non-repurchasing firms (i.e., 243 firms that had bonds outstanding during the sample period of 2008-2020 but did not execute any bond repurchase during this period.). *Current Assets/Total Assets* is the median of the quarterly ratios of current assets to total assets across quarters and firms. *Cash/Total Assets* is the median of the quarterly ratios of cash to total assets across quarters and firms. *Leverage* is the median of the quarterly ratios of total debt (long-term debt plus debt in current liabilities) to the market value of assets (book value of assets minus book value of equity plus market value of equity) across quarters and firms. *Current Assets/Total Assets*, *Cash/Total Assets*, and Leverage are winsorized to (0,100%). *Current Ratio* is the median of the quarterly ratios of current assets to current liabilities across quarters and firms. *Total Debt* is the quarterly median of total debt (long-term debt plus debt in current liabilities) across quarters and firms. *Face Value of Bonds Debt* is the median of the total daily face value adjusted for accrued interest and indexation of each firm's bonds across days and firms. *Half Bid-Ask Spread* is the median across firms of each firm's median daily half bid-ask spread across days and bonds. ***, **, * denote that the median firm characteristic is significantly larger for the repurchasing firms than for the non-repurchasing firms at the 1%, 5%, and 10% levels, respectively, using the chi-squared test for equality of medians.

3. Methodology

In order to examine whether firms time the market in their bond repurchases, we estimate whether these bond repurchases are followed by abnormal returns on the repurchased bonds. To this end we suggest estimating a simple model that looks for the effect of the bond repurchase and the days around it on bond returns, while controlling for relevant bond characteristics. Basically, we estimate a simple OLS regression of daily bond returns on relevant bond characteristics, as well as on dummy variables for the periods around bond repurchases.

We believe that our method is preferable over the commonly used method of cumulative abnormal returns (CAR) since (a) It allows us to use all available bond-date observations in the estimation; (b) It offers flexibility with respect to the variables affecting bond returns, enabling us to control for all the relevant bond characteristics, for day and firm fixed effects, for the impact of the bond repurchase, and for interactions of the bond repurchase dummy variables and relevant bond/repurchase attributes. (c)

The impact (or lack thereof) of the different bond characteristics on bond returns is determined endogenously within the model, rather than assumed ex-ante. However, the main results are robust to the use of cumulative abnormal returns (see the robustness section below).

Our method is in the spirit of Bessembinder, Cooper, and Zhang (2019) that propose a two-stage method whereby: (a) firm returns are regressed on lagged firm characteristics and the lagged estimated intercept and slope coefficients are used to predict current returns. (b) In the second stage, the difference between the realized and predicted returns is regressed on an event dummy variable. We suggest a simpler one-stage estimation that uses all available bond-date observations while controlling for relevant bond attributes.[22] However, our inferences are robust to using a two-stage method on the basis of Bessembinder et al. (2019), whereby the intercepts and slope coefficients from the first-stage are averaged over the prior 250 trading days.

Specifically, we regress daily bond returns on the following bond characteristics: rating, duration, floating rate dummy, CPI indexation dummy, and USD indexation dummy, and on the following bond repurchase dummy variables: a dummy that equals 1 between the 10^{th} and 6^{th} trading days prior to the bond repurchase and 0 otherwise; a dummy that equals 1 between the 5^{th} and last trading days prior to the bond repurchase and 0 otherwise; a dummy that equals 1 on the bond repurchase date and up until the last trading date prior to its disclosure to the public and 0 otherwise; a dummy that equals 1 on the repurchase disclosure trading day and 0 otherwise; a dummy that equals 1 between the 1^{st} and 5^{th} trading days following the repurchase disclosure and 0 otherwise; a dummy that equals 1 between the 6^{st} and 10^{th} trading days following the repurchase disclosure and 0 otherwise. In some of the specifications we also control for date fixed effects and firm fixed effects. We cluster the standard errors at the firm level to account for correlation between different bonds of the same firm.[23]

Corporate bonds' rating and duration are commonly used in the bond event-study literature to control for bond attributes (e.g. Bessmbinder, Kahle, Maxwell, and Xu, 2009). We use the local corporate bond rating as per the two rating agencies active in Israel - 'Maalot' and 'Midroog'. The rating is converted to numeric scale with the lowest

[22] We note that this simpler method is especially appropriate to our setting since we study daily observations and focus on short-term abnormal returns, and as the estimated coefficients are generally stable over our sample period.

[23] The results are robust to double-clustering by firm and date.

number attributed to the highest rating and the highest number attributed to the lowest rating.[24] Thus, we expect higher values of the 'rating' variable (that is, lower credit rating) to positively affect bond returns, due to positive risk premium on the riskier bonds. We use the modified duration as estimated by the Bank of Israel to account for the bond time to maturity and its coupons' schedule. We expect the duration to positively impact bond returns due to the positive slope of the term-structure during most of our sample period.

We also control for floating rate as some corporate bonds pay an interest rate that varies with some market rate. We expect this feature to negatively impact bond returns in our sample since interest rates declined during our sample period. Finally, we control for bond indexation as some corporate bonds in Israel are indexed either to the Consumer Price Index or to the U.S. Dollar. We expect CPI indexation to have a negative impact on bond returns as inflation in Israel was lower than expected during most of our sample period. The effect of Dollar indexation on bond returns is more ambiguous as the USD/NIS exchange rate fluctuated over the sample period, resulting in a minor NIS devaluation of 1.4% over these 8 years.

4. Results

4.1 Abnormal Returns on a Firm's Securities Following Bond Repurchase

Table 3 shows a formal statistical analysis of the abnormal returns around bond repurchase events. Specifically, we regress bond returns on bond characteristics and on dummy variables for different periods around the bond repurchase. The table uses the detailed nature of the data to separately analyze abnormal returns over six different periods: from the 10th trading day preceding the bond repurchase to the 6th trading day preceding the bond repurchase (d_b_rep_6_10); from the 5th trading day preceding the bond repurchase to the last trading day before the bond repurchase (d_b_rep_1_5); the bond repurchase period from the actual bond repurchase to the end of the trading date preceding the repurchase disclosure date (rep_period);[25] the trading day on which the

[24] Unsolicited bond rating is not common in Israel. We assign bonds that lack credit rating to the low-rating group. However, neither excluding these bonds from the estimation nor assigning them a value of zero and adding a dummy that receive the value of 1 only for bonds with bond rating dummy (in the spirit of Pontiff and Woodgate, 2008) alters our qualitative results. The results are also robust to replacing the discrete rating variable with a dummy variable for each rating category.

[25] If the repurchase was disclosed on the same date of the actual bond repurchase then this period does not exist. The results are robust to the exclusion of these repurchases.

repurchase is disclosed (rep_disc);[26] the 5 trading days period following the repurchase disclosure date (d_f_disc_1_5); the following 5 trading days (d_f_disc_6_10).

Table 3: Bond returns and bond repurchases

	(1)	(2)	(3)
constant	-0.002%	0.221%***	0.206%***
floating_rate	-0.009%***	-0.016%***	-0.014%***
cpi_indexed	0.004%*	-0.007%**	-0.005%
fx_indexed	0.003%	-0.007%	-0.001%
duration	0.005%***	0.005%***	0.006%***
low_rating	0.001%***	0.001%***	0.002%**
d_b_rep_6_10	-0.146%***	-0.058%**	-0.063%**
d_b_rep_1_5	-0.275%***	-0.138%***	-0.141%***
rep_period	0.075%	0.147%**	0.145%**
rep_disc_dummy	0.137%***	0.147%***	0.146%***
d_f_disc_1_5	0.253%***	0.138%***	0.135%***
d_f_disc_6_10	0.085%**	-0.004%	-0.008%
date FE		YES	
firm FE		YES	YES
Observations	1,722,398	1,722,398	1,722,398
R-squared	0.028%	4.165%	4.208%

The table shows the results of an OLS estimation, regressing bond returns on a floating_rate dummy, cpi-indexed dummy, fx_indexed dummy, bond duration, bond rating, and dummy variables for the 5 trading days preceding the bond repurchase (d_b_rep_1_5), the 5 trading days preceding these days (d_b_rep_1_5), the bond repurchase period (rep_period), the bond repurchase disclosure trading day (rep_disc), the 5 trading days following the disclosure (d_f_disc_1_5) and the 5 subsequent trading days (d_f_disc_6_10). The first column presents the results from the basic specification, the second column controls also for date fixed effects, and the third column controls both for date fixe-effects and firm fixed effects. ***, **, * denote that the coefficient is significantly different from zero at the 1%, 5%, and 10% levels, respectively, using standard errors clustered at the firm level.

The table shows that, controlling for the repurchased bond attributes, bond repurchases follow periods of low bond returns. This inference is somewhat weakened, once we also control for the period (columns 2 and 3), but it remains statistically significant. The finding that firms repurchase their bonds following down periods is in line with previous findings about stock repurchases: Peyer and Vermaelen (2009) report average prior 6-month abnormal stock return of -9.05% for stock repurchase announcement; DF (2015) show that firms manage to execute stock repurchases at prices significantly below the average stock price both prior and following the stock repurchase, for periods of up to 6 months from each side of the stock repurchase month.

[26] If the repurchase was disclosed after trading hours then this period is the next trading day.

Following the bond repurchase, the repurchased bonds enjoy positive abnormal returns.[27] The bonds react positively on the repurchase period, perhaps due to the price pressure of the repurchase or because sophisticated investors infer that the firm is repurchasing its bonds and react even before the official disclosure. Once the information about the repurchase is disclosed to the public, there is a strong reaction resulting in a daily abnormal return of about 0.15%, controlling for the bond attributes as well as for firm and date fixed effects. Though statistically and economically significant, this reaction apparently does not reflect a full adjustment of the prices to the new information, as it is followed by an abnormal return of 0.7%-1.3%, depending on the specification, over the subsequent 5 trading days. The basic specification suggest an abnormal return of another 0.4% over the five following trading days (that is, the 6th to 10th trading days following the bond repurchase disclosure to the public), but this result does not hold once we control for the date on columns 2 and 3 of the table.[28] Cumulating the returns over the days following the bond repurchase disclosure results in a drift of 1.7% (0.7%) in the 10 trading days following the bond repurchase disclosure, above and beyond what is explained by the repurchased bond characteristics (and the examined date).

The examined bond attributes have the expected signs. Floating-rate bonds under-perform as they do not enjoy the down-trend in yields over the sample period. Bonds indexed to the consumer price index also tend to yield lower returns, due to the lower-than-expected inflation over the sample period. Investors are compensated by higher returns for holding longer-term bonds or lower-rated bonds. Finally, we note that the results are robust to using bond fixed effects instead of firm fixed effects, as well as to clustering standard errors by both firm and date.

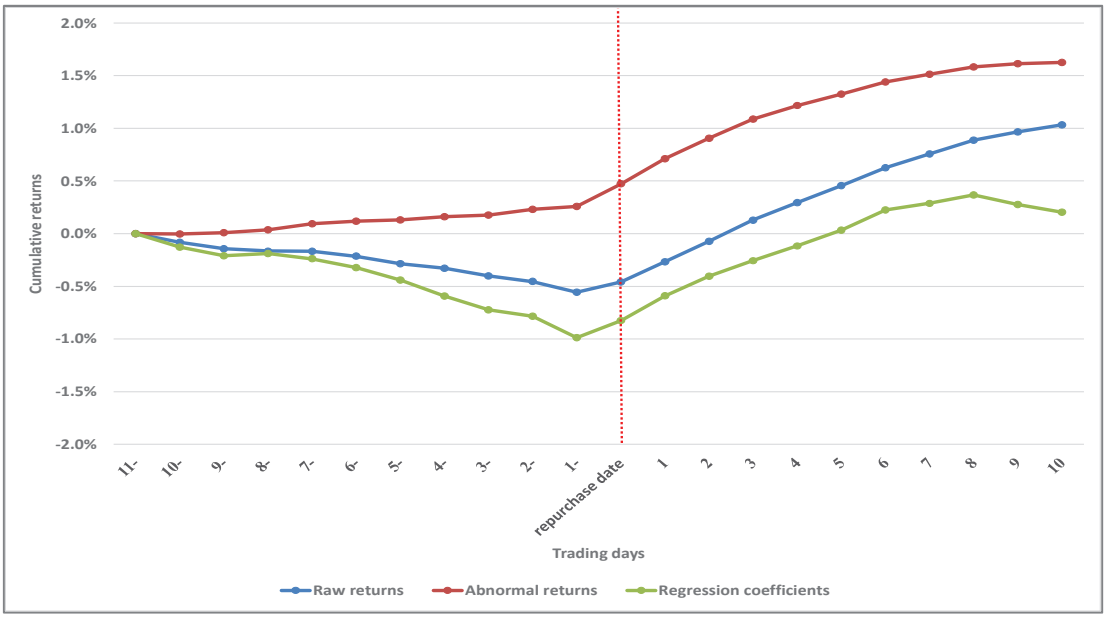
Figure 4 depicts the development of the cumulative returns around bond repurchases. The green line is based on the coefficients from a regression much like the one presented in Table 3, but with a separate dummy variable for each trading day around the bond repurchase. In line with the results in the table, the figure shows negative coefficient for the days preceding a bond repurchase. These coefficient

[27] In unreported results we also find some evidence for positive abnormal returns on other issues of the repurchasing firm following bond repurchase disclosure, but this abnormal return is not statistically different from zero once we control for the date.

[28] In unreported analyses, we also examined the bond repurchase impact over the following 10 trading days (i.e. the 11th to 21st trading days following the bond repurchase) and found no impact in any of the specifications. Also, the main results are robust to the exclusion if repeated repurchases of the same bond within the same month.

accumulate to about -1% over the ten days preceding the bond repurchase. Then, as of the repurchase date, the daily (excess) returns based on the regression coefficients turn positive, with the daily return culminating on the day following the bond repurchase, which is usually the day on which the firm discloses the repurchase to the public. Notwithstanding the sharp surge in returns on the repurchased bonds on the repurchase day and the subsequent trading day, the figure shows a prolonged drift that lasts for another 7 trading days. The regression coefficients remain significantly positive at the 5% level up to the 7th trading day following the bond repurchase. By this day, the cumulative excess return based on the regression coefficients, is 1.3% higher than its level on the eve of the repurchase date.

Figure 4: Cumulative average returns across bonds



This figure describes the development of the cumulative returns around bond repurchases using three alternative methods for (excess) bond returns estimation. The green line shows cumulative daily dummy variables coefficients from a regression of bond returns on bond characteristics, date FE, and dummy variables for the days around the bond repurchase. The red line shows cumulative average abnormal returns (CAR) on repurchased bonds around the bond repurchase, whereby abnormal returns are estimated by subtracting the daily return on an equally weighted portfolio of matched corporate bonds from the daily return on the repurchased bonds. The blue line shows cumulative average raw returns on repurchased bonds around the bond repurchase.

The return trend following the bond repurchase is not very sensitive to the estimation method. The blue line in Figure 4 depicts the cumulative raw returns in the days around an average bond repurchase, while the red line shows the Cumulative Abnormal Returns (CAR) versus a portfolio of similar corporate bonds over these

days.[29] Both these alternative measures show positive returns on the repurchase date and on the next trading day, followed by a drift that lasts for at least another 7 trading days. Our method, however, differs from the CAR method with regard to the days preceding the bond repurchase. While the cumulative abnormal returns evolve around zero prior to the bond repurchase, our estimation suggests, in line with the raw returns, that bond repurchases tend to follow days of abnormally low returns.

Do firms benefit from the bond price surge that follows their bond repurchases, or maybe their demand drives the repurchase price too high, especially for the less liquid bonds? In other words, does the increase in bond prices on the repurchase date occur before or after the bond repurchase, and does it mitigate the benefits from the repurchase? To address this question, we examine the development of the repurchased bond prices over the repurchase trading day, distinguishing the hours preceding the bond repurchase from the subsequent hours. To this end we estimate the raw returns and the abnormal returns on the repurchased bonds, separately for the time period from the opening of trade on the repurchase date until the bond repurchase (AR_until_rep) and for the time period from the bond repurchase until the closing of trade on the same trading date (AR_from_rep). The raw return over the sub-period AR_until_rep is based on the change in the bond price between the base price and the repurchase price, while the raw return over the sub-period AR_from_rep is based on the change in the bond price between the repurchase price and the closing price. Abnormal return in each of these sub-periods is estimated by subtracting half the daily return on a portfolio of similar corporate bonds from the raw returns.[30]

The table clearly demonstrates that the surge in bond prices on the repurchase date is attributable to the post-repurchase hours, while the repurchase price itself is not significantly different than the bond price at the beginning of trade. This conclusion holds even if we focus only on the higher half of the bid-ask spread distribution among the repurchases (bottom two rows of Table 4). Hence, the increased demand from the firm doesn't seem to significantly affect bond prices, even for relatively illiquid bonds. The firm doesn't overpay, and it benefits from the subsequent increase in the repurchased bond price, at the expense of the selling bondholders.[31]

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[29] For details regarding the CAR estimation, see the robustness section below.

[30] For further details regarding the abnormal returns estimation, see the robustness section below.

[31] The results in Table 4 are qualitatively similar if we exclude all the bond repurchases that were disclosed on the date of the bond repurchase, such that AR_from_rep incorporates the impact of the repurchase disclosure.

Table 4: Bond returns on bond repurchase dates, before and after the repurchase

		raw returns			Abnormal returns		
		Observations	Returns	t-stat (firm cluster)	Observations	Abnormal Returns	t-stat (firm cluster)
All bonds	AR_until_rep	5537	-0.007%	-0.12	5537	0.055%	0.95
	AR_from_rep	5537	0.103%	3.73	5537	0.166%	5.75
Liquid bonds	AR_until_rep	2709	0.022%	0.50	2709	0.046%	1.08
	AR_from_rep	2709	0.079%	5.23	2709	0.103%	6.17
Illiquid Bonds	AR_until_rep	2669	-0.031%	-0.29	2669	0.075%	0.72
	AR_from_rep	2669	0.119%	2.21	2669	0.225%	4.12

The table shows the abnormal returns (AR) in the two sub-periods of open market bond repurchase dates: the time period from the opening of trade on the repurchase date until the bond repurchase (AR_until_rep) and the time period from the bond repurchase until the closing of trade on the same trading date (AR_from_rep). Columns 3-5 show the average raw returns on the repurchased bonds. Columns 6-8 show the average abnormal returns, whereby abnormal returns for each sub-period are estimated by subtracting half the daily return on an equally weighted portfolio of matched corporate bonds from the raw return on the repurchased bond. Rows 1-2 show average returns for the entire sample of actual bond repurchases, rows 3-4 show average returns for bond repurchases in the bottom half of the bid-ask spread distribution, and rows 5-6 show average returns for bond repurchases in the uper half of the bid-ask spread distribution. ***, **, * denote the average abnormal return is significantly different from zero at the 1%, 5%, and 10% levels, respectively, using the parametric t-test, with standard errors clustered at the firm level.

The positive impact of debt repurchases on the repurchased bonds could have stemmed from their impact on the firms' leverage.[32] However, open market bond repurchases, as opposed to bond tender offers, tend to be rather small relative to the firms' debt.[33] Total open-market bond repurchases by the median firm in the sample over the entire sample period serve to reduce its leverage by less than 2 percentage points. Therefore, leverage reduction does not appear to be a sufficient explanation for the large effect of open-market bond repurchases on the repurchasing firms' bonds.

4.2 The Cross-Section of the Abnormal Bond Returns

In this section we will take advantage of the cross-section of our unique sample in order to better understand how important attributes of the bond repurchases and the bonds themselves affect the abnormal returns on the repurchased bonds. The choice of characteristics examined is motivated by the above findings as well as by the findings in the share repurchase literature. We analyze the impact of the examined characteristics

[32] Hovakimian (2004) finds that firms use debt reductions to offset accumulated deviations from a target leverage that balances the costs and benefits of debt.

[33] See, e.g., the descriptive statistics in LS (2017).

on bond returns within our estimation framework, by adding the relevant attribute and its interaction with the bond repurchase dummy to the regression.

4.2.1 Repurchase Programs

Israeli securities regulations permit the repurchase of bonds either under a repurchase program or on an ad-hoc basis. Interestingly, as Panel A of Table 5 shows, the majority of the actual bond repurchases were not executed within a repurchase program.[34] A repurchase program informs the market that the firm intends to repurchase some of its bonds. However, a repurchase program is not an obligatory and precise commitment to repurchase and it may be realized only partially or may not be fulfilled at all (Stephens and Weisbach, 1988). Hence, the existence of a repurchase program supply the market with a noisy signal regarding actual future repurchases. When investors observe an increased demand for bonds for which a repurchase program have been previously announced, they may infer that this demand is driven by the firm repurchasing its bonds in accordance with the pre-announced program. In this case the investors may react and demand a premium for the repurchased bonds, even before the repurchase has been formally disclosed by the firm.

Panel B of Table 5 reports estimations for the effect of a bond repurchase program on market reaction to an actual bond repurchase. In columns 1-3, we distinguish between abnormal returns following ad-hoc bond repurchases and abnormal returns following bond repurchases conducted within a bond repurchase program, by adding a repurchase program dummy (*rep_prog*) and its interactions with the bond repurchase dummies to the estimation. The dummy variables for the days preceding the bond repurchase are negative and statistically significant, while the dummy variables for the repurchase disclosure date and for the subsequent trading days are positive and statistically significant, in line with our main results. In addition, the repurchase program dummy has significant effects.

[34] It is worth noting that while firms were required to disclose actual bond repurchases throughout the sample period, only in December 2008 did the ISA directly instruct them to also disclose the adoption of a bond repurchase program or changes to such a program. The lack of a clear requirement to disclose bond repurchase programs prior to December of 2008 can explain the prevalence of ad-hoc bond repurchases in the first year of the sample period, but it cannot account for the prevalence of ad-hoc repurchases throughout the sample period, noticeable in Panel A of Table 4.

Table 5: Bond returns, bond repurchases, and the existence of repurchase program

Panel A: The prevalence of repurchase programs within actual bond repurchases

	Outside bond repurchase program	Within bond repurchase program
Number of bond repurchases	4,802	784
Number of repurchased bonds	295	126
Number of repurchasing firms	176	75

Panel B: Bond returns and repurchase program variables

	(1)	(2)	(3)	(4)	(5)	(6)
constant	-0.005%	0.221%***	0.205%***	-0.005%	0.221%***	0.205%***
floating_rate	-0.009%***	-0.016%***	-0.014%***	-0.009%***	-0.016%***	-0.014%***
cpi_indexed	0.005%**	-0.007%**	-0.005%	0.005%**	-0.007%**	-0.005%
fx_indexed	0.006%	-0.007%	0.000%	0.006%	-0.007%	0.000%
duration	0.006%***	0.006%***	0.006%***	0.006%***	0.006%***	0.006%***
low_rating	0.001%***	0.001%***	0.002%**	0.001%***	0.001%***	0.002%**
rep_prog	0.047%**	0.029%	0.027%	0.044%**	0.027%	0.025%
d_b_rep_6_10	-0.165%***	-0.065%*	-0.069%**	-0.165%***	-0.065%*	-0.069%**
d_b_rep_6_10 * rep_prog	0.085%	0.012%	0.013%	0.077%	0.004%	0.005%
d_b_rep_1_5	-0.306%***	-0.153%***	-0.156%***	-0.307%***	-0.154%***	-0.157%***
d_b_rep_1_5 * rep_prog	0.173%**	0.068%	0.074%	0.162%**	0.058%	0.064%
rep_period	-0.014%	0.069%	0.067%	-0.014%	0.069%	0.067%
rep_period * rep_prog	0.621%***	0.550%***	0.552%***	0.610%***	0.540%***	0.542%***
rep_disc	0.164%***	0.177%***	0.176%***	0.164%***	0.177%***	0.177%***
rep_disc* rep_prog	-0.203%	-0.244%**	-0.241%**	-0.199%	-0.240%**	-0.236%**
d_f_disc_1_5	0.302%***	0.181%***	0.177%***	0.302%***	0.181%***	0.178%***
d_f_disc_1_5* rep_prog	-0.298%***	-0.260%***	-0.252%***	-0.291%***	-0.253%***	-0.245%***
d_f_disc_6_10	0.116%***	0.020%	0.016%	0.116%***	0.020%	0.016%
d_f_disc_6_10* rep_prog	-0.192%*	-0.145%	-0.140%	-0.188%*	-0.141%	-0.136%
rep_prog _announcement				0.695%***	0.668%***	0.664%***
date FE		YES	YES		YES	YES
firm FE			YES			YES
Observations	1,722,398	1,722,398	1,722,398	1,722,398	1,722,398	1,722,398
R-squared	0.037%	4.170%	4.213%	0.040%	4.173%	4.216%

The table examines how the abnormal returns on repurchased bonds vary with the existence of a bond repurchase program at the time of the bond repurchase. Panel A shows the distribution of repurchase events, repurchased bonds, and repurchasing firms by the existence of a valid repurchase program at the time of the repurchase. Panel B shows the results of an OLS estimation, regressing bond returns on a floating_rate dummy, cpi-indexed dummy, fx_indexed dummy, bond duration, bond rating, and dummy variables for the 5 trading days preceding the bond repurchase (d_b_rep_1_5), the 5 trading days preceding these days (d_b_rep_1_5), the bond repurchase period (rep_period), the bond repurchase disclosure trading day (rep_disc), the 5 trading days following the disclosure (d_f_disc_1_5) and the 5 subsequent trading days (d_f_disc_6_10), as well as dummy variables for a repurchase within a bond repurchase program (rep_prog) and its interactions with the above-mentioned repurchase period dummies, and a dummy variable for the announcement of a bond repurchase program (rep_prog_announcement). Columns 1 and 4 present the results from the basic specification, columns 2 and 5 control also for date fixed effects, and columns 3 and 6 control both for date fixe-effects and firm fixed effects. ***, **, * denote that the coefficient is significantly different from zero at the 1%, 5%, and 10% levels, respectively, using standard errors clustered at the firm level.

Bond repurchases within a pre-announced bond repurchase program seem to depend less on prior bond returns, as the interactions of the repurchase program dummy with the pre-repurchase days tend to be positive (though not statistically significant in most specifications), thus mitigating the negative pre-repurchase trend in bond prices. Repurchases within a bond repurchase program have a large effect on bond prices in the actual repurchase period, even prior to its disclosure to the public; It seems that, in line with the above conjecture, the market reaction is much timelier for bond repurchases conducted within a repurchase program than for ad-hoc bond repurchases, to which the market reacts only upon the formal public disclosure of the repurchase. The interaction coefficients of the repurchase program with the repurchase disclosure date and with the two drift dummy variables are negative, completely eliminating the positive impact of the repurchase disclosure and the following drift that are observable for ad-hoc bond repurchases. Thus, there is a very strong and short-lived positive reaction to actual bond repurchases within a pre-announced repurchase program, while the market is much slower to react to ad-hoc bond repurchases, but the overall impact is similar and positive.

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To complete the picture we also estimate the market reaction to the announcement of a bond repurchase program. In Panel B of Table 5, columns 4-6, we repeat the estimation in columns 1-3, but also with a dummy variable that receives the value of 1 only for bond-dates observation on which the firm announce a bond repurchase program that encompasses the examined bond. The program announcement dummy does not alter the main inferences from columns 1-3 of the table. In addition, it shows that the market reacts very positively to the announcement of a bond repurchase program. The coefficient on the bond repurchase program announcement dummy is 0.7%. This coefficient is not only statistically significant, but also very large. It is larger than the total impact of the actual bond repurchase, as measured by the sum of the coefficients on the dummy variables for the repurchase period, the disclosure date and the subsequent trading days.

Taken together, these findings reveal that investors respond strongly to the announcement of a bond repurchase program, but also consider actual bond repurchases to be informative, even within such a program. Bond repurchases with a pre-announced program seem to be more salient than ad-hoc bond repurchases, as investors positive reaction to the former is very timely, preceding their formal disclosure. It seems that many firms choose to exploit private positive information by timing the market through ad-hoc bond repurchases (in the spirit of Kumar, Langberg, Oded, and Sivaramakrishnan, 2017), but few of their counterparts prefer to signal their high quality to the market by using a bond repurchase program (in the spirit of Ofer and Thakor, 1987; Oded, 2005).[35] The firms that use ad-hoc repurchases do not announce their intentions in advance, take advantage of decline in bond prices, and manage to repurchase the bonds with minimum price-impact. When they finally have to disclose the repurchase to the public, the investors view it very positively. The firms that repurchase bonds within a pre-announced repurchase program seem less concerned with the bond price trend prior to the actual repurchase and with the repurchase price impact. The investors react to the initial announcement on the bond repurchase program made by these firms, but also to its materialization.

[35] Bond and Zhong (2016) construct a dynamic model in which share repurchases are used both as a signal (by bad firms) and as a means to time the market (by good firms). In their model some firms repurchase their shares in order to improve the terms of a subsequent seasoned equity offering. In our data, however, less than 4% of bond repurchases were followed by an issue of the repurchased bond in the following year.

4.2.2 Bond Rating

Corporate bonds in Israel are rated either by Maalot (a fully owned subsidiary of Standard & Poor's rating agency) or Midroog (a partially owned [51 percent] subsidiary of Moody's rating agency). Both rating agencies use a local rating scale that is easily convertible to the international rating scale. In order to examine the bond rating's impact on the market reaction to its repurchase, we divide the sample into investment grade (IG) bonds (bonds rated BBB- and above according to the local credit scale) and high-yield (HY) bonds (bonds rated below BBB- including unrated bonds). The distinction between IG bonds and HY bonds is common practice for market participants, regulators, and researchers. Focusing on the information sensitivity of debt, recent papers suggest that debt is very information in-sensitive when it is deep in the money, as is normally the case with IG bonds. However, when the firm is closer to the default region, as is the case with HY bonds, the value of its bonds is very sensitive to private information (Holmstrom, 2015; Benmelech and Bergman, 2018). Based upon this reasoning, we expect that if bond repurchases are informative about the firm value, then their impact on HY bonds will be larger than their impact on IG bonds.

To test this assumption, Table 6 repeats the main estimation (Table 3, Panel A), controlling also for the rating of the examined bonds. To this end, we add a HY dummy variable (*HY*) and its interactions with the bond repurchase dummies.[36] The coefficient on the HY dummy is positive and statistically significant, much like the coefficient on the low rating dummy in the main estimation, and in accordance with the notion that holders of lower quality bonds that carry higher risk are to be compensated by higher returns. In line with the above prediction, HY bonds are more affected by repurchases than their IG counterparts. While investors in both groups react positively to the disclosure of a bond repurchase, the effect is stronger for the HY bonds. We note that though the interaction terms of HY with the different bond repurchase dummies are not statistically significant in most specifications, the sum of the HY interactions with the post-repurchase dummy variables (i.e. *HY*rep_period* + *HY*rep_disc* + *HY*d_f_disc_1_5* + *HY*rep_disc* + *HY*d_f_disc_6_10*) accumulate to a return of about 1.3% above the return on investment grade bonds following bond repurchases. This sum of interaction coefficients is also larger than zero with a significance level of at least 5% in all of our specifications. The stronger impact of bond repurchases on low

[36] The HY dummy replaces the rating variable, as to avoid high multi-collinearity.

rated bonds lends further support for the information explanation for the positive response of investors to actual bond repurchases.

Table 6: Bond returns, bond repurchases, and credit rating

Panel A: The prevalence of investment-grade bonds (IG) and high-yield bonds (HY) within actual bond repurchases

	IG bonds	HY bonds
Number of bond repurchases	3,796	1,786
Number of repurchased bonds	234	157
Number of repurchasing firms	107	115

Panel B: Bond returns and credit-rating group

	(1)	(2)	(3)
constant	0.006%*	0.229%***	0.219%***
floating_rate	-0.010%***	-0.016%***	-0.014%***
cpi_indexed	0.004%	-0.008%**	-0.005%
fx_indexed	0.003%	-0.006%	0.001%
duration	0.005%***	0.005%***	0.006%***
HY	0.018%***	0.012%**	0.023%*
d_b_rep_6_10	-0.113%**	-0.019%	-0.021%
d_b_rep_6_10* HY	-0.082%	-0.098%	-0.102%
d_b_rep_1_5	-0.258%***	-0.133%***	-0.134%***
d_b_rep_1_5* HY	-0.036%	0.000%	-0.006%
rep_period	0.028%	0.087%	0.086%
rep_period* HY	0.124%	0.164%	0.163%
rep_disc	0.136%**	0.130%***	0.130%***
rep_disc* HY	0.055%	0.124%	0.119%
d_f_disc_1_5	0.222%***	0.091%**	0.090%**
d_f_disc_1_5* HY	0.078%	0.126%**	0.121%*
d_f_disc_6_10	0.066%	-0.040%	-0.043%
d_f_disc_6_10* HY	0.044%	0.084%	0.081%
date FE		YES	YES
firm FE			YES
Observations	1,722,396	1,722,396	1,722,396
R-squared	0.029%	4.170%	4.212%

The table examines how the abnormal returns on repurchased bonds vary with the credit rating of the bond. Panel A shows the distribution of repurchase events, repurchased bonds, and repurchasing firms by credit rating group. Panel B shows the results of an OLS estimation, regressing bond returns on a floating_rate dummy, cpi-indexed dummy, fx_indexed dummy, bond duration, bond rating, and dummy variables for the 5 trading days preceding the bond repurchase (d_b_rep_1_5), the 5 trading days preceding these days (d_b_rep_1_5), the bond repurchase period (rep_period), the bond repurchase disclosure trading day (rep_disc), the 5 trading days following the disclosure (d_f_disc_1_5) and the 5 subsequent trading days (d_f_disc_6_10), as well as dummy variables for non-investment grade bonds (HY) and its interactions with the above-mentioned repurchase period dummies. The first column presents the results from the basic specification, the second column controls also for date fixed effects, and the third column controls both for date fixe-effects and firm fixed effects. ***, **, * denote that the coefficient is significantly different from zero at the 1%, 5%, and 10% levels, respectively, using standard errors clustered at the firm level.

4.3 Bond Repurchase and Insider Trading

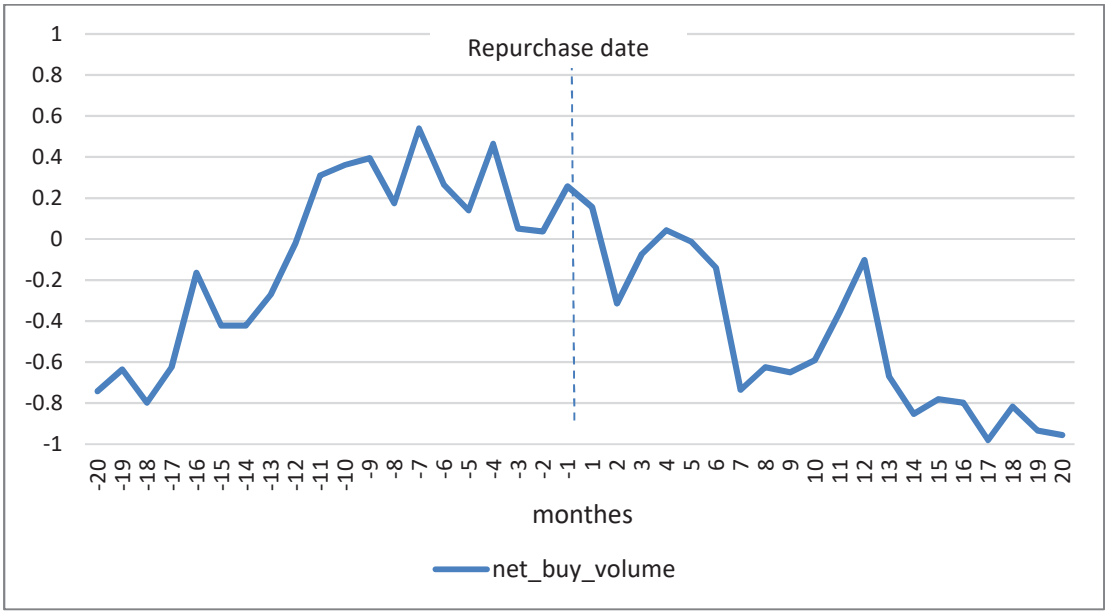
The findings so far suggest that bond repurchases reflect positive information of the repurchasing firms' managers about their firms. If this is the case, one may suspect that the managers will also try to gain more directly from this positive information by trading for their own benefit. Indeed, previous papers find that insiders' net purchases relate positively to actual share repurchase amounts (BOW, 2014), negatively to actual repurchase prices (DF, 2015), and positively to repurchase announcement returns (Cziraki, Lyandres, and Michaely, 2021). In addition, LS (2017) find that insiders' net purchases relate positively to open-market bond repurchases in the same quarter.

In this section we examine the development of insider trading around actual open-market bond repurchases and its interaction with the market reaction to the bond repurchase disclosure. We use data on all insiders' trades according to ISA form 76 from January 2008 to December 2020. We exclude all reports that do not disclose actual purchases or sells of shares (option executions, bond conversions, etc.), reports that disclose insiders' trades in securities other than common stocks, and reports disclosing purchases or sells by the firm itself, institutional investors, and banks. Following Cziraki, Lyandres, and Michaely (2021), we calculate insiders' net purchases as:

$$net\ buy\ volume = \frac{\#\ shares\ purchased\ by\ insiders - \#\ shares\ sold\ by\ insiders}{\#\ shares\ purchased\ by\ insiders + \#\ shares\ sold\ by\ insiders}$$

We begin by examining insider trading around bond repurchase events. Figure 5 depicts the average net repurchases of insiders at the monthly level around actual open-market bond repurchases. In line with the papers mentioned above, the figure shows that on average insiders tend to sell their firms' shares. However, the figure demonstrates that insiders turn into net buyers about a year prior to bond repurchases. This pattern resembles Cziraki, Lyandres, and Michaely's (2021) finding for the months preceding a share repurchase announcement, but the effect we find is much stronger. It suggests that insiders act upon their positive private information or their superior interpretation of public information not only to benefit the firm using bond repurchases but also to benefit personally using net stock purchases (or fewer net stock sells).

Figure 5: Average insiders' net purchases around bond repurchases



This figure describes the development of the average monthly insiders' net purchases around the bond repurchase. *net_buy_volume* is calculated as (number of shares purchased by insiders in the examined month - number of shares sold by insiders in the examined month)/ (number of shares purchased by insiders in the examined month + number of shares sold by insiders in the examined month). The months are depicted relative to the actual bond repurchase date (time 0), where each month includes 20 trading days.

Next, we examine whether insider trading prior to actual open-market bond repurchases contains additional relevant information. Following Cziraki, Lyandres, and Michaely (2021), we measure insider trading over a six-month period beginning 7 months before the bond repurchase and ending 1 month before the bond repurchase. To test the effect of insider trading on the market reaction to bond repurchases, we repeat in Table 7 the main estimation (Table 3), but focus on the impact of prior insider trading. To this end, in Table 7 we add to the estimation a dummy variable that receives the value of 1 only for firms with insiders' net purchases in months (-7,-1) relative to the examined period (*insider_purchase*) and its interaction with the bond repurchase dummy variables.

The table shows that, in line with the findings of DF (2015) and Cziraki, Lyandres, and Michaely (2021) for share repurchases, the effect of bond repurchases is larger for firms whose insiders purchased their shares in the preceding months. Firms whose insiders purchased their stocks are more likely to repurchase their bonds following a decline in their prices. While investors in both groups react positively to actual bond repurchases, the effect is larger for bond repurchases preceded by insiders' net

purchases. Most notably, the upside drift in the 10 trading days following the bond repurchase disclosure is much larger, both statistically and economically, when the repurchase was preceded by insiders' purchases. These results provide further support for the idea that open-market bond repurchases reflect managers' positive information about the value of their firms.

Table 7: Bond returns, bond repurchases, and Insiders' net purchases

	(1)	(2)	(3)
constant	0.001%	0.221%***	0.206%***
floating_rate	-0.011%***	-0.016%***	-0.014%***
cpi_indexed	0.004%	-0.007%**	-0.005%
fx_indexed	0.004%	-0.007%	-0.001%
duration	0.005%***	0.005%***	0.006%***
low_rating	0.001%***	0.001%***	0.002%**
insider_purchase	-0.025%***	-0.004%	-0.005%
d_b_rep_6_10	-0.151%***	-0.064%**	-0.069%**
d_b_rep_6_10* insider_purchase	0.042%	0.037%	0.037%
d_b_rep_1_5	-0.234%***	-0.113%***	-0.117%***
d_b_rep_1_5* insider_purchase	-0.280%**	-0.172%**	-0.170%**
rep_period	0.109%	0.156%**	0.154%**
rep_period* insider_purchase	-0.222%	-0.061%	-0.060%
rep_disc	0.115%***	0.121%***	0.121%***
rep_disc* insider_purchase	0.156%	0.182%	0.184%
d_f_disc_1_5	0.221%***	0.114%***	0.111%***
d_f_disc_1_5* insider_purchase	0.230%**	0.167%*	0.171%*
d_f_disc_6_10	0.090%***	-0.004%	-0.008%
d_f_disc_6_10* insider_purchase	-0.029%	-0.004%	-0.002%
date FE		YES	YES
firm FE			YES
Observations	1,722,418	1,722,418	1,722,418
R-square	0.034%	4.167%	4.209%

The table shows the results of an OLS estimation, regressing bond returns on a floating_rate dummy, cpi-indexed dummy, fx_indexed dummy, bond duration, bond rating, and dummy variables for the 5 trading days preceding the bond repurchase (d_b_rep_1_5), the 5 trading days preceding these days (d_b_rep_1_5), the bond repurchase period (rep_period), the bond repurchase disclosure trading day (rep_disc), the 5 trading days following the disclosure (d_f_disc_1_5) and the 5 subsequent trading days (d_f_disc_6_10), as well as a variable for prior insider trading (Insider_purchase) and its interactions with the above-mentioned repurchase period dummies. Insider_purchase is a dummy that receives the value of 1 for bonds of firms whose insiders have been net buyers of the firm shares in months (-7,-1), and zero otherwise. The insider purchase dummy is based on *net_buy_volume* = (number of shares purchased by insiders in the examined month - number of shares sold by insiders in the examined month)/ (number of shares purchased by insiders in the examined month + number of shares sold by insiders in the examined month). Column 1 presents the results from the basic specification, column 2 controls also for date fixed effects, and column 3 controls both for date fixed effects and firm fixed effects. ***, **, * denote that the coefficient is significantly different from zero at the 1%, 5%, and 10% levels, respectively, using standard errors clustered at the firm level.

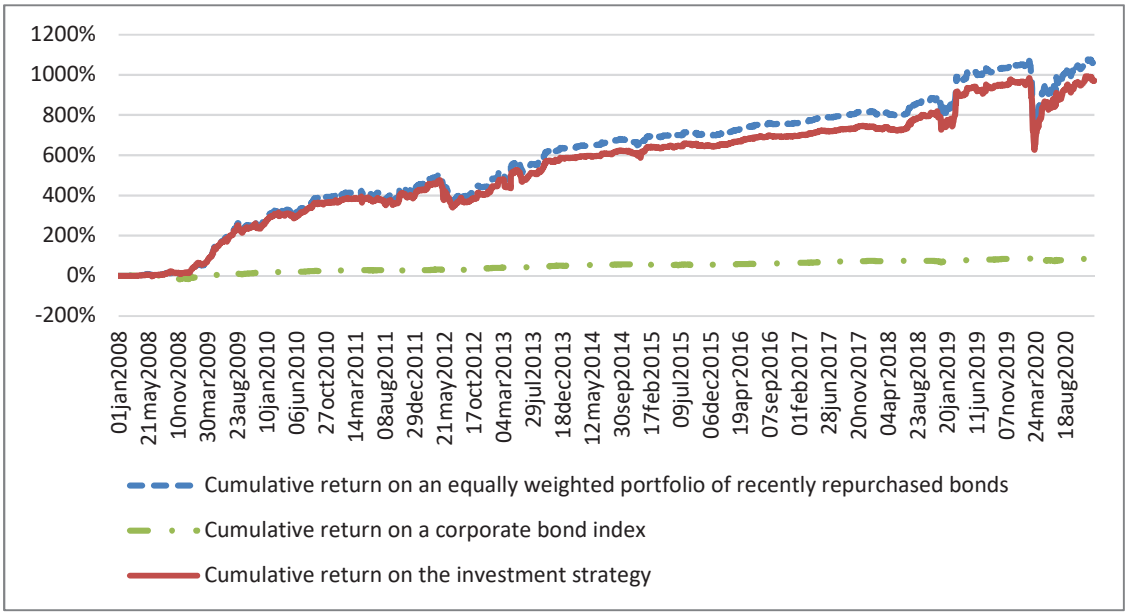
4.4 Trading Strategy

Table 3 demonstrates that bond repurchases are followed by statistically highly significant and economically large abnormal returns and that these returns last for several days after the repurchase disclosure. In this section we will explore whether investors can take advantage of this gradual market reaction to bond repurchase disclosure, by examining an implementable investment strategy. To ensure that this is indeed an applicable strategy from the outsiders' perspective we will assume that investors become aware of the bond repurchase only at the end of the disclosure day or the end of the next trading day if the repurchase was disclosed after trading hours. Note that this is a conservative assumption since investors can trade on the new information on the disclosure day in the hours following the disclosure. Also, information may leak before the disclosure or be inferred by investors with some probability. Thus, our results here constitute a lower bound for the actual potential trading gains in the sample period.[37]

The repurchase-based trading methodology amounts to taking a long position on recently repurchased bonds and taking a short position on TASE's general corporate bond index. Figure 6 depicts the development through the sample period of this strategy and both its legs: the accumulated returns from investing in TASE's general corporate bond index (the short leg) alongside the accumulated returns from investing in an equally weighted portfolio of bonds whose repurchase was disclosed in the previous 5 trading days (the long leg). The difference in returns is striking: a Shekel invested in the corporate bond index on January 1, 2008, would have yielded 1.87 Shekels by the end of 2020, whereas a Shekel invested in recently repurchased bonds would have yielded 11.58 Shekels (!) over the same period. This difference results in a cumulative return of 972% for the long-short strategy over the years 2008-2020.

[37] Indeed, the returns for an insider that implements the same strategy starting on the first trading day following the bond repurchase, rather than on its disclosure trading day, are much higher. These results are available from the authors upon request.

Figure 6: Cumulative returns on an implementable trading strategy



This figure describes the development of the cumulative returns on the long and short legs of an investment strategy going long on recently repurchased bonds and short on a corporate bond index, as well as the cumulative return on the strategy itself. The green line shows the cumulative returns throughout the sample period from daily investment in TASE's general corporate bond index. The blue line shows the cumulative returns throughout the sample period from daily investment in an equally weighted portfolio of all the corporate bonds whose repurchase have been disclosed in the prior five trading days when there were reports on bond repurchases in the preceding 5 trading days, and investing in TASE's general corporate bond index otherwise. The red line shows the cumulative returns throughout the sample period from daily investment in an equally weighted portfolio of all the corporate bonds whose repurchase have been disclosed in the prior five trading days, funded by shorting TASE's general corporate bond index when there were reports on bond repurchases in the preceding 5 trading days, and investing in TASE's general corporate bond index otherwise.

In order to translate this figure into a completely applicable trading strategy, we examine the following decision rule: if there were any reports on bond repurchases in the previous five trading days than short the index and use the intakes to purchase an equal share of all the bonds whose repurchase was disclosed in the previous five trading days; otherwise invest in the index. In 75.6% of the trading days from the beginning of 2008 until the end of 2020 there have been bond repurchases reported in the previous five trading days, while in the remaining trading days the strategy yields the index return. Table 8 shows the returns from daily investment in this implementable trading strategy. The table demonstrates that this investment strategy yields a very statistically and economically significant annual return of 16%, though at a higher risk than investing in the general corporate bond index, as evident from its higher standard deviation. Even more strikingly, the fifth and sixth columns of the table establish that this large return is not driven solely by low-rated or illiquid bonds. In particular,

limiting investment only to investment-grade bonds or only to bonds with high daily trading volume reduces the number of days in which one can apply the long-short strategy; nevertheless, the trading strategy achieves high positive returns even under these limitations. For example, limiting investment only to bonds with a daily trading volume above NIS 1 million reduces the number of days in which one can apply the long-short strategy by almost 20%, turning 428 potentially more profitable trading days into index-investment days. However, the remaining days suffice to achieve an annually compounded return of 20.1%, which is even above the return of the unlimited trading strategy.

Table 8: Returns on investment strategy based on bond repurchases

	The 2 legs of the strategy		Implementable trading strategy		
	Repurchased portfolio	Index	Full sample	IG bonds	Volume> NIS 1m
Annual return	21.605%***	5.095%***	16.068%***	8.353%***	20.982%***
Daily return	0.080%***	0.020%***	0.061%***	0.033%***	0.078%***
Daily S.D.	0.743%	0.32%	0.616%	0.530%	0.845%

The table shows the performance of daily investment in an implementable trading strategy. The upper line shows the annually compounded return, calculated as (1+daily return) ^244. The middle line shows the daily return. The bottom line shows the standard deviation of the daily returns. The first column shows the return on the long leg of the strategy, i.e. buying an equally weighted portfolio of all bonds whose repurchase was disclosed in the preceding 5 trading days when there were reports on bond repurchases in the preceding 5 trading days, and investing in TASE's general corporate bond index otherwise. The second column shows the return on the short leg of the strategy, i.e. investing in TASE's general corporate bond index. Columns 3-5 show the return on the implementable trading strategy, consisting of buying an equally weighted portfolio of all bonds whose repurchase was disclosed in the preceding 5 trading days and selling TASE's general corporate bond index when there were reports on bond repurchases in the preceding 5 trading days, and investing in TASE's general corporate bond index otherwise. The third column shows the strategy's returns for the entire sample. The forth column limits the calculation to investment-grade bonds (i.e., bonds rated BBB- and above). The fifth column limits the calculation to date-bond observations with daily trading volume above NIS 1 million. ***, **, * denote that the annual/daily return is significantly different from zero at the 1%, 5%, and 10% levels, respectively, based on a two-sided t-test.

4.5 Robustness Tests

4.5.1 Financial Crises

The thirteen years that we analyze saw some very turbulent times, as can be seen in Figure 3. Noteworthy among these are the global financial crisis of 2008, the European sovereign debt crisis that reached its pick in 2011, and the COVID-19 crisis of 2020. In order to examine if the market reacts differently to bond repurchases in normal times

and in times of a financial meltdown, we use the Israeli VIX (Eldor, Hauser, and Libel 2008). We define crisis months as months in which the VIX level is higher than its sample mean + 2 standard deviations. This procedure results in 5 crisis months (October 2008, November 2008, December 2008, September 2011, March 2020) and 151 normal months. Crisis months are unique not only in the high expected volatility as reflected by the VIX, they are also characterized by stress in the corporate bond market; The median spread between corporate bonds and similar government bonds during these 5 months is 4.8%, relative to less than 1.3% in normal months. We note that, in line with Figure 3, repurchases in crisis months account for 20% of all bond repurchases in the sample, even though these months constitute only 3% of the sample months.

In Table 9 we repeat our main estimations (Table 3), distinguishing 'normal' months (columns 1-3) from crisis months (columns 4-6). Crisis months differ from the other months, as is apparent even from the control variables. The low rating variable for example turns negative in crisis months, as the risk, for which the lower quality bonds earn higher returns in normal times, materializes. Focusing on the bond repurchase variable, we find qualitatively similar market response to bond repurchases in normal and turbulent times, but with several nuances. In both periods, firms tend to repurchase their bonds following days of low returns, but these returns are much lower in crisis months, even once we control for date fixed effects. The market reaction to the repurchase is very positive, but in normal times this reaction is also very fast – even prior to the repurchase disclosure, while in crisis period the investors react only after the firm formally reports the bond repurchase to the public. Finally, in both periods there is a significant positive drift in the trading days following the bond repurchase disclosure, but this drift is much larger in periods of financial meltdown. Taken together, the results suggest that firms time the market in their open market bond repurchases both in good and bad times, but the impact of these repurchases is more dramatic in times of crisis.

Table 9: Bond returns and bond repurchases in 'normal' times vs. crisis months

	Not crisis months			Crisis months		
	(1)	(2)	(3)	(4)	(5)	(6)
constant	-0.003%	.0021577***	0.149%***	-0.249%***	-1.757%***	-1.247%***
floating_rate	-0.014%***	-0.016%***	-0.012%**	.0012043**	0.033%	-0.067%
cpi_indexed	0.009%***	-0.008%**	-0.004%	0.027%	0.004%	-0.041%
fx_indexed	-0.014%**	-0.036%**	-0.024%	0.501%***	0.608%***	0.468%**
duration	0.006%***	0.005%***	0.006%***	0.001%	0.012%	-0.009%
low_rating	0.002%***	0.001%***	0.002%**	-0.014%***	-0.012%***	-0.002%
d_b_rep_6_10	-0.027%	-0.012%	-0.016%	-0.272%**	-0.219%**	-0.223%**
d_b_rep_1_5	-0.113%***	-0.070%**	-0.074%***	-0.593%***	-0.375%***	-0.377%***
rep_period	0.137%*	0.206%***	0.204%***	-0.057%	-0.029%	-0.068%
rep_disc_dummy	0.060%	0.063%	0.061%	0. 367%***	0. 449%***	0. 449%***
d_f_disc_1_5	0.221%***	0.104%***	0.100%***	0.626%***	0.313%***	0.314%***
d_f_disc_6_10	0.163%***	0.024%	0.020%	-0.066%	-0.122%	-0.110%
Observations	1,672,134	1,672,134	1,672,134	50,247	50,247	50,247
R-squared	0.028%	2.684%	2.738%	0.303%	13.460%	14.932%

The table shows the results of an OLS estimation, regressing bond returns on a floating_rate dummy, cpi-indexed dummy, fx_indexed dummy, bond duration, bond rating, and dummy variables for the 5 trading days preceding the bond repurchase (d_b_rep_1_5), the 5 trading days preceding these days (d_b_rep_1_5), the bond repurchase period (rep_period), the bond repurchase disclosure trading day (rep_disc), the 5 trading days following the disclosure (d_f_disc_1_5) and the 5 subsequent trading days (d_f_disc_6_10). Columns 1-3 present the results for 'normal' months (Not crisis months), that is months in which the Israeli VIX is below its sample mean + 2 standard deviations, while columns 4-6 present the results for 'crisis' months (crisis months), that is months in which the Israeli VIX is above its sample mean + 2 standard deviations. Columns 1 and 4 present the results from the basic specification, columns 2 and 5 control also for date fixed effects, and columns 3 and 6 control both for date fixe-effects and firm fixed effects. ***, **, * denote that the coefficient is significantly different from zero at the 1%, 5%, and 10% levels, respectively, using standard errors clustered at the firm level.

4.5.2 Cumulative Abnormal Returns

Our main analysis is based on regressing bond raw returns on bond characteristics and bond repurchase dummy variables. However, for robustness, we also apply the cumulative abnormal returns (CAR) method. CAR estimation requires establishing a benchmark for the normal returns. Bessembinder, Kahle, Maxwell, and Xu (2009) find that a matching portfolio of corporate bonds with similar rating and duration to the event bonds is well specified and has sufficient power to detect abnormal bond returns. Thus, we use an equally weighted portfolio of matched corporate bonds to ascertain that our conclusions do not depend on our new estimation method.[38,39] We note that our

[38] Specifically, we match bonds based on their rating and duration. For the rating, we use the major rating categories based on the combined local ratings of the two major rating agencies in Israel, namely, 'Maalot' and 'Midroog'. For the duration we divide the bonds into three groups according to their duration (in years) – 0-2, 2-4, and 4 and above.

[39] We use equally-weighted portfolios because they have better explanatory power for corporate bond yields than value-weighted portfolios in our sample, either including or excluding bond-repurchase dates. The results are very similar using value-weighted portfolios.

main inferences are also robust using either raw bond returns, excess returns versus TASE's general corporate bond index, or excess returns versus the mean-adjusted return model of Handijinicolaou and Kalay (1984).[40]

We calculate the excess return on each of the repurchasing firm's bonds as the total bond return over the examined horizon minus the total return of a matching corporate bond portfolio over the same horizon. We evaluate the statistical significance of the abnormal returns using the parametric t-test with standard errors clustered at the firm level, and the non-parametric sign test.[41]

Table 10 shows the main results using Cumulative Abnormal Returns. When we estimate the bond excess returns over a portfolio of similar bonds and examine the distribution of the excess returns, using either the parametric t-test or the non-parametric sign test, we find positive reaction to bond repurchases. Both tests show that repurchased bonds earn significantly positive abnormal returns on the date of the repurchase, and on the date of the repurchase disclosure to the public. They also show, in line with our main results, very significant positive cumulative abnormal returns over the 5 trading days following the repurchase disclosure. However, as suggested by figure 4, the CAR method fails to detect statistically significant negative abnormal bond returns prior to the bond repurchase, and the sign test suggest that the return is even positive in the days preceding the repurchase, thus differing from our main results.

[40] This model matches each event bond to a government bond with a similar duration. We estimate the average spread between the event bond and the government bond with the same attributes (indexation and interest type) and similar maturity over an estimation period that begins half a year before the event and ends a month prior to the event (102 trading days). Then, we subtract this "normal" return from the daily spread between the event bond and the government bond to estimate the abnormal return on event days.

[41] The sign test is commonly used to examine equality of medians (e.g. DF, 2015). Bessembinder, Kahle, Maxwell, and Xu (2009) and Ederington, Guan and Yang (2015) find that it has more power than the t-test to reject the null of no abnormal returns in bond-event studies. We obtain similar results using the sign-rank test or standardized abnormal returns (Ederington, Guan, and Yang, 2015).

Table 10: Cumulative Abnormal Returns (CAR) around bond repurchases

	CAR	# negative	# positive
CAR_d_b_rep_6_10	0.12%	2628	2956***
CAR_d_b_rep_1_5	0.14%	2704	2882**
CAR_rep_period	0.29%***	1988	2640***
AR_rep_disc_dummy	0.25%***	2337	3154***
CAR_d_f_disc_1_5	0.71%***	2385	3167***
CAR_d_f_disc_6_10	0.14%	2794	2727

The table shows the cumulative abnormal returns in different periods around an open market bond repurchase: the 5 trading days preceding the bond repurchase (CAR_d_b_rep_1_5), the 5 trading days preceding these days (CAR_d_b_rep_1_5), the bond repurchase period (CAR_rep_period), the bond repurchase disclosure trading day (AR_rep_disc), the 5 trading days following the disclosure (CAR_d_f_disc_1_5) and the 5 subsequent trading days (CAR_d_f_disc_6_10). The first column shows the average abnormal returns; ***, **, * denote the average cumulative abnormal return is significantly different from zero at the 1%, 5%, and 10% levels, respectively, using the parametric t-test, with standard errors clustered at the firm level. The second and third columns count the number of negative and positive cumulative abnormal returns respectively (the number of observations differ somewhat between the periods due to data availability. Also, the abnormal return on bond repurchases that have been disclosed to the public on the same trading day are attributed to the disclosure period and not to the repurchase period); ***, **, * denote that the median is significantly different from zero at the 1%, 5%, and 10% levels, respectively, using the non-parametric sign test.

4.5.3 *Controlling for Share Repurchases*[42]

Given the well-known importance of share repurchases, a potential concern regarding this paper's findings about the impact of bond repurchases is that the latter merely serve as a proxy for the former. That is, if firms tend to repurchase bonds and shares in tandem then our results may only reflect the (uncontrolled for) effect of contemporaneous share repurchases.[43] In order to test whether this is the case, we supplement the bond repurchase data with share repurchase data. Specifically, we collect data on all firms' share repurchases from January 2008 to December 2020 from ISA form 85. We exclude all the irrelevant reports, recurring reports, and reports disclosing the re-sell of previously repurchased shares, and combine the reports at the firm-date level to obtain 10,413 observations. Finally, we merge this sample of share repurchases with the sample of bond repurchases by date and firm.

The data shows that the concern about a high correlation between bond repurchases and share repurchases driving the results is unwarranted: less than 5% of the bond repurchase events in the sample are accompanied by a share repurchase by the firm on the same date. Even at the monthly level, only about 10% of the bond repurchases are

[42] Results are not presented to conserve space. They are available from the authors upon request.
[43] In contrast to Maxwell and Stephens (2003) who report a negative effect of share repurchase announcements on bond prices, we report a positive effect of bond repurchases on bond prices.

accompanied by a share repurchase in the same month. All the same, we examine more formally whether the impact of bond repurchases on the repurchasing firms' bonds is driven by parallel share repurchases. We repeat the our main estimations, with a stock repurchase dummy variable that receives the value of 1 on days in which the bonds' issuing firm has disclosed an actual stock repurchase. The coefficient on this stock repurchase dummy is not statistically significant, and none of the main results reported in Table 3 is materially affected by its addition.

4.5.4 *Low Liquidity Bonds*[44]

One may be concerned that the results presented in the paper are driven by a small subset of bonds with very low liquidity. In particular, low liquidity may serve to explain the prolonged price adjustment process following bond repurchases. To address such concerns, we repeat the main estimations but controlling also for the bond liquidity. Adding the bond half bid-ask spread to the estimation does not alter the main results, as presented in Table 3. All else equal, the bid-ask spread doesn't have a statistically significant effect on bond returns. Our main inferences are unchanged when we control for the interaction terms between the bid-ask spread and the bond repurchase dummies. We do find stronger tendency to repurchase less liquid bonds following price decline and a stronger positive reaction to their repurchase on the disclosure date and the following trading days. These results show that our conclusions are somewhat stronger for low liquidity bonds, but they are also valid for the more liquid bonds in our sample.

5. Conclusion

This paper uses unique data from Israel on all actual open-market bond repurchases to answer a hitherto unaddressed question in the literature: whether firms time the market in their bond repurchases. Combining data on the exact date of the repurchase and its disclosure with daily trading data, we find that repurchased bonds enjoy positive abnormal returns following the repurchase disclosure. Firms repurchase their bonds following a decline in their price. The bond repurchase and its disclosure to the public result in daily excess returns of about 0.15% each, controlling for the relevant bond characteristics. The bond repurchase is also followed by a statistically significant drift resulting in an excess return of at least another 0.14% in each of the 5 trading days

[44] Results are not presented to conserve space. They are available from the authors upon request.

following the bond repurchase disclosure. Due to this drift, an implementable investment strategy of buying a portfolio of recently repurchased bonds after the repurchase disclosure earns an annual return of 16%.

Comparing different actual open-market bond repurchases, we find that the market reaction to bond repurchases is faster if the firm has announced a repurchase program in advance. In addition, the market reaction is stronger for low credit rating bonds. Bond repurchase activity is positively correlated with insiders' net purchases in the preceding months, and when the latter are larger the abnormal returns following bond repurchases are higher. This suggests that both the firm itself and its insiders trade in the same direction to benefit from their informational advantage. Taken together, these findings are in line with the information explanation for bond repurchases.

The paper complements and expands the findings of LS(2017) about long-horizon market timing in bond repurchases, by utilizing a much larger sample of open market bond repurchases and focusing on the short-term. This is the first paper to show the positive market reaction to the announcements of actual open market bond repurchases. Thus, the paper adds to the well-documented finding that firms time the market in their share repurchase announcements and in their actual share repurchases. We show that firms do not limit themselves to repurchasing shares, but also repurchase bonds at prices beneficial to ongoing stakeholders but detrimental to selling bondholders. Therefore, the results of this paper may suggest that more stringent disclosure requirements on actual bond repurchases in other markets, such as those in the US, can improve market efficiency and limit the potential for wealth transfers between better-informed and less-informed stakeholders in the firm.

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