The Use of Credit Ratings in the Delegated Management of Fixed Income Assets

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August 2022

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Abstract

Investment mandates of fixed income funds constrain managers' portfolio decisions, often employing credit ratings to classify asset risk. We categorize U.S. and European fixed income funds' mandates using textual analysis and measure the use of ratings. Over the past two decades, despite the weaknesses of ratings revealed in the global financial crisis, ratings use has increased significantly. Since 2010, the fraction of funds not using ratings in any way has fallen by almost half in both the U.S. and Europe. By 2020, 94% of U.S. funds and 65% of European funds use ratings. These patterns fit agency-based models of investment mandates and point to a lack of practically useful alternatives.

Keywords: Credit ratings, investment mandates, delegated asset management, financial crisis

JEL Classifications: G24, G23, G01

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Fixed income markets are large and of central importance to the financial system, providing much of the external financing of corporations, financial institutions, and the public sector.[1] Most investment decisions in fixed income markets are not made by the ultimate asset owners (e.g., households and governments) but by agents such as mutual funds, insurance companies, and pension funds. Together, bond mutual funds and money market mutual funds managed $13.7 trillion worldwide in 2021 (Investment Company Institute 2022). The interaction between such asset managers and the ultimate asset owners is key to understanding fixed income markets. An important determinant of the relationship between owners and managers is the investment mandate, which stipulates how assets are to be managed and with which restrictions. For example, a mandate may define a fund's broad investment strategy, or dictate which types of assets a fund manager can purchase. In particular, investment mandates often restrict the risk of portfolio assets (Almazan, Brown, Carlson, and Chapman 2004; He and Xiong 2013). In this paper, we examine the structure of such investment mandates for fixed income asset managers and the role that credit ratings play in restricting risk taking by funds.

Using regulatory filings in the U.S. and Europe for the last twenty (U.S.) and ten (Europe) years, we perform a textual analysis on investment mandates (contained in the filings) to classify how portfolio risk is characterized and constrained in these mandates. Most mandates limit the set of investable assets using credit ratings. In all, 60% of European funds and 93% of U.S. fund mandates refer to credit ratings in some way.[2] This is in line with earlier survey-based findings by Cantor, Gwilym, and Thomas (2007) that credit ratings are used in the guidelines of some of

[1] The value of outstanding U.S. fixed income securities, for example, rose from 57 percent of GDP in 1980 to 182 percent of GDP in 2007 (Greenwood and Scharfstein 2013).

[2] This count includes direct references (e.g., "assets rated BBB") as well as related terms like "high yield" and "investment grade", and it reflects the periods 2010 – 2020 for the U.S. and 2012 – 2021 for Europe.

the largest asset managers working with pension plans.[3] References to credit ratings are implemented in different ways: some mandates specify that assets will be invested "primarily" in investment grade securities, others determine that most funds will be invested in high yield assets; some require ratings from a particular agency, while others allow the ratings of any agency certified by regulators. Mandates also differ in their amount of leeway (e.g., allowing 10% of assets to be outside the target rating range).

We collect data on security holdings of funds to establish that portfolios conform to mandates: the credit ratings of fund assets closely match mandates. For example, examining corporate bond portfolios of Investment Grade ("IG") funds, we document that 96% of assets are IG. In contrast, High Yield ("HY") funds hold 7% IG assets. Funds without ratings references of any kind hold 60% IG assets. The close match between mandates and holdings may reflect legal and commercial risks associated with deviations from investment mandates. Examples of lawsuits about this include a 2008 case in which investors in Schwab's YieldPlus Fund filed a class action suit against Schwab for deviating from investment and concentration policies. The defendant paid $119 million to settle the charges (Laisse 2011). Similarly, in 2012, Evergreen Investment Management Company paid $25 million to settle a class action claiming it misled investors about one of its fund's exposure to mortgage-backed securities (Reuters 2012).[4]

The use of ratings in mandates extends to funds marketed to retail as well as to institutional investors (as in the Cantor et al. 2007 study), to ETFs as well as open-ended mutual funds, and across all large categories of fixed income funds (e.g., municipal bond funds and corporate bond

[3] Cantor, Gwilym, and Thomas (2007) survey 50 fund managers and 50 trustees/pension plan sponsors in the U.S. and in Europe regarding the use of credit rating rules and guidelines in the conduct of their investment activities.

[4] In contrast to our finding of a close match between mandates and portfolios, Chen, Cohen, and Gurun (2021) report that some fixed income mutual funds strategically misreport key risk metrics (such as the fraction of AAA securities held) to private information intermediaries such as Morningstar. One potential difference between investment mandates and web site descriptions of fund portfolios is the status of the fund prospectus as a legally binding document.

funds). Younger funds, funds with more assets under management, corporate bond funds, and ETFs are more likely to use ratings, while index funds are less likely to do so. Broad-based use of ratings is consistent with an agency-based view of asset management (e.g., He and Xiong 2013, Admati and Pfleiderer 1997), whereby constraints on risk-taking are required to convince investors to invest with a manager.

Not only is ratings use *frequent*, but it has also been *increasing*. In our U.S. sample, a broad measure of ratings use in mandates increased from 90.0% of funds in 2010 to 94.4% in 2020. This implies that non-use has been cut in almost half and suggests a net increase in ratings use by 0.4% of the fund stock annually (this net reflects both changes in mandates and turnover in the fund universe). In Europe, ratings use increased from 46.8% to 65.8% between 2012 and 2021, suggesting that non-use has been reduced by one third (equivalent to an annual increase in ratings use by 1.9% of the European fund universe). Increases in ratings references in mandates are observed after controlling for fund characteristics such as assets under management and asset class (corporate, municipal, etc.) and within individual funds over time. The pattern of increasing ratings use holds for the period after the global financial crisis in 2008, as well as in the decade preceding it.

This broad-based trend might seem puzzling given the widespread criticism of credit ratings following the financial crisis.[5] There are at least three possible explanations (not mutually exclusive). First, despite the popular and regulatory backlash against credit rating agencies, the financial crisis may not have changed sophisticated investors' perceptions of ratings quality much, at least for asset classes not associated with major losses during the financial crisis. The most significant losses were sustained in structured assets, which most funds do not hold: fixed

[5] The literature pinpointing these issues is too long to do justice here, but see, for example, Skreta and Veldkamp (2009), Benmelech and Dlugosz (2009b), Becker and Milbourn (2011), Bolton, Freixas and Shapiro (2012), Gordy and Willeman (2012), Opp, Opp and Harris (2013), and Partnoy (2017). Benmelech and Dlugosz (2009a), Griffin and Tang (2012), and deHaan (2017) point out that failures occurred in the context of credit ratings of structured assets.

income mutual funds largely invest in corporate and municipal bonds, and in Treasury securities. European mandates most often use ratings when investing in U.S. assets, where coverage is deepest and where the history is the longest. Perhaps ratings are perceived as reliable metrics in this area and have no viable alternatives. Under this view, low quality ratings generate a negative externality on the financial system, given that they are effectively irreplaceable.[6]

Second, competition between asset managers for funds may force increased use of ratings. As Stein (2005) points out for open-ended fund structures, and Donaldson and Piacentino (2018) for references to credit ratings, competition for funds under management accelerates the adoption of contractual commitments that reduce agency problems.[7] Competition has been increasing in asset management (e.g., Khorana and Servaes 2012, Gârleanu and Pedersen 2018), and this trend fits increasing ratings use in mandates.

Third, ratings use in fixed income mandates and other private, non-regulatory settings may be "sticky," so that the use of ratings remains the market convention even if better alternatives exist. For example, contracting conventions may lead to the ubiquity of ratings.[8] Further, network externalities may result in persistent and increasing use of ratings through market participants' desire for consistency and comparability of credit risk metrics; thus, increasing ratings use may

[6] Such externalities constitute a legitimate motivation for policies designed to improve the quality of credit ratings, but not necessarily for policies that aim to limit the usage of ratings in general. Possible externalities include fire sales of illiquid assets (see Goldstein, Jiang, and Ng 2017, and Ellul, Jotikasthira, and Lundblad 2011).

[7] In the Donaldson and Piacentino (2018) model of asset management, a manager must commit to portfolio constraints to attract capital through lower fees. Competition forces this process even if these contracts do not reduce ex post agency problems, but just expand the contracting space.

[8] The persistent use of simple, standardized, and potentially "sub-optimal" (relative to the predictions of standard principal-agent models) contract terms across firms has been documented in a variety of settings, such as sharecropping and franchising (Bhattacharyya and Lafontaine 1995 review some of the early literature). For example, Lafontaine and Shaw (1999) document "stickiness" of franchise contract terms within firms over time.

increase the utility of ratings to investors, issuers, and intermediaries.[9] This view implies that there may be multiple equilibria (e.g., all funds use ratings or all funds use market prices to measure credit risk) and raises the possibility of welfare losses associated with the current equilibrium.

The widespread and increasing use of ratings in private contracting has implications for financial regulation. Credit ratings fulfill the same function in regulation as in private contracting: measuring credit risk. They have well-understood scales (especially the investment grade and high yield categories), they have a long track record, and they are available for many securities free of charge to investors. Having a well-understood risk measure available broadly and at zero marginal cost to contracting parties allows regulators to make capital requirements of financial institutions dependent on the risk of their assets in a transparent manner, just as it allows mutual fund clients to allocate funds across risk categories.[10] Given this similarity between the various private and public uses of ratings, a lack of alternatives for one is likely informative about a lack of alternatives for the other. Among recent rulemaking in the U.S., the Dodd-Frank Act instructed federal agencies to remove references to ratings wherever possible.[11] Our findings suggest that contracting on credit risk without ratings may be infeasible and replacing them difficult. In countries with less developed fixed income markets (such as those in Europe), formal contracting is used less by fixed income funds. Our results suggest that increased reliance on credit ratings

[9] Network externalities have been used to explain the establishment and persistence of inferior technologies in other contexts, such as the QWERTY keyboard (David 1985) and the VHS standard (Park 2004).

[10] In the same way, ratings allow loan pricing to reflect changes in credit risk. Asquith, Beatty, and Weber (2005) document that performance pricing in corporate loans usually relies on various leverage ratios, but in a minority of cases loan ratings are used. Even earlier, Cantor and Packer (1995) also discuss uses of ratings, including investment management and loan covenants.

[11] Apart from removing references to ratings, rulemaking in Dodd-Frank related to credit ratings included: sales and marketing practices of agencies, disclosure of performance statistics, as well as staff training and monitoring. As Partnoy (2017) points out, Dodd-Frank did not require removal of references to ratings in state legislation and regulation, much of which continues to reference credit ratings.

may be unavoidable in these markets, as delegated asset management with formal mandates and competition for funds are likely to increase.

1. Data and main samples

A. General aspects of the textual analysis

We construct a dataset that quantifies textual information related to investment mandates in both U.S. and European fixed income mutual funds. For the U.S. mutual funds, this information is extracted from archived prospectuses of U.S. investment companies. The source of these documents is the EDGAR database of the SEC. Our primary sample comprises fund-specific summary prospectuses (filing type 497K) filed between 2010 and 2020 pursuant to rule 497(k) of the Securities Act of 1933.[12] Summary prospectuses are typically short (2 – 3 pages), have standardized headings, and were specifically designed by the SEC with retail investors in mind.[13] Because these documents describe specific funds, we can link them to observable portfolio characteristics from the CRSP Mutual Fund Database such as investment style classifications and holdings.

In addition to fund-specific summary prospectuses, we also consider prospectuses filed at the level of fund groups (filing types 485APOS and 485BPOS).[14] Such groups of funds are typically a

[12] The Securities Act of 1933 was amended with rule 497(k) in early 2009, with mandatory compliance starting on January 1, 2010.

[13] Before its introduction, the SEC contracted with Abt SRBI Inc. to conduct focus groups to assess and incorporate retail investor views on a mutual fund summary prospectus. In its Summary Prospectus Adopting Release (Release Nos. 33-8998; IC-28584; File No. S7-28-07), the SEC wrote that it is *"adopting an improved mutual fund disclosure framework that […] is intended to provide investors with information that is easier to use and more readily accessible, while retaining the comprehensive quality of the information that is available today. The foundation of the improved disclosure framework is the provision to all investors of streamlined and user-friendly information that is key to an investment decision."*

[14] SEC Form N-1A is the registration form for investment companies, used for registering mutual funds and exchange-traded funds (ETFs). The form encompasses information from the prospectus as well as additional information. Form N-1A is used for both initial registration (first filing) and subsequent amendments (i.e., updates). A fund must update its Form N-1A registration statement annually. These filings appear in the EDGAR database as filing types 485APOS and 485BPOS, which are prepared according

subset of an investment company's funds that were launched on the same date. While most of these fund group-prospectuses encompass more than one fund, making cross-sectional comparisons across funds less clear-cut, they allow for an analysis of trends over a longer sample that covers both the pre- and post-financial crisis periods. We consider group prospectuses filed between 1999 and 2020.[15]

We remove filings which contain no text that is useful for our analysis.[16] We use Series IDs in the case of 497K filings and Central Index Keys (CIKs) in the case of 485 filings to identify funds and fund groups, respectively. The CIK is a unique identifier for fund groups, and the Series ID is the unique identifier at the fund level. Each filing is associated with the date on which it was filed with the SEC. Whenever we are left with more than one filing at the CIK or Series ID level in a given year, we use the one that contains the largest number of sentences.

To construct text-based variables from the prospectuses, we first perform some basic cleaning steps and remove formatting and html code. Next, we identify and extract text passages that explicitly describe the reporting funds' investment mandates. Finally, using dictionaries that we develop for this purpose, we perform text searches that capture references to credit ratings and several related concepts. For example, we record whether a given fund's mandate explicitly refers to specific agencies, and whether it mentions the terms "investment grade" and "high yield".

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to SEC rules 485(a) and 485(b), respectively. The main difference between these two filing types is that 485APOS filings are used when the changes relative to the previous filing are more substantial. However, in terms of general structure and content, they are largely identical.

[15] While these documents are in principle available on EDGAR from 1997 onward, the SEC made significant changes to the underlying Form N-1A that became effective in June 1998. Furthermore, Lipper objective codes, which we use to identify and categorize fixed income funds, are available starting in 1998. To ensure a consistent sample of filings with similar informational content over time, we thus start the sample in 1999.

[16] First, we remove all filings that contain an XBRL attachment and fewer than 100 sentences; typically, they are filed for the sole purpose of submitting additional exhibits for a previously filed prospectus. We also remove supplements and incomplete filings. We remove 497K filings with fewer than 10 sentences as well as 485APOS and 485BPOS filings with fewer than 25 sentences. Supplements and incomplete 497K filings are identified using a list of supplement expressions as well as the absence of a mandatory disclaimer sentence required by rule 497(k).

In the case of 497K filings, we identify the relevant passages by focusing on the mandatory section "Principal Investment Strategies". Following SEC regulation, this section contains the rules according to which the reporting funds invest.[17] Fund group filings of the types 485APOS and 485BPOS tend to have a more idiosyncratic structure than 497K summary prospectuses, which are standardized. However, we can extract the same type of information from group prospectus filings by focusing on sentences that contain the following elements: (i) a relevant fund word (e.g., "we", "fund", "portfolio"); (ii) a relevant action word (e.g., "invest", "hold", "purchase"); (iii) a mandate phrase (e.g., "we may", "up to XX% of the portfolio").[18]

For both U.S. filing types, we also exclude examples and consider only statements about credit quality.[19] This ensures that we do not capture references that are unrelated to credit ratings (for example, references to S&P indices). Given the selected passages and the dictionaries we develop, we can run fully automatic searches that achieve a high classification accuracy and yield all the main text-based variables employed in the analysis of Section 2.[20] We report these variables together with the corresponding dictionaries and exclusion lists in Table 1.

For the analysis of European fixed income fund investment mandates, we use *Key Investor Information Documents* ("KIIDs") that we obtain in PDF format from the Morningstar Direct database. KIIDs are two-page documents that are similar in nature to the 497K summary

[17] Table A1 in the appendix shows several excerpts to illustrate the type of information these sections contain. We reproduce the entire mandate section, which is typically entitled "Principle Investment Strategies," of six funds, three of which refer to ratings in the mandate, while the rest do not.

[18] The full lists of expressions used for each of these three criteria are reported in Table A2 in the appendix. Sentence boundaries are discovered using the algorithm of Kiss and Strunk (2006), trained on texts from the Wall Street Journal.

[19] These statements must contain at least one term directly related to the concept of credit quality, and they may not refer to equity indexes or ESG. Examples are defined as statements that follow "for example", "e.g.", and "such as", or that contain a boilerplate expression. The exact terms used for these filters are shown in Table A3.

[20] We perform a manual validation exercise on the mandate passages of 100 randomly drawn debt-fund summary prospectuses. For 97% of these documents, all the rating variables used in the analysis are correctly classified. Thus, while some measurement error does exist in the data, its magnitude is small.

prospectuses used for the analysis of U.S. mutual funds. KIIDs are prepared according to the UCITS IV Directive of the European Parliament, implemented in January of 2009. We consider all European open-end fixed income funds that are domiciled in Luxembourg, and which are available in Morningstar Direct as of mid-2021. Morningstar Direct publishes the latest KIID for each share class of a fund; in some cases, a limited set of historical KIIDs can also be retrieved. For each fund with non-missing information on net assets and non-missing ISIN (International Securities Identification Number, a unique share-class level identifier), we collect English-language KIID filings of the fund's largest share class. We consider KIIDs from 2012 (there are few filings for prior years on Morningstar) to 2021.[21]

In the KIIDs, the mandatory section that contains the funds' investment mandates is typically entitled *"Objectives and Investment Policy"*. We extract these sections from the PDFs and convert them to machine readable texts using optical character recognition. To construct the variables that we use in the empirical analysis, we then implement the same filters and definitions as in the case of the U.S. 497K summary prospectuses.

B. Sample of summary prospectuses

Our main sample consists of fund-specific summary prospectuses of U.S. funds (filing type 497K). Using the EDGAR – CRSP linking file, we combine information from the CRSP mutual fund database with information from funds' SEC filings on EDGAR. Using this link, we add the funds' Lipper objective codes from CRSP to the funds' summary prospectuses. In our main tests, we retain the 497K filings of fixed income mutual funds according to the Lipper classification. We exclude from our main sample filings of money market mutual funds, because the investment opportunity set of such funds was circumscribed by ratings-based regulation until the end of 2016 (Rule 2a-7 of the Investment Company Act of 1940). We also exclude fixed income funds that only

[21] While KIIDs are filed for each share class (ISIN), the portfolio holdings are identical for all share classes of a fund. The KIIDs were downloaded from Morningstar Direct in August and September 2021.

invest in U.S. government securities, as those assets de facto all carry the highest credit ratings. The fund categories in the sample thus comprise municipal debt funds, fixed income funds focusing on debt from international issuers, corporate debt funds, funds investing in mortgage-backed securities, and "other" fixed income funds. Table A4 in the Appendix lists the main fixed income categories examined by us, along with the constitutive Lipper objective codes.

Table 2, Panel A, reports the number of summary prospectus filings by fund category; a given fund is represented at most once per year. The sample includes 19,304 filings by 2,642 fixed income mutual funds. The number of summary prospectus filings has increased over time, reflecting a rising number of reporting funds. The two largest fund categories in terms of filing volume are corporate debt funds (7,463 filings) and municipal debt funds (5,601), followed by "other" fixed income mutual funds (4,064). Fixed income funds primarily investing in foreign debt securities and those primarily investing in MBS contribute 2,011 and 165 filings, respectively.

Since 2010, funds have been required to include a separate summary section in their fund group prospectuses (filing type 485). However, they can also release these summary sections as separate filings (497K). Therefore, the number of 497K filings in any given year does not necessarily reflect the number of active U.S. funds. In fact, based on our analysis of CRSP data, the number of fixed income mutual funds (defined using Lipper objective codes, excluding government and money market funds) with at least one million dollars in total net assets was 2,026 in 2011, increasing almost monotonically to 2,388 funds in 2020 (there were 3,352 unique funds over that period). In contrast, the number of fixed income funds filing summary prospectuses increased from 1,020 in 2010 to 2,076 in 2020. We consider possible changes in the composition of the sample over time by including fund fixed effects in some of the regression specifications (see Section 2).

Panel B of Table 2 presents summary statistics. We report various variables derived from the investment mandate passages extracted from the 497K filings. The construction of these variables is discussed in Table 1. We also report portfolio characteristics of the funds in our sample using data from the CRSP Mutual Fund database.

C. Sample of fund group prospectuses

Filings of the types 485APOS and 485BPOS encompass entire fund groups (which can include both equity and fixed income funds), and they are available for a longer period than the 497K summary prospectuses, namely from 1999 to 2020. We match the fund group's CIK from the 485 filing to the CRSP Mutual Fund database using the EDGAR – CRSP linking file. We then determine if the fund group includes a fund that is classified as a debt fund using Lipper objective codes (see Table A4 in the appendix). We retain in the sample those 485 filings that contain at least one debt fund.[22] The resulting sample contains 13,194 prospectuses filed by 758 different fund groups over the period 1999 – 2020. Panel C of Table 2 reports summary statistics for this sample. It shows the variables derived from the extracted investment mandate passages.

D. Corporate bond holdings of U.S. mutual funds

To analyze the correspondence between mandates and portfolio holdings, we obtain quarterly data on fixed income funds' security holdings from the CRSP Mutual Fund Database and bond credit ratings from Mergent-FISD. We focus on corporate bonds from Mergent-FISD (the variable BOND_TYPE must equal CCOV, CCPI, CCUR, CDEB, CLOC, CMTN, CMTZ, CP, CPAS, CPIK, CS, CZ, EBON, EMTN, RNT, UCID, or USBN). We match this dataset with 497K filings for each fund and quarter using the EDGAR – CRSP linking file.

For this analysis, we divide funds by mandate type and focus on IG funds, HY funds, and funds that do not make ratings references in the mandate. IG and HY funds are those for which the variables *IG fund* and *HY fund*, respectively, take a value of one; funds that do not make rating references in their mandate are those for which the variable *All ratings references* takes the value of zero (see description in Table 1). The resulting sample contains 25,264 rated corporate bonds pertaining to 395 fund portfolios over the period from 2010 to 2019.

[22] As in Section 1.B, debt funds comprise municipal debt funds, fixed income funds focusing on debt from international issuers, corporate debt funds, funds investing in mortgage-backed securities, and "other" fixed income mutual funds.

E. Sample of European Key Investor Information Documents

Panel D of Table 2 reports the number of KIID filings by fund category (funds are grouped into five coarse categories using more detailed underlying information on fund types from Morningstar; for details on the grouping please refer to Appendix Table A5). The sample spans the years 2012 to 2021 and encompasses 12,382 KIIDs from 2,189 European fixed income funds.[23] The KIIDs were downloaded from Morningstar Direct in August and September 2021. Because the database primarily covers recent filings and historical filings are not available for all funds, the sample size increases over time.[24] Panel E reports summary statistics for the variables used in the analysis of European fixed income funds. These comprise text-based variables (see Table 1 for details) as well as variables from Morningstar Direct, with values as of 2021.

2. Empirical analysis

A. Proof of concept

In this section, we verify that the textual data extracted from mutual fund investment mandates accurately capture references to credit ratings. To conserve space, we focus on two salient settings, but we report additional checks in Appendix B. First, we provide some time-series evidence on the plausibility of the measures. Second, we examine funds' investment portfolios to assess if the mandate prescriptions match the actual holdings of funds.

For the first part of this analysis, we exploit a regulatory reform that affected money market mutual funds. As discussed in Section 1.B, we exclude money market mutual funds (MMMFs) from our main sample, because the investment opportunity set of such funds was circumscribed

[23] In the European sample, we include funds that invest predominantly in government securities, as such securities may have a wide range of ratings (several sovereign issuers in Europe have credit ratings below AA, according to S&P); European funds investing in government securities contribute only 627 of the 12,382 KIID filings. In contrast, in the U.S. setting, we exclude fixed income funds that only invest in U.S. government securities, as those assets de facto all carry the highest credit ratings.

[24] To our knowledge, there exists no systematic repository of historical KIID filings for the European market.

by ratings-based regulation until 2016; this could imply that references to ratings in such funds' mandates could differ in nature from non-regulated funds. These rules were changed in 2016 which gives us an opportunity to test the mechanical properties of our algorithm. Under the old Rule 2a-7 of the Investment Company Act of 1940, to ensure that MMMF assets were sufficiently low in risk, eligible securities for investment by MMMFs were those with one of the two highest short-term ratings from an NRSRO. In July 2014 (effective October 2016), this rule was changed to comply with the Dodd-Frank Act, which requires federal agencies to remove references to credit ratings from regulations wherever possible. The amended rule defines eligible securities as those with "minimal credit risk." We expect MMMFs to be less likely to refer to credit ratings in their prospectuses after the implementation of the reform. This is no test of how funds evaluate credit ratings of their own choice, since regulation encouraged ratings references before 2016, and discouraged them afterward. Hence, any change is likely a reflection of regulation. The event *does* allow us to test how well our text-based measures reflect changes in ratings use.

We apply our algorithm to mandates in regulatory filings of MMMFs, in the same way our main sample uses other fixed income mutual fund mandates. In Table 3, we report annual averages of the dummy variables *NRSRO, Big 3,* and *All ratings references* for money market mutual funds. Before the money market fund reform became effective in 2016, a notable fraction of money market mandates did not contain credit rating references. Many of these mandates instead explicitly mention Rule 2a-7. That is, as an alternative to using rating terms, these pre-2016 mandates refer directly to the regulation that imposes the applicable rating requirements.[25] More importantly, the fraction of money market funds that refer to credit ratings falls

[25] For example, the 2012 investment mandate of the Blackrock Liquidity Tempfund contains the following text: "The securities purchased by the Fund are subject to the quality, diversification, and other requirements of Rule 2a-7 under the Investment Company Act of 1940, as amended (the "1940 Act"), and other rules of the Securities and Exchange Commission."

considerably following the implementation of the reform: for example, the share of money market funds referring to the term "NRSRO" drops from 18% in 2015 to 1% in 2018.

For the second proof of concept, we examine whether our text-based measures based on the content of investment mandates match the actual portfolio holdings of fixed income funds. We examine the ratings of corporate bonds held by three groups of fixed income funds, classified using the text-based analysis of the investment mandates: high yield funds, investment grade funds, and funds that do not have any investment restrictions based on credit ratings (for a description of the sample construction see Section 1.D).

Figure 1 plots the distribution of credit ratings of corporate bonds contained in the fund portfolios of fixed income funds classified as "high yield", "investment grade", and of funds that do not refer to ratings. The observations are weighted by the market value of the investment in each security by a given fund. Portfolios are very closely connected to investment mandates: assets of IG funds are 96% IG, 3% HY and less than 1% unrated; assets of HY funds are 7% IG, 91% HY, and 1% unrated; and assets of funds with no ratings reference are 60% IG, 37% HY, and 2% unrated. In other words, investment grade funds overwhelmingly hold high-rated securities, funds classified as high yield hold a vast majority of lower-rated securities, while funds not restrained by rating-based mandates hold securities across the whole rating spectrum. This analysis illustrates that our text-based classification produces data with meaningful cross-sectional properties and that ratings-based investment restrictions are indeed reflected in the portfolios of fixed income funds.

In the Appendix (Section B), we perform an additional test to illustrate that the measures derived from the text analysis of fixed income fund investment mandates are reliable and are related to the portfolios of funds. We consider security sales and purchases by funds with different investment mandates. These tests show that high yield funds are significantly more likely to buy newly issued high yield securities, while investment grade funds are significantly less likely to do so. Further, securities that are downgraded to high yield are less likely to be sold by high yield funds and are more likely to be sold by investment grade funds.

In sum, the analyses discussed in this section confirm that funds not only refer to credit ratings in their investment mandates, but that the ratings-based investment restrictions of the mandates are also reflected in funds' actual portfolio holdings.

B. The use of credit ratings in U.S. investment mandates, 2010 – 2020

Which types of U.S. fixed income funds use credit ratings in their mandates to delineate the investment opportunity set? Table 4 sheds some light on this question. We report coefficients from OLS regression models of the following type, which can be interpreted as cross-sectional comparisons:

$$Y_{f,t} = \alpha + \beta \cdot X_{f,t} + \gamma_t + \varepsilon_{f,t} \quad (1)$$

where f denotes the fund and t the year. γ_t is a vector of year fixed effects. Because we are primarily interested in fund characteristics, we cluster standard errors at the fund level in these specifications. X denotes a set of fund characteristics. Y denotes the dependent variables: *All ratings references* (columns 1 and 2), which captures any type of reference to a credit rating in the investment mandate; *HY/IG* (columns 3 and 4) is a dummy variable that is one if the mandate refers to terms that denote the investment grade threshold; *Big 3* is one if the mandate refers to S&P, Moody's, or Fitch (columns 5 and 6); *NRSRO* captures references to the term "nationally recognized statistical ratings organization" (columns 7 and 8); finally, *Letter rating* takes the value of one if the mandate refers to a specific alphanumeric credit rating, such as "A+" (columns 9 and 10).

Based on Table 4, we make several observations about the characteristics of funds that use ratings. First, fixed income funds investing primarily in corporate bonds (*Category - corporate* is the omitted fund category-variable in the regressions and thus serves as the reference point) are significantly more likely to use ratings terms in the mandate than other types of fixed income funds. This is consistent with the fact that ratings for corporate bonds have historically been the most reliable measure of default risk, compared to ratings for other asset classes (Cornaggia, Cornaggia, and Hund 2017). Second, younger funds and ETFs are significantly more likely to use ratings, while index funds are less likely to do so. Third, the positive and significant coefficients on the variables *Fraction (.)* suggest that ratings use is strongly correlated across funds within management companies. These patterns are consistent across various measures of ratings use in

mandates (different dependent variables). There is also some evidence that funds with more assets under management, funds that have retail share classes, and those charging higher fees tend to rely more on ratings than other funds, but the corresponding coefficients on these variables are not statistically significant in all specifications.

C. Trends in the use of credit ratings in U.S. investment mandates, 2010 – 2020

How has the use of credit ratings in U.S. fixed income investment mandates evolved over time? Has the financial crisis affected the private use of ratings in financial markets, mirroring regulatory efforts to pull back on the reliance on ratings? Table 5 reports the annual fraction of funds that make various ratings-related references in their investment mandates over the 2010 – 2020 period. 88% of fixed income mutual funds refer to the investment grade threshold (the mandates refer to "investment grade" or "high yield," or both); this fraction has increased from 84% in 2010 to 90% in 2020. We consider the investment grade threshold as an indirect reference to credit ratings. About 23% of debt funds refer to the term "NRSRO". 57% of funds refer to specific alphanumeric ratings or agencies (variable *Direct ratings reference* in the table) in 2010, rising to 62% in 2020. Overall, Table 5 suggests that both direct and indirect references to ratings in fixed income mandates have modestly increased over the 2010 – 2020 period, from a high initial level.

At the end of our sample, 94% of the fixed income funds contain a direct or indirect ratings reference (up from 90% in 2010). Given the near-universal use of ratings in U.S. investment mandates, this begs the question of which funds do *not* use ratings and why. While a detailed investigation is beyond the scope of this paper, we have more closely analyzed U.S. funds that do not use ratings. 253 funds that belong to 133 fund groups do not reference ratings over the 2010 – 2020 period. Based on univariate comparisons, these funds are significantly more likely to be index funds (35% of non-ratings users versus 10% of ratings users), more likely to be ETFs (26% versus 11%), less likely to be mainly investing in corporate bonds (15% versus 40%), and more likely to be investing primarily in MBS (10% versus 0.2%); non-ratings users also have slightly lower expense ratios (0.7% versus 0.8% on average), and tend to be larger (average TNA of $2.3 billion versus $1.8 billion). Other differences in characteristics do not stand out as economically significant. In Appendix Table A1, we have reproduced investment mandates of

three funds that refer to ratings and three funds that do not. The mandates that do not refer to ratings appear to be shorter and vaguer than other mandates, based on this limited sample.

Investment mandates of fixed income funds regularly refer to specific rating agencies. Do trends differ across these different raters? Are there reversals in trends, perhaps due to reputational damage suffered by specific rating agencies in relation to the financial crisis? For example, in 2015 (2017), S&P (Moody's) settled a collection of lawsuits filed by the U.S. government related to S&P's (Moody's) structured finance ratings prior to the financial crisis. It is conceivable that S&P or Moody's suffered reputational damage related to the quality of ratings produced in the run-up to the financial crisis. Consequently, fixed income funds may have switched to other raters in their investment mandates for the purposes of defining the investment opportunity set.

Table 5 also sheds some light on this question. The table reports the unconditional averages of the variables *S&P*, *Moody's*, and *Fitch* over the 2010 – 2020 period. S&P is referred to most often (on average, 30% of the funds refer to S&P), Moody's only slightly less frequently. Fitch is mentioned by around 18% of the funds. Over the 2010 to 2020 period, the fraction of funds referring to Fitch has increased from 13% to 21%, a steeper increase than for the other two raters. The average of the variable *Nb. agencies* (number of unique credit rating agencies mentioned by name in the mandate) increased from 0.6 in 2010 to 0.9 in 2020, which suggests that funds have been adding Fitch as an additional rater in mandates, rather than using it as a substitute for S&P or Moody's. Overall, the table suggests that ratings use in mandates is widespread and that there has been no substantial negative revision of the view of individual agencies since the financial crisis.[26]

[26] In untabulated tests, we also analyze whether funds refer to other credit rating agencies such as Dominion, Duff & Phelps, Morningstar, or Kroll. During the 2010 – 2020 sample period, Kroll is mentioned in 15 filings, while Dominion is mentioned in 12 filings. Otherwise, only S&P, Moody's, and Fitch are referenced in mandates.

The aggregate time trends in the sample suggest a stable, or somewhat increasing, use of credit ratings in U.S. investment mandates. However, other variables may be changing over time, and this may make a clear interpretation of the findings in Table 5 difficult. To avoid drawing conclusions from time trends that may be affected by omitted variables bias, we introduce controls for key characteristics that are potentially related to ratings use. Perhaps most critical in this regard are entry and exit from the universe of reporting funds. The aggregate trend toward (moderately) increased use of ratings indicates some combination of (i) new funds using ratings more than the existing population, (ii) exiting funds using ratings less, and (iii) continuing funds changing their mandates from year to year.

To address these issues and to investigate trends in the use of ratings over time, we estimate OLS regression models of the following type:

$$Y_{f,t} = \alpha + \beta \cdot Linear\ trend_t + \gamma_f + \varepsilon_{f,t} \quad (2)$$

where *f* denotes the fund and *t* the year. γ_f is a vector of fund fixed effects, which we include in some of the specifications; these eliminate the impact of fund turnover on the time trend, isolating the effect of changes in mandates of continuing funds. *Linear trend* takes the value of 0 in the year 2010; it is 1 in 2011, 2 in 2012, 3 in 2013 etc. The coefficient β therefore captures trends in rating references by fixed income funds. We cluster standard errors at the year level in these specifications because we are primarily interested in the precision of the estimate for the coefficient on the variable *Linear trend*. Y denotes the dependent variables, of which we report two in Table 6: *All ratings references* (columns 1 – 3), which captures any type of reference to a credit rating or rating agency, and *Big 3* (columns 4 – 6), which captures references to at least one of the three main rating agencies (S&P, Moody's, Fitch).

Column 1 of Table 6 reports the coefficients on *Linear trend* from regressions without controls and fixed effects. Column 2 reports coefficients from regressions that include various fund-level control variables: dummy variables for the fund type; assets under management; fund age; indicator variables for the existence of institutional or retail share classes; dummy variables for index funds and ETFs; the fund's annual expense ratio; and a variable denoting the fraction of other funds of the same management company having the respective rating reference in their

mandates. Finally, column 3 reports a specification with fund fixed effects.[27] Columns 4 – 6 report coefficients from similar specifications studying the trend in references to the three big credit rating agencies (dependent variable *Big 3*).

Consistent with the simple averages reported in Table 5, the regressions reported in Table 6 suggest that there has been a moderate increase in various rating references in fixed income investment mandates between 2010 and 2020. For example, considering the variable *All ratings references*, the coefficients on *Linear trend* range from 0.002 in column 3 to 0.005 in columns 1 and 2. This implies that the incidence of mandate use of ratings has increased by 0.2 to 0.5 percentage points per year over the period 2010 – 2020. A similar moderate, positive trend can be observed for the variable *Big 3:* up to 0.8 percentage points in specifications without fund fixed effects and 0.2 percentage points in regressions with fund fixed effects. These tests imply that about half of the increase is attributable to continuing funds adding references, the rest to entry and exit. In the Appendix (Table C1), we report coefficients from regressions using three additional ratings-related dependent variables: *NRSRO*, *HY/IG*, and *Letter rating*. Consistent with the patterns documented in Table 6, we also observe a moderate but significant positive trend over the 2010 – 2020 period using those alternative ratings variables.

D. The use of ratings in U.S. investment mandates over the 1999 – 2020 period

The sample employed in Section 2.C is based on annual summary prospectuses (filing type 497K). The advantage of this sample is that each filing is fund-specific, and that all filings contain standardized sections for funds' investment mandates. Furthermore, using the unique Series ID identifier from the SEC for each fund, together with the EDGAR – CRSP linking file, we can match the summary prospectuses to the CRSP mutual fund database and retrieve additional information

[27] In these specifications with fund fixed effects, we exclude some variables from the regression because they do not exhibit any within-fund variation (*Index fund*, *ETF*) or because the variation is not meaningful in these specifications (*Ln(Fund age)*). We note that our inference regarding the trend is unaffected by this cosmetic change in the specification.

on the funds. This permits us, for example, to classify funds as fixed income funds using Lipper objective codes. A disadvantage is that 497K filings are available only from 2010 onward, the post-financial crisis period. However, it is conceivable that the use of ratings by mutual funds differed prior, during, or after the financial crisis. To shed light on this issue, we extend our analysis to the pre-2010 period using fund group prospectuses (filings of the type 485, see Section 1). Each of these filings typically encompasses a group of funds rather than a single fund, and each filing may contain various types of funds (fixed income, equity, etc.). Furthermore, given the lack of common structure of these documents, it is not always possible to link discussions of investment mandates to specific funds within the filing. We describe the construction of the sample of fund group prospectus filings in Section 1.C.

We first examine the annual averages of the ratings-based variables in Table 7 for this sample of fund group prospectuses, covering the period 1999 – 2020. The time-series average of the variable *All ratings references* is 0.97. This implies that most fund groups that contain at least one fixed income mutual fund have at least one such fund that refers to credit ratings in its investment mandate. Most ratings terms become more widely used over the sample period. For example, references to the investment grade threshold (variable *HY/IG*) increase from being in 83% of the group prospectuses in 1999 to featuring in 96% in 2020, while references to the term "NRSRO" increase from 45% to 60% over the same period. The increase is almost monotonic in most variables. There are a few exceptions to this pattern, however. First, references to alphanumeric ratings (variable *Letter rating*) remain rather flat during the sample period. Second, it appears that there is a modest, temporary drop in references to S&P and Moody's after 2009, while references to Fitch continue to increase during the same period. While this hardly constitutes dramatic evidence, it is suggestive that there may have been some reputational repercussions for S&P and Moody's after the financial crisis.

Table 8 reports regressions studying the trend in ratings references over the period 1999 – 2020 more systematically. We report coefficients from regression models of the following type:

$$Y_{g,t} = \alpha + \beta \cdot Linear\ trend_t + \gamma_g + \varepsilon_{g,t} \quad (3)$$

where g denotes the fund group and t the year. γ_g is a vector of fund group fixed effects. *Linear trend* takes the value of 0 in the year 1999; it is 1 in 2000, 2 in 2001, etc. Y is the dependent variable;

we employ *All ratings references* in columns 1 – 4 and *Big 3* in columns 5 – 8 (specifications using the dependent variables *NRSRO*, *HY/IG*, and *Letter rating* are reported in Table C2 of the Appendix). Standard errors are clustered at the year level. While the specification reported in column 1 does not contain any fixed effects, the coefficients reported in column 2 are from a regression that contains fund group fixed effects.

Based on the estimate of the coefficient on the variable *Linear trend* in columns 1 and 2, we infer that ratings references in fixed income investment mandates have increased by about 0.3 percentage points per year over the 1999 – 2020 period. This trend estimate is comparable in size to the one based on summary prospectuses reported in Table 6. The regressions support the conclusion that ratings use has moderately increased over the 1999 – 2020 sample period, from a high initial level.

We also investigate if the rate of adopting ratings in investment mandates has changed after the global financial crisis (GFC) of 2008. During the GFC, banks and investors sustained large losses, in many cases on securities that had been rated in the highest categories.[28] This resulted in widespread criticism of rating agencies' methods, business models, and market power.[29] Figure 2 provides an illustration of this view, based on the tone of news coverage of credit ratings and rating agencies in the financial press during the 2000 – 2019 period: the tone of news articles became significantly more negative following the GFC. Regulatory reforms after the crisis were aimed at reducing the risk of ratings inflation and limiting the impact of flawed ratings in the future. There was broad agreement that the financial system's reliance on credit ratings should

[28] See Benmelech and Dlugosz (2009a), Griffin and Tang (2011), and Gordy and Willeman (2012).

[29] For example, on October 22, 2008, U.S. Congressman Henry Waxman stated (see, e.g., Morgenson 2008): "The story of the credit rating agencies is a story of colossal failure. [...] Millions of investors rely on them for independent, objective assessments. The rating agencies broke this bond of trust, and federal regulators ignored the warning signs and did nothing to protect the public."

be reduced; references to credit ratings were removed from many regulations.[30] Reforms include several provisions in the Dodd-Frank Wall Street Reform and Consumer Protection Act, approved by the U.S. Congress in 2010. Furthermore, both in the U.S. and Europe new agencies were instituted: the European Securities and Markets Authority (ESMA) and the SEC's Office of Credit Ratings. Given the backlash against rating agencies after the GFC, a drop in the use of credit ratings by private parties, including in mandates, could be expected.

To investigate if the rate of adoption of ratings in mandates changed after the financial crisis, we modify regression model (3) by estimating separate trends for the 1999 – 2007 and the 2008 – 2020 periods, respectively. Results are reported in columns 3 and 4 of Table 8. We find that the trend in ratings use has been positive both in the pre- as well as in the post-GFC period; however, the positive trend is flatter in the post-GFC period. According to column 3 in Table 8, the time trend coefficient is 0.005 for the pre-GFC sample, 0.003 post-GFC. Both coefficients are significantly different from zero, and the difference between the two sub-sample coefficients is significant (the p-value of that difference is 0.004). An examination of the trends in references to the big three credit rating agencies (specifications reported in columns 5 – 8 of Table 8, using the dependent variable *Big 3*) leads to a similar observation.

What can one conclude from the reduced increase in the rate of adoption after the financial crisis? The patterns documented in Table 8 (columns 3 & 4, 7 & 8) need to be interpreted with caution. Whether the slow-down is driven by Dodd-Frank, the crisis itself, reputational damage suffered by the raters, or by some other event cannot be answered conclusively using these time-series regressions. The slow-down in the increase of ratings use in mandates may be due to these factors, but may also be a purely mechanical effect: the use of ratings is capped at 100%, so the

[30] See, e.g., Opp, Opp, and Harris (2013), SEC (2013), Sangiorgi and Spatt (2017), FDIC (2018), and Becker, Opp, and Saidi (2019).

rate of increase must slow down as the market approaches universal use of ratings. Given the very high level at the end of the sample (see Tables 5 and 7), this must happen soon.

Overall, our analysis suggests that, over the period from 1999 to 2020, the trend in the adoption of credit ratings in investment mandates has been positive, but the rate of increase has been slowing down over the past decade as the U.S. investment management industry approaches near universal ratings use.

E. Changing contract terms: adding or removing rating references in investment mandates

Asset managers may change the fund's contract terms, including their investment strategies and how the investment opportunity set is demarcated. Funds that refer to ratings in their investment mandate in one year may cease to do so in the following year, and vice versa.[31]

How persistent are contract terms in fixed income funds? Do funds frequently add and remove credit rating references in their investment mandates? Do new funds tend to use ratings? We examine these questions in Table 9, in which we report transition frequencies for funds with respect to their use of credit ratings. We classify funds into four mutually exclusive categories: (i) funds that do not refer to any ratings-related term in their investment mandate; (ii) funds that refer only to the investment grade threshold (i.e., the dummy variable *Direct ratings reference* is zero, while *HY / IG* takes the value of one); (iii) funds for which *Direct ratings reference* is one; or

[31] For example, the Harbor Bond Fund referred to credit ratings in its 2016 summary prospectus filing when defining the type of securities it invests in: *'The Fund invests primarily in investment-grade debt securities, but may invest up to 15% of its total assets in below investment-grade securities, commonly referred to as "high-yield" or "junk" bonds. For all securities other than mortgage-related securities, the Fund may invest in below investment-grade securities only if they are rated B or higher by Moody's, S&P or Fitch, or, if unrated, determined to be of comparable quality. For mortgage-related securities, the Fund may invest in securities of any credit quality, including those rated below B.'* In the following year, the same fund no longer used specific credit rating terms to define what it considers to be its investment opportunity set, but rather referred to the investment grade threshold in more general terms: *'The Fund invests primarily in investment-grade debt securities, but may invest up to 20% of its total assets in below investment-grade securities, commonly referred to as "high-yield" or "junk" bonds."'* This change is captured via our text-based variables in the following way. The indicator variable *HY/IG* takes the value of one in both 2016 and 2017, while the variables *Letter rating* and *Big 3* take the value of one in 2016 only (they are zero in 2017).

(iv) new funds, i.e., funds that file a summary prospectus (497K) for the first time. We observe that rating references are rather "sticky." Funds that refer to credit ratings in a given year (either directly, or indirectly by referring to the investment grade threshold) have a likelihood of more than 95% to do the same in the next year. Less than 0.5 percent of the funds that use ratings in their investment mandates in a given year stop doing so in the following year. We also find that more than 90% of the new funds make a direct or indirect credit ratings reference in their investment mandates.

F. The use of credit ratings in investment mandates of European fixed income funds

Does the use of ratings in mandates of European fixed income funds differ from the use by U.S. funds? There are notable differences between the bond-, ratings-, and mutual fund-markets of the U.S. and Europe. For example, in the U.S., publicly listed firms obtain a larger share of their financing from bonds than from loans, while for European listed companies, the amount of loans outstanding is twice the amount of bonds (Becker and Josephson 2016). Consequently, as a fraction of GDP, the European corporate bond market is significantly smaller than that of the U.S. (10% of GDP in 2017, compared with 31% in the U.S.). The European market is also more heterogeneous and fragmented along national lines. For example, while most European corporate bonds are rated, only about half of Nordic corporate bonds are rated.[32] However, there are also similarities. As in the U.S., S&P, Moody's, and Fitch have more than 90% market share in the European ratings market (source: ESMA).

As discussed in Section 1.E, European UCITS-regulated investment funds must publish documents aimed at investors (so-called Key Investor Information Documents, or KIIDs) that are very similar in structure and content—including a discussion of the investment mandate—to the

[32] See the European Commission's 2017 report on "Improving European Corporate Bond Markets." In 2017, unrated corporate bonds represented only 13% of the outstanding total in the European Union as a whole. In the same year, more than 50% of the bonds issued in the Nordic countries were unrated (own calculations using the database Stamdata).

497K summary prospectuses. This enables us to compare the use of ratings in fixed income mandates in Europe to that in the U.S. We first ask which fund characteristics are associated with the use of ratings in European fixed income fund investment mandates. Table 10 reports coefficients from regression model (1) estimated using the European fund data. Consistent with the evidence from the U.S. sample, European corporate fixed income funds are significantly more likely to refer to ratings in their investment mandates than other fixed income fund types (*Category – corporate* is the omitted category dummy variable in the regressions). Furthermore, funds with more assets under management and younger funds are more likely to refer to ratings, which also mirrors the evidence from the U.S. sample. The specifications reported in Table 10 also show that Luxembourg-domiciled funds that mainly invest in emerging market (U.S.) debt securities are significantly less (more) likely to refer to ratings in their mandates than funds that mainly purchase European debt securities (*Inv. area – Europe* is the omitted reference category in the regression). Regarding the region of sale, there does not appear to be any specific pattern.

Next, we shed light on the trend in the use of ratings in Europe. Table 11 reports annual averages of the text-based variables for the European mandate sample, which covers the years 2012 – 2021. Compared to the averages of ratings variables reported in Table 5 for the U.S. sample, there are many similarities but also several notable differences. First, as in the U.S. sample, there is a clear upward trend in the use of ratings over time. The trend appears to be steeper than in the U.S. (a more formal test follows in Table 12). Second, while ratings are commonly used in European mandates, they are still significantly less common in mandates than in the U.S. case. For example, in 2020, 65% of the funds refer to any ratings (variable *All ratings references*), while the corresponding figure in the U.S. is 94%. This pattern can be observed for all ratings variables.

Third, while references to S&P and Moody's are equally common in U.S. mandates (see Tables 5 and 7), S&P is used significantly more often in European mandates than Moody's (e.g., 17% of the European funds refer to S&P in 2021, while only 11% refer to Moody's). As in the U.S., Fitch features considerably less often in European mandates but it is on an upward trend (increasing from 2% of the mandates in 2012 to 7% of the mandates in 2021). These patterns are qualitatively consistent with market share data from the European securities markets regulator, ESMA: in 2018,

S&P had 42% market share in Europe, compared to 33% for Moody's and 17% for Fitch.[33] This suggests that investor demand may be driving the use of ratings in mandates. Also like the U.S., other rating agencies are rarely mentioned in the mandates: while Kroll, Morningstar, and Duff & Phelps are never mentioned, Dominion is mentioned in only 10 out of 12,382 mandates during the sample period.

Table 12 examines trends more systematically by estimating regression model (2) using the European sample. Specifications 1 – 3 employ the dependent variable *All ratings references*, while specifications 4 – 6 use the variable *Big 3*; we report similar regressions with the dependent variables *HY/IG* and *Letter rating* in Appendix Table C3, which permit us to draw the same conclusions. Column 1 reports coefficients from a regression without control variables, specification 2 includes the same set of control variables as the regressions reported in Table 10 (in addition to the *Linear trend* variable), and column 3 reports a specification with fund fixed effects. We find that the use of ratings has been trending up over time. Considering the dependent variable *All ratings references* in columns 1 – 3, we find that references to ratings have become more common over the 2012 – 2021 sample period by 1.3 to 2.7 percentage points per year. Regressions employing the dependent variable *Big 3* show the same patterns, although the annual increase is more modest (between 0.5 and 0.6 percentage points per year, depending on the specification).

How do the trends in ratings use in Europe compare to those in the U.S.? To make a comparison, we pool the observations from both samples. The combined U.S. and European sample spans the years 2012 to 2020 (the years for which the two geographical samples overlap).

[33] In accordance with Article 8d(3) of the CRA Regulation, the total market share for each registered rating agency is calculated with reference to annual turnover generated from credit rating activities and ancillary services at the group level in the E.U. for that rating agency. Market share data is obtained from ESMA's annual "Report on CRA Market Share Calculation".

To compare trends, we estimate the following regression model (separately for U.S. funds, for European funds, and in the pooled sample):

$$All\ ratings\ references_{f,t} = \alpha + X'\beta + \gamma_f + \varepsilon_{f,t} \quad (4)$$

where f denotes the fund and t the year. γ_f is a vector of fund fixed effects. X is a vector of year fixed effects for the years 2013 – 2020; the dummy variable for the year 2012 is omitted and serves as the benchmark. The coefficients in vector β therefore capture trends in rating references by fixed income funds after accounting for fund fixed effects. The fund fixed effects eliminate the impact of fund turnover on the time trend, isolating the effect of changes in mandates of continuing funds. These fixed effects also help account for the fact that the coverage in the European sample increases over time (see Table 2). Figure 3 reports the coefficients β from regression model (4), including 99% confidence intervals based on heteroskedasticity-robust standard errors clustered at the year level. Overall, the trend in ratings use is steeper in Europe than in the U.S., which is unsurprising given that the level of ratings use is already significantly higher in the U.S. than in Europe (see Tables 5 and 11). The time trend in the pooled sample is intermediate (steeper than in the U.S. sample but flatter than in Europe).

Finally, Table 13 reports transition frequencies between rating references in investment mandates for the European sample. As in the U.S. sample, the probability of a fund exiting the sample (for example, due to closure of the fund) is around 2 – 4 percent per annum. Also like in the U.S., funds that refer to ratings in a given year have a likelihood of more than 95% to do the same in the next year. However, there are notable differences between the U.S. and European fixed income funds. In the U.S. sample, 8% of the funds that do not use ratings will use ratings in the subsequent year; in contrast, only 5% of the European funds that do not use ratings will do so in the next year. Furthermore, less than 0.5% of U.S. funds that use ratings will not use ratings in the subsequent year, while the corresponding fraction for European funds is around 1.5%.

In sum, ratings are widely used in both the European and the U.S. fixed income markets, but more so in the U.S. than in Europe. There is a modest but significant upward trend in ratings use by funds domiciled on both continents. S&P features most commonly in European mandates, with some distance to Moody's and a large gap to Fitch; in the U.S., S&P and Moody's appear to be similarly widespread, with a large but less glaring distance to Fitch.

3. Conclusions

Fixed income securities constitute a large component of the financial system, of investor financial wealth, and of financial institutions' assets. These markets are of critical importance to monetary policy, and to the financing for governments and firms. Overwhelmingly, investment decisions for these assets are delegated to professional managers. How are principal-agent conflicts in this market overcome? We use textual analysis to classify the mandates of fixed income mutual funds in the U.S. and Europe to shed light on the features of the interaction between portfolio managers and investors.

We find that credit ratings are widely used in mandates. Ratings fulfill a unique role as ex-ante constraints on the level of risk taking by funds.[34] The use of ratings is almost universal in U.S. fixed income funds; in Europe, about two-thirds of the funds refer to ratings in their mandates. While credit ratings have been in use in the U.S. for more than a century, ratings are a more recent phenomenon in Europe; this may be part of the explanation why delegated asset management of fixed income assets in Europe is less reliant on ratings than in the U.S.

Not only is the frequency of ratings references in mandates high throughout our sample, it has also increased over recent years, both in the U.S. and Europe. In the U.S., the use of ratings went from very common (nine in ten funds in 2010) to almost universal (sixteen in seventeen funds in 2020). In Europe, ratings use went from half of funds to two thirds between 2012 and 2020. The steady increase in the use of ratings in delegated management of fixed income assets may be due to a variety of factors, including competition, which has steadily increased in the mutual fund sector.[35] Ratings may be increasingly used by fund managers in their contracts with

[34] This use is consistent with theoretical work by He and Xiong (2013) and Parlour and Rajan (2020), who point out that public signals of asset quality can help mitigate agency problems in the delegation of portfolio management.

[35] See Khorana and Servaes (2012), Investment Company Institute (2020), Gârleanu Pedersen (2018), and Di Maggio and Kacperczyk (2017).

asset owners to attract investor capital in an increasingly competitive environment (consistent with Donaldson and Piacentino 2018).

The pattern of high and rising use of credit ratings contrasts with the negative view of ratings that emerged after the financial crisis. Even if credit ratings have important flaws, as the academic literature convincingly suggests,[36] they remain critical to fixed income investors, the health of financial markets, and to the funding that flows through these markets. The continued and widespread private use of credit ratings may reflect, either, that financial market participants find them reliable enough, or that there is a lack of appropriate substitutes. This has important implications for the ability to replace ratings. Any regulatory effort to curb the usage of ratings therefore needs to recognize as a first order challenge the need for viable alternatives.

Given that European asset management is increasingly competitive, reflecting the common currency, regulatory harmonization such as the introduction of ESMA in 2012, and specific efforts to raise competition in asset management (European Commission 2020), we would hypothesize that the use of credit ratings will continue to rise in Europe.

[36] See, for example, Cornaggia, Cornaggia, Hund (2017); Benmelech and Dlugosz (2009a, 2009b); Griffin and Tang (2011); Gordy and Willeman (2012); Baghai, Servaes, and Tamayo (2014); He, Qian, and Strahan (2014); Flynn and Ghent (2018); Baghai and Becker (2020).

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Figure 1. Bond rating distribution: high yield funds, investment grade funds, and funds without ratings in mandate

The figure plots the distribution of corporate bond credit ratings contained in the portfolios of fixed income funds. The sample spans the years 2010 – 2019 and uses the following data sources. We start with quarterly data on fixed income mutual funds' security holdings from CRSP. Using the securities' CUSIPs, we add bond credit ratings (highest rating from S&P, Moody's, and/or Fitch) from Mergent-FISD. The ratings reflect credit risk information as of the reporting month of the portfolio holdings. For each fund portfolio and year, using the EDGAR – CRSP linking file, we add information on ratings references in the funds' investment mandates from the 497K filings. We report the distribution of the ratings of debt securities contained in the portfolios of the following three fund categories, classified using their mandate content (the percentages displayed in the figure sum to 100 percent for each fund type): high yield funds (174 funds holding 12,293 bonds), investment grade funds (166 funds holding 19,432 bonds), and funds that make no reference to credit ratings in their mandate (61 funds with 15,631 bonds). Investment grade and high yield funds are identified using mandate restrictions that apply to 80% or more of portfolio assets. A fund is classified as investment grade if its mandate refers to investment grade securities and does not contain any references to high yield instruments. A fund is classified as high yield if its mandate refers to high yield securities and does not contain any references to investment grade instruments. "No ratings mandate" funds are those for which the variable *All ratings references* is zero.

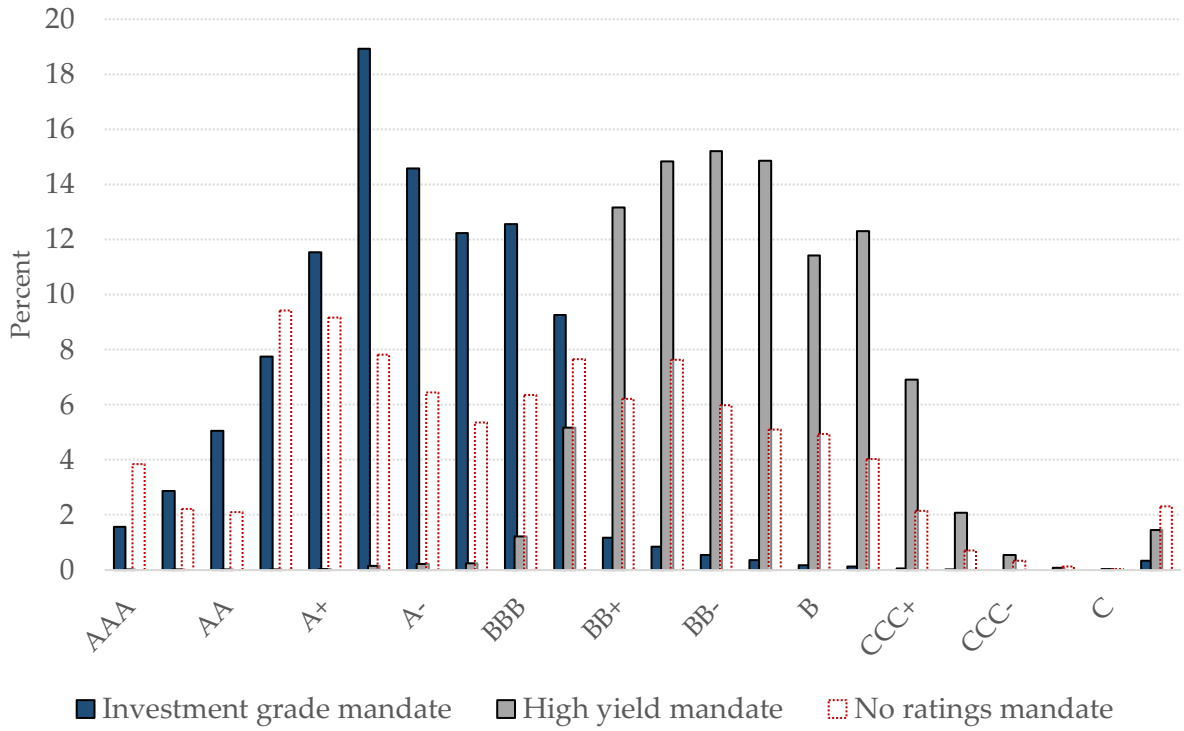

Figure 2. Tone in news articles mentioning credit rating agencies, 2000 – 2019

We analyze sentiment about credit rating agencies using news articles from the Financial Times and the Wall Street Journal (from January 2000 to December 2019). We consider articles about credit rating agencies and, for each article, calculate the fraction of words with negative tone; negative tone words are defined using the Loughran-McDonald sentiment dictionary (we use the updated 2018 version of the sentiment word list obtained from the website of Bill McDonald at sraf.nd.edu). Following Nimark and Pitschner (2019), we use text snippets from the beginning of each article, which capture the main topic and sentiment of a story. News articles about credit rating agencies are those that discuss these firms either in their headlines or in their lead paragraphs. To identify the relevant articles, we use the key words "rating agencies", "rating(s) industry", "rating companies", "rating firms", "rating organizations", and "credit ratings". We also include articles with the words "rating" or "credit" as well as the name of at least one of the three big rating agencies (S&P, Moody's, and Fitch). Texts that make references to ESG ratings or specific rating decisions (e.g., "downgrade", "upgrade", "slash", "cut", "notch", "affirm", "credit watch", "outlook") are removed. 4,241 articles are used in the analysis. The figure plots the average fraction of words with negative tone per quarter. It also shows the moving average of the fraction of negative words over the current and the past eight quarters (grey dashed line). The shaded area indicates the duration of the Great Recession according to the NBER (December 2007 to June 2009).

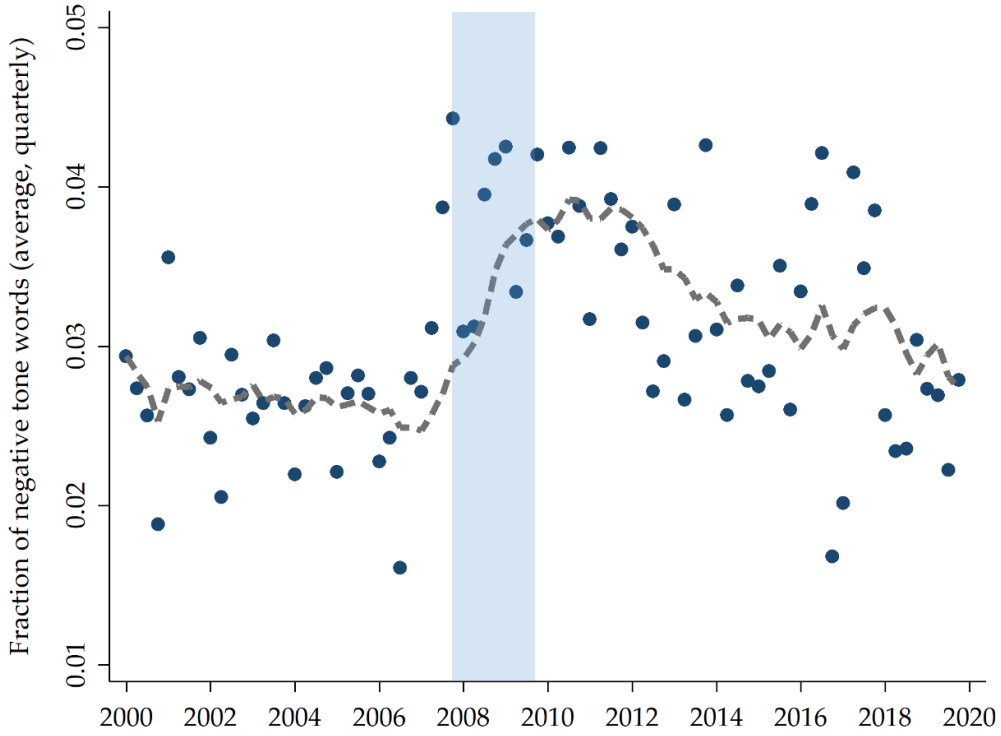

Figure 3. Trends in ratings references, U.S. and Europe, 2012 – 2020

This figure shows trends in rating use in investment mandates over the period 2012 – 2020 (note that we use an overlapping sample period in this figure: U.S. data end in 2020 while European data start in 2012). We estimate the following regression model separately in three samples: U.S. sample (described in Section 1.B), European sample (as described in Section 1.E), and pooled European and U.S. sample.

$$All\ ratings\ references_{f,t} = \alpha + X'\beta + \gamma_f + \varepsilon_{f,t}$$

where *f* denotes the fund and *t* the year. γ_f is a vector of fund fixed effects. *X* is a vector of year fixed effects with corresponding regression coefficients β; we include dummy variables for the years 2013 – 2020, omitting the variable for the year 2012, which serves as the benchmark. We plot the coefficients β, including 99% confidence intervals based on heteroscedasticity robust standard errors clustered at the year level.

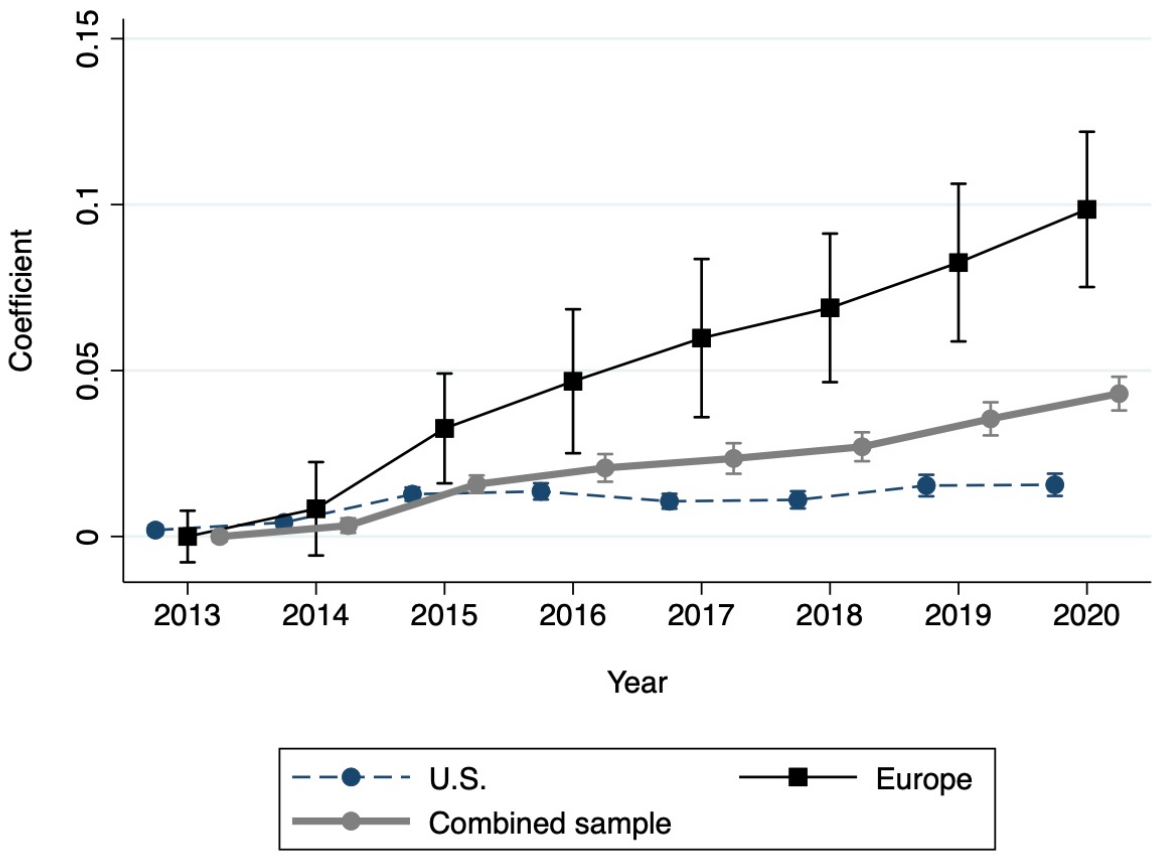

Table 1. Descriptions of the main text-based variables

This table reports the main text-based variables together with the corresponding dictionaries in the column "Search terms". The column "Excluded search terms" shows several expressions that are not considered to be matches because they do not capture the desired concepts. Minor variations in terms of spelling and capitalization are also included in the searches but are not separately designated in the table. Parentheses denote optional elements. All variables are indicator variables that take the value of one if the relevant investment mandate passage of the prospectus includes one of the search terms; for further details, see Section 1.

Variable name	Search terms	Excluded search terms
S&P	S&P, Standard & Poor, Standard and Poor	S&P 100, S&P 400, S&P 500, S&P 600, S&P Composite, S&P Index, S&P Target, S&P Small Cap, S&P Mid Cap, S&P Large Cap
Fitch	Fitch	-
Moody's	Moody	-
Duff & Phelps	Duff and Phelps, Duff & Phelps, D&P	-
Dominion	Dominion, DBRS	-
Kroll	Kroll, KBRA	-
Big 3	Search terms listed for the variables S&P, Fitch, and Moody's	Exclusion terms as listed for the variable S&P
NRSRO	NRSRA, NRSRO, [nationally] recognized statistical rating agency, [nationally] recognized statistical rating organization	-
Letter rating	Aaa, Aa1, Aa2, Aa3, A1, A2, A3, Baa1, Baa2, Baa3, Ba1, Ba2, Ba3, B1, B2, B3, Caa1, Caa2, Caa3, Ca, C, P1, P2, P3, Not Prime, NP, AAA, AA+, AA, AA-, A+, A, A-, BBB+, BBB, BBB-, BB+, BB, BB-, B+, B, B-, CCC+, CCC, CCC-, CC, C, RD, SD, D, A1+, A1, A2, A3, B, C, D, F1+, F1, F2, F3, SG, SP1+, SP1, SP2, SP3, VMIG1, VMIG2, VMIG3, VMIG4, MIG1, MIG2, MIG3, MIG4	Part A, Part B, Part C, Part D, Class A, Class B, Class C, Class D, Investor A, Investor B, Investor C, Investor D, Fund(s) A, Fund(s) B, Funds(s) C, Fund(s) D, Appendix A, Appendix B, Appendix C, Appendix D, Schedule(s) A, Schedule(s) B, Schedule(s) C, Schedule(s) D, A fund, A maximum, A minimum, A bond, A financial, A wide, A security, A core, A financed, A basket, A composite, A portfolio, A fundamental, A non-fundamental, A broadly, A diversified, A sub-advisor, A shares, B shares, C shares, D shares, (A), (B), (C), (D)
Direct ratings reference	Search terms listed for the variables S&P, Fitch, Moody's, Duff & Phelps,	Exclusion terms as listed for the variables S&P and Letter rating.

	Dominion, Kroll, NRSRO, and Letter rating. Additional search terms: rating agency, rating agencies, rating organization(s)	
HY / IG	investment grade, high yield, speculative grade, junk, below investment grade, non-investment grade	-
All ratings references	Search terms listed for the variables Direct ratings reference and HY / IG	Exclusion terms as listed for the variable Direct ratings reference
ESG	ESG, CSR, socially, social and governance, social responsibility, social values, social impact, corporate responsibility, corporate governance, governance factors, governance criteria, governance guidelines, environmental(ly), responsible investment(s), responsible investing, responsibility factors	-
IG fund	Fund types are identified using mandate restrictions that apply to 80% or more of portfolio assets. A fund is classified as investment grade if its mandate refers to investment grade securities and does not contain any references to high yield instruments.	below investment grade, non-investment grade, lower than investment grade
HY fund	Fund types are identified using mandate restrictions that apply to 80% or more of portfolio assets. A fund is classified as high yield if its mandate refers to high yield securities and does not contain any references to investment grade instruments. The terms speculative grade, junk, below investment grade, lower than investment grade and non-investment grade are considered equivalent to the term 'high yield.'	-

Table 2. Summary statistics

This table reports summary statistics for the main variables. Minima and maxima of dummy variables are not reported.

Panel A shows the number of summary prospectus filings (form 497K) over the period 2010 to 2020. Fund type classifications are based on Lipper objective codes (from the CRSP Mutual Fund database); see Table A4 for details.

Panel B reports variables constructed using text from the fund-specific summary prospectuses (filing type 497K); the sample period is 2010 – 2020. Table 1 provides a detailed definition of the text-based variables together with the corresponding dictionaries. *Nb. agencies* is the sum of the variables *S&P*, *Moody's*, *Fitch*, *Dominion*, *Duff & Phelps*, and *Kroll*. *Fraction (All ratings references)* is the fraction of other funds of the same management company that refer to ratings in their mandates (that is, funds for which *All ratings references* takes the value of one). *Fraction (HY/IG), Fraction (NRSRO), Fraction (Big 3),* and *Fraction (Letter rating)* are defined analogously. *Category – foreign* to *Category – other* are indicator variables for the fixed income fund types; these categories are based on Lipper objective codes from the CRSP Mutual Fund database (see Table A4 for details). Panel B additionally reports the following variables, which are based on data from the CRSP Mutual Fund database. *Ln(Assets)* is the natural logarithm of the fund portfolio's total net assets in the quarter of the prospectus filing. *Ln(fund age)* is the natural logarithm of one plus the fund's age (the difference between the prospectus-filing year and the initial offering year of the fund). *Institutional* (*Retail*) is a dummy variable for funds that have at least one share class that is primarily marketed to institutional (retail) investors each year. *Index fund* and *ETF* are, respectively, indicator variables for index funds and ETFs. *Expense ratio* is the fund's expense ratio at fiscal year-end.

Panel C reports variables constructed using text from prospectuses filed at the level of fund groups (filing types 485A and 485B); the sample period is 1999 – 2020.

Panel D reports the number of KIID filings obtained from Morningstar Direct, by year and fund type; the sample period is 2012 – 2021. We consider all European open-end fixed income funds that are domiciled in Luxembourg, and which are available in Morningstar Direct as of mid-2021. For each fund with non-missing information on net assets and non-missing ISIN, we collect English-language KIID filings of the fund's largest share class. Fund type classifications are based on Morningstar categories; see Table A5 for details.

Panel E reports variables constructed using text in the 'Objectives and Investment Policy' section contained in the KIID documents. Table 1 discusses the content of these variables in detail. *Currency - …*, *Sales region - …*, *Inv. Area - …*, and *Category - …* are indicator variables for various fund classifications according to Morningstar; see Table A5 for details. Panel E additionally reports the following variables, which are based on information from the Morningstar Direct database as of mid-2021. *Ln(Assets)* is the natural logarithm of the fund portfolio's total net assets (in million Swedish Kronor). *Ln(fund age)* is the natural logarithm of one plus the fund's age (the difference between the KIID-filing year and the inception year of the fund).

Panel A: Number of summary prospectus filings by fund type, 2010 – 2020

Year	Foreign	Corporate	Municipal	MBS	Other fixed income
2010	87	401	388	13	131
2011	104	425	377	15	186
2012	152	538	464	17	249
2013	177	627	507	16	329
2014	197	691	528	16	391
2015	204	746	557	16	435
2016	219	810	573	16	456
2017	205	742	479	16	413
2018	229	855	578	14	495
2019	223	829	581	13	498
2020	214	799	569	13	481
Sum	2,011	7,463	5,601	165	4,064

Panel B: Variables from the sample of 497K filings, 2010 – 2020

	Obs.	Mean	Std. Dev.	Min.	Max.
S&P	19,304	0.301	0.459		
Fitch	19,304	0.175	0.380		
Moody's	19,304	0.291	0.454		
Big 3	19,304	0.309	0.462		
Nb. agencies	19,304	0.768	1.204	0.000	5.000
NRSRO	19,304	0.226	0.418		
Letter rating	19,304	0.425	0.494		
Direct rating reference	19,304	0.600	0.490		
Rating agency	19,304	0.361	0.480		
HY/IG	19,304	0.884	0.320		
All ratings references	19,304	0.932	0.251		
ESG	19,304	0.029	0.169		
Category - foreign	19,304	0.104	0.305		
Category - municipal	19,304	0.290	0.454		
Category - MBS	19,304	0.009	0.092		
Category - corporate	19,304	0.387	0.487		
Category - other	19,304	0.211	0.408		
Ln(Assets)	18,739	5.724	2.026	-2.303	12.533
Ln(Fund age)	18,739	2.400	0.993	0.000	4.575
Retail	18,739	0.686	0.464		
Institutional	18,739	0.771	0.420		
Index fund	18,739	0.117	0.322		
ETF	18,739	0.122	0.327		
Expense ratio	16,287	0.008	0.004	0.000	0.044
Fraction (All ratings references)	16,656	0.896	0.222		
Fraction (Big 3)	16,656	0.286	0.338		

Fraction (Letter rating)	16,656	0.405	0.342
Fraction (HY/IG)	16,656	0.846	0.251
Fraction (NRSRO)	16,656	0.229	0.314

Panel C: Variables from the sample of 485 filings, 1999 – 2020

	Obs.	Mean	Std. Dev.	Min.	Max.
S&P	13,194	0.696	0.460		
Fitch	13,194	0.324	0.468		
Moody's	13,194	0.685	0.464		
Big 3	13,194	0.704	0.456		
Nb. agencies	13,194	1.728	1.234	0.000	5.000
NRSRO	13,194	0.558	0.497		
Letter rating	13,194	0.738	0.440		
Direct rating reference	13,194	0.901	0.298		
Rating agency	13,194	0.691	0.462		
HY/IG	13,194	0.920	0.271		
All ratings references	13,194	0.970	0.170		
ESG	13,194	0.865	0.342		

Panel D: Number of KIID filings by fund type, 2012 – 2021

Year	Corporate	Emerging markets	Government	Short-term	Other
2012	67	51	41	9	311
2013	95	85	47	12	427
2014	108	113	48	14	513
2015	142	135	56	16	615
2016	167	150	58	20	735
2017	186	167	63	20	831
2018	209	197	67	25	1,004
2019	229	228	78	26	1,178
2020	240	245	85	27	1,268
2021	249	254	84	31	1,356
Sum	1,692	1,625	627	200	8,238

Panel E: Variables from the sample of KIID filings, 2012 – 2021

	Obs.	Mean	Std. Dev.	Min.	Max.
S&P	12,382	0.153	0.360		
Fitch	12,382	0.052	0.222		
Moody's	12,382	0.101	0.301		
Big 3	12,382	0.154	0.361		
Nb. agencies	12,382	0.307	0.791	0	4
Letter rating	12,382	0.233	0.423		
Direct rating reference	12,382	0.289	0.454		
HY/IG	12,382	0.500	0.500		
All ratings references	12,382	0.595	0.491		
Currency - euro	12,382	0.601	0.490		
Currency - GBP	12,382	0.037	0.189		
Currency - USD	12,382	0.287	0.452		
Currency - other	12,382	0.075	0.263		
Investment area - Europe	12,382	0.297	0.457		
Investment area - Global	12,382	0.421	0.494		
Investment area - Global emerging markets	12,382	0.133	0.340		
Investment area - USA	12,382	0.076	0.265		
Investment area - other	12,382	0.073	0.259		
Sales region - Offshore	12,382	0.098	0.297		
Sales region - Global	12,382	0.218	0.413		
Sales region - Europe	12,382	0.632	0.482		
Sales region - other	12,382	0.053	0.224		
Fund category - corporate	12,382	0.137	0.343		
Fund category - emerging markets	12,382	0.131	0.338		
Fund category - government	12,382	0.051	0.219		
Fund category - short-term	12,382	0.016	0.126		
Fund category - other	12,382	0.665	0.472		
Ln(Assets)	12,327	7.543	1.851	-4.539	12.361
Ln(Fund age)	12,262	1.712	0.886	0	3.871

Table 3. Proof of concept: Rating references in money market mutual funds

This table reports the fraction of money market mutual funds whose mandates refer to ratings or rating agencies (dummy variable *All ratings references*), the fraction of funds referring to S&P, Moody's, and/or Fitch (dummy variable *Big 3*), as well as the fraction of funds whose mandates contain a variant of the term "NRSRO" (dummy variable *NRSRO*). The sample consists of funds that file 497K forms and which are classified as money market funds using Lipper objective codes (see Table A4).

Year	All ratings references	Big 3	NRSRO
2010	0.274	0.009	0.166
2011	0.231	0.012	0.153
2012	0.244	0.010	0.162
2013	0.282	0.010	0.168
2014	0.291	0.010	0.182
2015	0.294	0.013	0.184
2016	0.176	0.003	0.103
2017	0.093	0.004	0.022
2018	0.081	0.003	0.013
2019	0.070	0.003	0.007
2020	0.063	0.004	0.007

Table 4. Determinants of ratings use in U.S. fixed income fund mandates

This table reports regression models documenting the characteristics associated with rating references in fixed income fund investment mandates. The sample consists of annual summary prospectuses (filing type 497K) of U.S. fixed income mutual funds over 2010 – 2020. *All ratings references* is one if the fund mandate makes any type of ratings reference (including, but not limited to, any rating agency, a letter rating, or the term NRSRO). *HY/IG* is a dummy variable that is one if the mandate refers to terms that denote the investment grade threshold (such as "high yield", "speculative grade", or "investment grade"). *Big 3* is one if the mandate refers to S&P, Moody's, or Fitch. *NRSRO* is one if the mandate refers to the term "nationally recognized statistical ratings organization." *Letter rating* takes the value of one if the mandate refers to a specific alphanumeric credit rating, such as "A+." *Fraction (All ratings references)* is the fraction of other funds in the fund family that refer to ratings in their mandates (i.e., funds for which *All ratings references* is one). *Fraction (HY/IG)*, *Fraction (Big 3)*, *Fraction (NRSRO)*, and *Fraction (Letter rating)* are defined analogously. *Category – foreign* to *Category – other* are indicator variables for the fixed income types; fund type classifications are based on Lipper objective codes (see Table A4 for details). *Ln(Assets)* is the natural logarithm of the fund's total net assets in the quarter of the prospectus filing. *Ln(fund age)* is the log of one plus the fund's age (defined as the difference between the prospectus-filing year and the fund's initial offering year). *Institutional* (*Retail*) is a dummy variable for funds that have institutional (retail) share classes. *Index fund* and *ETF* are, respectively, indicator variables for index funds and ETFs. *Expense ratio* is the fund's expense ratio at fiscal year-end. Heteroskedasticity-robust standard errors, clustered by fund, are reported below coefficients. * denotes estimates that are significantly different from zero at the 10% level, ** at the 5% level, and *** at the 1% level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	All ratings references		HY/IG		Big 3		NRSRO		Letter rating	
Category - foreign	-0.063***	-0.066***	-0.064***	-0.083***	-0.099***	-0.109***	-0.057**	-0.046*	-0.069**	-0.068**
	(0.014)	(0.015)	(0.018)	(0.020)	(0.033)	(0.028)	(0.027)	(0.024)	(0.035)	(0.033)
Category - other	-0.100***	-0.093***	-0.099***	-0.101***	-0.116***	-0.127***	-0.032	-0.004	-0.109***	-0.102***
	(0.013)	(0.014)	(0.016)	(0.017)	(0.025)	(0.023)	(0.021)	(0.020)	(0.026)	(0.025)
Category - municipal	-0.053***	-0.060***	-0.112***	-0.109***	-0.137***	-0.082***	0.029	0.008	-0.026	-0.034
	(0.011)	(0.011)	(0.017)	(0.016)	(0.024)	(0.019)	(0.024)	(0.018)	(0.027)	(0.021)
Category - MBS	-0.773***	-0.776***	-0.869***	-0.864***	-0.278***	-0.206***	-0.252***	-0.194***	-0.244**	-0.217***
	(0.096)	(0.095)	(0.064)	(0.065)	(0.067)	(0.049)	(0.021)	(0.048)	(0.099)	(0.076)
Ln(Assets)	0.001	-0.000	-0.003	0.001	0.007	0.007*	0.004	0.006*	0.010**	0.008*
	(0.003)	(0.003)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)
Ln(Fund age)	-0.021***	-0.027***	-0.025***	-0.042***	-0.038***	-0.040***	-0.018*	-0.019**	-0.042***	-0.036***
	(0.005)	(0.005)	(0.007)	(0.007)	(0.011)	(0.009)	(0.010)	(0.009)	(0.012)	(0.011)
Retail	0.022**	0.005	0.043***	0.012	-0.042*	-0.041	0.097***	0.002	-0.013	-0.042
	(0.011)	(0.015)	(0.015)	(0.023)	(0.024)	(0.025)	(0.020)	(0.021)	(0.025)	(0.028)

Institutional	0.016	-0.009	0.023	-0.017	0.037*	-0.042**	-0.039*	-0.063***	0.024	-0.039
	(0.011)	(0.013)	(0.015)	(0.017)	(0.021)	(0.021)	(0.020)	(0.019)	(0.023)	(0.024)
Index fund	-0.207***	-0.195***	-0.198***	-0.171***	-0.055	-0.087**	-0.201***	-0.116***	-0.157***	-0.137***
	(0.031)	(0.032)	(0.032)	(0.034)	(0.039)	(0.035)	(0.028)	(0.029)	(0.038)	(0.036)
ETF	0.055**	0.052*	0.060**	0.078**	0.085*	0.040	0.089***	0.035	0.009	0.024
	(0.027)	(0.028)	(0.030)	(0.033)	(0.045)	(0.038)	(0.034)	(0.034)	(0.044)	(0.041)
Expense ratio		1.760		9.382***		4.707*		-0.612		3.285
		(1.960)		(2.262)		(2.601)		(2.139)		(2.784)
Fraction (All ratings references)		0.255***								
		(0.034)								
Fraction (HY/IG)				0.420***						
				(0.036)						
Fraction (Big 3)						0.829***				
						(0.022)				
Fraction (NRSRO)								0.866***		
								(0.021)		
Fraction (Letter rating)										0.798***
										(0.021)
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	18,739	16,284	18,739	16,284	18,739	16,284	18,739	16,284	18,739	16,284
Adjusted R^2	0.144	0.207	0.110	0.234	0.041	0.404	0.036	0.433	0.018	0.321

Table 5. Annual averages of ratings variables, U.S. (2010 – 2020)

This table reports annual averages of the variables referring to credit ratings, constructed using text from fund-specific summary prospectuses (filing type 497K); the sample period is 2010 – 2020. *S&P*, *Moody's*, and *Fitch* take the value of one if the investment mandate refers to the respective credit rating agencies, zero otherwise. *Nb. agencies* is the number of unique credit rating agencies mentioned by name in the mandate. *NRSRO* is one if the mandate refers to the term "nationally recognized statistical ratings organization." *Letter rating* takes the value of one if the mandate refers to a specific alphanumeric credit rating, such as "A+." *Direct ratings reference* is one if the mandate refers to the generic term "rating agency," the name of a specific rating agency, an alphanumeric rating, or the term NRSRO. *HY/IG* is a dummy variable that is one if the mandate refers to terms that denote the investment grade threshold (such as "high yield", "speculative grade", or "investment grade"). Finally, *All ratings references* is the union of all other ratings-based indicator variables. Table 1 provides a more detailed definition of the text-based variables together with the corresponding dictionaries.

Year	S&P	Moody's	Fitch	Nb. agencies	NRSRO	Letter rating	Direct ratings reference	HY/IG	All ratings references
2010	0.257	0.251	0.125	0.632	0.225	0.380	0.565	0.836	0.900
2011	0.257	0.250	0.142	0.649	0.211	0.393	0.557	0.832	0.890
2012	0.270	0.260	0.147	0.677	0.215	0.412	0.579	0.853	0.915
2013	0.283	0.271	0.158	0.711	0.216	0.422	0.591	0.872	0.925
2014	0.285	0.274	0.160	0.719	0.216	0.421	0.591	0.882	0.929
2015	0.294	0.283	0.177	0.754	0.217	0.424	0.593	0.898	0.941
2016	0.303	0.293	0.176	0.772	0.228	0.425	0.601	0.899	0.942
2017	0.328	0.313	0.189	0.830	0.238	0.443	0.615	0.899	0.939
2018	0.320	0.307	0.188	0.819	0.225	0.432	0.611	0.896	0.941
2019	0.334	0.323	0.200	0.861	0.237	0.447	0.632	0.900	0.947
2020	0.326	0.320	0.206	0.856	0.242	0.437	0.622	0.897	0.944
2010 - 2020	*0.301*	*0.291*	*0.175*	*0.768*	*0.226*	*0.425*	*0.600*	*0.884*	*0.932*

Table 6. Trends in rating references in the U.S.

This table reports regression models estimating trends in rating references in fixed income fund investment mandates. The sample consists of annual summary prospectuses (filing type 497K) of fixed income mutual funds over 2010 – 2020. *Linear trend* is 0 for the year 2010; it is 1 for 2011, 2 for 2012, etc. *All ratings references* is one if the fund mandate makes any type of ratings reference (including, but not limited to, any rating agency, a letter rating, or the term NRSRO). *Big 3* is one if the mandate refers to S&P, Moody's, or Fitch. *Fraction (All ratings references)* is the fraction of other funds in the fund family that refer to ratings in their mandates (i.e., funds for which *All ratings references* is one); *Fraction (Big 3)* is defined analogously. The following variables use data from the CRSP Mutual Fund database: *Category – foreign* to *Category – other* are indicator variables for the fixed income types; fund type classifications are based on Lipper objective codes (see Table A4 for details). *Ln(Assets)* is the natural logarithm of the fund's total net assets in the quarter of the prospectus filing. *Ln(fund age)* is the log of one plus the fund's age (defined as the difference between the prospectus-filing year and the fund's initial offering year). *Institutional* (*Retail*) is a dummy variable for funds that have institutional (retail) share classes. *Index fund* and *ETF* are, respectively, indicator variables for index funds and ETFs. *Expense ratio* is the fund's expense ratio at fiscal year-end. Heteroskedasticity-robust standard errors, clustered by year, are reported below coefficients. * denotes estimates that are significantly different from zero at the 10% level, ** at the 5% level, and *** at the 1% level.

	(1)	(2)	(3)	(4)	(5)	(6)
	All ratings references				Big 3	
Linear trend	0.005***	0.005***	0.002**	0.008***	0.004***	0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)
Category - foreign		-0.066***			-0.109***	
		(0.009)			(0.008)	
Category - other		-0.093***			-0.127***	
		(0.002)			(0.006)	
Category - municipal		-0.060***			-0.082***	
		(0.003)			(0.005)	
Category - MBS		-0.776***			-0.206***	
		(0.010)			(0.012)	
Ln(Fund age)		-0.027***			-0.040***	
		(0.001)			(0.003)	
Retail		0.005			-0.041***	
		(0.005)			(0.008)	
Institutional		-0.008			-0.042***	
		(0.006)			(0.005)	
Index fund		-0.194***			-0.087***	
		(0.017)			(0.017)	
ETF		0.052***			0.040**	
		(0.015)			(0.017)	
Ln(Assets)		-0.000	-0.002		0.007***	-0.002*
		(0.001)	(0.002)		(0.001)	(0.001)
Expense ratio		1.815*	1.627		4.709***	-4.397*
		(0.986)	(2.183)		(0.900)	(2.286)

Fraction (All ratings references)		0.256***	0.181***			
		(0.015)	(0.027)			
Fraction (Big 3)					0.829***	0.335***
					(0.005)	(0.024)
Constant	0.906***	0.801***	0.755***	0.263***	0.200***	0.246***
	(0.006)	(0.011)	(0.037)	(0.003)	(0.013)	(0.019)
Fund F.E.	No	No	Yes	No	No	Yes
Observations	19,304	16,284	16,299	19,304	16,284	16,299
Adjusted R^2	0.003	0.207	0.850	0.003	0.405	0.912

Table 7. Annual averages of ratings variables, U.S. (1999 – 2020)

This table reports annual averages of the variables referring to credit ratings, constructed using the group prospectuses (filing type 485A/B); the sample period is 1999 – 2020. All variables are indicator variables that take the value of one if the relevant investment mandate passage of the prospectus includes one of the search terms. *S&P*, *Moody's*, and *Fitch* take the value of one if the investment mandate refers to the respective credit rating agencies, zero otherwise. *Nb. agencies* is the number of unique credit rating agencies mentioned by name in the mandate sections of the group prospectus. *NRSRO* is one if the mandate refers to the term "nationally recognized statistical ratings organization." *Letter rating* takes the value of one if the mandate refers to a specific alphanumeric credit rating, such as "A+." *Direct ratings reference* is one if the mandate refers to the generic term "rating agency," the name of a specific rating agency, an alphanumeric rating, or the term NRSRO. *HY/IG* is a dummy variable that is one if the mandate refers to terms that denote the investment grade threshold (such as "high yield", "speculative grade", or "investment grade"). Finally, *All ratings references* is the union of all other ratings-based indicator variables. Table 1 provides a more detailed definition of the text-based variables together with the corresponding dictionaries.

Year	S&P	Moody's	Fitch	Nb. agencies	NRSRO	Letter rating	Direct rating references	HY/IG	All ratings references
1999	0.672	0.675	0.203	1.624	0.454	0.734	0.889	0.834	0.932
2000	0.666	0.658	0.204	1.607	0.436	0.735	0.872	0.843	0.925
2001	0.644	0.634	0.194	1.535	0.428	0.715	0.857	0.830	0.911
2002	0.676	0.673	0.206	1.588	0.461	0.745	0.908	0.859	0.953
2003	0.689	0.677	0.215	1.615	0.482	0.760	0.901	0.899	0.961
2004	0.697	0.684	0.217	1.627	0.496	0.766	0.876	0.895	0.961
2005	0.718	0.703	0.241	1.699	0.502	0.788	0.906	0.904	0.970
2006	0.702	0.686	0.268	1.684	0.518	0.796	0.910	0.911	0.973
2007	0.699	0.682	0.299	1.699	0.529	0.774	0.898	0.910	0.973
2008	0.713	0.692	0.315	1.736	0.549	0.752	0.900	0.925	0.974
2009	0.718	0.701	0.328	1.761	0.561	0.755	0.900	0.930	0.978
2010	0.686	0.678	0.340	1.720	0.565	0.733	0.910	0.933	0.977
2011	0.694	0.689	0.355	1.751	0.593	0.744	0.893	0.918	0.957
2012	0.700	0.692	0.365	1.767	0.609	0.747	0.913	0.944	0.978
2013	0.693	0.687	0.365	1.755	0.627	0.710	0.913	0.941	0.982
2014	0.689	0.686	0.371	1.754	0.635	0.706	0.908	0.948	0.983
2015	0.684	0.670	0.372	1.735	0.647	0.710	0.917	0.940	0.983
2016	0.708	0.698	0.390	1.805	0.631	0.708	0.913	0.949	0.986
2017	0.703	0.688	0.418	1.821	0.596	0.719	0.894	0.941	0.977
2018	0.716	0.707	0.424	1.861	0.594	0.731	0.915	0.960	0.986
2019	0.709	0.702	0.418	1.842	0.596	0.712	0.906	0.961	0.985
2020	0.700	0.694	0.416	1.821	0.596	0.731	0.904	0.963	0.987
1999 - 2020	*0.696*	*0.685*	*0.324*	*1.728*	*0.558*	*0.738*	*0.901*	*0.920*	*0.970*

Table 8. Trends in rating references, 1999 – 2020, U.S.

This table reports the coefficients for regression models estimating trends in rating references in mutual fund investment mandates contained in fund group prospectuses (filing type 485A/B). The sample period is 1999 – 2020. *Linear trend* takes the value of 0 in the year 1999; it is 1 in 2000, 2 in 2001, 3 in 2002 etc. *All ratings references* and *Big 3* are defined in Table 1. *Linear trend (1999-2007)* takes the value of 0 in the year 1999, and in the years 2008 – 2020; it is 1 in 2000, 2 in 2001, 3 in 2002, …, and 8 in 2007. *Linear trend (2008-2020)* takes the value of 0 in the years 1999 – 2007; it is 9 in 2008, 10 in 2009, 11 in 2010, etc. The sample is based on a match between a fund group's CIK from the 485 filing to the CRSP Mutual Fund database using the CRSP-CIK linking file. The sample includes group prospectuses which contain at least one fund that is classified as a fixed income fund using Lipper objective codes. Heteroskedasticity-robust standard errors, clustered by year, are reported below coefficients. * denotes estimates that are significantly different from zero at the 10% level, ** at the 5% level, and *** at the 1% level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All ratings references (col. 1 - 4)				Big 3 (col. 5 - 8)			
Linear trend	0.003***	0.003***			0.002***	0.003***		
	(0.000)	(0.000)			(0.000)	(0.000)		
Linear trend (1999-2007)			0.005***	0.006***			0.004***	0.005***
			(0.001)	(0.001)			(0.001)	(0.001)
Linear trend (2008-2020)			0.003***	0.003***			0.003***	0.003***
			(0.000)	(0.000)			(0.001)	(0.000)
Constant	0.942***	0.936***	0.933***	0.927***	0.679***	0.670***	0.672***	0.662***
	(0.007)	(0.007)	(0.008)	(0.008)	(0.007)	(0.006)	(0.009)	(0.007)
Fund group F.E.	No	Yes	No	Yes	No	Yes	No	Yes
Observations	13,194	13,194	13,194	13,194	13,194	13,194	13,194	13,194
Adjusted R^2	0.008	0.390	0.009	0.391	0.001	0.663	0.001	0.663

Table 9. Transition frequencies between rating references, U.S.

This table reports a transition matrix for fixed income mutual funds that pertain to either of four categories in any given year (2010 – 2019): (1) funds that do not refer to any ratings-related term in their investment mandate; (2) funds that refer only to the investment grade threshold (i.e., the dummy variable *Direct ratings reference* is zero and *HY / IG* takes the value of one); (3) funds for which *Direct ratings reference* is one; or (4) funds that file a summary prospectus (497K) for the first time. Note that for each fund category (1 – 4) corresponding to a given line of the table, the transition frequencies reported in the columns sum to 100% (the categories into which the funds can transition in the following year are mutually exclusive). The sample consists of 497K filings of fixed income mutual funds (defined using Lipper objective codes), spanning the years 2010 - 2020.

	No rating (t+1)	HY / IG only (t+1)	Direct ratings reference (t+1)	Exit sample (t+1)
No rating (t) (Obs. = 1,153)	0.882	0.042	0.043	0.032
HY / IG only (t) (Obs. = 5,572)	0.003	0.938	0.027	0.032
Direct ratings reference (t) (Obs. = 10,080)	0.002	0.006	0.957	0.035
New fund (t) (Obs. = 2,395)	0.067	0.331	0.577	0.025

Table 10. The use of ratings in investment mandates of European fixed income funds

This table reports regression models documenting the characteristics associated with the use of rating references in Luxembourg-domiciled fixed income fund mandates. The sample consists of investment mandates contained in KIID filings collected from Morningstar Direct; the sample period is 2012 – 2021. We consider all European open-end fixed income funds that are domiciled in Luxembourg and which are available in Morningstar Direct as of mid-2021. For each fund with non-missing information on net assets and non-missing ISIN, we collect English-language KIID filings of the fund's largest share class. The following text-based variables are constructed using text in the 'Objectives and Investment Policy' section contained in the KIID documents. *All ratings references* is one if the fund mandate makes any type of ratings reference (including, but not limited to, any rating agency, or a letter rating). *HY/IG* is a dummy variable that is one if the mandate refers to terms that denote the investment grade threshold (such as "high yield", "speculative grade", or "investment grade"). *Big 3* is one if the mandate refers to S&P, Moody's, or Fitch. *Letter rating* takes the value of one if the mandate refers to a specific alphanumeric credit rating, such as "A+." *Ln(Assets)* is the natural logarithm of the fund portfolio's total net assets (in million Swedish Kronor). *Ln(fund age)* is the natural logarithm of one plus the fund's age (the difference between the KIID-filing year and the inception year of the fund). *Currency - …*, *Sales region - …*, *Inv. Area - …*, and *Category - …* are indicator variables for various fund classifications in Morningstar Direct; see Table A5 for details. These variables are based on information from the Morningstar Direct database as of mid-2021. Heteroskedasticity-robust standard errors, clustered by fund, are reported below coefficients. * denotes estimates that are significantly different from zero at the 10% level, ** at the 5% level, and *** at the 1% level.

	(1)	(2)	(3)	(4)
	All ratings references	HY/IG	Big 3	Letter rating
Fund category - emerging markets	-0.120	-0.016	0.072	-0.044
	(0.080)	(0.081)	(0.062)	(0.067)
Fund category - government	-0.200***	-0.108*	-0.048	-0.195***
	(0.059)	(0.060)	(0.047)	(0.048)
Fund category - short-term	-0.328***	-0.300***	-0.080	-0.161**
	(0.083)	(0.059)	(0.071)	(0.081)
Fund category - other	-0.116***	-0.055*	-0.036	-0.104***
	(0.030)	(0.033)	(0.027)	(0.032)
Currency - GBP	-0.009	0.066	0.011	-0.086*
	(0.059)	(0.060)	(0.044)	(0.046)
Currency - USD	-0.031	-0.019	0.001	-0.043*
	(0.029)	(0.029)	(0.023)	(0.026)
Currency - other	-0.058	-0.061	-0.018	-0.047
	(0.043)	(0.041)	(0.029)	(0.035)
Investment area - global	0.023	0.030	-0.011	-0.003
	(0.028)	(0.029)	(0.022)	(0.027)
Investment area - global emerging markets	-0.262***	-0.303***	-0.161***	-0.098
	(0.077)	(0.076)	(0.057)	(0.063)
Investment area - USA	0.236***	0.195***	0.054	0.116**
	(0.043)	(0.048)	(0.041)	(0.047)
Investment area - other	-0.113**	-0.082*	-0.033	-0.046

	(0.049)	(0.048)	(0.033)	(0.036)
Sales region - Offshore	-0.030	-0.063*	0.034	0.033
	(0.033)	(0.033)	(0.028)	(0.031)
Sales region - Global	0.026	0.020	-0.005	-0.088***
	(0.029)	(0.030)	(0.023)	(0.026)
Sales region - other	-0.058	-0.120***	0.107***	0.081*
	(0.048)	(0.044)	(0.041)	(0.045)
Ln(Assets)	0.024***	0.016***	0.009**	0.015***
	(0.006)	(0.006)	(0.004)	(0.005)
Ln(Fund age)	-0.087***	-0.076***	-0.002	-0.020**
	(0.011)	(0.011)	(0.009)	(0.009)
Year F.E.	Yes	Yes	Yes	Yes
Observations	12,207	12,207	12,207	12,207
Adjusted R^2	0.115	0.099	0.016	0.038

Table 11: Annual averages of ratings variables, Europe

This table reports annual averages of the variables referring to credit ratings. The sample consists of investment mandates contained in KIID filings collected from Morningstar Direct; the sample period is 2012 – 2021. We consider all European open-end fixed income funds that are domiciled in Luxembourg, and which are available in Morningstar Direct as of mid-2021. For each fund with non-missing information on net assets and non-missing ISIN, we collect English-language KIID filings of the fund's largest share class. The following text-based variables are constructed using text in the 'Objectives and Investment Policy' section contained in the KIID documents. *S&P*, *Moody's*, and *Fitch* take the value of one if the investment mandate refers to the respective credit rating agencies, zero otherwise. *Nb. agencies* is the number of unique credit rating agencies mentioned by name in the mandate. *Letter rating* takes the value of one if the mandate refers to a specific alphanumeric credit rating, such as "A+." *Direct ratings reference* is one if the mandate refers to the generic term "rating agency," the name of a specific rating agency, or an alphanumeric rating. *HY/IG* is a dummy variable that is one if the mandate refers to terms that denote the investment grade threshold (such as "high yield", "speculative grade", or "investment grade"). Finally, *All ratings references* is the union of all other ratings-based indicator variables. Table 1 provides a more detailed definition of the text-based variables together with the corresponding dictionaries.

Year	S&P	Fitch	Moody's	Nb. agencies	Letter rating	Direct rating reference	HY/IG	All ratings references
2012	0.119	0.023	0.086	0.228	0.200	0.225	0.355	0.468
2013	0.113	0.027	0.081	0.221	0.195	0.222	0.386	0.489
2014	0.113	0.025	0.079	0.217	0.187	0.239	0.397	0.500
2015	0.146	0.046	0.104	0.296	0.219	0.271	0.426	0.532
2016	0.147	0.051	0.112	0.311	0.230	0.279	0.459	0.560
2017	0.165	0.052	0.109	0.326	0.240	0.299	0.483	0.588
2018	0.158	0.051	0.103	0.312	0.236	0.300	0.508	0.607
2019	0.168	0.060	0.106	0.336	0.240	0.308	0.543	0.634
2020	0.161	0.060	0.099	0.322	0.236	0.300	0.574	0.650
2021	0.168	0.068	0.105	0.343	0.264	0.323	0.573	0.658
2012 - 2021	*0.153*	*0.052*	*0.101*	*0.307*	*0.233*	*0.289*	*0.500*	*0.595*

Table 12. Trends in rating references, Europe

This table reports regression models estimating trends in rating references in fixed income fund investment mandates of Luxembourg-domiciled funds. The sample consists of investment mandates contained in KIID filings collected from Morningstar Direct; the sample period is 2012 – 2021. We consider all European open-end fixed income funds that are domiciled in Luxembourg and which are available in Morningstar Direct as of mid-2021. For each fund with non-missing information on net assets and non-missing ISIN, we collect English-language KIID filings for the fund's largest share class. The following text-based variables are constructed using text in the 'Objectives and Investment Policy' section contained in the KIID documents. *All ratings references* is one if the fund mandate makes any type of ratings reference (including, but not limited to, any rating agency, or a letter rating). *Big 3* is one if the mandate refers to S&P, Moody's, or Fitch. *Linear trend* is 0 for the year 2012; it is 1 for 2013, 2 for 2014, etc. Specifications 2 and 4 include the following additional control variables, the coefficients of which are not reported to conserve space (the variables used are identical to those employed in the regressions reported in Table 10). *Ln(Assets)* is the natural logarithm of the fund portfolio's total net assets (in million Swedish Kronor). *Ln(fund age)* is the natural logarithm of one plus the fund's age (the difference between the KIID-filing year and the inception year of the fund). *Currency - …*, *Sales region - …*, *Inv. area - …*, and *Category - …* are indicator variables for various fund classifications in Morningstar Direct; see Table A5 for details. These variables are based on information from the Morningstar Direct database as of mid-2021. Heteroskedasticity-robust standard errors, clustered by year, are reported below coefficients. * denotes estimates that are significantly different from zero at the 10% level, ** at the 5% level, and *** at the 1% level.

	(1)	(2)	(3)	(4)	(5)	(6)
	All ratings references			Big 3		
Linear trend	0.022***	0.027***	0.013***	0.006***	0.006***	0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)
Constant	0.469***	0.547***	0.520***	0.120***	0.090***	0.128***
	(0.005)	(0.023)	(0.005)	(0.007)	(0.008)	(0.003)
Additional controls	No	Yes	No	No	Yes	No
Fund F.E.	No	No	Yes	No	No	Yes
Observations	12,382	12,207	12,382	12,382	12,207	12,382
Adjusted R^2	0.014	0.115	0.835	0.002	0.016	0.852

Table 13. Transition frequencies between rating references in investment mandates (Luxembourg-domiciled funds)

This table reports a transition matrix for fixed income mutual funds that pertain to either of four categories in any given year (2012 – 2020): (1) funds that do not refer to any ratings-related term in their investment mandate; (2) funds that refer only to the investment grade threshold (i.e., the dummy variable *Direct ratings reference* is zero and *HY / IG* takes the value of one); (3) funds for which *Direct ratings reference* is one; or (4) funds whose KIID filing appears in our dataset for the first time. Note that for a given fund category (1 – 4) corresponding to a given line of the table, the transition frequencies reported in the columns sum to 100% (the categories into which the funds can transition in the following year are mutually exclusive). The sample consists of investment mandates contained in KIID filings collected from Morningstar Direct; the sample period is 2012 – 2021. We consider all European open-end fixed income funds that are domiciled in Luxembourg and which are available in Morningstar Direct as of mid-2021. For each fund with non-missing information on net assets and non-missing ISIN, we collect English-language KIID filings of the fund's largest share class.

	No rating (t+1)	HY / IG only (t+1)	Direct ratings reference (t+1)	Exit sample (t+1)
No rating (t) (Obs. = 4,190)	0.931	0.031	0.016	0.021
HY / IG only (t) (Obs. = 3,000)	0.018	0.927	0.028	0.026
Direct ratings reference (t) (Obs. = 2,842)	0.014	0.016	0.946	0.023
New fund (t) (Obs. = 1,983)	0.378	0.308	0.275	0.039

Appendix to The Use of Credit Ratings in Financial Markets

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A. Additional information on the data, main samples, and variables

Table A1 reports excerpts from extracted sections on Principal Investment Strategies in 497K filings. Table A2 reports expressions used to select mandate passages in group prospectuses (filings of the type 485APOS and 485BPOS). Table A3 reports expressions used to identify statements about credit quality, "boilerplate" disclosure, and stock indices. Table A4 reports the main fixed income mutual fund categories considered in this paper, along with the constitutive Lipper objective codes (from CRSP). Table A5 shows fund classifications resulting from an aggregation of detailed Morningstar Direct classifications into coarser categories.

B. Additional proofs of concept

B1. Time-series evidence

To provide additional evidence that the textual data we extract from investment mandates have real economic content, we identify references to environmental, social, and governance (ESG) criteria in investment mandates.[37] Given the rising interest in ESG issues in recent years, a positive trend would seem natural. Table B1 reports the fraction of summary prospectus filings that mention ESG-related terms over the period 2010 – 2020. As expected, only a minority of fixed income funds discuss such matters. In addition to the modest overall level, we also observe the expected increase in ESG references over time (from 0.3% of fixed income funds in 2010 to 13.6% of funds in 2020). This provides additional evidence that the text-based analysis of mandates yields useful data on how fixed income funds operate.

B2. Investment mandates and funds' asset allocation decisions

We consider security sales and purchases by funds with different investment mandates. The purpose of this analysis is to show that funds not only refer to credit ratings in their investment mandates, but that the ratings-based investment restrictions of the mandates are reflected in their

[37] See Table 1 in the main article for a comprehensive list of the search terms used to identify ESG references.

active portfolio choices. The sample is constructed as follows. We start with quarterly data on fixed income mutual funds' security holdings from CRSP. Using the securities' CUSIPs, we add corporate bond credit ratings (for each security, we use the highest rating from S&P, Moody's, and/or Fitch) from Mergent-FISD; ratings reflect securities' credit risk at the end of the month in which the portfolio holdings are reported.[38] We exclude unrated securities from the analysis. For each fund portfolio and year, we add (using the EDGAR – CRSP linking file) information on ratings references in the funds' investment mandates from the 497K filings. Using this sample, we estimate the following regression model:

$$Sell_{i,f,t} = \alpha \cdot Downgrade\ to\ HY_{i,t} \cdot HY\ fund_{f,t} + \beta \cdot Downgrade\ to\ HY_{i,t} \cdot IG\ fund_{f,t} + \gamma \cdot Downgrade\ to\ HY_{i,t} + X'\delta + \varepsilon_{i,f,t} \quad \text{(B1)}$$

where i denotes a fixed income security, f denotes a fund portfolio, and t denotes a quarter. *Sell* is an indicator variable that takes a value of one if a given security is included in a given portfolio in quarter t but is not in the portfolio in quarter $t+1$; it takes a value of zero otherwise. *Downgrade to HY* is a dummy variable that takes the value of one if a security is rated BBB- or higher in quarter t and it is rated BB+ or lower (or the security becomes "unrated") three months later. *HY fund* and *IG fund* are dummy variables reflecting whether the mandate of a fund indicates that it primarily invests in high yield or investment grade securities, respectively. $X'\delta$ is a matrix consisting of the following variables and their regression coefficients: fund fixed effects, security fixed effects, and year-quarter fixed effects. Summary statistics for this sample are reported in Panel A of Table B2.

[38] We note that the ratings data only cover corporate bonds and Treasury securities, which leads to a limited sample of fund mandates that we can consider in these tests.

In Panel B, we report the coefficients from regression model (B1). The estimates suggest that securities that are downgraded to high yield are less likely to be sold by high yield funds and they are more likely to be sold by investment grade funds. The benchmark group in this analysis consists of funds that are neither classified as high yield funds, nor as investment grade funds.

Our next test sheds light on security purchases by funds with different investment mandates. The sample consists of quarterly data on fixed income security issuances from Mergent /FISD. We include all security issuances that have a Moody's, S&P and/or Fitch corporate bond credit rating in the quarter that they are issued. We match these securities to fund portfolios from CRSP and to our data on fund-specific summary prospectuses. Using this sample, we estimate the following regression model:

$$Buy_{i,f,t} = \alpha \cdot HY\ security_{i,t} \cdot HY\ fund_{f,t} + \beta \cdot HY\ security_{i,t} \cdot IG\ fund_{f,t} + X'\delta + \varepsilon_{i,f,t} \qquad \text{(B2)}$$

where i denotes a fixed income security, f denotes a fund portfolio, and t denotes a quarter. *Buy* is an indicator variable that takes the value of one if a corporate bond that is issued in quarter t is included in a given fund's portfolio in quarter *t+1*. *HY security* is a dummy variable that indicates that the highest rating the security receives at issuance is BB+ or lower; we consider ratings by Moody's, S&P, and Fitch. The other variables are the same as in regression model (B1) and Table B2.

Panel A of Table B3 reports summary statistics for this sample. In Panel B of Table B3, we report coefficients from the estimation of regression model (B2). We find that high yield funds are significantly more likely to buy newly issued high yield securities, while investment grade funds are significantly less likely to do so. As in Table B2, the benchmark group in this analysis consists of funds that are neither classified as high yield funds nor as investment grade funds.

In sum, this section provides additional evidence that funds not only refer to credit ratings in their investment mandates but that the ratings-based investment restrictions of the mandates are also reflected in funds' actual portfolio allocation decisions.

C. Additional evidence on the use of credit ratings in fixed income mutual fund investment mandates

In this Section, we report regressions like those reported in certain tables of the main article, but we use additional dependent variables. Table 6 in the article examines trends in the use of credit ratings in fixed income investment mandates over the period 2010 – 2020. As the dependent variables in these regressions, we employ *All ratings references* and *Big 3* (see Table 1 in the article for detailed definitions). In Table C1, we report coefficients from similar regressions with additional dependent variables: *HY/IG* (1 – 3); *NRSRO* (columns 4 – 6) and *Letter rating* (7 – 9).

Table C2 reports regressions as Table 8 for the trends in the use of ratings in U.S. fixed income fund group prospectuses; we employ the following additional dependent variables: *HY/IG* (Panel A, columns 1 – 4), *NRSRO* (Panel A, columns 5 – 8), and *Letter rating* (Panel B).

Table 12 in the article reports regressions examining trends in the use of credit ratings in the investment mandates of European (Luxembourg-domiciled) UCITS funds. Table C3 reports coefficients from similar regressions but with two additional dependent variables: *HY/IG* (columns 1 – 3) and *Letter rating* (columns 4 – 6).

Table A1. Examples of Principal Investment Strategies sections

This table reproduces the complete "Principal investment strategy" sections of six U.S. fixed income funds, extracted from three 497K prospectuses in our sample. The first three examples reproduced below refer to ratings, while the last three example sections are for funds that do not make any rating references. For details on how we use these sections to construct the text-based variables, see the description in Section 1.

Filing details	Excerpt from section on principal investment strategies
Northwestern Mutual Series Fund Select Bond Portfolio, 2016/05/01	Normally, the Portfolio invests at least 80% of net assets (plus any borrowings for investment purposes) in a diversified portfolio of investment grade debt securities with maturities exceeding one year. The Portfolio may also invest up to 10% of net assets in non-investment grade, high yield/high risk bonds (so called "junk bonds"). Investment grade securities are generally securities rated investment grade by major credit rating agencies (BBB- or higher by S&P; Baa3 or higher by Moody's; BBB- or higher by Fitch) and non-investment grade securities are generally securities rated below investment grade by major credit rating agencies (BB+ or lower by S&P; Ba1 or lower by Moody's; BB+ or lower by Fitch), or, if unrated, determined by the Portfolio's adviser to be of comparable quality. The Portfolio invests primarily in U.S. Government obligations, corporate bonds and mortgage- and asset-backed securities, including mortgage dollar rolls, and may invest in Rule 144A securities. Also, the Portfolio may invest up to 20% of net assets in foreign securities, consistent with its investment objectives. Foreign securities held by the Portfolio consist primarily of U.S. dollar denominated securities but may also include non-U.S. dollar denominated securities. Debt securities may be of any maturity or duration, but under normal market conditions, the Portfolio attempts to maintain an overall dollar-weighted average effective duration that is within 10% of the Barclays® U.S. Aggregate Index, which had a duration of 5.47 years as of March 31, 2016. Duration is a measure of the sensitivity of the price of the Portfolio's fixed income securities to changes in interest rates; the longer the duration, the more sensitive the price will be to changes in interest rates. The Portfolio does not target an average effective maturity. The adviser uses a fundamental, relative value investment approach to construct the portfolio of investments. The adviser invests in debt securities that it believes offer competitive returns and are undervalued, offering additional income and/or price appreciation potential relative to other debt securities of similar credit quality and interest rate sensitivity. The adviser may engage in active and frequent trading of portfolio securities to achieve its investment objectives. The adviser may sell a portfolio security that has achieved its desired return or if the adviser believes the security or its sector has become overvalued. The adviser may also sell a security if a more attractive opportunity becomes available or if the security is no longer attractive due to its risk profile or as a result of changes in the overall market environment.
Prudential Total Return Bond Fund, 2011/11/08	The Fund will seek to achieve its objective through a mix of current income and capital appreciation as determined by the Fund's investment subadviser. The Fund invests, under normal circumstances, at least 80% of the Fund's investable assets in bonds. For purposes of this policy, bonds include all fixed-income securities,

	other than preferred stock, with a maturity at date of issue of greater than one year. The term "investable assets" refers to the Fund's net assets plus any borrowings for investment purposes. The Fund's investable assets will be less than its total assets to the extent that it has borrowed money for non-investment purposes, such as to meet anticipated redemptions. The Fund will provide 60 days' prior written notice to shareholders of a change in the 80% policy stated above. The Fund's investment subadviser allocates assets among different debt securities, including (but not limited to) U.S. Government securities, mortgage-related and asset-backed securities, corporate debt securities and foreign securities. The Fund may invest up to 50% of its investable assets in high risk, below investment-grade securities having a rating of not lower than CCC—also known as high-yield debt securities or junk bonds. The Fund may invest up to 45% of its investable assets in foreign debt securities. Some (but not all) of the U.S. Government securities and mortgage-related securities in which the Fund will invest are backed by the full faith and credit of the U.S.Government, which means that payment of interest and principal is guaranteed, but yield and market value are not. While we make every effort to achieve our objective, we can't guarantee success.
Carillon Reams Core Plus Bond Fund, 2017/11/20	Under normal circumstances, the fund invests at least 80% of its net assets in bonds of varying maturities, including mortgage- and asset-backed securities. Any change in this 80% policy approved by the Board may not take effect until shareholders have received written notice of the change at least sixty days before it occurs. The bonds in which the Fund may invest also include other fixed income instruments such as debt securities, to-be-announced securities and other similar instruments issued by various U.S. and non-U.S. public- or private-sector entities. The fund invests primarily in investment grade securities, but may also invest up to 25% of its assets in non-investment grade securities, also known as high yield securities or “junk” bonds. Investment grade securities include securities rated in one of the four highest rating categories by a nationally recognized statistical rating organization, such as BBB- or higher by Standard & Poor’s Financial Services LLC (“S&P®”). In addition, the fund may purchase or sell securities on a when-issued, delayed delivery or forward commitment basis. Securities will generally be U.S. dollar denominated although they may be securities of foreign issuers. The fund may also invest in securities denominated in foreign currencies. Mortgage-backed securities are pools of mortgage loans that are assembled as securities for sale to investors by various governmental, government-related and private organizations. Asset-backed securities are securities that are secured or “backed” by pools of various types of assets, such as automobile loans, consumer loans, credit cards and equipment leases, on which cash payments are due at fixed intervals over set periods of time.
AST Goldman Sachs Global Income, 2020/04/27	In pursuing its investment objective, the Portfolio normally invests at least 80% of its assets (net assets plus any borrowings for investment purposes) in a portfolio of fixed income instruments of US and foreign issuers (measured at the time of purchase). The Portfolio also enters into transactions in currencies (including foreign currencies), typically through the use of forward contracts and swap contracts to

	seek to enhance returns and to seek to hedge its portfolio against currency exchange rate fluctuations. The Portfolio also may invest in other derivatives for both investment and hedging purposes. Derivatives are instruments that have a value based on another instrument, exchange rate, interest rate or index. The Portfolio's investments in derivatives may include futures, swaps (including credit default, index, basis, total return, volatility, interest rate and currency swaps), to-be-announced contracts (TBAs), forward rate agreements (FRAs), repurchase agreements and options and currency forwards. The Portfolio may use derivatives instead of buying and selling bonds to manage duration, to gain exposure or to short individual securities or to gain exposure to a credit or asset backed index. The Portfolio may also employ money market instruments and affiliated mutual funds for cash management and asset allocations to specific sectors of the bond market. Under normal market conditions, the Portfolio invests at least 40% of its net assets plus any borrowings for investment purposes (measured at the time of purchase) in foreign securities. Foreign securities include securities of issuers located outside of the US or securities quoted or denominated in a currency other than the US dollar. The Portfolio is classified as non-diversified under the Investment Company Act of 1940, which means that it may invest a larger percentage of its assets in fewer issuers than a diversified mutual fund.
Vanguard New Jersey Long-Term Tax-Exempt Fund, 2020/03/27	The Fund invests primarily in high-quality municipal bonds issued by New Jersey state and local governments, as well as by regional governmental and public financing authorities. Under normal circumstances, at least 80% of the Fund's assets will be invested in securities whose income is exempt from federal and New Jersey state taxes. Although the Fund has no limitations on the maturities of individual securities, its dollar-weighted average maturity is expected to be between 10 and 25 years.
AST BlackRock/Loomis Sayles Bond, 2020/04/27	In pursuing its investment objective, the Portfolio normally invests at least 80% of its assets (net assets plus any borrowings made for investment purposes) in fixed income investments which may be represented by forwards or derivatives such as options, futures contracts, or swap agreements. In selecting fixed income securities, the subadvisers, BlackRock Financial Management, BlackRock International Limited, BlackRock (Singapore) Limited and Loomis, Sayles & Company, L.P., use economic forecasting, interest rate anticipation, credit and call risk analysis, foreign currency exchange rate forecasting, and other securities selection techniques. The proportion of the Portfolio's assets committed to investment in securities with particular characteristics (such as maturity, type and coupon rate) will vary based on the subadvisers' outlook for the US and foreign economies, the financial markets, and other factors. The management of duration (a measure of a fixed income security's expected life that incorporates its yield, coupon interest payments, final maturity and call features into one measure) is one of the tools used by the subadvisers.

Table A2. Expressions used to select mandate passages in group prospectuses

This table reports the search terms used to identify mandate passages within the 485APOS and 485BPOS group prospectuses. Minor variations in terms of spelling, capitalization, tense and singular/plural are also included in the searches, but are not separately designated in the table. Parentheses denote optional elements. Slashes denote that only one of the elements is required to occur. [*] denotes a wildcard. Qualifiers such as "normally", "typically" and "mainly" are allowed to occur in the mandate phrases".

Category	Search terms
Fund Terms	"we", "our", "fund", "portfolio", "trust", "(sub)adviser", "manager", "series", "strategy"
Action Terms	"invest", "buy", "hold", "maintain", "consider", "consist", "purchase", "allocate", "include", "define"
Mandate Phrases	"[%/percent/all/most] (or more) of (its/their/the fund's/the portfolio's/the series') (investable/total/net) [assets/income/value/portfolio]", "[at least/… …more than/less than/up to] [*] [%/percent]", "[fund/portfolio/trust/… …(sub)adviser/manager/series/strategy] [will/may/can/cannot/invests/… …consists/allocates/purchases/maintains/holds/buys/considers/defines/… …is (not) [permitted/allowed/restricted/limited]/does not]", "[fund/… …portfolio/trust/(sub)adviser/manager/series/strategy] [intends/seeks/… …attempts/tries/expects]", "[investment/portfolio/fund/operating/... …fundamental] [strategy/objective/goal/policy]"

Table A3. Expressions used to identify statements about credit quality, "boilerplate" disclosure, and stock indices

This table reports the search terms used to identify statements about credit quality, boilerplate disclosure, and stock indices. Minor variations in terms of spelling, capitalization, tense and singular/plural are also included in the searches, but are not separately designated in the table. Slashes denote that only one of the elements is required to occur.

Category	Search terms
Terms used to identify statements about credit quality	"credit quality", "credit risk", "rating", "rated", "upgraded", "downgraded", "nrsro", "nrsra", "investment grade", "high grade", "high yield", "junk", "speculative grade"
Terms used to identify boilerplate disclosure	"by consent of", "written request", "all of the information", "applicable laws", "laws and regulation", "under the terms of the", "pursuant to the requirements", "cannot assure", "no assurance", "the risk that", "regulated investment company", "pre-effective", "post-effective", "you should", "you may", "if you", "when you", "you are", "[could/may/can/to] lose money"
Terms used to identify statements about stock indexes	"stock market index", "stock price index", "stock index", "equity index"

Table A4. Fixed income fund categories and Lipper objective codes

This table reports the main fixed income mutual fund categories employed in the analysis of U.S. fixed income funds, along with the constitutive Lipper objective codes (from CRSP). Note that money market funds are not contained in our main sample; we use money market funds only in the sample underlying Table 3.

Fixed income fund category	Lipper objective codes
Corporate	A, BBB, BBBL, CV, HY, IID, SID, SII
Foreign	EMD, EML, GLI, INI, SWM
Mortgage-backed securities	ARM, GNM
Municipal	AL, AZ, CAG, CAI, CAS, CAT, CO, CT, FL, FLI, FLT, GA, GM, HI, HM, IMD, KS, KY, LA, MA, MAT, MD, MDI, MI, MN, MO, NC, NJ, NY, NYI, NYT, OH, OHT, OR, OSS, OST, OTH, PA, PAT, SC, SIM, SMD, SSIM, TN, TX, VA, VAT, WA
Other	ACF, CPB, FLX, GB, IUT, LP, MSI, SFI, STB, USO
Money market	CAM, CTM, IMM, ITE, ITM, IUS, MAM, MIM, MM, NJM, NYM, OHM, OTM, PAM, TEM, USS, UST

Table A5. Fixed income fund categories based on Morningstar Direct fund classifications

This table reports various fund classifications resulting from an aggregation of detailed Morningstar Direct classifications into coarser categories. The classifications are used to construct indicator variables of the same name which are used in the analyses in Tables 10 to 13.

Fixed income fund classification	Morningstar Direct classification
Category – corporate	Morningstar Category contains "Corporate"
Category – em. mkt.	Morningstar Categories contains "Emerging Market", "China", or "Emerging Europe"
Category – government	Morningstar Category contains "Government"
Category – ultra short-term	Morningstar Category contains "Ultra Short-Term"
Category – other	All other *Morningstar Categories* not listed above
Currency – euro	Base Currency is "Euro"
Currency – GBP	Base Currency is "Pound Sterling"
Currency – USD	Base Currency is "US Dollar"
Currency – other	All other *Base Currencies* is any other not listed above
Inv. area – global	Investment Area is "Global"
Inv. area – global em. mkt.	Investment Area is "Global Emerging Mkts"
Inv. area – USA	Investment Area is "United States of America"
Inv. area – Europe	Investment Area is "Euroland", "Europe", "Europe (North)", "Europe Emerging Mkts", "Belgium", "Czech Republic", "Greece", "Hungary", "Italy", "Denmark", "Norway", "Sweden", or "Switzerland"
Inv. area – other	All other *Investment Areas* is any other not listed above
Sales region – offshore	Region of Sale is "Pure Offshore"
Sales region – global	Region of Sale is "Global Cross-Border"
Sales region – Europe	Region of Sale is "European Cross-Border", "Italy", "Netherlands", or "Switzerland"
Sales region – other	*Region of Sale* is any other not listed above

Table B1. Proof of concept: ESG references in fixed income funds

This table reports the fraction of fixed income mutual funds mentioning "ESG"-related terms in their investment mandate (instances when the dummy variable *ESG* takes the value of one). The sample construction is described in Section 1.B in the main article.

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
ESG	0.003	0.003	0.004	0.004	0.007	0.009	0.010	0.015	0.022	0.067	0.136

Table B2. Security sales and investment mandates

This table reports summary statistics (Panel A) and coefficients for regression models for security sales by investment grade funds and high yield funds, compared to other fixed income funds (Panel B). Quarterly data on fixed income mutual funds' security holdings is from CRSP. Using the securities' CUSIPs, we add corporate bond ratings (for each security, we use the highest rating from S&P, Moody's, and/or Fitch) from Mergent-FISD; ratings reflect securities' credit risk at the end of the month in which the portfolio holdings are reported. For each fund portfolio and year, we add (using the EDGAR – CRSP linking file) information on ratings references in the funds' investment mandates from the 497K filings. *Sell* is an indicator variable that takes a value of one if a given security is included in a given portfolio in quarter *t* but is not in the portfolio in quarter *t+1*; it takes a value of zero otherwise. *Downgrade to HY* is a dummy variable that takes the value of one if a security is rated BBB- or higher in quarter *t* and it is rated BB+ or lower (including cases where the security becomes unrated) three months later. *HY fund* and *IG fund* are dummy variables indicating whether a fund primarily invests in high yield or investment grade securities, respectively (see Table 1 for a detailed definition). In the regression reported in Panel B, heteroskedasticity-robust standard errors, clustered by fund, are reported below the coefficients. * denotes estimates that are significantly different from zero at the 10% level, ** at the 5% level, and *** at the 1% level. The sample period is 2010 – 2018.

Panel A: Variables for the analysis of security sales

	Obs.	Mean	Std. Dev.
Sell	7,119,342	0.129	0.336
Downgrade to HY	7,119,342	0.004	0.065
HY fund	7,119,342	0.120	0.325
IG fund	7,119,342	0.108	0.310

Panel B: Regression analysis of security sales

Dependent variable:	Sell
Mean:	0.129
Downgrade to HY × HY fund	-0.354***
	(0.019)
Downgrade to HY × IG fund	0.095***
	(0.026)
Downgrade to HY	0.512***
	(0.013)
Fund F.E.	Yes
Security F.E.	Yes
Year-quarter F.E.	Yes
Observations	7,119,342
Adjusted R^2	0.119

Table B3. Security purchases and investment mandates

This table reports summary statistics (Panel A) and coefficients for regression models that study purchases of newly issued debt securities by investment grade funds and high yield funds, compared to other fixed income funds (Panel B). The sample consists of quarterly data on fixed income security issuances from Mergent /FISD. We include all security issuances that have a Moody's, S&P and/or Fitch credit rating in the quarter that they are issued. We match these securities to fund portfolios from CRSP and to our data on fund-specific summary prospectuses. *Buy* is an indicator variable that takes the value of one if a security that is issued in quarter *t* is included in a given fund's portfolio in quarter *t+1*. *HY security* is a dummy variable that indicates that the highest rating the security receives at issuance is BB+ or lower; we consider ratings by Moody's, S&P, and Fitch (or any subset of these raters). *HY fund* and *IG fund* are dummy variables indicating whether a fund primarily invests in high yield or investment grade securities, respectively (see Table 1 for a detailed definition). In the regression reported in Panel B, heteroskedasticity-robust standard errors, clustered by fund, are reported below the coefficients. * denotes estimates that are significantly different from zero at the 10% level, ** at the 5% level, and *** at the 1% level. The sample period is 2010 – 2018.

Panel A: Variables for the analysis of security purchases

	Obs.	Mean	Std. Dev.
Buy	34,925,173	0.012	0.107
HY security	34,925,173	0.170	0.376
HY fund	34,925,173	0.070	0.256
IG security	34,925,173	0.830	0.376
IG fund	34,925,173	0.126	0.332

Panel B: Regression analysis of security purchases

Dependent variable:	Buy
Mean:	0.012
HY security × HY fund	0.115***
	(0.007)
HY security × IG fund	-0.016***
	(0.002)
Fund F.E.	Yes
Security F.E.	Yes
Year-quarter F.E.	Yes
Observations	34,925,173
Adjusted R^2	0.071

Table C1. Trends in rating references, additional specifications (U.S. summary prospectus sample)

This table reports the coefficients for regression models estimating trends in rating references in U.S. fixed income fund investment mandates. The sample consists of summary prospectuses (filing type 497K) of fixed income mutual funds (defined using Lipper objective codes, see Table A4) over the years 2010 – 2020. *Linear trend* takes the value of 0 in the year 2010; it is 1 in 2011, 2 in 2012, 3 in 2013 etc. The remaining variables are defined in Table 1. Heteroskedasticity-robust standard errors, clustered by year, are reported below coefficients. * denotes estimates that are significantly different from zero at the 10% level, ** at the 5% level, and *** at the 1% level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		HY/IG			NRSRO			Letter rating	
Linear trend	0.006***	0.007***	0.003**	0.003***	0.002***	0.002***	0.005***	0.004***	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)
Category - foreign		-0.083***			-0.046***			-0.068***	
		(0.009)			(0.007)			(0.007)	
Category - other		-0.101***			-0.004			-0.102***	
		(0.002)			(0.006)			(0.007)	
Category - municipal		-0.109***			0.008			-0.034***	
		(0.003)			(0.006)			(0.006)	
Category - MBS		-0.865***			-0.194***			-0.217***	
		(0.008)			(0.009)			(0.009)	
Ln(Fund age)		-0.042***			-0.019***			-0.036***	
		(0.002)			(0.003)			(0.004)	
Retail		0.012*			0.002			-0.042***	
		(0.006)			(0.009)			(0.008)	
Institutional		-0.016**			-0.063***			-0.039***	
		(0.006)			(0.004)			(0.004)	
Index fund		-0.170***			-0.116***			-0.137***	
		(0.015)			(0.008)			(0.021)	
ETF		0.077***			0.035***			0.024	
		(0.011)			(0.009)			(0.015)	
Ln(Assets)		0.001	-0.003		0.006***	-0.002*		0.008***	-0.000

		(0.001)	(0.002)		(0.001)	(0.001)		(0.001)	(0.001)
Expense ratio		9.416***	1.234		-0.604	5.566***		3.302**	-4.036
		(0.940)	(2.328)		(1.018)	(1.267)		(1.354)	(3.605)
Fraction (HY/IG)		0.421***	0.218***						
		(0.017)	(0.015)						
Fraction (NRSRO)					0.866***	0.526***			
					(0.005)	(0.054)			
Fraction (Letter rating)								0.798***	0.374***
								(0.006)	(0.037)
Constant	0.848***	0.599***	0.686***	0.210***	0.108***	0.075***	0.397***	0.214***	0.304***
	(0.008)	(0.010)	(0.030)	(0.004)	(0.017)	(0.016)	(0.006)	(0.012)	(0.039)
Fund F.E.	No	No	Yes	No	No	Yes	No	No	Yes
Observations	19,304	16,284	16,299	19,304	16,284	16,299	19,304	16,284	16,299
Adjusted R^2	0.003	0.234	0.883	0.000	0.434	0.921	0.001	0.321	0.900

Table C2. Trends in rating references, additional specifications (U.S. group prospectus)

This table reports the coefficients for regression models estimating trends in rating references in mutual fund investment mandates contained in fund group prospectuses (filing type 485A/B). The sample period covers the years 1999 – 2020. The dependent variables (*HY/IG* and *NRSRO* in Panel A, and *Letter rating* in Panel B) are defined in Table 1. *Linear trend* takes the value of 0 in the year 1999; it is 1 in 2000, 2 in 2001, 3 in 2002 etc. *Linear trend (1999-2007)* takes the value of 0 in the year 1999, and in the years 2008 – 2020; it is 1 in 2000, 2 in 2001, 3 in 2002, …, and 8 in 2007. *Linear trend (2008-2020)* takes the value of 0 in the years 1999 – 2007; it is 9 in 2008, 10 in 2009, 11 in 2010, etc. The sample is based on a match between a fund group's CIK from the 485 filing to the CRSP Mutual Fund database using the CRSP-CIK linking file. The sample includes group prospectuses which contain at least one fund that is classified as a fixed income fund using Lipper objective codes. Heteroskedasticity-robust standard errors, clustered by year, are reported below coefficients. * denotes estimates that are significantly different from zero at the 10% level, ** at the 5% level, and *** at the 1% level.

Panel A: Trends—references to the investment grade threshold and to the term "NRSRO"

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	HY/IG (col. 1 - 4)				NRSRO (col. 5 - 8)			
Linear trend	0.006***	0.007***			0.009***	0.011***		
	(0.001)	(0.001)			(0.001)	(0.001)		
Linear trend (1999-2007)			0.008***	0.009***			0.007**	0.009***
			(0.002)	(0.001)			(0.003)	(0.002)
Linear trend (2008-2020)			0.006***	0.007***			0.009***	0.011***
			(0.001)	(0.001)			(0.001)	(0.001)
Constant	0.857***	0.845***	0.848***	0.838***	0.453***	0.434***	0.461***	0.442***
	(0.009)	(0.008)	(0.010)	(0.010)	(0.011)	(0.009)	(0.015)	(0.013)
Fund group F.E.	No	Yes	No	Yes	No	Yes	No	Yes
Observations	13,194	13,194	13,194	13,194	13,194	13,194	13,194	13,194
Adjusted R^2	0.017	0.471	0.017	0.471	0.014	0.612	0.014	0.612

Panel B: Trends—references to specific alphanumeric ratings

	(1)	(2)	(3)	(4)
	Letter rating			
Linear trend	-0.002***	-0.001		
	(0.001)	(0.001)		
Linear trend (1999-2007)			0.006***	0.006***
			(0.002)	(0.001)
Linear trend (2008-2020)			-0.001	0.000
			(0.001)	(0.000)
Constant	0.762***	0.747***	0.734***	0.726***
	(0.011)	(0.009)	(0.009)	(0.008)
Fund group F.E.	No	Yes	No	Yes
Observations	13,194	13,194	13,194	13,194
Adjusted R^2	0.001	0.587	0.002	0.587

Table C3. Trends in rating references, additional specifications (Luxembourg-domiciled funds)

This table reports regression models estimating trends in rating references in fixed income fund investment mandates of Luxembourg-domiciled funds. The sample consists of investment mandates contained in KIID filings collected from Morningstar Direct; the sample period is 2012 – 2021. We consider all European open-end fixed income funds that are domiciled in Luxembourg and which are available in Morningstar Direct as of mid-2021. For each fund with non-missing information on net assets and non-missing ISIN, we collect English-language KIID filings of the fund's largest share class. The following text-based variables are constructed using text in the 'Objectives and Investment Policy' section contained in the KIID documents. *HY/IG* is a dummy variable that is one if the mandate refers to terms that denote the investment grade threshold (such as "high yield", "speculative grade", or "investment grade"). *Letter rating* takes the value of one if the mandate refers to a specific alphanumeric credit rating, such as "A+." *Linear trend* is 0 for the year 2012; it is 1 for 2013, 2 for 2014, etc. Specifications 2 and 4 include the additional control variables, the coefficients of which are not reported to conserve space (the variables used are identical to those employed in the regressions reported in Table 10). *Ln(Assets)* is the natural logarithm of the fund portfolio's total net assets (in million Swedish Kronor). *Ln(fund age)* is the natural logarithm of one plus the fund's age; a fund's age is the difference between the KIID-filing year and the inception year of the fund. *Currency - …*, *Sales region - …*, *Inv. Area - …*, and *Category - …* are indicator variables for various fund classifications according to Morningstar; see Table A5 for details. These variables are based on information from the Morningstar Direct database as of mid-2021. Heteroskedasticity-robust standard errors, clustered by year, are reported below coefficients. * denotes estimates that are significantly different from zero at the 10% level, ** at the 5% level, and *** at the 1% level.

	(1)	(2)	(3)	(4)	(5)	(6)
		HY/IG			Letter rating	
Linear trend	0.026***	0.030***	0.018***	0.007***	0.007***	0.004**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	0.354***	0.421***	0.400***	0.193***	0.238***	0.212***
	(0.006)	(0.022)	(0.006)	(0.007)	(0.018)	(0.006)
Additional controls	No	Yes	No	No	Yes	No
Fund F.E.	No	No	Yes	No	No	Yes
Observations	12,382	12,207	12,382	12,382	12,207	12,382
Adjusted R^2	0.019	0.100	0.818	0.002	0.038	0.868

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