

Internet Appendix:

Corporate Pension Risk-Taking in a Low Interest Rate Environment

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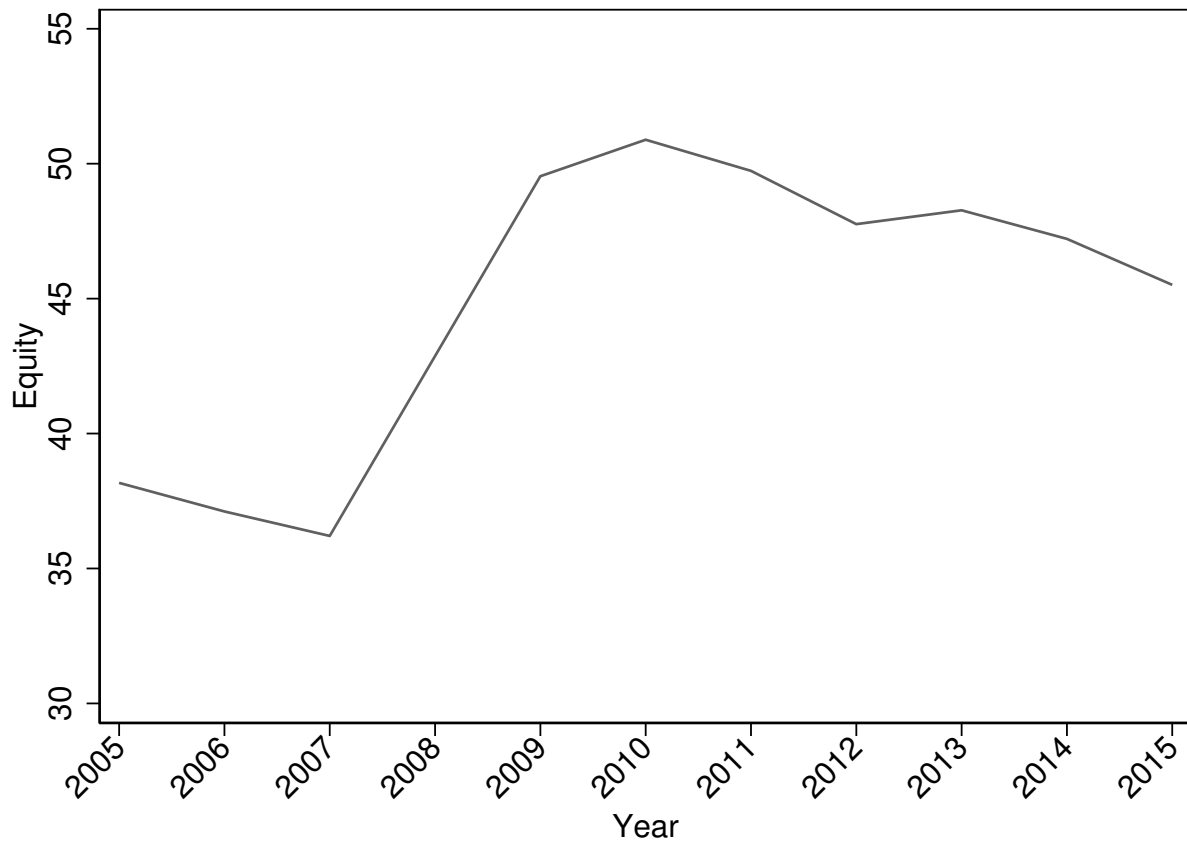


Figure IA1. Average Share of Equity Over Time

This figure reports the average equity share (i.e., fraction of assets invested in equity, in percentage points) of US corporate DB pensions between 2005 and 2015. Data is retrieved from Schedule H (before 2009) and Schedule R (since 2009) of the Form 5500 Annual Report dataset.

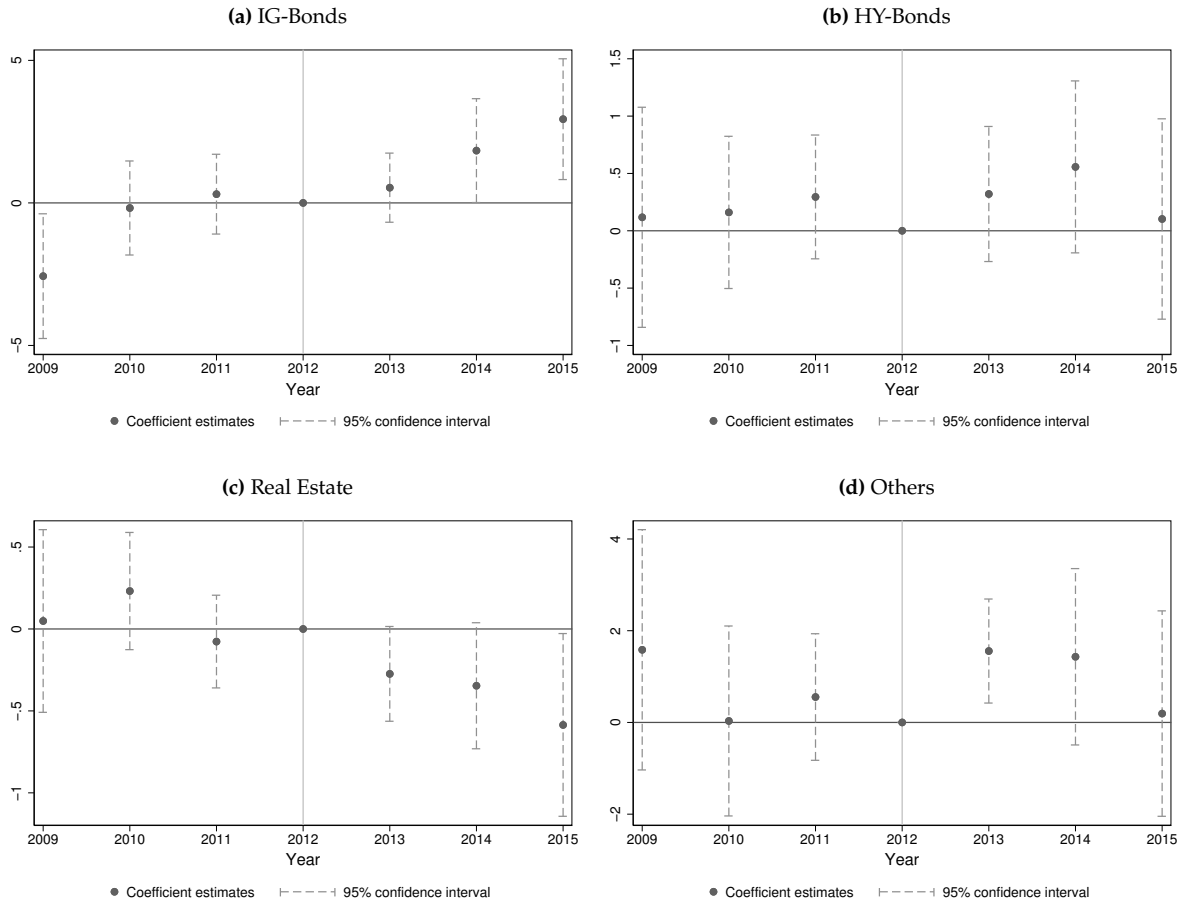


Figure IA2. Dynamic DiD for Bunchers: Other Asset Classes

The figure reports estimated DiD coefficients (and their 95% confidence intervals) of a dynamic specification of Equation (2) in the paper, where the dummy variable $Post_t$ is replaced with separate dummy variables for each year from three years before to three years after MAP-21. The dependent variables are IG-Bonds, HY-Bonds, Real Estate, and Others (i.e., the share of assets invested in each of these asset classes). Every point estimate, represented by a dot, measures the difference in Equity share between the treatment and control group in a year relative to 2012. The sample consists only of pension funds with 2011-FTAPs in the interval [80%, 85%], which we refer to as 'bunchers'. The treatment (control) group includes DB plans experiencing above (below) median increases in funding status from MAP-21, where the increase in funding status of a DB plan is measured by $Assets_{2011}/Liabilities_{2012} - Assets_{2011}/Liabilities_{2011}$, Equation (1) in the paper, that keeps the value of assets fixed at 2011 and only captures the liability-induced change in funding status. Standard errors are corrected for heteroskedasticity and clustered at the pension plan level.

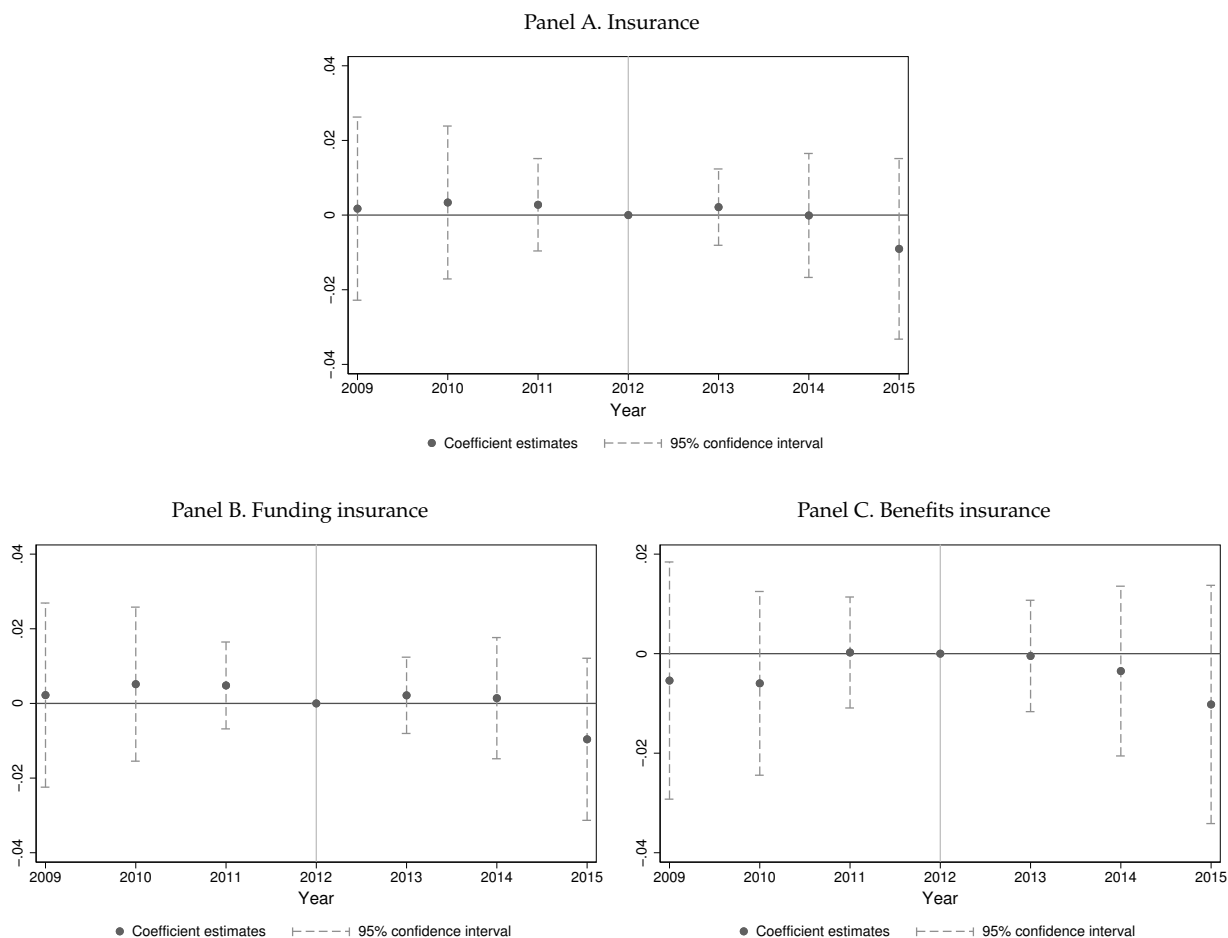


Figure IA3. Dynamic DiD by Type of Insurance

The figure reports estimated DiD coefficients (and their 95% confidence intervals) of a dynamic specification of Equation (2), where the dummy variable $Post_t$ is replaced with separate dummy variables for each year from three years before to three years after MAP-21. The dependent variable is an indicator variable that equals to one if the pension plan is covered by a funding or benefits insurance contracts (Panel A), only funding insurance contracts (Panel B), or only benefits insurance contracts (Panel C), and zero otherwise. The information is retrieved from Schedule A of the Form 5500 Annual Report dataset maintained by the U.S. Department of Labor. The sample consists of DB pension plans with 2011-FTAPs in [80%, 85%]. The corresponding treatment (control) group includes DB plans experiencing above (below)-median increases in funding status from MAP-21, where the increase in funding status of a DB plan is measured by $Assets_{2011}/Liabilities_{2012} - Assets_{2011}/Liabilities_{2011}$, Equation (1), which keeps the value of assets fixed at 2011 and only captures the liability-induced change in funding status. All specifications include pension plan fixed effects and industry-year fixed effects, based on sponsor firms' 3-digit NAICS code. Standard errors are corrected for heteroskedasticity and clustered at the pension plan level. Variable definitions are available in Appendix Table A1.

Table IA1. Robustness: Changes in the Asset Allocations of Bunchers after MAP-21

This table reports estimation results of Equation (2) of the paper. In Panel A, the sample includes only plans with 2011-FTAPs in [80%, 85%], which we refer to as the *bunchers* and excludes plans with a common sponsor firm. In Panel B, we use our baseline sample of plans with 2011-FTAPs in [80%, 85%] and cluster standard errors at the sponsor level. The dependent variable for each specification is the share of assets invested in each asset class: equity (column 1), investment-grade (IG) bonds (column 2), high-yield (HY) bonds (column 3), real estate (column 4), and others (column 5). The dummy variable High-Relief equals one if a plan experienced an above-median increase in its FTAP from MAP-21, and zero otherwise. The increase in a plan's FTAP is measured by $Assets_{2011}/Liabilities_{2012} - Assets_{2011}/Liabilities_{2011}$, which keeps the value of assets fixed at 2011 and only captures the liability-induced changes in FTAP. The dummy variable Post equals one after 2012 (i.e., the year MAP-21 was enacted), and zero otherwise. The event window for estimation is three years before and three years after MAP-21, where the event year (2012) is excluded. All specifications include pension plan and industry-year fixed effects, based on sponsor firms' 3-digit NAICS code. Standard errors, corrected for heteroskedasticity and clustered at the pension plan (in Panel A) and sponsor (in Panel B) level, are reported in parentheses below the estimated coefficients. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively. Variable definitions are available in Appendix Table A1.

	(1)	(2)	(3)	(4)	(5)
Panel A: Excluding common sponsor firms					
	Equity share	IG-Bonds	HY-Bonds	Real Estate	Others
High-Relief × Post	-2.121** (1.058)	2.752*** (1.047)	-0.084 (0.366)	-0.467* (0.256)	-0.125 (0.986)
Plan FE	Yes	Yes	Yes	Yes	Yes
Industry-by-Year FE	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.624	0.619	0.453	0.538	0.650
Obs.	4,871	4,871	3,717	3,378	4,389
Num. plans	871	871	765	722	834
Panel B: Clustering at sponsor level					
	Equity share	IG-Bonds	HY-Bonds	Real Estate	Others
High-Relief × Post	-2.813*** (0.984)	2.614*** (0.935)	-0.010 (0.336)	-0.412* (0.234)	0.634 (0.944)
Plan FE	Yes	Yes	Yes	Yes	Yes
Industry-by-Year FE	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.645	0.632	0.434	0.563	0.647
Obs.	5,826	5,826	4,556	4,180	5,263
Num. cluster	933	933	827	784	895

Table IA2. Robustness Test: Equity Share and Funding Status

The table presents the results of estimating a panel regression model that examines the relationship between pension plans' equity share and their FTAPs. The model specifications are based on [Rauh \(2009\)](#). The sample period covers 1990 to 2007 and includes exclusively those pension plans that are present in our baseline sample period from 2009 to 2015. This selection ensures that the observed sign flip in the later period is not due to changes in sample composition caused by plans leaving the sample. All specifications include pension plan and year fixed effects. Pension assets are reported in billions of USD. Robust standard errors, clustered at the pension plan level, are reported in parentheses. Significance levels are indicated by ***, **, and *, corresponding to the 1%, 5%, and 10% levels, respectively. Variable definitions are available in Appendix Table [A1](#).

	(1)	(2)	(3)
	Sample period: [1990-2007]		
	Equity share		
FTAP	0.054*** (0.011)	0.058*** (0.012)	0.035** (0.014)
Active employee share		-0.235 (2.345)	-0.748 (2.481)
Pension assets (bn)		-5.309*** (1.804)	-5.481*** (1.971)
Log(Pension assets)		-0.017 (0.962)	-0.185 (1.061)
Lag (Investment return)			18.392*** (2.226)
Adj. R^2	0.616	0.617	0.631
Obs.	16,887	16,827	15,041
Num. plans	1,757	1,755	1,683

Table IA3. Robustness Tests: Narrower FTAP Range to Define Bunchers

This table reports robustness analysis of Equation (2) for bunchers' with above vs. below median increase in funding status using narrower windows above the 80% threshold i.e., with 2011-FTAPs in [80%, 84%], [80%, 83%], and [80%, 82%], respectively. The dependent variable in all specifications is the share of assets invested equities. The dummy variable High-Relief equals one if a plan experienced an above-median increase in its FTAP from MAP-21, and zero otherwise. The increase in a plan's FTAP is measured by $Assets_{2011}/Liabilities_{2012} - Assets_{2011}/Liabilities_{2011}$, Equation (1), which keeps the value of assets fixed at 2011 and only captures the liability-induced changes in FTAP. The dummy variable Post equals one after 2012 (i.e., the year MAP-21 was enacted), and zero otherwise. The event window for estimation is three years before and three years after MAP-21, where the event year (2012) is excluded. All specifications include pension plan and industry-year fixed effects, based on sponsor firms' 3-digit NAICS code. Standard errors, corrected for heteroskedasticity and clustered at the pension plan level, are reported in parentheses below the estimated coefficients. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively. Variable definitions are available in Appendix Table A1.

	(1)	(2)	(3)
	Dep. Var.: Equity share		
	[80%, 84%]	[80%, 83%]	[80%, 82%]
High-Relief $\times$ Post	-2.537** (0.995)	-2.468** (1.040)	-2.394** (1.088)
Industry-by-year FE	Yes	Yes	Yes
Plan FE	Yes	Yes	Yes
Adj. R^2	0.653	0.655	0.673
Obs.	5,409	4,963	4,458
Num. plans	967	888	795

Table IA4. Pension Plans Characteristics After Matching: Treated vs. Control Group

This table compares the characteristics of pension plans that experienced an above-median increase in their FTAPs from MAP-21 (High-Relief = 1) with those that saw a below-median increase (High-Relief = 0) after the propensity score matching. All plan and sponsor firm characteristics are as of 2011 (i.e., the year prior to MAP-21) and are winsorized at the 1st and 99th percentiles. Columns (3) reports the differences in the average values of the two groups and indicates whether they are statistically different from zero. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Variable definitions are available in Appendix Table A1.

	(1)		(2)		(3)
	High-Relief = 1 (Treated)		High-Relief = 0 (Control)		Diff.
	Mean	Std. Dev.	Mean	Std. Dev.	(1) - (2)
FTAP ratio (%)	81.003	1.434	80.914	1.309	0.088
Equity share (%)	50.346	17.298	51.815	17.653	-1.468
Log(Pension assets)	18.914	1.409	18.925	1.293	-0.012
Total participants (K)	11.913	35.508	10.740	24.487	1.173
Frozen	0.315	0.465	0.298	0.458	0.017
Active employee share	0.339	0.181	0.333	0.175	0.005

Table IA5. Robustness: Cross-sectional heterogeneity

This table reports estimation results for an augmented version of Equation (3), allowing for interactions with pension plan or sponsor characteristics, Z . The sample only includes plans with 2011-FTAPs in [80%, 85%], i.e., the *bunchers*. The dependent variable for each specification is Equity share (i.e., the share of assets invested in equity). The dummy variable High-Relief equals one for pension plans with an above-median increase in funding status from MAP-21, and zero otherwise. The increase in funding status of a DB plan is measured by $Assets_{2011}/Liabilities_{2012} - Assets_{2011}/Liabilities_{2011}$, Equation (1), which keeps the value of assets fixed at 2011 and only captures the liability-induced change in funding status. The dummy variable Post equals one after 2012 (i.e., the year MAP-21 was enacted), and zero otherwise. The event window for estimation is three years before and three years after MAP-21, with the event year (2012) excluded. To facilitate the interpretation of the estimated coefficients and avoid simultaneity problems, all interaction variables, $Z_{i,2011}$, are defined as dummy variables based on the median value of the characteristic in 2011. The variable Bargaining is dichotomous (1/0) by design. Therefore, we set it to its 2011 value. Column (1) sorts plans based on the ratio between pension and sponsor firm asset values. Column (2) sorts plans based on the ratio between mandatory contributions towards the plan and the sponsor net income. Column (3) sorts plans based on whether contributions and/or benefits to the plan are subject to a collective bargaining process. All specifications include pension plan and industry-year fixed effects, based on sponsor firms' 3-digit NAICS code. Standard errors, corrected for heteroskedasticity and clustered at the pension plan level, are reported in parentheses below the estimated coefficients. ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively. Variable definitions are available in Appendix Table A1.

	(1)	(2)	(3)
	Dependent variable: Equity share		
$Z_{i,2011}$:	Plan/sponsor size	Contr./Net-income	Bargaining
High-Relief $\times$ Post $\times Z_{i,2011}$	0.530 (3.348)	-2.961 (3.473)	3.832 (3.692)
High-Relief $\times$ Post	-1.390 (2.508)	0.330 (2.441)	-2.527 (2.137)
Post $\times Z_{i,2011}$	-4.459* (2.274)	-0.279 (2.324)	-4.370* (2.357)
Plan FE	Yes	Yes	Yes
Industry-by-year FE	Yes	Yes	Yes
Adj. R^2	0.726	0.725	0.725
Obs.	2,266	2,210	2,266
Num. plans	317	311	317

Table IA6. Robustness Tests - DiD Results for Funding and Benefit Insurance Contracts

The table presents estimates for the model specified in Equation (2), where the dependent variable is an indicator capturing the purchase of either funding or benefits insurance by the DB corporate pension plans in our sample. The information is retrieved from Schedule A of the Form 5500 Annual Report dataset maintained by the U.S. Department of Labor. We analyze pension plans we categorize as ‘*bunchers*’, which refers to plans whose funding status in 2011 falls between 80% and 85%. This model compares the purchase of insurance by plans above versus below the median increase in funding status following the introduction of MAP-21. The dummy variable High-Relief equals one for pension plans with an above-median increase in funding status, and zero otherwise. The increase in funding status of a DB plan is measured by $Assets_{2011}/Liabilities_{2012} - Assets_{2011}/Liabilities_{2011}$, Equation (1), which keeps the value of assets fixed at 2011 and only captures the liability-induced change in funding status. The dummy variable Post equals one after 2012 (i.e., the year MAP-21 was enacted), and zero otherwise. The event window for estimation spans three years before and three years after MAP-21, excluding the event year (2012). All specifications include pension plan fixed effects and industry-by-year fixed effects, based on sponsor firms’ 3-digit NAICS code. Standard errors, corrected for heteroskedasticity and clustered at the pension plan level, are reported in parentheses below the estimated coefficients. Significance levels are denoted by ***, **, and * for significance at the 1%, 5%, and 10% levels, respectively. Variable definitions are available in Appendix Table A1.

	(1)	(2)
	Funding insurance	Benefits insurance
High-Relief × Post	-0.006 (0.010)	-0.001 (0.010)
Industry-by-year FE	Yes	Yes
Plan FE	Yes	Yes
Adj. R^2	0.918	0.916
Obs.	6,075	6,075
Num. plans	1,080	1,080