DOES DISTRIBUTION GROWTH AFFECT THE INSURERS' ASSET ALLOCATION IN LIFE INSURANCE? THE CASE OF CENTRAL EUROPE*

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Abstract

This paper deals with the effects of distribution stress and macroeconomic factors on the composition of life insurance investment portfolios on the Central European market. Using a wide array of variables and the VAR model as our main method, we have found that a strong majority of insurers react to external shocks, induced by high levels of contract turnover or positive changes in macro-variables such as GDP and inflation, by strengthening bond components of their portfolio. The exception is connected to interest rates (two-week repo), which presumably have a negative effect on bond investments. Other components such as shares, funds and cash positions have been affected in a diverse way, yet to a minor extent. This implies that insurers tend to react to external stressors by beefing up the conservative part of their investments, potentially leading to an underperformance of managed assets. As such, our results point to conceivable regulatory implications, which would prevent those secondary negative detriments of life distribution growth (*i.e.*, reselling), which are to be expected on the surveyed market.

Keywords: Life insurance, life investments, distribution growth, insurance reselling, macroeconomic factors

JEL Classification: G11, G22, C32

1. Introduction

Insurance companies, specifically in the field of life insurance, remain one of the principal institutional investors on the capital market. According to EIOPA Insurance statistics (EIOPA 2018), the European insurance sector (EEA) had in 2017 invested a total amount of 8.38 trillion EUR of life insurance-related assets, accounting to more than 41% of the area's annual GDP. Because of that, substantial efforts have been made in order to disseminate factors that influence the insurers' investment policy. There is wide agreement

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that this policy is determined by regulatory measures (Becker, 2016; Bijapur *et al*., 2012) and influenced by macroeconomic factors – most notably interest rates (Briys and de Varenne, 1995; Berends *et al*., 2012), but also possibly by the output or inflation rate (Gründl *et al*., 2016). Aside from these two dominant areas, little knowledge has been gained about other influences, mainly of the distribution-related factors. While research has already mapped how distribution channels affect general business efficiency of insurers (Klumpes, 2004; Chen and Lai, 2010), there is no empirical analysis describing how they translate into the institutional investors' role. The single distant exemption might be Bikker and van Leuvensteijn's (2008) paper, which, however, provides only a loose evaluation of the connection between market competition and the insurers' economy. Otherwise, evidence is missing.

The object of our analysis, the Czech life insurance sector, represents a typical example of a Central European market, in many regards dissimilar to its Western counterparts. The field of life insurance is generally smaller than in the West, with its total 11.2 billion EUR of investment assets accounting for just about 5.7% of the country's nominal GDP (CNB, 2018). It is being operated by a total number of 6 life and 14 composite insurers as of 2018, who had to endure similar macroeconomic challenges in recent decades, including the great recession and the subsequent era of near-zero interest rates and expansive monetary policy (Daňhel and Ducháčková, 2012). Although found resilient in the supervisory stress-testing (CNB, 2017), it had to undergo significant turbulences related to distribution channels at the same time. Beginning with a steep increase in new contracts and premiums in 2010–2012, new business expansion was debunked by a steep increase in lapses and surrenders beginning in the same period and lasting to the very present day. This unfavourable development, arguably, results from qualitative issues incorporated in past rapid sales (Jedlička, 2015), inflicting significant distribution-induced stress. How did these factors influence the sector's investment policy over the years? Was the insurers' reaction as strong as or even stronger than to the well-known macro challenges?

This paper seeks to find answers to the questions outlined above. Its objective is to determine the effect of selected distribution and macroeconomic factors on investment behaviour of Czech life insurers. Our main working hypothesis, following the literature analysis, is that under stressful conditions, insurance companies will tend to make their portfolios more conservative. The results will be phenotypical in many regards to other CEE markets such as Slovakia, Hungary or Poland, which have undergone similar developments. In order to achieve the said goal, the paper is divided into three sections. In the first part, our structural model and its individual components are defined, along with data sources. Then, the VAR along with a (structured) vector error correction (VEC/SVEC) model, followed by the orthogonal impulse-reaction method, is used to determine the size of individual effects on the composition of the Czech insurers' portfolio. Finally, results of the analysis are discussed and macro-prudential implications highlighted.

2. Data

For our analysis, we have gathered quarterly data on Czech life insurance[1] undertakings ranging from Q1 2009 to Q2 2018 (total number of 38 items). All in all, 9 variables are included, falling into three distinctive categories: (i) main components of the insurers' investment assets, (ii) data on life insurance distribution and (iii) principal macro variables. A detailed overview is provided in Table 1.

Table 1: Overview of model variables

Variable	Abbre-vation	Denomi-nation	Description*	Data source
Share of total life insurance investments				
Bond investments	*BOND*	%	Government bonds, Corporate bonds	CNB (2018)
Share investments	*SHARE*	%	Share investments, excluding investment funds	CNB (2018)
Investment funds[1]	*FUNDS*	%	Inv. funds of all classes	CNB (2018)
Cash and deposits	*DEPO*	%	Investments held in cash and deposits of all kinds	CNB (2018)
Distribution activity				
New contracts	*NEWC*	pieces	Number of new policies underwritten in given quarter (life)	CNB (2018)
Preliminarily terminated contracts	*SURC*	pieces	Preliminarily ended contracts in given quarter (life)	CAP (2018)
Macroeconomic				
Real GDP growth	*GDP*	%	y/y in given quarter	CZSO (2018)
2*W Repo interest rate*	*REPO*	%	average value in given quarter	CNB (2018)
Inflation rate	*INFLA*	%	y/y change of consumer price index in giver quarter	CNB (2018)

Note: * Solvency II directive classification was used, with pre-2016 categories transformed accordingly. Before 1Q/2017, the individual asset classes were subject to regulatory limits: government bonds up to 100% of investments (corporate bonds up to 20%), shares up to 10% and investment funds up to 20%. Source: own work [2]

1 All life and life-part of composite insurers operating in the CR in a given time period, both domestic and foreign undertakings.

2 Internal structure of the investment funds category remains (as of 6/2018) primarily based on equity funds (43%) and bond funds (20%), with detailed data available only after Solvency II reporting implementation (6/2016). Since then, the structure remains essentially unchanged (starting values equity: 39%, bond funds: 21%).

3. The Model

In order to determine the answer to our research question, we have utilized the vector autoregression (VAR) modelling. This method is a popular choice for dissemination of macroeconomic time series data based on Gaussian errors, especially when a combination of long-run and short-run information is to be exploited. For further details on the general method attributes, the comprehensive work of Juselius (2006) is recommended. In the first step, we used VAR models to asses causality among the investigated variables. We tested the hypothesis that the explaining variables do not causally affect the explained ones. This hypothesis was rejected with $p < 0.001$.

In the second step, we utilised the VEC model followed by the impulse-response analysis. Unfortunately, the SVEC model with all selected parameters does not converge well. Because of that, a reduction was made in order to lower the size of the model, with economically less important variables left out (*NEWC*, *DEPO*, *INFLA* and *FUNDS*).

A structured vector error correction (SVEC) model was then calculated for the reduced range of parameters, with the contemporaneous and long-run impact matrices as shown in Table 2.

Table2: SVEC model matrices

I. Contemporaneous impact matrix restrictions

	BOND	***SHARE***	***SURC***	***GDP***	***REPO***
BOND	NA	0	NA	0	NA
SHARE	0	NA	NA	0	NA
SURC	NA	NA	NA	0	0
GDP	NA	NA	NA	NA	NA
REPO	NA	NA	NA	NA	NA

II. Long-run impact matrix restrictions

	BOND	***SHARE***	***SURC***	***GDP***	***REPO***
BOND	NA	0	NA	0	NA
SHARE	0	NA	NA	NA	0
SURC	NA	NA	NA	NA	0
GDP	NA	NA	NA	NA	NA
REPO	NA	NA	NA	NA	NA

Note: NA = coefficient to be estimated, 0 = relationship not presumed
Source: own research

In the short term, we do not expect a relationship between both portfolio components (*BOND*, *SHARE*), as well as between them and *GDP*. This is also true for the preliminary surrenders (*SURC*), with this variable not relating to the *REPO* interest rates either. In the long term, the first part of the inter-portfolio non-relationship (*BOND* x *SHARE*) is preserved. Further, we do not expect *BOND* investments to relate with country *GDP*, as well as *SHARE* part to not affect the two-week REPO, along with preliminary surrenders (*SURC*).

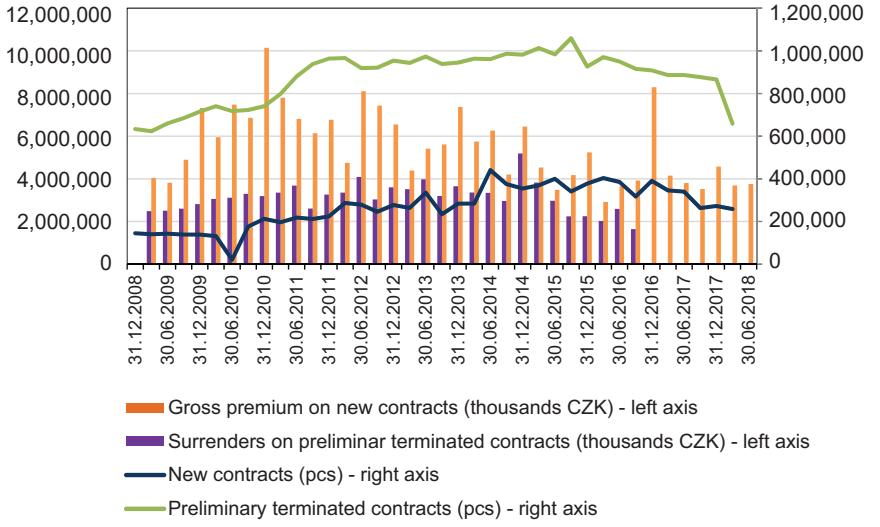
Finally, the orthogonal impulse-response analysis was conducted in order to asses dynamically the relationships of explained vs. explaining variables. This method enables us to identify relevant impulses (changes in traced variables) and the reaction they produce in other observed model components, as described by, *e.g.*, Lütkepohl (2005). Operational details of both methods are provided in relation to their following results; P-values less than 0.05 were considered statistically significant. The analysis was conducted using the R statistical package, version 3.4.4.

4. Results

4.1 Market overview in the surveyed period

The life insurance market underwent dramatic development in the given period. As illustrated by Figure 1, it first enjoyed a period of a new sales boom, yet in parallel suffered tremendous amounts of preliminary surrenders. This indicates sales quality issues, leading into an overall market drop (GWP) since 2013 (regularly paid products).

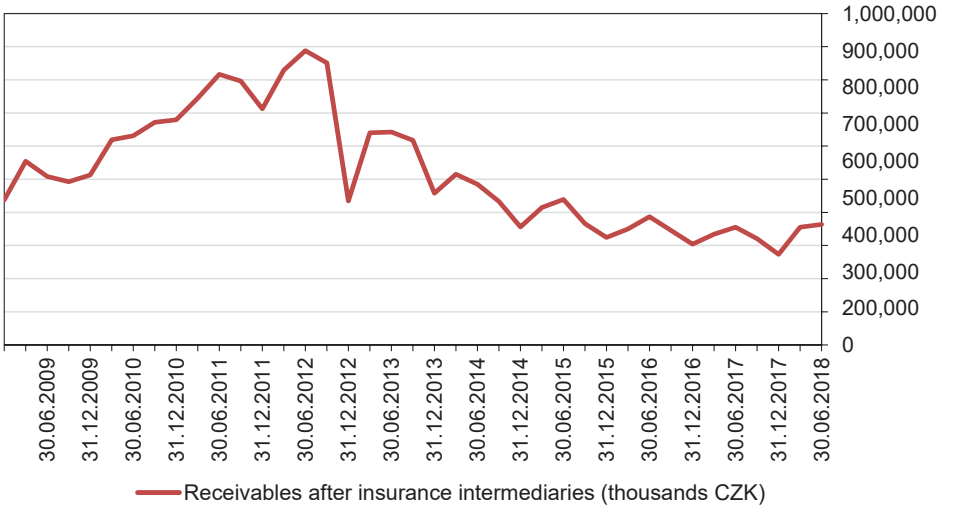
Figure 1: New sales development



Sources: CNB (2018) and CAP (2018)

Such immediate turnover of mostly long-term life contracts represents strong distribution stress on insurance companies. The combined contract turnover, the main indicator of such a state, oscillated from 15.09% (1Q 2013) to as high as 28.88% (4Q 2011), setting the most stressful period to the years 2009–2015[3]. This is coupled with the development in two main account categories: acquisition costs and receivables after the main distribution channel, the insurance intermediaries. Both thrived during and specifically right after the new sales bubble burst at the end of 2012 (Figure 2).

Figure 2: Acquisition costs and receivables after insurance intermediaries

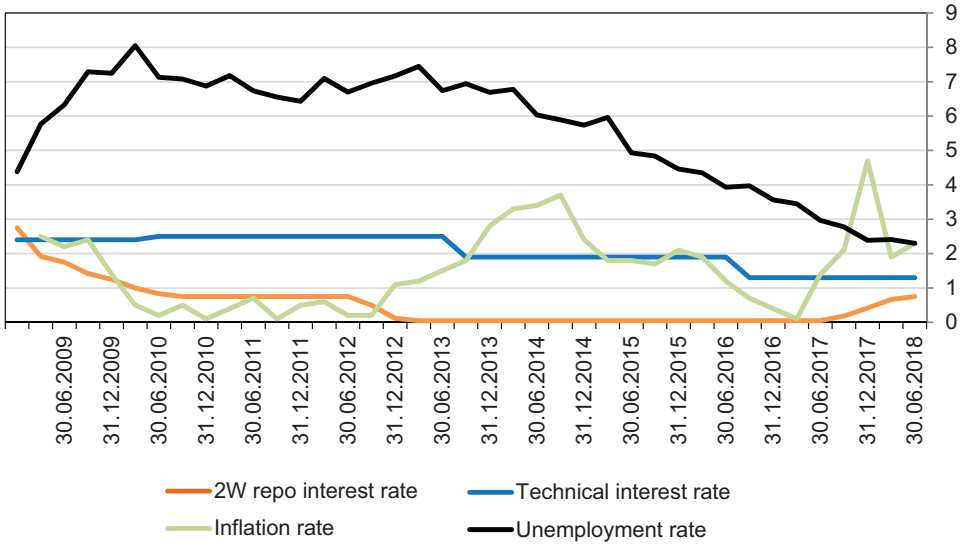


Source: CNB (2018)

Coincidentally with the distribution development, the macro-environment also produced challenging inputs. At the beginning of the surveyed period, the economy stumbled into recession, followed by a worsening unemployment rate and overshadowed by decreasing interest rates along with inflation. Technical interest rates, representing limits to a maximum possible reserve yield attributed to clients, were slightly increased at the same time by the regulator, nevertheless. After temporary growth in 2010–2011, the economy once more dived into recession and then finally recovered, producing strong GDP growth, declining unemployment and increasing inflation, accompanied by zero-bound interest rates and similarly decreasing the technical interest rate (Figure 3).

3 Contract turnover = share of new contracts plus preliminarily terminated contracts in total amount of life contracts in a portfolio. Most stressful period defined by years, when in at least two quarters this indicator exceeded 20%.

Figure 3: Macroeconomic development



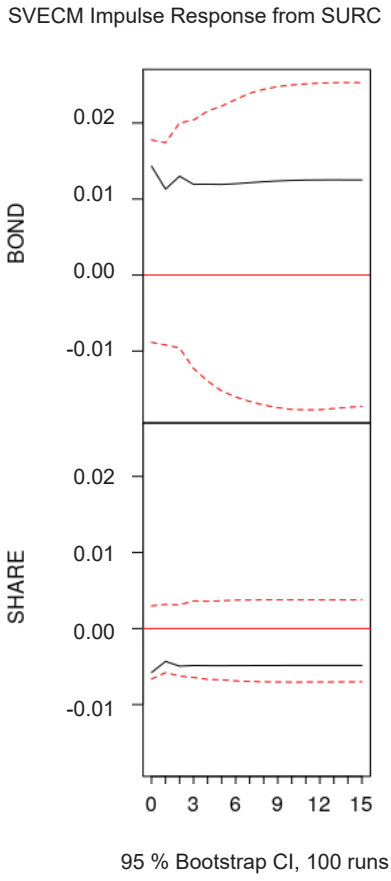
Source: CNB (2018) and CZSO (2018)

Both groups of factors intermingle in an interesting way, as the distribution (new sales) boomed in a period (2012) when the real economy dwindled. Our assumptions regarding both groups of factors copy general expectations based on the insurance companies' financial management. In times of notable distribution growth (2009–2015), insurers might be hoarding cash and deposits to compensate for large influx and outflow of new sales/preliminary terminates. Macroeconomically, decreasing interest rates could have affected mainly the bond part of the life investment portfolio, in both ways: increasing bond values, but also prompting lower bond investments. A gradual recovery from the 2009 stock market slump could have, analogically, produced diverse effects on shares investments. Further relations are to be revealed.

4.2 Model results

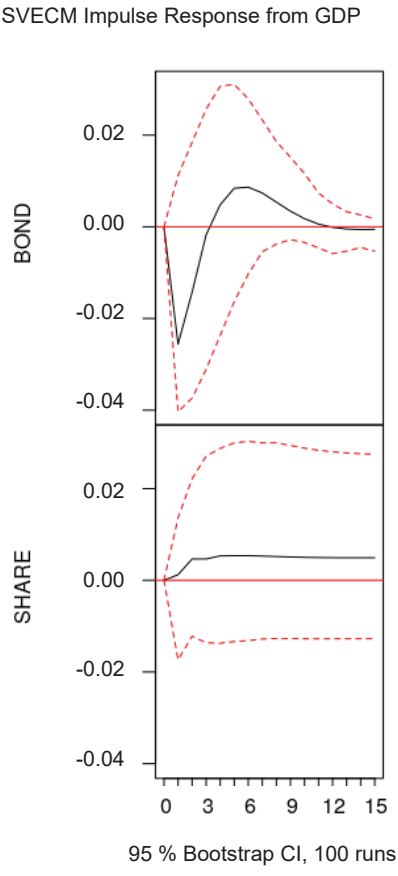
Details of the full first-stage (constructed seasonal) VAR model of lag 2 are provided in Appendix 1. The length of the season is 4. The presented model is restricted to significant parameters only. Based on the SVEC model constructed from a reduced set of parameters, the orthogonal impulse-reaction analysis was used to indicate how the investment components react over time to shocks in explaining variables (factors). Let us begin with the first item, *i.e.*, the preliminary surrenders (Figure 4).

Figure 4: Impulse-reaction analysis for preliminarily terminated contracts



Source: own research

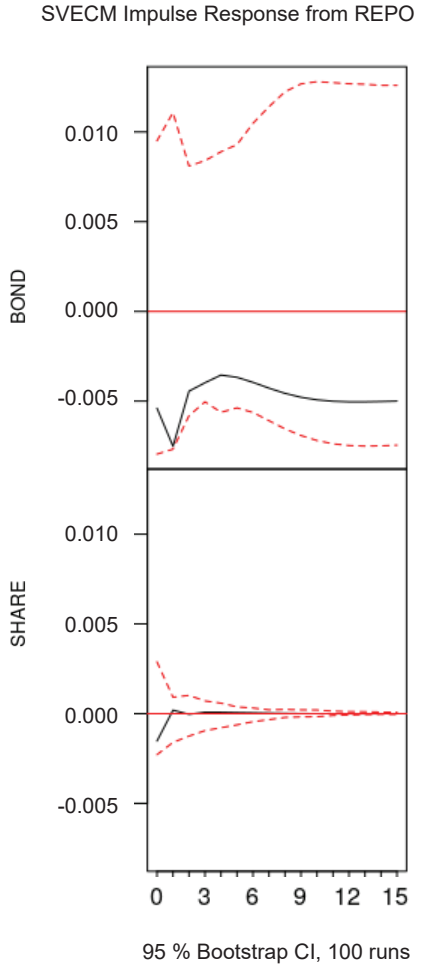
Figure 5: Impulse-reaction analysis for real GDP growth



Source: own research

The effect of preliminarily terminated contracts is two-fold. Insurers react to a high number of premature surrenders by increasing their bond investments and prefer gradual divesting of share positions. The confidence interval is very wide in the first (*BOND*) case, making this part of the behaviour much less predictable. Disturbingly, equity outflow continues in the later stages of the surrender-based growth as well, indicating that this component is preferred not only to absorb the initial shock, but also to endure the ongoing distribution imbalance. Let us see what effects in comparison are produced by macroeconomic factors, namely real GDP growth (Figure 5).

Figure 6: Impulse-reaction analysis for real 2W repo interest rate



Source: own research

How do insurers react to the economy's upheaval in the case of the surveyed market, strongly associated with regional and pan-European levels as well? At first, the bond components are divested, paralleled by a gradual growth of share investments. The bond component, however, reverses its development in the later stages of the economic boom, with reversed U-shaped rejuvenation investments. Again, both directions of deviations are possible, as suggested by the dotted probability belts.

Interest rates are one of the principal factors affecting insurance business in general. As such, it produced a notably different effect than the previous variables. As could be expected, the 2W repo goes up over time and bond investments will suffer. Share positions more or less stagnate after an initial drop, regardless of the length of the development. The confidence interval is very narrow here, indicating a high probability of the predicted behaviour.

5. Discussion

Coming back to the theoretical background of the problem, we identify three main points to discuss. Firstly, our analysis confirmed that the "stressing" distribution factor can produce an influence on the life insurers' investment portfolio comparable to the traditionally emphasized macro-environment, amending relevant literature in this regard (*e.g.*, Berends *et al.*, 2012; Gründl *et al.*, 2016). The effect of macro-elements was also concretised utilising impulse-reaction analysis, implying that a positive response in the bond component is a favoured reaction of insurers to most external factors in question. The only negative reaction in this regard was detected with interest rates, in line with previous observations produced by Briys and de Varenne (1995). This supports the criterial validity of the results we have obtained.

The second perspective considers consequences for the utility of individual clients whose reserves are being invested. Since the most common reaction to external (distribution) stress was strengthening the conservative bond component, mainly filled with treasury bonds, updated portfolios will naturally exhibit lower volatility but also lower returns. This may lead to underperformance that will negatively affect the benefits of the insured, both in terms of surrender values and premium bonuses. Since (investment) underperformance is a chronic problem of life insurance (as postulated by Chen *et al.*, 2007 or EIOPA, 2016), our study proves that distribution stress will only add to this problem. Not only will the reselling damage consumer interest directly, by doubling acquisition costs (Jedlička, 2015), it will also harm the whole client base by inducing avoidable underperformance of "their" investments. This point clearly has regulatory implications.

The final discussion relates to the regional validity of our results. Considering the available publications at hand, *e.g.*, Reifner *et al.*, (2012) or EIOPA (2014, 2016), there is ample evidence that similar distribution development, implying appropriate stress, has been observed on many other Central and Eastern European life markets. This is also evinced by the regulation of agents' commissions, which was gradually implemented or proposed in all countries of the region[4]. Considering the interconnection of the region's most important

4 Specifically: Germany in 2016 (latest update), Hungary in 2017, Czech Republic in 2016 and Slovakia in 2020 (planned).

insurers and the common regulatory base, this raises a strong hypothesis of validity of our results across other CEE countries as well. Such findings notably underline the importance of our discovery as well as the systemic nature of the described problem.

6. Conclusions

The goal of this paper was to determine the link between distribution stress, macroeconomic factors and the composition of the life insurers' investment portfolio. Using comprehensive models, we were able to hypothesize how insurance companies react to inputs from both aforementioned groups. The set of tested factors was found significant (Granger causality, $p < 0.001$), which enables us to aggregate three scenarios of behaviour under different conditions. These represent a synthesis of relationships detected by individual impulse-response analyses, essentially outlining how distribution stress (high number of preliminarily terminated contracts) will affect insurers' behaviour under different macro-conditions:

1) Distribution stress in a growing economy – in a state of growing economy, with increasing interest rates, high contract turnover will stipulate a likely increase in the bond component, later followed by its probable decline. The share component will exhibit minor oscillations, resulting in a likely stable residual composition.
2) Distribution stress in a declining economy – declining GDP and decreasing interest rates will induce a continuous increase in bond portfolios. Equity investments are likely to be divested in this scenario, or stagnate around zero again.
3) Distribution stress in a recovering economy – stagnant GDP with stable interest rates will, again, likely inflict a beefing up of the bond investments. That will be accompanied by a gradual reduction of the share component, about to be "escaped".

As the above summary suggests, bond investments are the principal channel through which insurance companies absorb external shocks. Although this does not undermine the Solvency II risk-based approach stability-wise, our results point out that these reactions might lead to consumer detriment through asset underperformance. Traditionally, financial stability was thought to be threatened by over-aggressiveness of insurers. Our research, however, suggest that over-conservativeness represents a risk as well, although probably not to the stability of the industry, but to its asset management performance. Authorities might, therefore, consider (re)introducing soft limits to investment positions held in life insurance, which were abolished by Solvency II, and specifically, moderating companies' stress reactions at the supervisory level. After all, financial stability and consumer (investment) protection must go hand in hand.

Finally, our results are bound by three main limitations. The first is the geographical focus. Although Central and Eastern Europe represents a vital part of the EU's life insurance industry, our findings still need to be verified in the Western and Southern parts of the continent, as these spheres fall under the same regulations and the freedom-of-movement umbrella. Particularly, the distribution channels used there are partly different from the German model, prevalent in the CEE, raising the possibility of different impulse-reaction schemes. The second limitation is connected to the range of time series used. Although the one we got for our model was long enough from a statistical and factual point of view, it did not constitute a full business cycle (crisis, recession and recovery period were covered). Our conclusions would greatly benefit from testing conducted over a much longer time frame. That is not possible in the CEE post-communist markets, but is perfectly possible for its Western counterparts. Finally, the paper did not analyse data for individual insurance companies, but for the entire sector. Under such set-up, differences between, *e.g.*, small and big players cannot be evaluated, suggesting yet another direction for detailed follow-up analysis. Hence, all limitations point to a common direction for future research, which is very likely to be prospectively undertaken by the authors.

Appendix 1: Full VAR model details

BOND

	Estimate	Std. error	*t* value	Pr(>|*t*|)
***BOND*.l1**	1.1027	0.1446	7.6252	0.0000
***SHARE*.l1**	2.0665	0.4056	5.0950	0.0000
***DEPO*.l1**	1.8528	0.3400	5.4490	0.0000
***SURC*.l1**	0.0000	0.0000	4.6184	0.0001
***REPO*.l1**	0.0678	0.0224	3.0284	0.0060
***INFLA*.l1**	0.0178	0.0022	8.1781	0.0000
***BOND*.l2**	−0.5414	0.1454	−3.7244	0.0011
***SHARE*.l2**	−0.9237	0.3765	−2.4534	0.0222
***NEWC*.l2**	0.0000	0.0000	2.7319	0.0119
***REPO*.l2**	−0.0800	0.0214	−3.7306	0.0011
***INFLA*.l2**	−0.0078	0.0024	−3.2234	0.0038
trend	−0.0021	0.0005	−4.6619	0.0001
sd1	−0.0112	0.0037	−3.0128	0.0062

SHARE

	Estimate	Std. error	*t* value	Pr(>|*t*|)
***REPO*.l1**	−0.0299	0.0107	−2.7968	0.0088
***INFLA*.l1**	−0.0048	0.0011	−4.4684	0.0001
***NEWC*.l2**	0.0000	0.0000	−5.0073	0.0000
***REPO*.l2**	0.0429	0.0114	3.7618	0.0007
const	0.0587	0.0044	13.4785	0.0000

FUNDS

	Estimate	Std. error	*t* value	Pr(>|*t*|)
***SURC*.l1**	0.0000	0.0000	2.6320	0.0133
***GDP*.l1**	−0.0019	0.0006	−3.1517	0.0037
***INFLA*.l1**	0.0030	0.0011	2.6640	0.0123
***SURC*.l2**	0.0000	0.0000	2.7271	0.0106
const	0.0587	0.0114	5.1351	0.0000
trend	−0.0026	0.0002	−11.5047	0.0000

DEPO

	Estimate	Std. error	*t* value	Pr(>|*t*|)
***FUNDS*.l1**	0.2186	0.0757	2.8899	0.0072
***SURC*.l1**	0.0000	0.0000	−2.1351	0.0413
***BOND*.l2**	0.0506	0.0246	2.0591	0.0486
***SHARE*.l2**	0.3673	0.0841	4.3698	0.0001
***SURC*.l2**	0.0000	0.0000	−2.5240	0.0173
trend	0.0016	0.0002	8.2267	0.0000
sd3	−0.0033	0.0016	−2.0617	0.0483

NEWC

	Estimate	Std. error	*t* value	Pr(>|*t*|)
***GDP*.l1**	26,180.6047	6,475.813	4.0428	3e−04
***REPO*.l1**	−92,860.9949	25,469.884	−3.6459	1e−03
***SURC*.l2**	0.1721	0.036	4.7749	0e+00
***GDP*.l2**	−29,336.3286	6,683.645	−4.3893	1e−04
trend	8,577.9434	1,580.862	5.4261	0e+00

SURC

	Estimate	Std. error	*t* value	Pr(>|*t*|)
***BOND*.l1**	1,132,392.0678	240,161.2684	4.7151	0.0001
***FUNDS*.l1**	3,853,147.7227	896,595.7121	4.2975	0.0002
***DEPO*.l1**	4,208,043.2606	1,591,499.6344	2.6441	0.0135
***NEWC*.l1**	0.3004	0.1184	2.5378	0.0172
***GDP*.l1**	8,023.0115	3,326.1661	2.4121	0.0229
***REPO*.l1**	−73,552.2103	26,669.8904	−2.7579	0.0103
***NEWC*.l2**	0.4061	0.1239	3.2778	0.0029
***INFLA*.l2**	−23,142.9808	6,836.4380	−3.3852	0.0022
const	−868,521.5706	271,112.5818	−3.2035	0.0035

GDP

	Estimate	Std. error	*t* value	Pr(>|*t*|)
***GDP*.l1**	1.4793	0.1240	11.9342	0.0000
***SURC*.l2**	0.0000	0.0000	2.7591	0.0095
***GDP*.l2**	−0.7641	0.1278	−5.9763	0.0000
trend	−0.0567	0.0225	−2.5263	0.0167

REPO

	Estimate	Std. error	*t* value	Pr(>|*t*|)
***BOND*.l1**	1.1098	0.2223	4.9920	0.0000
***FUNDS*.l1**	−4.1512	0.8921	−4.6531	0.0001
***GDP*.l1**	−0.0197	0.0060	−3.2690	0.0026
***REPO*.l1**	1.1740	0.1461	8.0334	0.0000
***REPO*.l2**	−0.3318	0.1388	−2.3894	0.0231

INFLA

	Estimate	Std. error	*t* value	Pr(>|*t*|)
***BOND*.l1**	−42.9297	11.8436	−3.6247	0.0012
***SHARE*.l1**	−89.5477	25.9620	−3.4492	0.0019
***FUNDS*.l1**	−37.7097	14.7954	−2.5487	0.0171
***REPO*.l1**	1.8000	0.5405	3.3305	0.0026
***INFLA*.l1**	0.6328	0.1538	4.1145	0.0003
***BOND*.l2**	37.4138	10.3578	3.6121	0.0013
***SHARE*.l2**	124.2456	35.5781	3.4922	0.0017
***SURC*.l2**	0.0000	0.0000	3.0023	0.0059
***INFLA*.l2**	0.4660	0.1955	2.3838	0.0247
trend	−0.1734	0.0491	−3.5342	0.0016

References

Becker, B. (2016). How the Insurance Industry's Asset Portfolio Responds to Regulation, in Hufeld, F., Koijen, R. S. J., Thimann, C., eds., *The Economics, Regulation, and Systemic Risk of Insurance Markets*. Oxford Scholarship Online, pp. 153–164, https://doi.org/10.1093/acprof:oso/9780198788812.003.0008

Berends, K., McMenamin, R., Plestis, T., et al., (2013). The Sensitivity of Life Insurance Firms to Interest Rate Changes. *Economic Perspectives*, 37(2).

Bijapur, M., Croci, M., Zaidi, R. (2012). *Do Asset Regulations Impede Portfolio Diversification*? *Evidence from European Life Insurance Funds*. New York, USA: Social Science Electronic Publishing, Inc.

Bikker, J. A., van Leuvensteijn, M. (2008). Competition and Efficiency in the Dutch Life Insurance Industry. *Applied Economics*, 40(16), 2063–2084, https://doi.org/10.1080/00036840600949298

Briys, E., de Varenne, F. (1995). *On the Risk of Life Insurance Liabilities: Debunking Some Common Pitfalls*. University of Pennsylvania: The Wharton School.

Chen, M.-S., Lai, G. C. (2010). Distribution Systems, Loyalty and Performance. *International Journal of Retail & Distribution Management*, 38(9), 698–718, https://doi.org/10.1108/09590551011062448

Chen, X., Yao, T., Yu, T. (2007). Prudent Man or Agency Problem? On the Performance of Insurance Mutual Funds. *Journal of Financial Intermediation*, 16(2), 175–203.

Czech Insurance Association (CAP) (2018). *Insurance Market Development*. Prague: Czech Insurance Association [Retrieved 2018-10-12] Available at: http://cap.cz/en/statistics/the-development-of-the-insurance-market

Czech National Bank (CNB). (2018). *The Database of ARAD Time Series – Financial Markets Data*. Prague: Czech National Bank [Retrieved 2018-10-12] Available at: https://www.cnb.cz/docs/ARADY/HTML/index_en.htm

Czech Statistical Office (CZSO) (2018). *Czech Republic Macroeconomic Data – Time Series.* Prague: Czech Statistical Office [Retrieved 2018-10-12] Available at: https://www.czso.cz/csu/czso/pmz_ts

Daňhel, J., Ducháčková, E. (2012). Změny v postavení odvětví pojišťovnictví jako důsledek finanční a ekonomické krize a následných regulačních schémat. *Pojistné rozpravy*, 28, 5–11.

European Insurance and Occupational Pensions Authority (EIOPA) (2014). *Third Consumer Trends Report*. Frankfurt am Main: European Insurance and Occupational Pensions Authority (EIOPA) [Retrieved 2018-10-12] Available at: https://eiopa.europa.eu/Publications/Reports/EIOPA-BoS-14-207-Third_Consumer_Trends_Report.pdf

European Insurance and Occupational Pensions Authority (EIOPA) (2016). *Fifth Consumer Trends Report*. Frankfurt am Main: European Insurance and Occupational Pensions Authority (EIOPA) [Retrieved 2018-10-12] Available at: https://eiopa.europa.eu/Publications/Reports/06.0._EIOPA-BoS-16-239%20-%20EIOPA%20Fifth%20Consumer%20Trends%20report%20-%20Clean%20after%20BoS.pdf

European Insurance and Occupational Pensions Authority (EIOPA) (2018). *Insurance statistics – Balance sheet*. Frankfurt am Main: European Insurance and Occupational Pensions Authority (EIOPA) [Retrieved 2018-10-12] Available at: https://eiopa.europa.eu/Pages/Financial-stability-and-crisis-prevention/Insurance-Statistics.aspx

Financial Stability Department, Czech National Bank (CNB) (2017). *Joint Stress Tests by the CNB and Insurance Companies in the Czech Republic*. Prague: Czech National Bank, Financial Stability Report.

Gründl, H., Gal, J., Dong, M. (2016). The Evolution of Insurer Portfolio Investment Strategies for Long-term Investing. *OECD Journal: Financial Market Trends*, 1–55, https://doi.org/10.1787/fmt-2016-5jln3rh7qf46

Jedlička, P. (2015). Srovnání statistik ČAP a ČNB: zprostředkování má systémový problém. *Pojistný obzor*, 2, 20–22.

Juselius, K. (2006). *The Cointegrated VAR Model: Methodology and Applications*. Oxford: Oxford University Press. ISBN 9780199285679.

Klumpes, P. J. M. (2004). Performance Benchmarking in Financial Services: Evidence from the UK Life Insurance Industry. *The Journal of Business*, 77(2), 257–273, https://doi.org/10.1086/381281

Lütkepohl, H. (2006). Structural Vector Autoregressive Analysis for Cointegrated Variables. *Allgemeines Statistisches Archiv*, 90(1), 75–88, https://doi.org/10.1007/s10182-006-0222-4

Reifner, U., Neuberger, D., Rissi, R., et al., (2013). *Study on Remuneration Structures of Financial Services Intermediaries and Conflicts of Interest*. IFF - Institut für Finanzdienstleistungen. Hamburg, Germany Final Report. Available at: https://ec.europa.eu/info/sites/info/files/file_import/1311-remuneration-structures-study_en_0.pdf