Global Life Insurers During a Low-Interest Environment

By Ralph S.J. Koijen and Motohiro Yogo*

The traditional role of life insurers is to insure idiosyncratic mortality and longevity risks. Over time, the business model of life insurance companies has changed due to the growth in insurance products with minimum return guarantees. Examples include variable annuities in the United States and profit participation products in Europe. The growing demand for such products in part is driven by the decline in defined benefit pension plans.

Insurance products with minimum return guarantees require life insurers to use complex financial engineering to determine the price and to hedge the risks (Koijen and Yogo, 2021). It can leave life insurers exposed to interest risk if they do not sufficiently increase the maturity of their bond portfolio or use derivatives to offset the negative duration and the negative convexity from variable annuities. Life insurers are also exposed to long-run volatility risk, which is difficult to hedge with traded options that are short term.

The resulting fragility was first on display during the global financial crisis (McDonald and Paulson, 2014; Koijen and Yogo, 2017). The balance sheets of life insurance insurers remain stressed in the aftermath of the financial crisis due to the low-interest environment that followed.

In this paper, we provide new evidence on the fragility of the life insurance sector along three key dimensions. First, we study European life insurers to complement the evidence on US life insurers. In particular, Koijen and Yogo (2021) document that equity prices of life insurers are significantly exposed to changes in interest rates following the global financial crisis, while the interest rate exposure was insignificant before then. We find a similar change in interest rate exposures for European life insurers, and the sensitivity to interest rates increases following the European sovereign debt crisis.

Second, we show that fragility at the insurer level is highly persistent. We compare the decline in equity prices during the global financial crisis and the COVID-19 crisis. For European insurers, we also study the European sovereign debt crisis. We find that the relative decline in equity prices is similar across these crisis periods.

Third, we relate the decline in equity prices during the COVID-19 pandemic to the riskiness of the liabilities as measured by the share of liabilities that have minimum return guarantees, and find a strong correlation across insurers.

I. Data

For US life insurers, we use data on stock returns of variable annuity insurers. The data construction is described in Koijen and Yogo (2022a). For European insurers, we use daily stock returns from Compustat Global. We use daily data from Morningstar Direct for the returns on the S&P Europe 350 index, which we use as the market index. For interest rates, we use the Euro yield curves based on AAA-rated Euro area central government bonds from Eurostat. We convert the spot yield curves to returns on 10-year bonds.

We complement the financial market data with information on the liabilities struc-

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Table 1—The Exposure of Equity Prices of European Insurers to Interest Rates

	2005-2019	2005-2007	2010-2019	2014-2019	2017-2019
S&P Europe 350	1.31	1.33	1.14	0.99	0.99
	(0.06)	(0.15)	(0.07)	(0.08)	(0.11)
10-yr bond return	-0.06	0.05	-0.52	-0.64	-0.78
	(0.17)	(0.26)	(0.18)	(0.21)	(0.31)
alpha (%)	0.05	-0.30	0.49	0.59	0.52
	(0.27)	(0.43)	(0.28)	(0.28)	(0.35)
Number of obs.	183	38	120	72	36
R^2	0.71	0.72	0.70	0.71	0.73

ture of European insurers. We use template S.12.01.02 to compute the ratio of insurance with profit participation relative to an insurer's total life and health liabilities. These products typically come with minimum return guarantees and thus measure the riskiness of the liabilities to aggregate market risks. We use the 2016 filing in our analysis, which is well before the COVID-19 crisis. For each insurance group, we aggregate the liabilities of the subsidiaries before computing the ratio.

To select our sample of European insurers, we start from the insurance groups included in the 2014 and 2018 stress test reports of EIOPA. This gives 31 groups in 2014 and 42 groups in 2018, and 52 unique groups in total out of which 34 companies are publicly listed. Several of the life insurers are part of broader financial conglomerates such as banks. To focus on insurers, we restrict attention to companies with GICS sub-industry 40301020 ("Life and Health Insurance") and 40301030 ("Multi-line Insurance"). This leads to our final sample of 23 insurance groups.

II. Interest-Risk Mismatch

We first explore how the interest rate exposure of insurers' equity returns has changed since the financial crisis. This analysis extends Paulson et al. (2012), who study the equity risks of US life insurers before and after the global financial crisis. They find that, while the interest rate exposure is small before the crisis, it increases significantly thereafter. This change in risk exposures cannot be seen in the UK, where minimum return guarantees are much less prominent (Sen and Humphry, 2020) or in property and casualty (P&C) insurers.

In Koijen and Yogo (2021), we update this evidence for US life insurers, focusing on variable annuity insurers. We consider a regression of the form:

$$(1)\quad R_{pt} = \alpha_i + \beta_m R_{mt} + \beta_b R_{bt} + \epsilon_{it},$$

where R_{pt} is the value-weighted return on a portfolio of variable annuity insurers, R_{mt} is the return on the aggregate stock market, and R_{bt} is the return on a 10-year bond.

We find that the bond beta, β_b, is insignificant for the period from 1999 to 2007, but it turns significantly negative with a point estimate of -1.28 for the period from 2010 to 2017. It implies that a 1% decline in the 10-year bond yield implies approximately a 12.8% decline in the returns of variable annuity insurers.

We now extend this evidence by focusing on European insurers. In Table 1, we report the estimates for different sample periods using a portfolio of European life insurers.

The first column presents the results for the sample from 2005 to 2019. During this long period, the bond beta is economically and statistically insignificant. However, this masks a shift in risk exposures. For the period from 2005 to 2007 (the second column), the bond return beta is slightly positive and again insignificant.

Following the global financial crisis, however, the bond beta turns significantly negative. The point estimate equals -0.52 for period from 2010 to 2019, -0.64 for the period from 2014 to 2019, and -0.78 for the

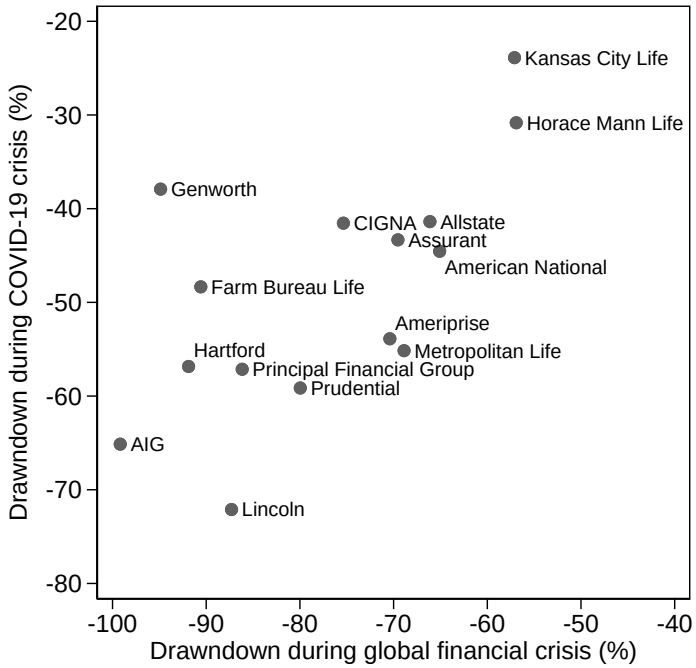

FIGURE 1. EQUITY DRAWDOWNS OF US LIFE INSURERS DURING THE 2008 FINANCIAL CRISIS AND THE COVID-19 CRISIS

period from 2017–2019 as can be seen from the last three columns. In the most recent period, a 1% decline in the 10-year bond yield implies approximately a 7.8% decline in the equity prices of life insurers.

Hence, during the low-interest environment following the European sovereign debt crisis, which is in part driven by the European Central Bank's (ECB) asset purchase program (Koijen et al., 2021), the equity prices of life insurance companies have become more sensitive to movements in interest rates.

This fact mirrors the evidence from the United States, although the bond beta in Europe is slightly less extreme (-0.78 versus -1.28).

There are at least two ways to interpret this evidence. First, the equity exposure to interest rates may reflect the fact that the duration of the assets is much shorter than the duration of the liabilities. Insurers may not be able to fully hedge because the minimum return guarantees have longer maturities than traded options, which is central to their financial engineering challenge.

Second, it may reflect the fact that the demand for insurance products with minimum return guarantees shifts in response to lower rates as such products become more expensive or less generous. In this case, the equity exposure reflects the sensitivity of future underwriting profits to interest rates.

While we cannot separate both explanations using publicly available data, European insurance regulators can because insurers are required to report the duration and convexity of assets and liabilities to the insurance supervisors as part of the Solvency II framework.

III. The Persistence in Fragility

Life insurance products with minimum return guarantees tend to have long maturities as such products are typically used as savings vehicles before and during retirement. This implies that the risks remain on insurers' balance sheets for long periods of time, in particular during periods of low

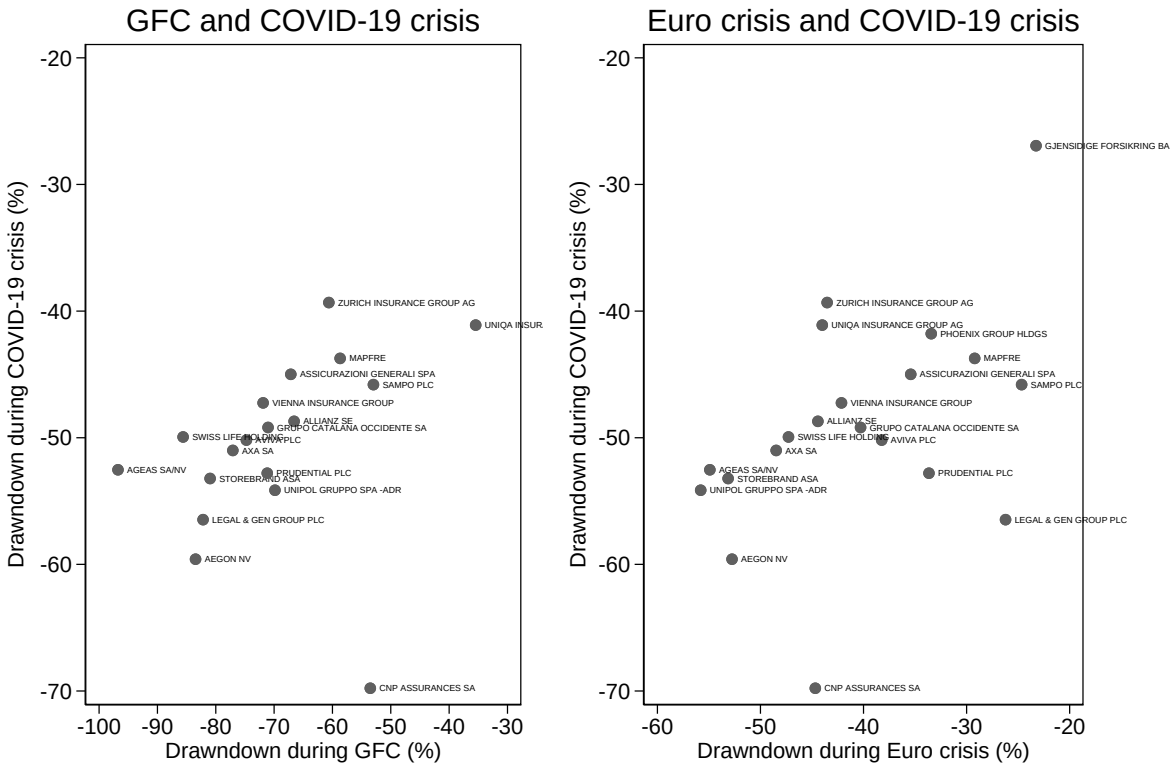

Figure 2. Equity Drawdowns of European Life Insurers During the 2008 Financial Crisis and the COVID-19 Crisis (left panel) and During the European Sovereign Debt Crisis and the COVID-19 Crisis (right panel)

interest rates.

In this section, we demonstrate the persistence in fragility during the three major events in our sample: the global financial crisis, the COVID-19 crisis, and, in case of the European insurers, the 2011 European sovereign debt crisis.

In Figure 1, we study the drawdown in equity prices for US life insurers during the global financial crisis (on the horizontal axis) and the COVID-19 crisis (on the vertical axis). The drawdown is measured as the cumulative decline in an insurer's stock price from its peak to the bottom. We find a strong correlation between the drawdowns across the periods. The correlation equals 0.64.

In the left panel of Figure 2, we repeat this analysis for the European insurance companies. As for the US insurers, we find that the same insurers that experienced large declines in their stock prices during the global financial crisis saw their stock prices drop relatively more during the COVID-19 crisis. The correlation is 0.32.

For the European insurers, we can also study the impact of the European sovereign debt crisis. Even though these events affected peripheral countries (e.g., Greece, Italy, Spain, and Portugal) more than the core countries, we find a similarly strong correlation across drawdowns. The correlation is 0.48.

The evidence presented thus far does not yet connect the drawdowns to risks in the liabilities or to the importance of minimum return guarantees.

In Koijen and Yogo (2021), we show that the nine insurers who experienced the largest drawdowns during the COVID-19

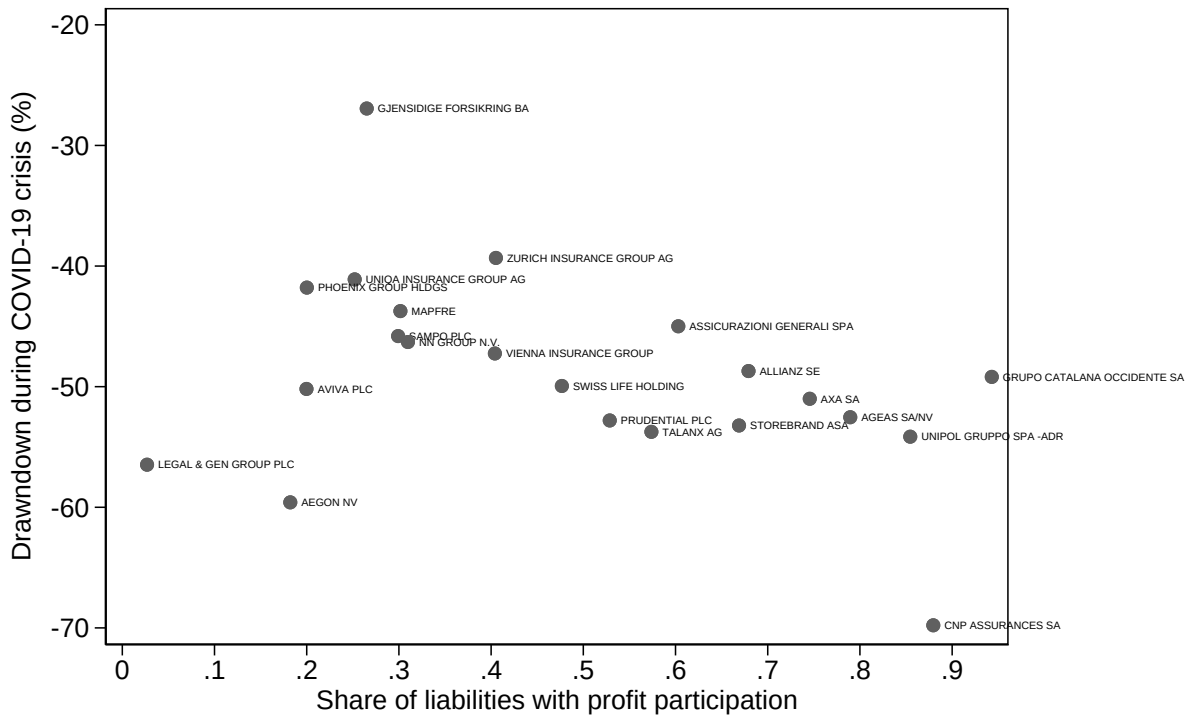

Figure 3. The Fraction of Liabilities in Insurance Products with Profit Participation and Equity Drawdowns of US Life Insurers During the COVID-19 Crisis

pandemic, which is more than a decade after the global financial crisis, are also the nine largest variable annuity insurers.

We now provide a direct connection between products with minimum return guarantees in Europe and equity drawdowns during the COVID-19 crisis.

In Figure 3, we plot the share of life and health liabilities with profit participation in 2016 on the horizontal axis. We choose 2016, which is the first year for which these data are available, as it is exogenous to the COVID-19 pandemic given the timing. On the vertical axis, we plot the drawdown during the pandemic.

We find that the drawdowns are strongly negatively correlated with the share of life insurance products with profit participation. The correlation is -0.38.

While these are correlations, the evidence from US and European life insurers combined suggests a strong link between the structure of the liabilities and in particular those with minimum return guarantees, the low-rate environment, and the fragility of the global life insurance sector.

IV. Broader Implications

We conclude by discussing some of the broader implications of our findings. First, an active literature explores how financial frictions and flows during times of stress can impact asset prices and real economic activity. Most of this literature focuses on fairly short-lived episodes during which there are large outflows or binding constraints, and the resulting fire sales stresses financial markets (Haddad et al., 2021; He et al., 2021, forthcoming; Ma et al., 2021, forthcoming).

What is unique about the life insurance sector is that the products offered by life insurers have long maturities that can span decades. Paired with the low-rate environment, financial constraints can bind for long periods of time. A series of papers shows how financial constraints affect the asset demand of insurers (Ellul et al., 2011, 2015;

Ge and Weisbach, 2020). As insurers are among the largest investors in various fixed income markets, such constraints can affect asset prices, and therefore firms' cost of capital, for an extended period of time.

Second, while traditional insurers have fared well during economic downturns, this is no longer the case. During the last three major events, life insurance companies experienced significant stress. This calls for a new theory in which financial and regulatory constraints play a prominent role.

In Koijen and Yogo (2022b), we develop such a theory and use it to study insurance prices, contract design, reinsurance decisions, and asset allocation. However, much more work is needed to understand the life insurance sector and its role in the broader economy.

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