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THE FACTORS AFFECTING CORPORATE BOND SPREADS[1]

MEITAL GRAHAM-ROZEN* HAIM VIEDER** AND NOAM MICHELSON***

Abstract

In this paper, we estimate the impact of fundamental economic factors on corporate bond spreads in Israel. Using a database that includes all tradable corporate bonds in Israel in 2008–20, we examine if, when, and in what bond groups there was a prolonged deviation of the actual spread from the spread forecast by the fundamental factors. We find that in the years prior to the crisis of 2008, and in the year prior to the European sovereign debt crisis in 2011, more than 20 percent of the corporate bond market value traded at spreads smaller than those forecast based on the fundamental factors. In addition, we find that aggregate flows to corporate bond mutual funds contributed to accentuating the trends of deviation from the forecast spread existing in the market, primarily in the period after the 2008 crisis. The results indicate that rapid aggregate inflows to mutual funds contribute to increasing the vulnerability of the corporate bond market. Should corporate bond spreads deviate from those forecasted by fundamental economic factors, such aggregate flows are liable to intensify rising-price trends, and when the trend changes—to exacerbate the declining-price trend.

1. FOREWORD

The low global and domestic yield and interest rate environment, high liquidity, and the search for yield in the 2010s have supported the rising prices of assets in general, and financial assets in particular. One of the assets that has been notably impacted by environmental conditions is the tradable corporate bond. In the period from January 2007 to February 2020, the proportion of tradable corporate bonds in the public's asset portfolio rose from 5 percent to 9 percent. Likewise, in the same period, this asset's share of the business

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* Research Department, Bank of Israel, meital.graham@boi.org.il
** Haim Vieder, haimivider@gmail.com
*** Research Department, Bank of Israel, noam.michelson@boi.org.il

sector's sources of finance also increased steadily, so that in October 2020 tradable corporate bonds accounted for 22 percent of all credit to this sector.

One of the key issues in financial stability over the past decade is the rising price of corporate bonds, despite their declining quality and the higher risks they incorporate. According to an OECD report, against the backdrop of accommodative monetary policy worldwide, corporate bonds have become a significant source of financing for nonfinancial companies: over the past ten years their volume has doubled (in real terms) reaching USD 13.5 trillion at the end of 2019. In parallel, the proportion of BBB-rated bonds increased at the expense of bonds with an AA and AAA rating, for which the share decreased so that in 2017–19, BBB-rated bonds accounted for 52 percent of all bond issuances (Çelik et al., 2020). The report also highlights the downward trend of the Global Corporate Bond Rating Index from the 1980s onward, so that over the last ten years it has been below BBB+. This decrease in quality of the debt shows that a future crisis in the bond market could lead to a higher proportion of defaults than in previous credit cycles.[2] The IMF's Global Financial Stability Report from October 2018 also shows that corporate bond yields are at an all-time low, and when considering anticipated default rates, we can conclude that the risks inherent in these bonds are underpriced (IMF, 2018). Nevertheless, some studies claim that at least part of the decline in corporate bonds' quality is attributed to changes in credit rating agencies' standards and rating methodologies (e.g., Alp, 2013; Baghai et al., 2014; Jorion et al., 2009; Afik & Galil, 2022).

The COVID-19 crisis did not change the earlier trend, with the exception of the first few weeks of the crisis when corporate bond prices plummeted as their inherent risks increased sharply. Due to concern for the collapse of this market, many banks introduced programs designed to provide assistance, whether directly or indirectly, in restoring liquidity and reducing credit spreads. In addition to reducing uncertainty, these programs helped restore confidence and bring investors back into the market.

In Israel, corporate bond prices have increased steadily since September 2012 while their yields have declined. Given that in the same period, interest rates that were defined as risk-free (the Bank of Israel interest rate and the market return on government bonds with similar durations) steadily declined, we examine the risk assessment reflected in the prices and yields of corporate bonds by means of the spread between corporate bond yields and government bond yields with similar linkage and term to maturity. From September 2012, corporate bond spreads decreased (on average, excluding the bonds of commercial banks and insurance companies) by 5.75 percentage points, to 1.8 percentage points (February 2020) in all

[2] Another fact noted in the report that indicates a decrease in the value of bonds over time: when purchasing bonds, the use of contracts designed to protect the rights of the bond holder. Compared with the period prior to 2008, the use of such contracts for bonds that do not have an investment rating declined, thus reducing the gap between the contractual protection for bonds with an investment rating and those without an investment rating. Low rates of contractual protection could negatively impact the investor's portfolio and recovery rate.

industries and for all ratings (see Figures 1 and 2). The falling spreads were set against the backdrop of a high level of activity in the economy, relatively low leverage of the business sector, aggregate profits which the companies utilized for financing their activity[3], the low interest rate in the economy, and the probability of default that was lower than in the past. Likewise, during this period the corporate bond market received a boost from the Hodak Committee recommendations which improved the quality of the bonds traded on the market, for example from the collateral perspective. When the COVID-19 pandemic erupted, bond spreads soared, peaking in March 2020, although later they declined. In July 2020, the Bank of Israel introduced a program to acquire corporate bonds on the secondary market and the spreads continued to decline. In December 2020, bond spreads were close to their pre-crisis level.

Over time, changes in corporate bond spreads have been accompanied by significant public investment activity[4] in this asset. The public's assets that are invested in bonds can be divided into those held directly and those held through financial institutions. The share of the public's assets held through financial institutions rose from 40.2 percent (NIS 756 billion) in 2008 to 52.7 percent (NIS 2.27 trillion) in November 2020. Whereas at the beginning of the period 13 percent (NIS 98 billion) of the public's assets held through financial institutions were in mutual funds, at the end of the period (November 2020) they accounted for 14.1 percent (NIS 321.5 billion). In October 2018, the Israel Securities Authority (ISA) reform was completed in which ETNs became closed mutual funds defined as ETFs. Upon completion of the reform, Assets Under Management (AUM) in mutual funds received an additional NIS 113 billion. Of NIS 321.5 billion in mutual funds in November 2020, NIS 234 billion were held in mutual funds that are not ETFs, and the rest (NIS 87 billion—27 percent) in ETFs. Due to the structural leap of the data, we will focus on the non-ETF mutual funds, but we will also address the structural change that occurred.[5]

Mutual funds can be divided into several specialization categories, which are determined according to the declared policy published by the fund in its prospectus and that reflect the key assets in which the funds invest. The funds that invest the most in corporate bonds are those for which their investment specialization is classified by the ISA as "Domestic Bonds – Corporate" and "Domestic Bonds – General". At the end of 2008, these funds accounted for 14.7 percent of all mutual fund assets (NIS 14.4 billion), and in November 2020 they

[3] See Bank of Israel (2016), Bank of Israel Annual Report - 2015, Chapter 4, and specifically Box 4.2.

[4] The public's asset portfolio includes assets of households and the business sector (real and financial companies). The portfolio does not include assets of the government, Bank of Israel, foreign residents, and banks.

[5] It is worth mentioning that the average monthly accumulation in mutual funds is twice bigger than in ETNs or ETFs (approximately NIS 270 million in mutual funds, compared with approximately NIS 120-130 million in ETNs/ETFs). In terms of monthly rates of change, the figures are also much bigger: 1.7 percent compared with 0.7-1.2 percent. This is another motivation for focusing on mutual funds in this paper.

accounted for 48.3 percent (NIS 112.9 billion) of all mutual fund assets (excluding ETFs). In the period under review, the share of corporate bonds from all mutual fund assets[6] (including ETFs) classified as "Domestic Bonds – Corporate" ranged from 80.7 percent to 95.1 percent (median: 86.4 percent), and the share of corporate bonds of all mutual funds classified as "Domestic Bonds – General" Bonds ranged from a minimum of 35.4 percent to a maximum of 59.5 percent (median: 45.7 percent).

Even when examining the share of the total value of tradable corporate bonds held by mutual funds, changes can be seen: On the eve of the 2008 financial crisis, mutual funds held about a quarter of all tradable corporate bonds' value, whereas at the peak of the crisis, this share had declined to 9 percent (December 2008). Since then it has gradually increased, and today (November 2020) mutual funds (excluding ETFs) hold about 25 percent of the value of tradable corporate bonds' value.

Mutual funds are a savings instrument that provides the public with a convenient and flexible option for depositing money, withdrawing money, or moving between investment tracks. Whereas provident funds are to some extent illiquid and any change made in them entails an element of bureaucracy, and in pension funds most of the money cannot be redeemed immediately and moving from one track to another is complicated, money in mutual funds can be deposited and withdrawn simply and online. Investors who wish to change their investments immediately will therefore tend to use this channel as their first option. In fact, past experience shows that when the bond market is booming, the public increases its holdings of mutual funds specializing in bonds, while in periods of slowdown the public moves quickly to redeem its savings in this category of mutual fund, thus pushing prices down even further. One example of this pattern is the COVID-19 outbreak in Israel (mid-March 2020), and an even stronger example was in 2008. In July 2008, AUM in corporate bond mutual funds totaled NIS 9.1 billion and in the three months from August to October there was a net outflow of NIS 6.2 billion. In the same period, the average spread soared from 3.1 (August) to 6.7 percent (November). There was a similar dynamic during the COVID-19 pandemic, although in a shorter time: in March, funds in the amount of NIS 4.2 billion were redeemed from an asset balance of NIS 40.9 billion in February. In that same period, the average spread rose from 1.8 to 4.8 percent.

The purpose of this paper is twofold: (a) to estimate the factors affecting corporate bond spreads from the middle of 2008 until the end of 2020, and to examine the changes in the deviation of the actual spreads from those forecast by the explanatory factors. An estimation

[6] Due to a paucity of data, this figure also includes the ETFs. Data for November, in which the data for ETFs and mutual funds are separate, show that corporate bonds in non-ETF mutual funds classified as "Domestic Bonds – Corporate" account for 90 percent of AUM, and in the ETFs classified as "Domestic Bonds – Corporate" this rate is close to 100 percent. Nonetheless, in non-ETF mutual funds classified as "Domestic Bonds – General" corporate bonds account for 54.4 percent of AUM and in ETFs with a similar classification the rate is just 2.6 percent.

of this kind provides an analytical framework for a prolonged review, also in real time, of the pricing of the risks in this key market which can be used to highlight pricing irregularities and monitor their origins. As will be mentioned later on, a significant systemic deviation from the spread forecast by the fundamental factors could predict future macroeconomic developments and it is therefore important to monitor these deviations.[7] (b) In the case of a deviation from the spread forecast by the fundamental factors, we examine the contribution of corporate bond mutual fund developments to explaining the deviations. Understanding the extent to which mutual fund flows contribute to deviations from the spread forecast by the fundamental factors is important for estimating vulnerability in this channel – namely, the extent to which a change of direction in the flow of resources into and out of mutual funds may trigger sharp changes in corporate bond spreads. Events at the onset of the COVID-19 pandemic, and previously in the 2008 financial crisis, confirm the need for monitoring this relationship.

Using a broad set of bonds' characteristics, the issuing companies' characteristics, and macroeconomic variables, we calculate the forecast bond spread and each bond's deviation from that spread. We find that in the years prior to the crisis of 2008 and in the year prior to the European sovereign debt crisis in 2011, more than 20 percent of the corporate bond market value traded at spreads lower than those forecast based on the fundamental factors, a pattern that was common in most industries and among all bonds' rating groups. In subsequent years, several other periods were observed in which a significant share of the bond market traded at spreads lower than those forecast, mainly in the investment and holding industry, in the trade and service industry and in the BBB-rated group. An analysis of the effect of net new investment (i.e., inflows minus outflows) into corporate bond mutual funds on existing trends in the market shows that a rapid net inflow or outflow has an exacerbating rather than an attenuating effect. In other words, if bond spreads deviate from those forecast, flows into the mutual funds will accentuate the trends of deviation rather than restoring the forecast spread. We further find that the marginal impact of inflow decreases and is noticeable in most of the rating groups and industries and only in the period after the 2008 financial crisis.

The study is arranged as follows: In Section 2 we review the theoretical background and literature on the subject; Section 3 describes the database and methodology that we used; Section 4 presents the results of the estimation, and the final section is devoted to a summary and conclusions.

[7] The estimation that we use was not designed to identify crises in the corporate bond market since in a time of crisis the spreads jump and no model is necessary to identify that a crisis is under way. It is in the periods between the crises, when crises build up, in which the estimation and its results are most useful.

2. SURVEY OF THE LITERATURE

The literature contains a number of models for pricing corporate bonds (Campbell and Taksler, 2003; Collin-Dufresne et al., 2001; Elton et al., 2001; Bao et al., 2010; Gilchrist and Zakrajšek, 2012). There is a strong overlap between the independent variable in these models which is derived from numerous theoretical models (see for example: Black and Scholes, 1973; Merton, 1974; Longstaff and Schwartz, 1995; Briys and de Varenne, 1997; as well as others). The variables can generally be divided into three groups: bond characteristics (size, duration, coupon, etc.), company characteristics (industry, leverage, profitability, etc.) and macro variables (market volatility, economic activity, slope of the government yield curve, etc.). Later studies add variables such as liquidity of the bond (Chen et al., 2007) or taxation (Elton, 2001). The increasing use of machine learning models in finance is also reflected in asset pricing: Bianchi et al., (2021) applied these models in an effort to forecast bond yields and showed that use of a particular model (ensembled deep neural networks) provides a better forecast than standard econometric models or other machine learning models.

A number of studies analyze the behavior of deviations from the price forecast by the fundamental factors. Collin-Dufresne et al. (2001) estimated the factors impacting bond spread changes and found that deviations from the forecast change among different types of bond are highly correlated, leading them to conclude that shocks to the demand for and supply of credit affect the pricing of the bond beyond the variables relating to structural factors. Gilchrist and Zakrajšek (2012) showed that when applying a pricing model to bond spreads, the difference between actual spread and forecast spread (when averaging the difference over all the traded bonds) provides a better forecast of economic activity than other financial indicators. The difference, which they term Excess Bond Premium (EBP) is created by the unexplained residual by a model which includes variables from the three groups mentioned above. Barnea and Menashe (2015) calculated the EBP in a similar manner for Israel, obtained similar results, and showed that the EBP is influenced by the risk-taking policy adopted by the commercial banks. Also worth noting in the Israeli context is Sasi-Brodesky's paper (2013), which estimates a Merton model and examines its ability to explain the bond spreads.

Regarding the relationship between the flow of savings into channels investing in corporate bonds and the price of the bonds, Edelen and Warner (2001) showed that the flow into institutional investors (including mutual funds) investing in stocks affects the stocks' prices on the same day, whereas flow follows stocks' returns with a one-day lag. Ben-Rephael et al. (2011) showed that aggregate flows into mutual funds do in fact impact asset prices, although half of this impact dissipates after ten days. The study closest to the question we are attempting to answer is that of Akbas et al. (2015) who examined the widespread belief that mutual funds (as an example of a liquid savings instrument popular among households) exacerbate over or underpricing in the stock market whereas the activity of more sophisticated investors, such as hedge funds, actually attenuates the deviations. They show that with respect to the stock market at least, this hypothesis is correct. Our paper partially

follows their lead and presents an additional assessment of the accuracy of the first part of the widespread belief regarding Israel's corporate bond market.

3. DATA AND METHODOLOGY

a. The dataset

The dataset that we used comprises all corporate bonds that were traded on the Tel Aviv Stock Exchange from 1996 to the present time. However, due to a paucity of data in some of the other independent variables, our study only covers the period from January 2008 to December 2020 (monthly data). For each bond, observations were taken from the last Tuesday or Wednesday in the window between the 10th and 22nd of each month, to avoid extreme fluctuations relating to weekends or end of the month. The credit spread for each bond is defined as the bond's yield-to-maturity minus that of a government bond with a similar duration[8] and similar indexation.[9] We exclude from the dataset all bonds with an option component or any other special feature, and bonds with variable interest rate. To each bond, we added the independent variables from three groups—bond characteristics, company characteristics and variables which reflect the financial and macroeconomic situation—and we used this set of variables to estimate the pricing regression. When a company has more than one traded bond, we used each bond's unique characteristics and the same issuing company and macroeconomic situation variables. Descriptive statistics of the dataset appear in Tables 1 and 1A. The data sources are companies' financial reports to the TASE, daily trading data from the TASE, and macroeconomics and financial data gathered and processed by the Central Bureau of Statistics and the Bank of Israel.

b. Impact of the fundamental factors on corporate bond spreads

In principle, the price of a bond (like that of any financial asset) should be determined by the anticipated flow of payments discounted by the risk-free interest rate. The structural factors that affect price are the risk-free interest rate, volume of the anticipated flow of payments and the probability that it will in fact take place. In other words, the impacting factors are probability of default (PD) and the Loss Given Default (LGD) rate. Even though we do not measure the two factors directly, we include as independent variables a broad set of (theoretical and empirical) related variables in these two factors. The risk-free interest rate,

[8] We adjusted the calculation of the duration also for bonds with amortization of notional amount over time.

[9] Although there are more accurate methodologies to calculate the spread (like using the zero yield curve), we use this simple measure in order to be in line with previous similar literature (e.g., Gilchrist and Zakrajšek, 2012) and with corporate bonds data and analyses used by the Bank of Israel's various publications.

represented by the yield-to-maturity of government bonds, is brought into the model by subtracting it from the corporate bond's yield-to-maturity.

The underlying assumption in our model is that over time, the relationship between the independent variables and the spread is fixed, and we extract the intensity of the relationship by the estimation. In practice, the relationships that we extract are based on the behavior of the market participants; however, since our estimation period is long and includes significant variance in the bond spreads, we can say that the estimates obtained reflect average relationships over time. It is of course possible that at any point in time the spread of a bond with similar characteristics will not correlate with its own characteristics, those of the issuing company, or of the macroeconomic conditions and it is precisely this deviation that interests us.

Following is our model for bond pricing:

$$(1) \qquad ln\_spread_{b,i,t} = \beta_0 + \beta' security_{b,i,t} + \gamma' firm_{i,t} + \delta' market_t + \eta_i + \varphi_i + \varepsilon_{i,t}$$

The dependent variable is the log of the spread. As noted, the spread is the difference in percentage points between the yield to maturity of a corporate bond b issued by company i and that of a government bond with similar duration and indexation, at month t. Like Gilchrist and Zakrajšek (2012), we use the log spread to overcome the heteroscedasticity, which is present because the distribution of the credit spreads has a long right tail. The dependent variables also include the bond characteristics (*security*) of the issuing company (*firm*), of the economic conditions (*market*) and a fixed effect for each company (η_i), in order to take into account the heterogeneity between the companies that stems from unobserved characteristics. Since some companies switched industries during the sample period, we also include φ_i, a fixed effect for company's industry.[10]

In greater detail—the bond (*security*) variables include the following independent variables: number of days to maturity; two dummy variables that receive the value 1 if the bond is indexed to inflation or to the dollar, and 0 otherwise; a dummy variable for each category of collateral or financial covenant which the bond has and a dummy variable for each of the bond rating categories.

The company variable group includes the following variables: company size, as measured by the natural log of assets; a squared expression of size; the nominal value of the Company's outstanding bonds; fundamental variables based on a Merton model (1974) for estimating the company's probability of default—the company's total leverage and the standard deviation of the daily yields of its shares in the last 90 days; the coverage ratio, which is defined as the ratio of the company's operating profit in the last four quarters to the company's net financing expenses in the same period, a ratio used to indicate its solvency; the company's profitability,

[10] We did not use fixed effect for each bond because that would have forced us to eliminate any fixed bond's observable characteristics, such as indexation, collateral, or rating.

as measured by its 4-quarter return on equity, and tangible assets as a proportion of total assets.[11]

The variables that we used to reflect the economic and financial situation in the economy are the standard deviation of the daily yields of the TA-125 Index in the last month; the real interest rate for one year which reflects the risk-free interest rate; the real slope of the curve, calculated as the difference between the ten-year yield and the yield for one year from the government yield curve; the difference between the capital adequacy of the banks and that required by the Supervisor of Banks—a variable which reflects the availability of bank credit – and the change therein relative to the last quarter.

Based on the literature on this subject (e.g., Helwege et al., 2014, Chen et al., 2007, Lin et al., 2011), we also included a variable that reflects the bond's liquidity. Investors will generally demand a higher yield (a lower price) for a bond with low liquidity, and vice versa. There are several methods for calculating the liquidity of a bond, each of which has advantages and disadvantages (see an extensive survey in Gamrasani, 2010). Due to data availability considerations, we chose to include the Amihud Index (Amihud, 2002), which reflects trading volume relative to price changes in a given time window (we chose a 30-day window). The higher the index, the less liquid the bond, and we would expect a positive correlation with the spread.[12]

To reflect the information available to market participants as they determine the bond price (and also the spread), we include the simultaneous bond and market variables as they are available in real time. In contrast, the availability of information about the company's financial position is more complex: a company's financial reports reflect its position in the previous quarter and they are also published on different dates during the quarter. This means that the information available about all companies at the beginning of January 2010, for example, is that for the third quarter of 2009 (from the report published by the company in the fourth quarter of 2009), but in the middle of February 2010, some of the companies have already published their reports for the fourth quarter of 2009, while others have yet to do so. Only at the end of March 2010 have all the companies published their reports for the fourth quarter of 2009. Given that we do not have access to the publication date of the report, we chose to use the report for the previous quarter, for two reasons: first, in the last two of the quarter's three months, the financial report for the previous quarter is already available (particularly regarding the quarterly rather than the annual report). Second, even if the information has not been published officially, market participants and analysts make a "soft"

[11] We examined the possibility of including a variable of the proportion of the holdings of private individuals or private companies in the issuing company, based on the findings of Sasi-Brodesky (2021), in which the loss given default declines in line with the proportion of the holding of private individuals and companies in the company. We found this variable to be irrelevant.

[12] Alternatively, we examined use of the daily bid-ask spread. The results are the same.

estimate of the previous quarter's results and operate accordingly. Due to these considerations, we decided to rely on the company's variables with a quarterly lag.

We estimate all the specifications using OLS and include fixed effects at company level, while the standard deviations are robust to heteroscedasticity and serial correlation. After estimating each of the specifications, we compute the forecast spread for each bond given its fundamental factors. The residual is defined as a deviation from the correct spread and since it is calculated as the actual spread minus the forecast spread, a negative value reflects a spread which is too low, namely—the risk is underpriced. Given that the addition of variables reduces the number of observations, the types of bonds included or the number of periods, we chose the specification with the maximum number of observations as our baseline specification.

From the full dataset, we dropped bonds issued by banks or insurance companies, bonds that have a duration of less than six months, bonds rated below BBB- and observations with outlying values (i.e., above the 99th percentile) of either the standard deviation of shares' returns, interest coverage ratio, liquidity index, or actual spread.

Using the obtained estimates, we calculate the forecast value, $\hat{y}$, and the disparity between it and the actual value:

$$\hat{u} = y - \hat{y} \qquad (2)$$

c. Relationship between flows into the mutual funds and the disparity between the actual spread and the spread forecast by the fundamental factors

Given that everything else is fixed, an increase in the demand for a bond by the mutual funds will trigger an increase in its price and a decrease in its spread. Increased demand may be the result of an improvement in the bond's fundamental economic factors in light of estimates of a future improvement in these factors, or the outcome of an increase in the supply of resources for purchasing the bond. An increase in the supply of resources may also be caused by an improvement of the fundamental factors or by assessments of such an improvement so that the causal relationships between price (spread) and flows of demand are correct in both directions. Studies that linked demand flows to changes in price are mostly based on high frequency macro data which allow shocks in the demand for a bond to be identified—mostly by investment instruments such as mutual funds—and the changes in the bond price associated with these shocks (see for example: Edelen and Warner, 2001 and Ben-Rephael et al., 2011).

Our paper differs from the aforementioned papers in several ways: first, we make adjustment for the fundamental factors in the first stage, using the regression described above. According to the definition of the fundamental factors as those closely related to the expected flow of payments from the bond, changes in demand by the mutual funds are not considered fundamental factors and we therefore did not include them in the estimation. Nonetheless, changes in demand most certainly correlate with price and spread (Collin-Dufresne et al.,

2001) and we therefore examine the relationship between changes in demand and that part of the spread that is not explained by the fundamental factors. Second, the question of causality direction is also true for the relationship between changes in demand and spread that is not explained by the fundamental factors. Deviation from the forecast spread could possibly stem from an omitted or unobserved factor, such as different assessments of financial developments and regulatory changes, and this deviation leads to changes in demand. We therefore examine the function of changes in demand, not as the primary cause of deviation from the forecast spread, but as a factor that exacerbates existing trends in this deviation.

We therefore adopt the method of Akbas et al. (2015) who examine whether flows into mutual funds accentuate trends of deviation from the forecast price or perhaps correct them. To answer this question we identify two categories of bond each month—those whose actual spread is greater than the forecast spread and those whose actual spread is less than the forecast spread. By examining the relationship between changes in demand and the change in their deviation in the following month, we can determine whether the change has an attenuating or exacerbating impact. For example, if the difference between the actual spread and the forecast spread is negative, and following an increase in demand the difference shrinks, our conclusion will be that the increased demand had an attenuating impact. If following an increase in demand the negative difference increases, then the increased demand had an accentuating impact.

Since in any given period the actual spread of some bonds may be greater than the forecast spread while for others the actual spread is less than the forecast spread, we must examine all the bonds to see the aggregate impact of changes in demand. Consequently, in each period we identify those bonds with a negative disparity between their actual and forecast spread (i.e., the spread is too low) and we examine the change in this disparity in the following month. The aggregate change for all these bonds is obtained by weighting the change in disparity according to the market value of the bond. Similarly, every month we identify those bonds with a positive disparity between their actual and forecast spread (i.e., the spread is too high), and we examine the change in this disparity in the following month. Here too, the aggregate change is calculated by weighting according to bond's market value.

After finding the change in disparity we compile a theoretical portfolio in which there is a short position on bonds with a negative disparity (because their price is expected to fall and their spread to increase) and an equally weighted long position on bonds with a positive disparity (because their price is expected to rise and their spread to decrease). Given that we are talking in terms of spread which is inverse to price, we are in fact examining the change in the spread differentials for the entire portfolio, which is calculated according to the change in the spread differentials for bonds with negative spread disparities minus the change in the spread differential for bonds with positive spread disparities. To express the relative size of both types of bonds, each category is weighted by the market value of the bonds. If the spread differentials converge with the forecast difference, in the following month, we obtain a positive value for the theoretical portfolio, and if the spread differentials intensify, we obtain a negative value.

Following is an example of the foregoing: we examine a bond where the difference between its actual spread and its forecast spread based on the fundamental factors was -2 percentage points. In the following month, the disparity increased to -4 percentage points—in other words, a decrease (increase) of a further 2 percentage points in the actual (forecast) spread. In parallel, the difference between the actual spread and the forecast spread of another bond was 3 percentage points and in the following month it was 6 percentage points, in other words – an increase (decrease) of 3 percentage points in the actual (forecast) spread. The entire portfolio, as described above, decreased by 5 percentage points: [(-4)-(-2)-(6-3)]=-5, implying that the aggregate difference intensified. In contrast, if the spread differentials of the bonds with a positive spread disparity decreased from 3 percentage points to 0, then the entire portfolio increased by one percentage point: ((-4)-(-2)-(0-3))=1 implying that the aggregate difference moderated.

After formulating the spread differentials for both bond categories and the total portfolio, we examine how the flow into the corporate bond mutual funds impacts the entire portfolio. If the mutual funds have a moderating impact, we would expect to obtain a positive relationship with the change in the theoretical portfolio, and if they have an intensifying impact, we would expect a negative relationship.

To test this hypothesis, we estimate a model in the following form:

$$
\begin{aligned}
(3) \qquad & portfolio\_return_{agg,t} \\
&= \beta_0 + \beta_1 portfolio\_return_{agg,t-1} + \beta_2 mf\_change_{t-1} + \beta_3 VIX_{t-1} \\
&+ \beta_4 bid\_ask_{t-1} + \beta_5 BBB\_AA_{t-1} + \beta_6 cross\_risk_{t-1} \\
&+ \beta_7 tel\_bond20\_ret + \varepsilon_{i,t}
\end{aligned}
$$

The dependent variable is the change in the deviation of the theoretical portfolio for bonds from the *agg* portfolio between month t-1 and month t. The theoretical portfolio includes all bonds with negative or positive spread disparities. We examine this separately for different groups of bonds (indexed by *agg*): all the bonds, bonds in specific rating categories (AAA-AA, A or BBB), and bonds associated with a specific industry. This is to help us examine the possibility that the mutual funds lead to underpricing in a specific part of the market but not in the entire market. The independent variable, which is the focus of our interest, is the net inflow (inflow minus outflow) in the corporate bond mutual funds as a percentage of the outstanding assets of these funds in the previous month (*mf_change*). This variable is introduced with a lag. Similar to Akbas et al. (2015), we also include, as independent variables, the dependent variable with a lag, and additional variables which reflect the state of the financial markets with respect to risk, liquidity and contagion; VIX-TA is the Israeli equivalent of the Chicago Board of Options Exchange (CBOE) VIX index; *bid_ask* is the monthly median of the difference between bid and ask in the corporate bond market and reflects the state of liquidity in this market; *BBB_AA* is the difference between the spread on BBB rated bonds and the spread on AA rated bonds; *cross_risk* is a systemic risk index

derived from comovement of TASE shares prices[13]; and *tel_bond20_ret* is the monthly change in the Tel Bond 20 index, which follows the prices of the largest 20 corporate bonds in the TASE (in terms of market value).[14]

4. RESULTS

a. Impact of the fundamental factors on corporate bond spreads

The results of the estimation of the factors affecting the log spread described above appear in Table 2. Column 1 includes only the bond's variables, column 2 only the company variables, column 3 only the macro variables, column 4 covers all the variables simultaneously, in column 5 we add fixed effects for the company (firm FE) and in column 6 we substituted the macro variables with time effect for each month.

For the analysis, we will focus on the estimation for which the results appear in column 5. The results obtained are fully consistent with previous studies that addressed a similar question: the spread increases with the number of days to maturity, bond risk as reflected in the rating, the company's leverage, volume of bond debt, non-current assets as a proportion of total assets, increase in the liquidity indicator (indicating lower liquidity) and volatility of the company's shares, decrease of the interest coverage ratio, decrease of profitability and the company's size. From the perspective of the collateral and financial covenants, the impact is different for each category relative to the base group, which is an unsecured bond. It appears that most liens are associated with lower spreads, except for negative pledge that is associated with higher spread.

The disparity between actual capital adequacy and that required by the Banking Supervision Department correlates negatively with the spread, whereas the change in the difference correlates with it positively. The reason for this is that the level of this variable is a proxy for the scope of the supply of bank credit so the greater the supply, the stronger the competition in the credit market as a result of which the cost of financing through non-bank credit is lower. In other words—the bond spreads are lower. However, if banks are accumulating capital, as reflected in a positive value of the quarterly change in the disparity between the required and actual capital adequacy, then fewer sources of credit are available, competition lessens, and credit prices—and bond spreads—rise. From the macro variables perspective, financial instability also correlates with large spreads, and a steep curve slope correlates with high short-term interest.

[13] The rate of covariance of the beta of the shares, which is explained by the five principal components in the method adopted by Kritzman et al. (2011).

[14] Our model did not include the Bank of Israel's bond purchases that began in July 2020 in the wake of the COVID-19 crisis. This is because in almost the entire sample period there were no such purchases, the purchases were of an extremely limited scope and ended after a short period.

The goodness of fit of the estimations is extremely high and ranges from 0.67 to 0.72. If our sole target function was to provide a forecast, a simple model in which the lagged log spread is the only dependent variable provides better goodness of fit (0.86). However, a model of this kind does not provide us with estimations of the relationship between the fundamental factors and the spreads, nor can we extract from it an estimation of the differential between the actual spreads and the spreads forecast by the fundamental factors. Moreover, if we add the independent variables that we included to the lagged log spread, the goodness of fit rises to 0.87, an extremely small increase. From this we can derive that most of the information factored in to the independent variables is expressed in the lagged log spread and use of the lag is therefore a reduced form substitute for use of the set of independent variables—even if it only produces a slight improvement in the goodness of fit.

In order to have some insights regarding the marginal importance of each variable, we calculate its contribution to the overall R-square in a very simplifying way: for each variable, we estimate a regression without it, take the difference between the full model's R-square and the partial model R-square, and divide it by the full model's R-square. We present the results in Figure 3. The most significant marginal contribution is made by the set of bond's rating dummy variables, followed by the number of days to redemption and firm's 90-day equity volatility. Each of these variables contribute about 5 percent to the R-square, while the other variables' contribution is lower than 1 percent.

Using the estimation results, we calculate the disparity between the actual and forecast spread for each bond, and average it over all the bonds for the entire period, weighted by the market value of the bond. Development of the average spread disparity appears in Figure 4. We can see that immediately prior to the 2008 crisis, the average disparity at the beginning of the period was negative (meaning that the actual spread was lower than the forecast spread), and equilibrium was restored during the crisis. Notably, these were the early years of significant volumes of trade on the tradable bond market so that at least part of this result should be attributed to "teething troubles" of the market and its traders.[15] As the market recovered in 2009–10, the average spread disparity once again dropped to negative values, but the increase in the bond spreads against the backdrop of the European sovereign debt crisis caused the spread disparity to return to positive values. Until the outbreak of the COVID-19 pandemic in Israel (March 2020) spreads trended downwards and the spread disparity hovered around 0. In any event, at no stage was the average spread disparity more than 2 standard deviations away from zero. As we can see in Figure 5, the correlation between the average spread and the average spread disparity is not negligible, at -0.24, but it is far from complete.

A review by economic industry and rating groups shows variance between the sectors and rating groups. In the trade and services industry, periods were observed in which the average spread disparity dropped significantly below zero, but not in the other industries. On the ratings front, several periods were observed in relation to BBB rated bonds in which the

[15] For elaboration, please refer to Benzion et al. (2018).

average spread disparity differed significantly from zero with more periods in which it was below zero.[16]

However, looking at the average provides an incomplete picture as it does not cover the entire distribution. To complete the picture, in each quarter we examined for what proportion of bonds (in terms of market value) is the spread markedly lower than the forecast spread (i.e., by two standard deviations from zero). Figure 6 shows this percentage allocated by industry and rating group. We see that in peak periods—prior to the 2008 crisis—about 30 percent of the value of the tradable bonds was traded with significant negative spread disparities, and in the trade and services industry they accounted for an even greater share. At the end of 2010, this proportion increased once again, peaking at a quarter of the market value, led by the investment and holding industry, but subsequently it decreased and since then the proportion of bonds with a negative spread disparity has been less than 5 percent. If we examine this by rating, we see that at the beginning of the period it was the highly rated bonds that were traded with negative spread disparities and subsequently these were the bonds in the lower rating groups.

Given that the weight of each industry and rating group changed over time, the above picture must be supplemented by examining what proportion of all bonds in the sector or rating group was traded with negative spread disparities (Figure 7). We see that from the industry perspective the picture is no different with respect to quality—bonds in the investment and holding industry and in the trade and services industry are often traded with negative spread disparities. From the rating perspective, the share of bonds in the BBB rated group—which account for between 5 and 15 percent of all tradable bonds—was relatively high in the middle of the previous decade.

b. Relationship between aggregate inflows to mutual funds and the disparity between the spread forecast by the fundamental factors and the actual spread

Figure 8 shows the net new investment (inflows minus outflows) into mutual funds classified as "Domestic Bonds – Corporate" and "Domestic Bonds – General" as a proportion of all the assets of these funds in the previous month, and the average spread of the corporate bonds. As we can see, periods of high net inflows are accompanied by declining spreads, and vice versa. Similar behavior was observed when examining net inflows against the average spread disparity, adjusted for the impact of the fundamental factors on the bond spreads: the negative disparity decreases as net new investments increase and are positive, and vice versa. This empirical evidence ostensibly supports the assumption that accelerated inflows or outflows have an exacerbating rather than attenuating effect, but it is inadequate, partly because the

[16] According to the regression assumption, the residuals should amount to zero. In fact, the sum of the residuals throughout the entire sample period was zero. Nonetheless, in the figures that present the residuals by industry or rating group, we can clearly see that the residuals do not amount to zero as the residuals are displayed for subsamples, whereas the regression was estimated using the full sample.

figures only present averages and they do not reflect changes in the entire distribution. In this section, we will examine whether this relationship between mutual fund inflows and the spread disparity does in fact exist.

After calculating the forecast spread and the disparity from that spread based on the estimates presented in Table 2, column 5, for each month we compile a portfolio of all the corporate bonds that have negative spread disparities and a portfolio of all the corporate bonds with positive spread disparities, where each bond is included in the portfolio according to the weight of its market value. We then examine the change in the spread disparities of each portfolio in the following month. Assuming that the spread disparity should approximate zero, we put together an investment portfolio that includes, every month, short positions on the prices of bonds in the portfolio in which the differential is negative and long positions on the prices of bonds that have a positive spread disparity, and we then examine the change in the spread (which is inverse to price) of the portfolio in the following month. In the second stage, we estimate regression (3) to examine whether the aggregate flow in to the mutual funds attenuates or accentuates the spread differentials.

As noted, our sample period for this analysis spans September 2008 to November 2020.[17] We discard extreme observations in which the dependent variable is greater than its 99th percentile. Table 3 shows descriptive statistics for the variables included in estimating the impact of the aggregate flow into the mutual funds on the spread differentials. During the period under review, the aggregate flow into corporate bond mutual funds accounted for an average of 1.7 percent of these funds' AUM in the previous month, with a median of 0.8 percent. The average dependent variable was 0.039. Based on the construction of the dependent variable, a positive value implies that the spreads in the weighted portfolio converged to the spreads forecast by fundamental factors.

In the second and third sections of Table 3, we present the same descriptive statistic for two sub-periods—the period centering on the 2008 crisis (up to the end of 2010) and the subsequent period, excluding 2020 in which there were extreme fluctuations due to the COVID-19 pandemic.[18] The variance between these two periods is apparent in the descriptive statistics as well: the average values for all the risk indicators (VIX-TA, the monthly median of the bid-ask in the corporate bond market and the difference between the spread on BBB rated bonds and the spread on AA rated bonds) in the crisis period are noticeably higher than in the subsequent period. The aggregate flow rate into in the mutual funds during the crisis period is almost ten times higher than after the crisis. Figure 9 shows the aggregate mutual fund inflow alongside the dependent variable—changes in the theoretical bond portfolio. The

[17] Data on mutual funds accumulation are available only from August 2008 onwards, but because we use its lagged value, our first month is September 2008; November 2020 is the last month because this was the last available data point we had when writing this paper.

[18] As mentioned above, in July 2020 the Bank of Israel introduced a plan to purchase corporate bonds on the secondary market which affected prices as well as the conduct and impacts of other players in the market.

upper section shows the entire sample period and the correlation between the two variables is low—0.09. In contrast, the correlation between the same variables in the sub-sample which only covers the period 2011–19 is negative and higher: -0.18.

Table 4 shows the results of the estimation. For the specification in column 1 we use as explanatory variables only the net inflow and its squared term, and find no significant effect. However, when we shorten the sample period so that it only covers non-crisis periods—January 2011 through December 2019 – we find a significant negative effect of the net inflow linear term, and a significant positive effect of its squared term (column 2). This implies that net inflows into mutual funds exacerbate spread disparities, but this effect marginally diminishes with the scope of inflows. The coefficients change only slightly when we add some control variables (column 3) or the lagged dependent variable. Despite the statistical significance, the economic significance of the effect is limited: If we use the net average inflow in the period 2011–19 (0.63 percent) and multiply it by the relevant factors (inflow and inflow squared) as they appear in column 4, we find that the effect on the dependent variable is -0.006, only about 10 percent of the standard deviation for this variable.

Table 5 presents several alternative specifications and sensitivity tests for the results we obtained when using the limited, non-crisis sample (2011–19). In column 1 we also add the inflow to the corporate bond mutual funds to the aggregate flow into the mutual fund classified as "Domestic Bond – General", since a large proportion of their assets are corporate bonds. The signs of the effects' linear and squared terms of net inflow do not change, but the magnitude of the linear effect decreases. In column 2 we also include the aggregate inflow to the corporate bond ETFs (until September 2018) or ETNs (since January 2019).[19] The signs of the effects remain, their magnitude is bigger, and so is their economic significance: the sample's average net inflow (0.71 percent) is translated into a -0.01 change in the dependent variable, about 20 percent of its standard deviation.[20]

In the remaining columns we present some placebo tests results. First, instead of using the aggregate flow into the corporate bond mutual funds we use the aggregate flow into mutual funds investing in stocks. If risk-appetite changes are responsible for driving the demand for mutual funds investing in risk assets as well as changes in the price of these assets over and above their fundamental factors, we would expect that the aggregate flow into these mutual funds—which are directly affected by changes in risk appetite but are not active in the corporate bond market—will also be correlated with spread disparities. The results in columns 3 and 4 show that this is not the case: aggregate flow into mutual funds investing in stocks has no significant impact of any kind on the spread disparities, neither in the full

[19] Because of some technical issues associated with the reform, there is no data for October to December 2018 so the sample for this exercise is 3 observations smaller.

[20] In an undocumented exercise (results are available upon request) we replace the net inflows in mutual funds with net inflows in ETNs/ETFs alone. We find no significant effect and significantly lower explanatory power.

sample, nor in the 2011–19 sample. The use of aggregate flow into all types of mutual funds other than corporate bond mutual funds (columns 5-6) produces the same result.

To examine whether the exacerbating effect of the aggregate inflow in the years 2011–19 impacted the entire bond market or only certain parts of it, we estimate the specification in Table 4, column 3, using samples which only include bonds from certain industry or certain rating groups. The dependent variable is built in the same way we described above, but the theoretical portfolio only includes bonds associated with a particular industry or rating group. Aggregate inflows are also calculated in the same way, using only funds that invest in corporate bonds. The results appear in Table 6.

The left side of the table shows the estimations that were made according to allocation by industry, and the right side of the table according to allocation by rating groups. The table shows that inflows to the mutual funds were found to have a significant exacerbating impact on the spread disparities in most of the partial samples. In fact, only in the construction and real estate industry and only for the most highly rated bonds were the mutual funds found to have neither an attenuating nor an exacerbating impact.[21]

5. SUMMARY AND CONCLUSIONS

Corporate bonds are an important part of the public's financial asset portfolio and a critical tool used by the business sector for raising credit. Due to their importance, sharp movements in their prices and spreads could, in extreme cases, have significant systemic ramifications. This paper attempts to shed light on these aspects. Our study estimated the forecast spread of corporate bonds and examined the behavior of deviations from the forecast spread, particularly the contribution of aggregate mutual fund inflows to these deviations. We find two periods in which a substantial part of this market is traded at significantly lower spreads than those forecast—immediately prior to the 2008 financial crisis and immediately prior to the European sovereign debt crisis of 2011. We also found that the aggregate inflow to corporate bond mutual funds accentuated, rather than moderated, the deviations. Thus, when the bond spread deviates from the forecast spread, aggregate flows into the mutual funds are liable to intensify that deviation, namely—cause them to move even further away from the forecast spread. The results emphasize the vulnerability of the corporate bond market to

[21] It is worth mentioning that the spread differentials included in the calculation are only those for bonds of real companies, excluding banks and insurance companies, whereas the mutual funds also hold and sell bank and insurance company bonds. Additionally, due to liquidity considerations, mutual funds tend to meet investors' demand for redemptions with the help of cash that they hold or by selling more liquid assets such as government bonds. Unfortunately, since we do not know which bonds are sold by mutual funds at the time of capital inflows and outflows, we are unable to isolate the changes in the funds' holdings of real company bonds alone. We therefore believe that our results underestimate the true impact of the mutual funds.

aggregate inflows of resources, which could exacerbate trends of over-optimism (as reflected in spreads that are significantly lower than those forecast), and when the trend changes intensify over-pessimistic trends.

From the financial stability viewpoint, this paper's contribution is in the development of a tool to detect widespread trends in the corporate bond market and in different segments of that market in real time, and to highlight one of the causes of the intensification of trends. These findings find their place in the discourse currently underway regarding financial stability, which issues a warning about the accumulation of risks in calm periods and in periods of low interest rates, risks which could intensify in periods of crisis. Even when the COVID-19 pandemic comes to an end, interest rates over the world will probably remain low to support economic activity. This will create conditions for pursuit of yields, with spreads decreasing beyond those forecasted and the possibility that mutual funds will exacerbate trends. Experience shows that policy makers must integrate these aspects of financial stability in their various decisions and develop supplementary policy instruments with the purpose of minimizing, to the extent possible, the vulnerability originating in this channel.

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Figure 1
Average spread of all tradable corporate bonds by industry, January 2008 through November 2020
Weights are by market value of the bond

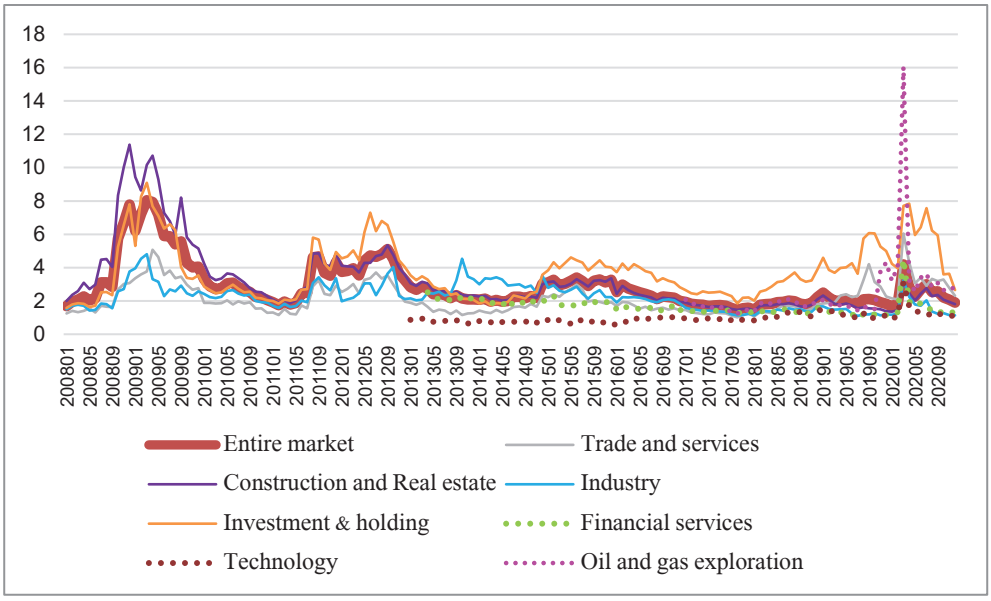


Figure 2
Average spread of all tradable bonds by rating group
Weights are by market value of the bond

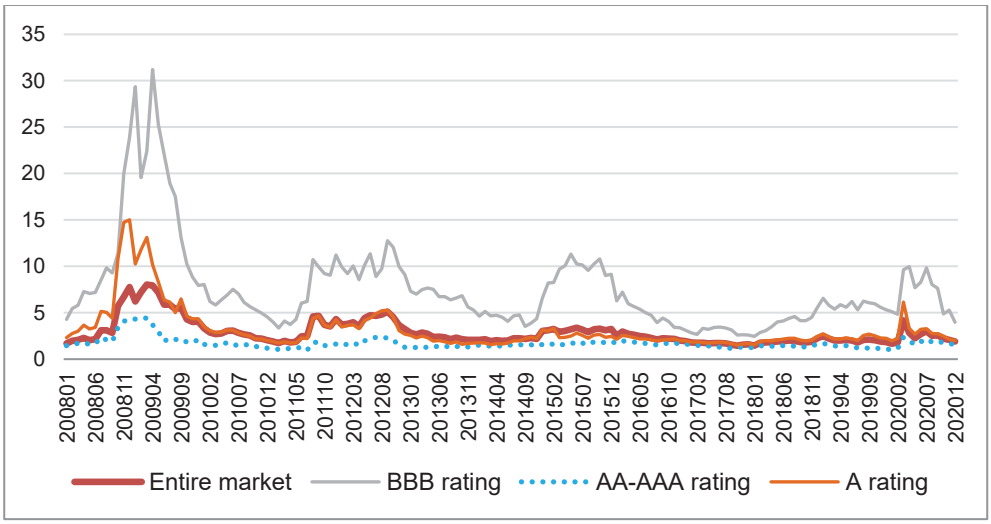


Figure 3
The marginal contribution of each variable to the overall goodness of fit (R-square)

This figure presents the marginal contribution of each variable to the full model's R-square. For each variable, we estimate a regression without it, take the difference between the full model's R-square and the partial model R-square, and divide it by the full model's R-square. In this exercise, the rating, security and indexation dummy variables were taken as a group.

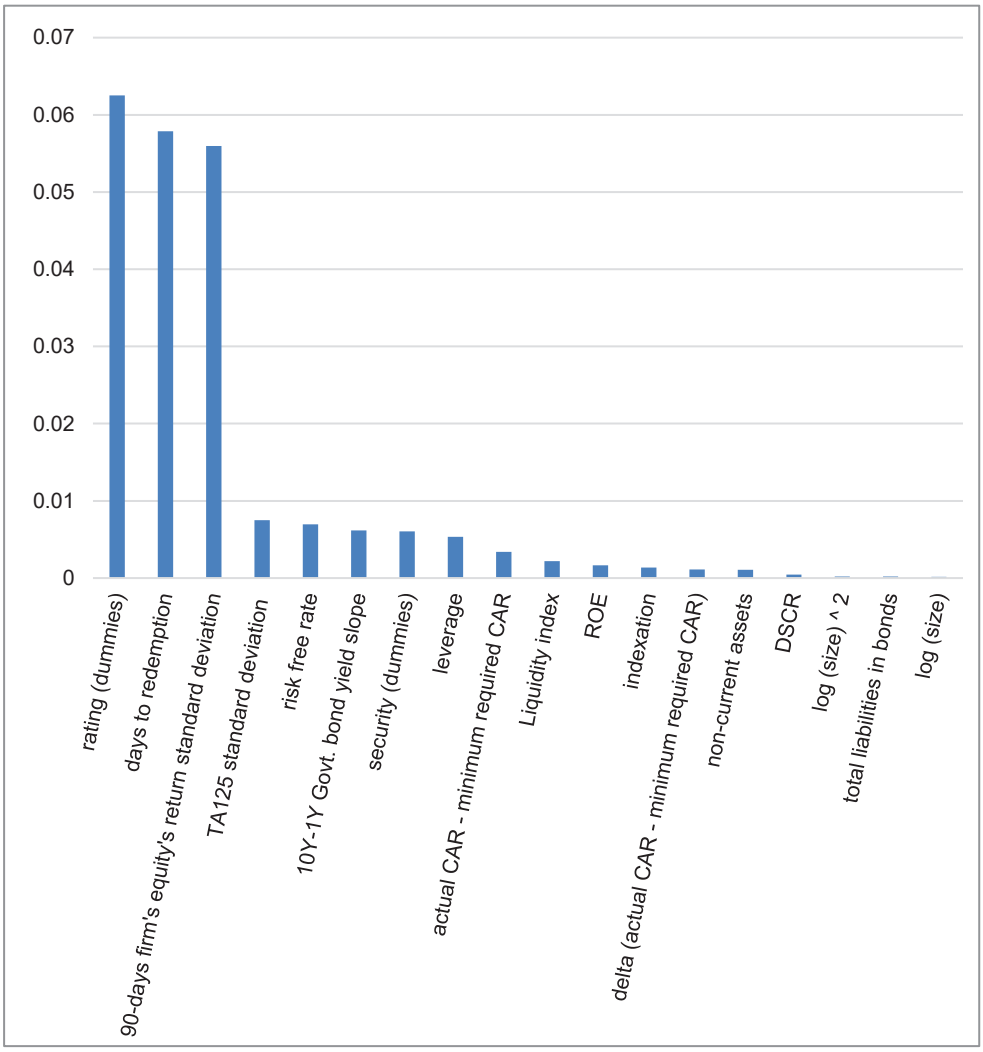
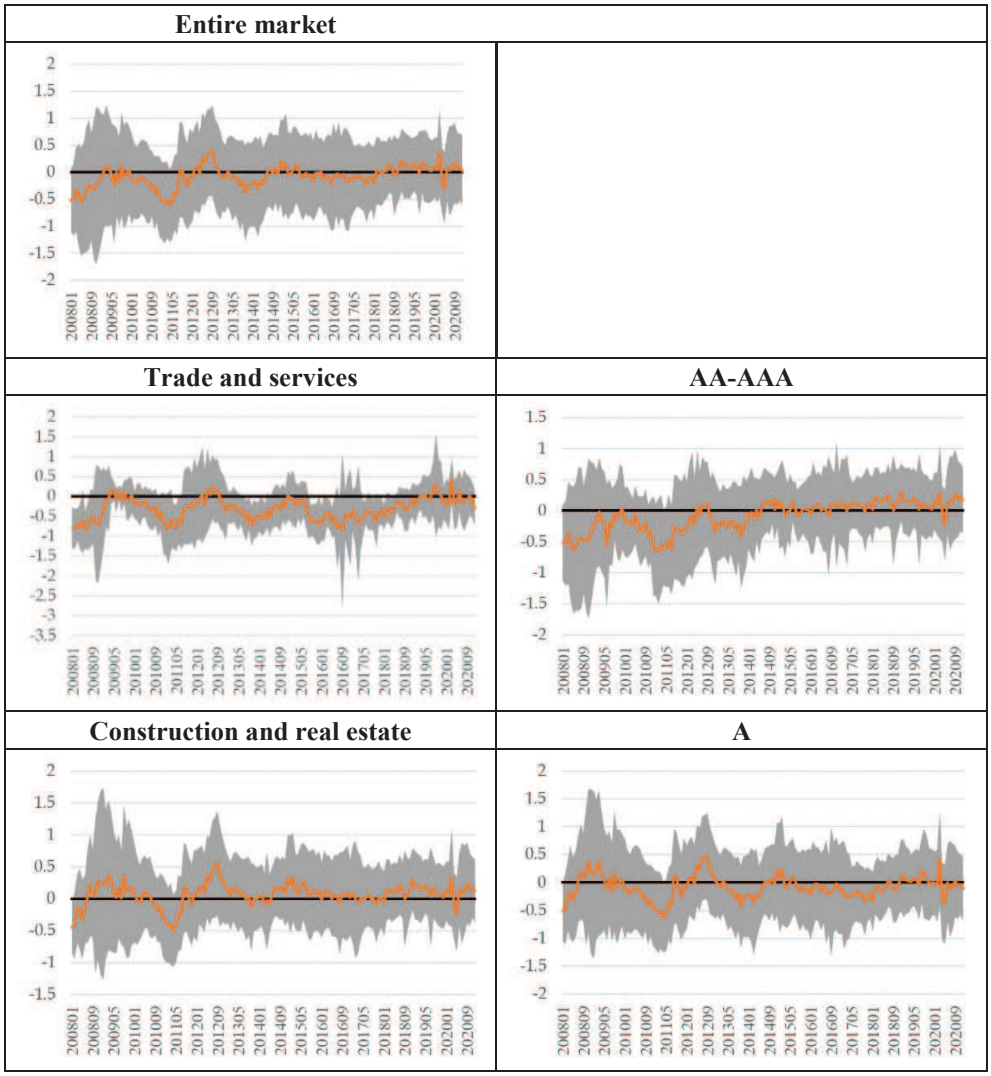


Figure 4
Average spread disparity, all bonds and by industry and rating groups

The average spread disparity is calculated according to the difference between the actual spread and the spread forecast by the fundamental factors. The forecast spread is based on the results of the estimation presented in Table 2, column 5. The weights are according to the bond's market value. The grey area indicates a 5 percent confidence interval, which is calculated using the standard deviation for the disparities in each period. The spread disparities and confidence intervals by sector and rating group were calculated in the same way.



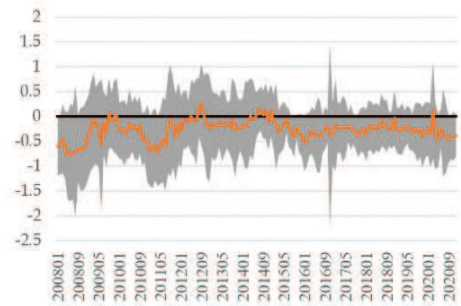
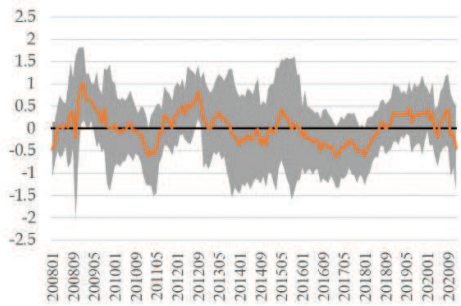
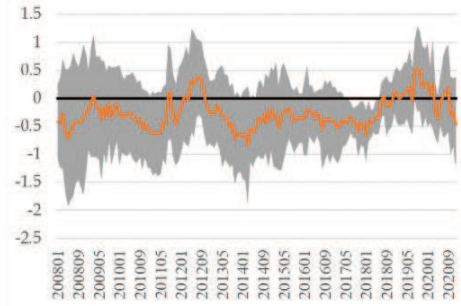
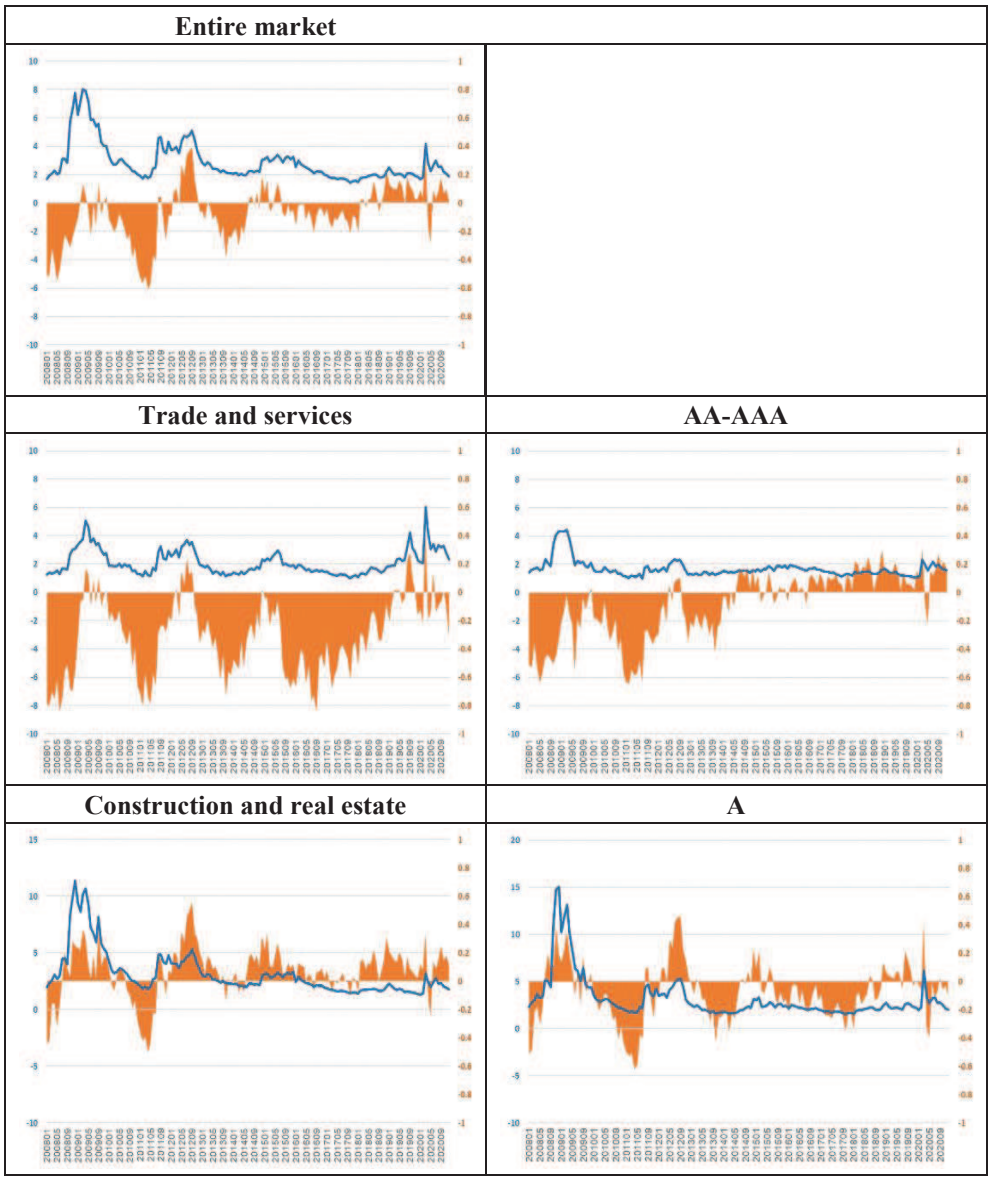
Industry	BBB
	
Investment and holdings	
	

Figure 5
Average spread and average spread disparity, total and by sector and rating group

The average spread disparity is calculated according to the difference between actual spread and the spread forecast by the fundamental factors. The forecast spread is based on the results of the estimation presented in Table 2, column 5. The weights are according to the bond's market value.



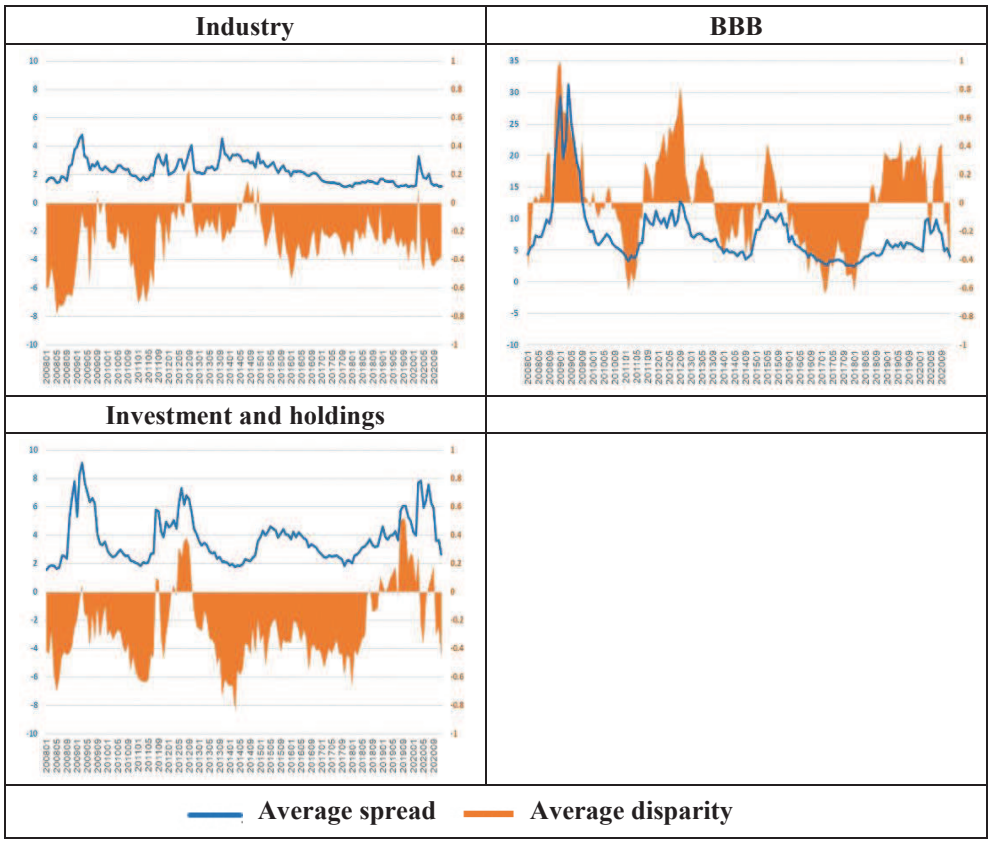

Industry
BBB
Investment and holdings
Average spread
Average disparity

Figure 6
Proportion of bonds traded with a negative spread disparity from the market value of bonds traded on the market, by sector and rating group

The market value proportion of bonds traded with a negative spread disparity (which is greater than two SDs of the spread disparity) from the market value of all bonds, in each spread disparity month calculated according to the difference between the actual spread and the spread forecast by the fundamental factors. The forecast spread is based on the results of the estimation presented in Table 2, column 5.

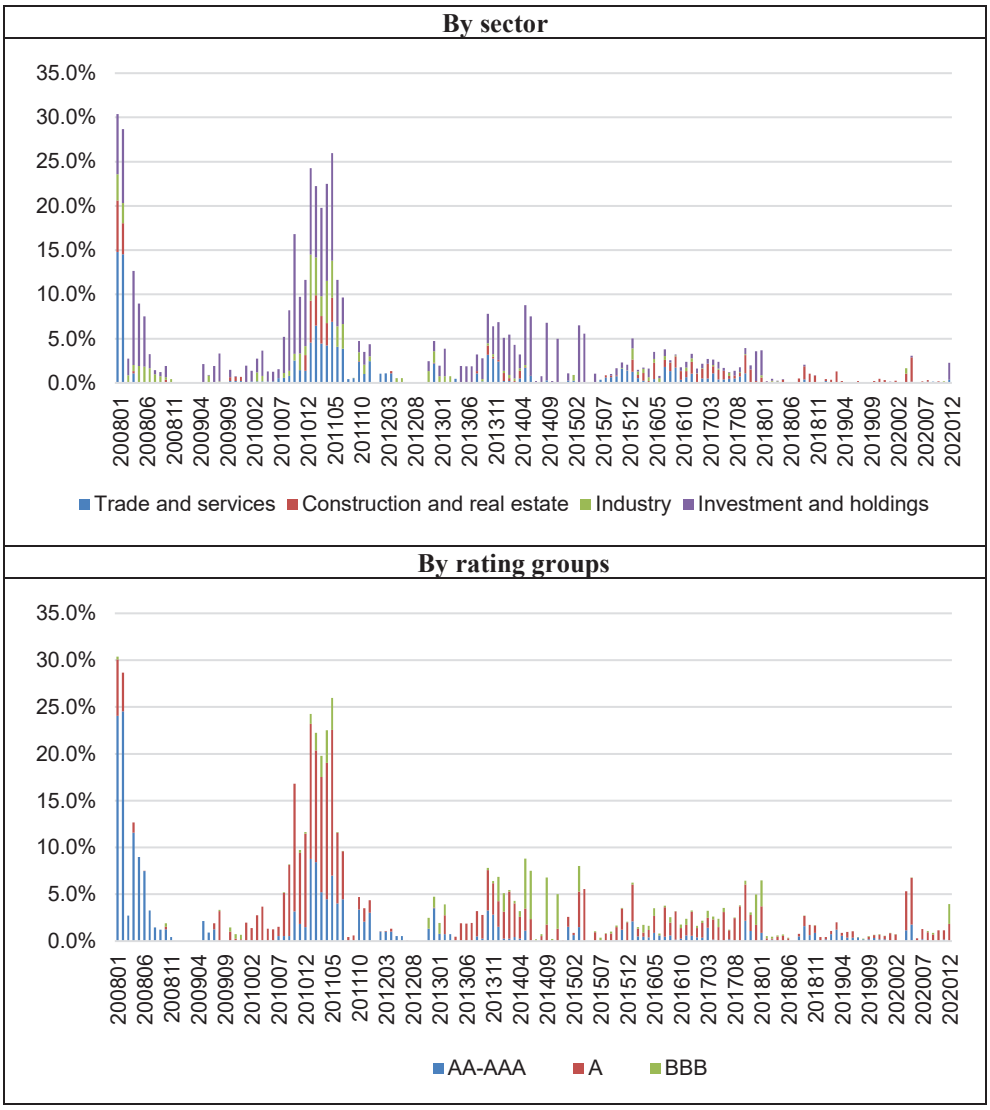
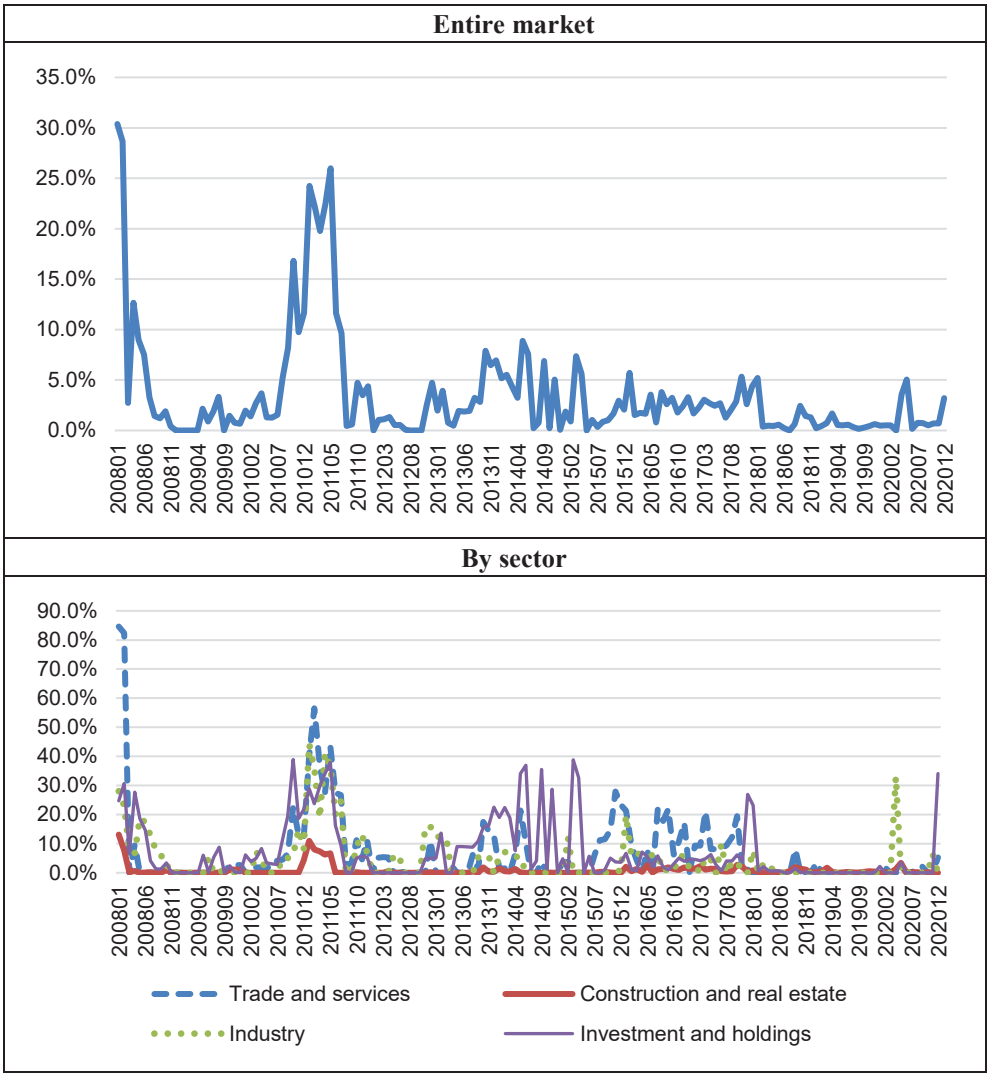


Figure 7
Proportion of bonds traded with a negative spread disparity from the market value of all bonds traded in each sector or rating group

The market value share of bonds traded with a negative spread disparity (which is greater than two SDs of the spread disparity) in the sector or rating group, from the market value of all bonds, in each month, in each sector and rating group. The spread disparity is calculated according to the difference between the actual spread and the spread forecast by the fundamental factors. The forecast spread is based on the results of the estimation presented in Table 2, column 5.



By rating groups

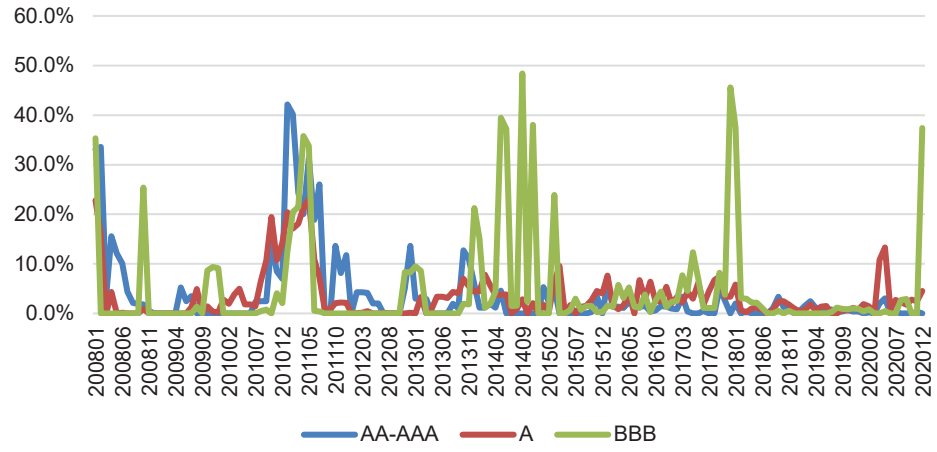


Figure 8
Average spread, average spread disparity and aggregate rate of flow into the corporate bond mutual funds

The spread disparity is calculated according to the difference between the actual spread and the spread forecast by the fundamental factors. The forecast spread is based on the results of the estimation presented in Table 2, column 5. The weights are according to the bond's market value. The accumulation rate is calculated as the net flow (inflow minus outflow) into the corporate bond mutual funds from all the assets of these funds in the previous month.

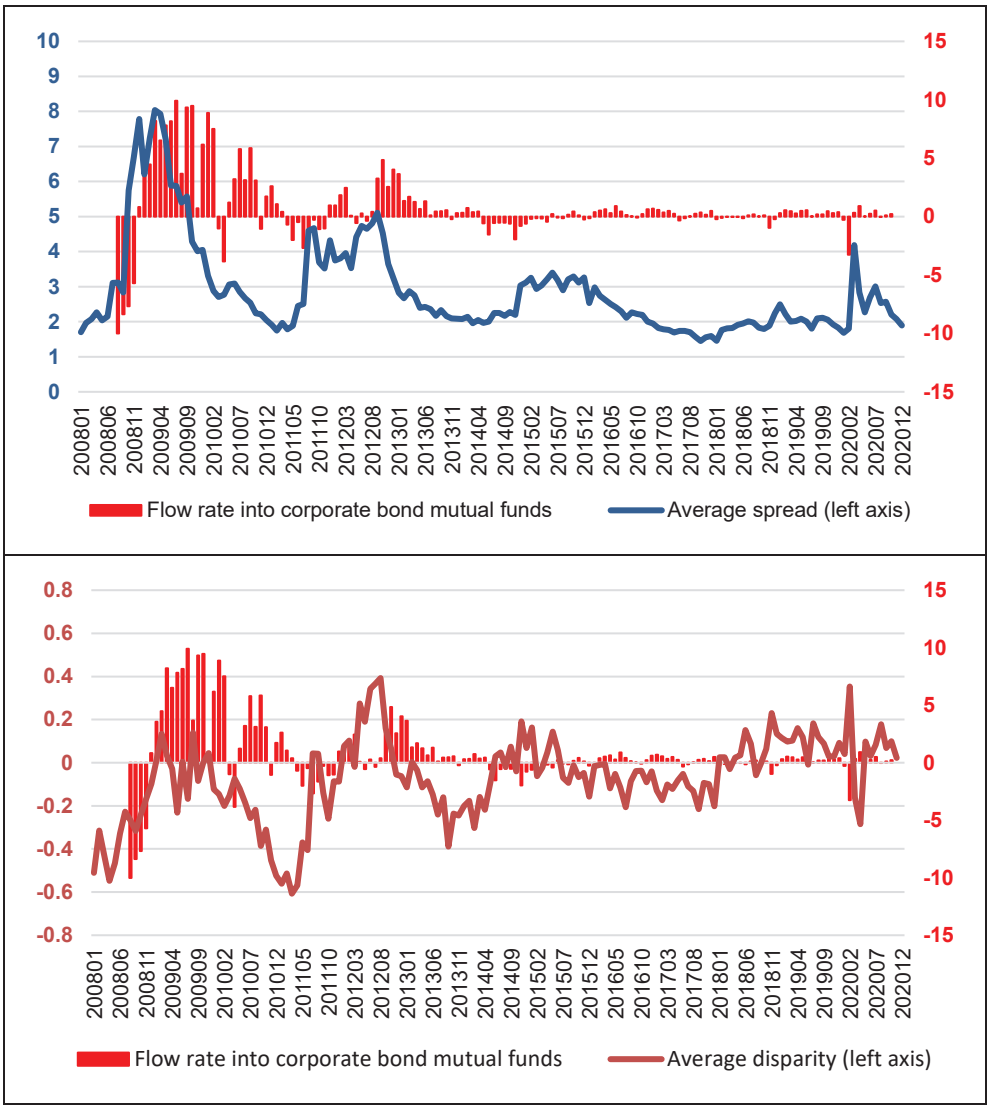


Figure 9
Change in spread of theoretical bond portfolio and net flow rate into corporate bond mutual funds

The theoretical bond portfolio consists of short positions on bonds with a negative spread disparity and long positions on bonds with a positive spread disparity. The accumulation rate is calculated as net flow into the corporate bond mutual funds (inflows minus outflows) in the previous month, from the total assets (AUM) in these funds in the month before the previous month.

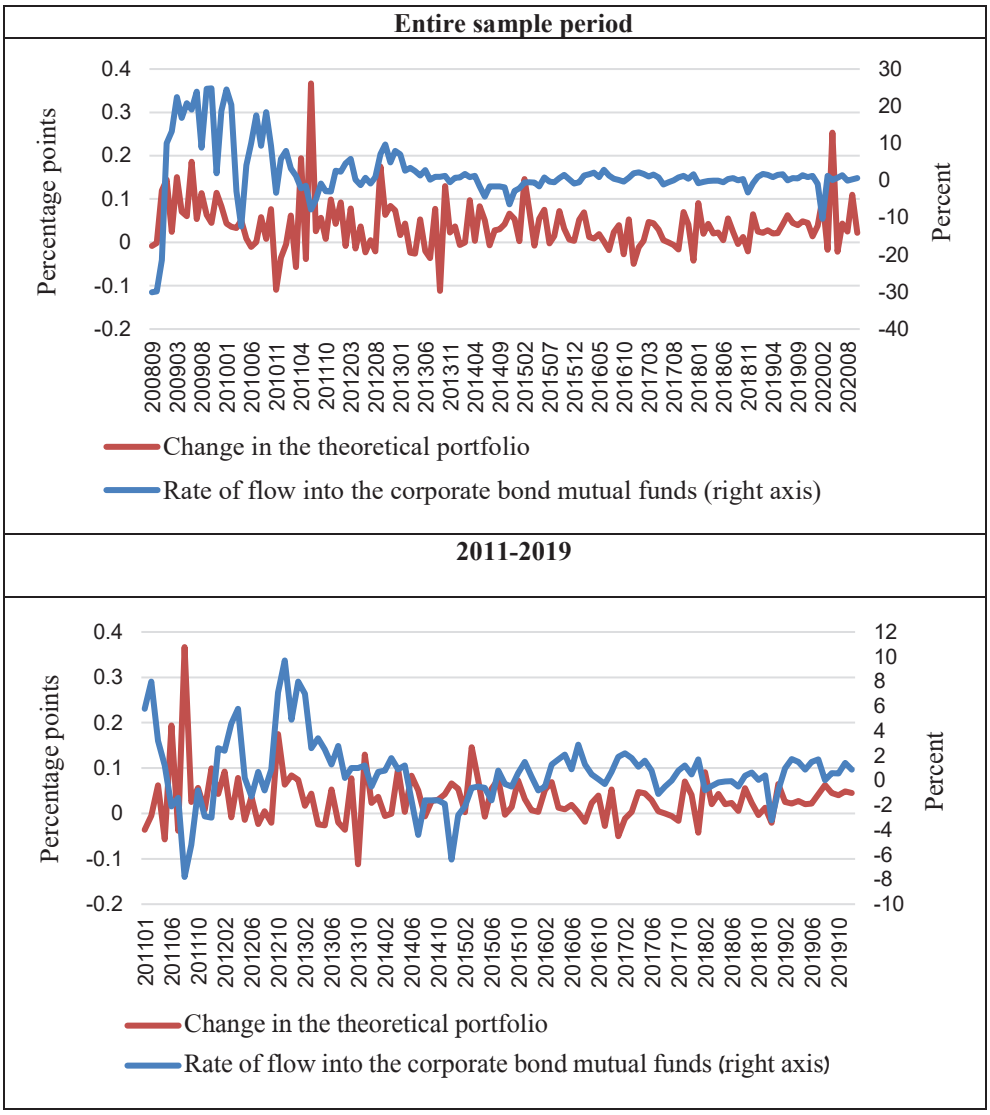


Table 1
Descriptive statistics of the dataset

The continuous variables included in the estimation of the factors impacting the corporate bond spreads. Additional explanations regarding the method of calculating each variable appear in the Appendix.

Name of variable	Definition of variable	No. of observations	Average	Median	SD	10th percentile	90th percentile
spread	Bond yield spread – difference between bond yield and yield on government bond with closest duration, with same linkage	28,720	3.17	2.08	3.66	1.03	6.05
ln(spread)	Log (spread)	28,720	0.83	0.73	0.75	0.03	1.80
days to redemption	No. of days to bond redemption	28,720	2,116	1,998	1,167	685	3,612
Liquidity index	trading volume relative to price changes in a 30-day window	28,720	.007	.001	.0172	.0001	.0192
log (size)	Company size, as measured by natural log of total assets	28,720	15.61	15.63	1.37	13.74	17.47

leverage	Long leverage – total liabilities divided by total assets	28,720	0.709	0.713	0.119	0.559	0.862
total liabilities in bonds	Company's total liabilities in form of bonds (NIS million)	28,720	3,540	1,342	5,391	124	9,821
ROE	Return on Equity – net profit divided by equity, multiplied by 100	28,720	7.34	10.35	46.39	-7.41	23.57
DSCR	Interest coverage ratio – ratio between operational profit in the last 4 quarters and net financing expenses in the same period, multiplied by 100	28,720	3.79	2.71	4.65	0.55	8.55
non-current assets	Non-current assets as a percentage of company's total assets	28,720	0.71	0.78	0.23	0.37	0.94
90-days firm's equity's return standard deviation	Standard deviation of share's daily yield – last 90 days	28,720	2.06	1.73	1.07	1.16	3.40

Macro variables (inter-period average)							
10Y-1Y Govt. bond yield slope	Slope of yield curve – difference between yield on 10-year government bonds and yield on one-year government bonds	156	1.41	1.35	1.06	0.23	2.56
risk free rate	Real interest rate in the economy – real yield for one year, from zero curve	156	-0.07	-0.28	0.89	-0.86	1.09
actual CAR - minimum required CAR	Difference between the banks' capital adequacy and that required by the Supervisor of Banks (in percentage points)	156	1.07	1.05	0.52	0.45	1.73
TA125 standard deviation	Standard deviation of daily yields on TA-125 index – last 30 days	156	23.90	20.40	15.34	10.45	39.23

Table 1A
Distribution of observations and market value of corporate bonds in the sample according to the categorical variables included in the estimation of the factors affecting the corporate bond spreads

	No. of observations	Percentage of market value
Linkage		
Not linked	8,830	21.6%
CPI-linked	19,875	78.4%
USD linked	15	0.0%
Rating		
AA+	759	5.6%
AA	2,223	11.5%
AA-	4,094	20.8%
A+	5,775	23.0%
A	6,541	21.1%
A-	4,560	9.3%
BBB+	2,495	3.9%
BBB	1,952	3.8%
BBB-	321	1.1%
Collateral and financial covenants		
No collateral and covenants	14,388	54.7%
First lien	4,069	10.2%
Secondary lien	264	0.9%
Negative pledge	9,001	30.2%
Floating charge	57	0.0%
Symbolic	570	2.8%
Other	142	0.9%
No data available	229	0.4%
Economic sector (by TASE sectors)		
Financial services	115	0.4%
Technology	423	0.9%
Trade and service	3,281	10.0%
Construction and real estate	18,041	61.4%
Industry	2,585	6.6%
Investment and holdings	3,878	19.5%
Oil and gas exploration	397	1.3%

Table 2
Bond pricing regressions – Estimation results

Results of the estimation of the factors affecting corporate bond spreads. The dependent variable is the log spread and the independent variables are those described in Tables 1 and 1A. The standard deviations are grouped by issuing company. * indicates significance level of 10 percent and less, ** indicates significance level of 5 percent and les, *** indicates significance level of 1 percent and less

		(1)	(2)	(3)	(4)	(5)	(6)
		Bond's variables	Bond's variables	Macro variables	All variables	All variables, with firm FE	All variables, with time FE
bond's characteristics	days to redemption	0.0002***			0.0001***	0.0002***	0.0002***
		(0)			(0)	(0)	(0)
	CPI indexation	0.66**			0.46	0.283	0.4248
		(0.34)			(0.31)	(0.314)	(0.328)
	Dollar indexation	0.13***			0.075***	0.0704***	0.0874***
		(0.01)			(0.01)	(0.007)	(0.007)
	Liquidity index	4.49***			2.24***	2.0355***	2.6547***
		(0.26)			(0.20)	(0.189)	(0.203)
ratings	AA	0.30***			0.18***	-0.02	-0.04
		(0.02)			(0.02)	(0.05)	(0.05)
	AA-	0.52***			0.46***	0.23***	0.18***
		(0.02)			(0.02)	(0.05)	(0.05)
	A+	0.70***			0.59***	0.38***	0.31***
		(0.02)			(0.02)	(0.05)	(0.05)
	A	1.01***			0.83***	0.63***	0.51***
		(0.02)			(0.02)	(0.05)	(0.05)
	A-	1.32***			1.08***	0.86***	0.72***
		(0.02)			(0.02)	(0.05)	(0.05)
	BBB+	1.58***			1.40***	1.16***	0.94***
		(0.02)			(0.02)	(0.05)	(0.05)
	BBB	1.90***			1.55***	1.29***	1.05***
		(0.02)			(0.02)	(0.05)	(0.05)
	BBB-	2.17***			1.82***	1.53***	1.22***
		(0.04)			(0.04)	(0.06)	(0.06)

Collateral And Covenants	first lien	-0.19*** (0.01)			0.01* (0.01)	-0.13*** (0.01)	-0.22*** (0.01)
	second lien	-0.18*** (0.03)			-0.02 (0.03)	-0.12*** (0.03)	-0.22*** (0.03)
	Negative pledge	-0.17*** (0.01)			0.12*** (0.01)	0.10*** (0.01)	-0.02** (0.01)
	floating charge	-0.29*** (0.06)			-0.25*** (0.05)		
	symbolic	0.21*** (0.03)			-0.01 (0.02)	-0.07*** (0.02)	0.02 (0.02)
	other	-0.26*** (0.05)			-0.01 (0.05)	-0.12** (0.05)	-0.23*** (0.05)
	No information	0.27*** (0.05)			-0.04 (0.04)	0.09** (0.04)	0.19*** (0.04)
firm's characteristics	log(assets)		-1.43*** (0.06)		-0.42*** (0.05)	-0.53*** (0.16)	-1.42*** (0.16)
	log(assets)^2		0.04*** (0)		0.01*** (0)	0.02*** (0.01)	0.04*** (0.01)
	Leverage		2.07*** (0.06)		0.42*** (0.04)	1.12*** (0.06)	1.73*** (0.06)
	Share of non-current assets		0.38*** (0.03)		0.11*** (0.02)	0.34*** (0.04)	0.40*** (0.04)
	ROE		-0.0014*** (0.001)		-0.0009*** (0.001)	-0.0007*** (0.001)	-0.0005*** (0.001)
	DSCR		-0.02*** (0.003)		-0.0048*** (0.001)	-0.0040*** (0.001)	-0.0049*** (0.001)
	total bonds liabilities		0.001 (0.001)		0.001*** (0.0001)	0.001*** (0.0001)	0.0001 (0.0001)
	90-days firm's equity's return standard deviation		0.29***		0.21***	0.19***	0.22***

macro variables	TA125 standard deviation			0.01*** (0)	0.00*** (0)	0.00*** (0)	
	10Y-1Y Govt. bond yield slope			0.17*** (0.01)	0.12*** (0.01)	0.09*** (0.01)	
	risk free rate			0.21*** (0.01)	0.13*** (0.01)	0.11*** (0.01)	
	actual CAR - minimum required CAR			-0.19***	-0.13***	-0.11***	
	delta(actual CAR - minimum required CAR)			(0.01)	(0.01)	(0.01)	
	Constant			1.22*** (0.08)	0.42*** (0.05)	0.42*** (0.05)	
	Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
	Firm FE	No	No	No	No	Yes	Yes
	TE	No	No	No	No	No	Yes
	Observations	28,720	28,720	28,720	28,720	28,720	28,720
	Adjusted R-squared	0.49	0.47	0.18	0.67	0.72	0.70

Table 3
Descriptive statistics of the variables included in the estimation of the impact of the flow into the mutual funds on the spread disparities

		No. of observations	Average	Median	SD	Maximum	Minimum
	Entire period (September 2008 through November 2020)						
portfolio return	Change in weighted portfolio (%)	144	0.039	0.030	0.061	0.377	-0.112
corporate bonds mutual funds accumulation	Rate of flow into corporate bond mutual funds (%)	144	1.767	0.800	8.296	24.800	-30.500
VIX-TA	VIX-TA	144	15.750	13.506	7.414	51.380	7.971
median bid-ask spread	Median bid-ask spread in corporate bond market (percentage points)	144	0.707	0.485	0.718	5.533	0.164
BBB-AA rated bonds spread	Spread disparity between BBB-rated and A-rated bonds (percentage points)	144	6.938	5.184	5.298	33.808	1.642
stocks' cross risk	Index of comovement of shares	144	84.954	84.706	2.416	91.705	80.136
Tel-Bond 20 monthly return	Rate of monthly change in Tel-Bond 20 index (%)	144	0.304	0.374	1.453	5.070	-8.412

	September 2008 through December 2010						
portfolio return	Change in weighted portfolio (%)	28	0.060	0.060	0.062	0.213	-0.096
corporate bonds mutual funds accumulation	Rate of flow into corporate bond mutual funds (%)	28	6.925	10.000	17.305	24.800	-30.500
VIX-TA	VIX-TA	28	23.280	21.630	8.783	47.600	13.545
median bid-ask spread	Median bid-ask spread in corporate bond market (percentage points)	28	1.499	1.014	1.202	5.533	0.551
BBB-AA rated bonds spread	Spread disparity between BBB-rated and A-rated bonds (percentage points)	28	12.045	8.318	8.263	33.808	3.997
stocks' cross risk	Index of comovement of shares	28	85.265	85.337	2.118	88.801	80.927
Tel-Bond 20 monthly return	Rate of monthly change in Tel-Bond 20 index (%)	28	0.681	1.203	2.445	5.070	-8.412

	January 2011 through December 2019						
portfolio return	Change in weighted portfolio (%)	107	0.032	0.026	0.057	0.377	-0.112
corporate bonds mutual funds accumulation	Rate of flow into corporate bond mutual funds (%)	107	0.629	0.700	2.589	9.700	-7.800
VIX-TA	VIX-TA	107	13.121	11.977	4.166	29.440	7.971
Median bid-ask spread	Median bid-ask spread in corporate bond market (percentage points)	107	0.508	0.429	0.327	1.743	0.164
BBB-AA rated bonds spread	Spread disparity between BBB-rated and A-rated bonds (percentage points)	107	5.643	4.825	3.391	17.330	1.642
stocks' cross risk	Index of comovement of shares	107	84.732	84.572	2.428	91.705	80.136
Tel-Bond 20 monthly return	Rate of monthly change in Tel-Bond 20 index (%)	107	0.282	0.351	0.811	2.334	-2.304

Table 4
Results of the estimation of the impact of the flow into the mutual funds on the spread disparities

The dependent variable is the change in the weighted portfolio, and the independent variables are those which appear in Table 3. The standard deviations are robust to a serial and heteroscedastic correlation. * indicates a significance level of 10 percent and less, ** indicates a significance level of 5 percent and less, *** indicates a significance level of 1 percent and less.

	(1)	(2)	(3)	(4)
	full period	full period	2011-2019	2011-2019
corporate bonds mutual funds accumulation	0.0007	-0.0084**	-0.0113***	-0.0105**
	(0.001)	(0.004)	(0.004)	(0.005)
(corporate bonds mutual funds accumulation)^2	0.0001	0.0018***	0.0019***	0.0018**
	(0.0001)	(0.001)	(0.001)	(0.001)
lag(dependent variable)				0.0012
				(0.001)
VIX-TA			0.0019	0.0017
			(0.003)	(0.003)
median bid-ask spread			-0.0531	-0.0502
			(0.043)	(0.046)
BBB-AA rated bonds spread			0.004	0.004
			(0.003)	(0.003)
stocks' cross risk			-0.0006	-0.0004
			(0.003)	(0.003)
Tel-Bond 20 monthly return			0.0106	0.0099
			(0.008)	(0.008)
Constant	0.0343***	0.0237***	0.0549	0.0317
Observations	144	107	107	107
Adjusted R-squared	0.11	0.11	0.10	0.27

Table 5

Impact of the flow into mutual funds on spread disparities – robustness tests

The dependent variable is the change in the weighted portfolio and the independent variables are those which appear in Table 3. The standard deviations are robust to a serial and heteroscedastic correlation. * indicates a significance level of 10 percent and less, ** indicates a significance level of 5 percent and less, *** indicates a significance level of 1 percent and less.

	(1)	(2)	(3)	(4)	(5)	(6)
	2011-2019	2011-2019	full period	2011-2019	full period	2011-2019
corporate bonds + general bonds mutual funds accumulation	-0.0064**					
	(0.003)					
(corporate bonds + general bonds mutual funds accumulation)^2	0.0019***					
	(0.001)					
corporate bonds mutual funds + MTFs + ETFs accumulation		-0.0192***				
		(0.007)				
(corporate bonds mutual funds + MTFs + ETFs accumulation)^2		0.0042***				
		(0.002)				
equity mutual funds accumulation			-0.0035	-0.0056		
			(0.003)	(0.005)		
(equity mutual funds accumulation)^2			0.0002	0.0003		
			(0)	(0.001)		
(all mutual funds accumulation) – (corporate bonds and general bonds mutual funds accumulation)					0.002	-0.0013
					(0.004)	(0.004)
[(all mutual funds accumulation) – (corporate bonds and general bonds mutual funds accumulation)]^2					0.0004*	0.0012
					(0)	(0.002)

VIX-TA	-0.0013 (0.002)	0.002 (0.003)	0.0009 (0.002)	-0.0014 (0.002)	0.0011 (0.002)	-0.0012 (0.002)
median bid-ask spread	-0.0006 (0.037)	-0.0366 (0.034)	0.005 (0.023)	0.0287 (0.03)	0.0041 (0.023)	0.0487 (0.032)
BBB-AA rated bonds spread	0.0023 (0.003)	0.0034 (0.003)	0.0011 (0.002)	0.0003 (0.003)	0.0009 (0.002)	-0.0006 (0.004)
stocks' cross risk	0.0018 (0.002)	-0.0006 (0.002)	0.0012 (0.002)	-0.0002 (0.003)	0.0015 (0.002)	0.001 (0.002)
Tel-Bond 20 monthly return	0.009 (0.008)	0.0103 (0.008)	0.0094 (0.006)	0.0096 (0.009)	0.0079 (0.005)	0.0087 (0.008)
Constant	-0.1254 (0.194)	0.0529 (0.208)	-0.0911 (0.186)	0.0503 (0.233)	-0.1203 (0.198)	-0.0618 (0.21)
Observations	107	104	144	107	144	107
Adjusted R-squared	0.25	0.24	0.09	0.02	0.07	-0.02

Table 6
Impact of the flow into mutual funds on the spread disparities by industry and rating group

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	by industry				by ratings		
	Commerce and services	Real estate	Manufacturing	Investment and holdings	AAA-AA	A	BBB
corporate bonds mutual funds accumulation	-0.0162***	-0.0149***	-0.0042	-0.0174***	-0.0066**	-0.0127***	-0.0013
	(0.004)	(0.004)	(0.004)	(0.005)	(0.003)	(0.004)	(0.003)
(corporate bonds mutual funds accumulation)^2	0.0021***	0.0018**	0.0013**	0.0023***	0.0025***	0.0019***	0.0001
	(0)	(0.001)	(0.001)	(0.001)	(0)	(0.001)	(0)
VIX-TA	0.0037	-0.0011	-0.0004	-0.0005	0.002	0.0022	-0.0007
	(0.004)	(0.004)	(0.003)	(0.005)	(0.003)	(0.003)	(0.003)
median corporate bonds spread	-0.105	0.0125	0.0051	-0.0919	-0.0293	-0.0497	-0.0283
	(0.065)	(0.07)	(0.042)	(0.093)	(0.057)	(0.043)	(0.044)
BBB-AA rated bonds spread	0.0084*	0.0053	-0.0002	0.0100*	-0.0019	0.004	0.0047*
	(0.004)	(0.005)	(0.003)	(0.006)	(0.004)	(0.003)	(0.003)
stocks' cross risk	0.0011	0.0029	0.0003	0.0001	0.0037	0.0008	-0.0019
	(0.005)	(0.004)	(0.002)	(0.007)	(0.004)	(0.003)	(0.002)
Tel-Bond 20 monthly return	0.0065	0.0115	0.005	-0.008	0.0023	0.0154*	-0.0008
	(0.013)	(0.013)	(0.007)	(0.013)	(0.01)	(0.009)	(0.007)
Constant	-0.12	-0.225	0.0022	0.0005	-0.2981	-0.0729	0.1831
	(0.407)	(0.379)	(0.183)	(0.598)	(0.326)	(0.269)	(0.209)
Observations	95	105	107	100	106	107	107
Adjusted R-squared	0.087	0.14	0.10	0.03	0.10	0.24	-0.03