

Insurance and the Macroeconomic Environment

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Abstract

Insurance companies play an important role in the financial sector and the availability of insurance products is an essential element of sustainable economic growth. This article analyses the relationship between growth in the insurance sector and key macroeconomic determinants using a European panel data set published by EIOPA. We focus on gross written premiums (GWP) to capture insurance market growth. Our empirical analysis reveals a high GWP persistence as well as a strong link between GWP and economic growth and unemployment. Moreover, the estimated model suggests a higher sensitivity to the macroeconomic environment for life compared to non-life insurance. Finally, there is also empirical evidence that insurers expand their international activities in periods when domestic growth opportunities are low. These findings can be used to underpin a quantitative financial stability framework to assess the potential impact of different macroeconomic scenarios on insurance market growth.

1. Introduction

The recent financial crisis illustrated the inter-linkages between the investment and commercial banking sectors and the real economy, and the channels for contagion into the insurance sector (Nyholm, 2012). The negative spill-overs and risk of bi-directional contagion led to an increased acknowledgement of the importance of the insurance sector for the overall financial stability (e.g. Bakk-Simon *et al.*, 2012). There is therefore a need to develop a quantitative framework which could help regulators to assess the insurance sector under different adverse macroeconomic scenarios. It needs to enable regulators to identify and quantify the relevant transmission channels through which adverse financial macroeconomic scenarios are transferred to the balance sheets of insurance companies and their profit and loss accounts. Growth in gross written premiums (GWP) is among the key insurance variables which are highly correlated with the macroeconomic environment (Faugere and Van Erlich, 2003). For this reason this article is focused on developing a model linking GWP and the macroeconomic environment.

Contrary to banking, quantitative modelling linking macro variables with insurance companies' balance sheets and profit and loss accounts is rather scarce. This article contributes to the current literature by exploring those

¹ European Insurance and Occupational Pensions Authority (EIOPA).

relations empirically using a broad sample of EU member states. While some research studies employing particular country data or even some particular business lines at the national level are available, this study adds to the current literature by employing a wide panel data set of European data collected from national supervisors, and by considering a broader set of macroeconomic indicators as potential explanatory variables. We also empirically test the evidence of expansion of European insurance groups globally, including to emerging markets, as a response to declining economic growth at home.

The remainder of the article is structured as follows. Section 2 provides a review of related studies on the link between insurance business and the macroeconomic environment. Section 3 presents a description of the dataset and some descriptive statistics on the GWP development in EU member states. Section 4 focuses on the econometric methodology which is applied for quantifying the relationship between GWP and the macroeconomic environment. On this basis, we present the results of an econometric model which quantifies this relationship. Finally, the expansion of insurance companies outside their national boundaries is empirically tested. Section 5 summarizes the results with regard to policy implications. The last section concludes.

2. Related Studies

Research studies focusing on the links between the macro-economy and the insurance sector are rather limited and the topic has not been deeply explored by the broader academic community. If there are papers published, this is mostly from regulators who are responsible for the financial stability including the insurance sector.

Bianchi *et al* (2011) investigate the potential growth of the insurance markets in Central, Eastern and Southeastern Europe (CESEE). They estimate insurance premium growth by applying a panel regression (cross-section with fixed effects), where real premium growth is explained by real GDP growth. However, they do not consider other important macroeconomic variables within the modelling framework which could contribute to the insurance market development in the region. The coefficient obtained for GWP is 1.51 which means that with each percentage point of GDP growth, insurance market growth increases by 1.5 % (measured by GWP). They claim that the potential growth of the insurance market in CESEE is closely connected with economic growth in the region.

Feyen *et al* (2011) examine determinants of life and non-life insurance premiums for a panel of 90 countries during the period 2000-08. The results show that premiums are driven by per capita income, the population size and density, demographic structures, income distribution, the size of the public pension system, state ownership of insurance companies, the availability of

private credit and religion. The study further points out that the development of the insurance sector can be influenced by a number of policy variables.

Several other papers focus on the potential for the insurance sector to contribute to economic growth. Arena (2006) tests empirically how insurance market activities (life and non-life) can influence economic growth by using the generalized method of moments for dynamic models of panel data for 56 countries and for years 1976-2004. The results show that both life and non-life insurance have a positive and significant causal effect on economic growth. Although this link is stronger for life insurers in high-income countries, this does not apply to non-life insurers. Similarly, Lee *et al.* (2013) apply a panel regression for 41 countries covering the years 1979–2007. The study reveals a long-run equilibrium relationship between real GDP and real life insurance premiums having allowed for the heterogeneous country effect. The results suggest that an increase of 1% in the real life premium raises the real GDP by 0.06%.

Burcă and Bătrîncă (2013) focus on marine insurance and employ ARIMA2 models to estimate and forecast the evolution of GWP for the years 1996-2011 in this particular line of business. It confirms a high persistence of GWP for this segment, but the study does not consider any macroeconomic variables. Using pure time series methods, it is based on a technical rather than a fundamental approach.

Another set of studies focuses on additional important macro-prudential indicators for the insurance sector. Kiesenbauer (2012), for example, investigates the determinants of lapses in the German life insurance industry for different lines of business. Logistic regression models are employed with macroeconomic indicators and company characteristics encompassing 133 German life insurers from 1997 to 2009. The findings confirm the strong link between macroeconomic indicators and lapse dynamics. The derived models can be used to predict lapse rates for the different products considered in the article.

3. Data, Stylized Facts and Hypotheses

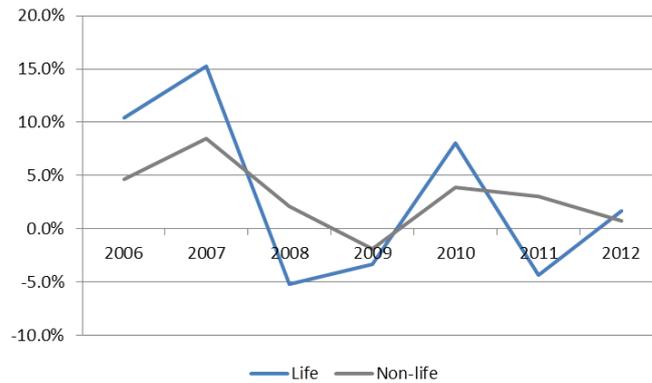
Although evidence remains limited, research is pointing to a positive relationship between insurance growth and general macroeconomic growth. In this study, we employ a dataset for the insurance sector published by EIOPA to shed more light on this topic. The data covers the developments in GWPs in 30 European countries between 2005 and 2012.³

² ARIMA - Autoregressive Integrated Moving Average - a statistical analysis model that uses time series data to predict future trends.

³ The data is available on EIOPA's website and is collected from national supervisors.

Figure A1.1 shows the development in total GWPs over the sample period. The decline in premiums in the life sector following the financial crisis in 2007-2008 is clearly illustrated in the graph, as is the low growth in many countries in the following years with very weak GDP growth and high unemployment.

Figure A1.1: Annual growth in GWP in 30 European countries between 2006 and 2012. Median

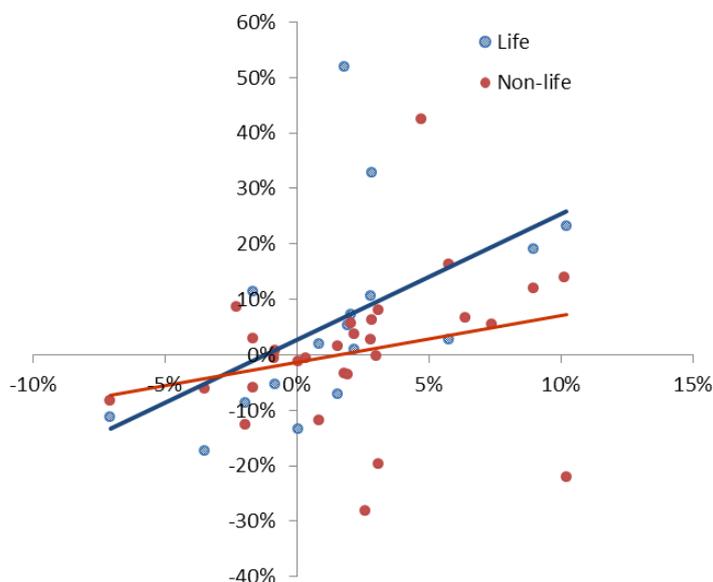


Source: EIOPA, EUROSTAT

Note: Graph covers countries with GWP in life of at least EUR 1 bn.

Naturally, aggregate information may average out important developments in particular economies. Therefore, the link between macroeconomic development and insurance market growth might be better observed by looking at individual countries. Figure A1.2 demonstrates the cross-country heterogeneity in experience in 2012. The partial analysis depicted in the figure seems to point to a relatively strong link between GWP and the gross domestic product (GDP).

Figure A1.2: Annual growth in GWP in life and non-life (y-axis, in %) vs. growth in nominal GDP in euro (x-axis, in %) in 2012

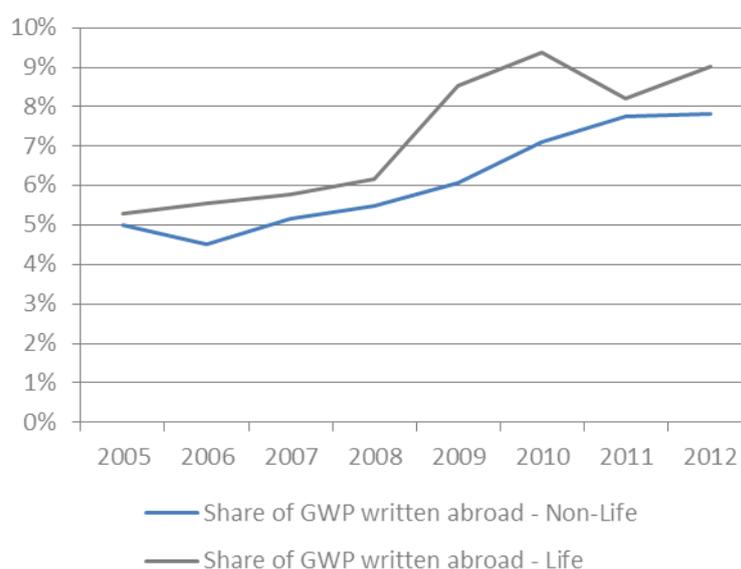


Source: EIOPA, EUROSTAT

Note: Graph covers countries with GWP in life and non-life (incl. composites) of at least EUR 5 billion

In addition to containing information about total GWPs in one particular country (by all companies there, also foreign), our dataset allows us to split GWPs between GWP written abroad and written at home. This enables us analyse the potential reaction pattern of insurers who face low GDP growth at home, threatening organic business growth. In particular, recent market research and commentary have argued that insurers are currently exploring business opportunities in emerging markets as a response to low growth potential at home. Indeed, Figure A1.3 shows that the average share of GWP abroad has grown from around 5% in 2005 to an average of 8% in non-life and 9% in life in 2012. There is indeed substantial cross-country variation. In our sample, the share of GWP abroad varies between 0% and almost 100% in both the life and non-life sector. However, the time series variation in our dataset allows us to investigate this potential reaction pattern empirically.

Figure A1.3 Share of GWP abroad. Per cent of total GWP. Median of country-level data.



Source: EIOPA

Table A1.1: Employed data set

Variable	Description	Transformation in model	Source	Model
$GWP_{i,t}^L$	Total GWP in country i on time t for the life sector	Log-difference	EIOPA ⁴	Model I
$GWP_{i,t}^{NL}$	Total GWP in country i on time t for the non-life sector	Log-difference	EIOPA	Model I
$GDP_{i,t}^{Nom}$ $GDP_{i,t}^{Real}$	Nominal and real GDP in country i on time t	Log-difference	Eurostat	Model I (nominal) and II (real)
$U_{i,t}$	Unemployment in country i on time t	First-difference	Eurostat	Model I
$IR_{i,t}$	Interest rate on long term government bonds as defined in the EU convergence rates	First-difference	Eurostat	Model I
$GWP_{i,t}^{LHome}$	GWP by companies domiciled in country i in the home country (i) on time t in the life sector	Log-difference	EIOPA	Model II

⁴ The data on the insurance sector in different countries is available as statistical annexes to the Financial Stability Reports, see <https://eiopa.europa.eu/publications/financial-stability/index.html>

$GWP_{i,t}^{NLHome}$	GWP by companies domiciled in country i in the home country (i) on time t in the non-life sector	Log-difference	EIOPA	Model II
$GWP_{i,t}^{LAbroad}$	GWP in other countries by companies in country i on time t in the life sector	Log-difference	EIOPA	Model II
$GWP_{i,t}^{NLAbroad}$	GWP in other countries by companies in country i on time t in the non-life sector	Log-difference	EIOPA	Model II
GDP_t^{Em}	Measure of development in real GDP on time t in emerging markets ⁵	Percentage change	IMF	Model II

The aim of this study is to empirically test the links between the macroeconomic environment and GWP. As market growth drivers substantially differ for life and non-life insurers, we focus on these two segments separately. Moreover, due to subdued economic growth, insurers are looking for growing opportunities outside their national boundaries (see chapter 1 and 2 in this report). This article tries to find some empirical evidence that companies are expanding abroad when domestic economic growth is significantly lower than in emerging markets.

4. Empirical Analysis

First, we estimate two separate models for each segment. Panel regression techniques on the sample of 29 (life insurance model) and 28 (non-life insurance model) countries are employed to obtain annual models for growth in GWP both for life and non-life insurers. Interest rates, unemployment rates and nominal GDP are considered as potential explanatory variables. Our empirical analysis points out the high persistence of GWP growth both for life and non-life insurers. Hence, dynamic panel regression with fixed effects using the Generalized Method of Moments (GMM) was employed. This approach is able to deal with the endogeneity problem and provides unbiased and consistent estimates even though the dataset only spans a period of 8 years. Moreover, cross-section weights were employed to control for the presence of cross-section heteroskedasticity. Due to a short available time series only two lags are allowed for all variables considered.

Logarithmic transformation is applied to GWP and nominal GDP. Then, first differences are applied to all variables considered to ensure their stationarity. GWP variables as well as nominal GDP represent the growth rate. Unemployment and interest rates express the change in unemployment and interest rates respectively. The empirical analysis reveals that dynamic models

⁵ 154 countries see the IMF World Economic Outlook 2013.

for GWPs are more suitable than static. Both lags of GDP turn out to be significant for the non-life sector only. The results further suggest that economic growth is the main driver for nonlife insurance premiums growth. Moreover, the results indicate that increasing interest rates effect negatively non-life premiums, probably via the negative impact on financial wealth reducing firms' and households' investments (commercial and residential properties, cars, etc.). On the other hand, the premium growth development for life insurance is not only affected by economic growth, but also largely driven by the situation in the labour market. A two year lagged unemployment rate proves to be a key driver of future insurance premium growth. Moreover, the results suggest that the development in life insurance is more sensitive to the macroeconomic environment than in non-life insurance where growth is more robust as it benefits from many compulsory insurance lines.

Table A1.2: Models for GWP growth for life and non-life insurance

	Dependent variable GWP Life	Dependent variable GWP Non-life
Constant	-0.011 (0.008)	-0.018*** (0.006)
$GWP_{i,t-1}^L$	-0.407*** (0.049)	---
$GWP_{i,t-2}^L$	-0.272*** (0.051)	---
$GWP_{i,t-1}^{NL}$	---	-0.197*** (0.060)
$GWP_{i,t-2}^{NL}$	---	-0.128** (0.061)
$GDP_{i,t}^{Nom}$	0.886*** (0.115)	0.753*** (0.117)
$GDP_{i,t-1}^{Nom}$	---	0.245** (0.094)
$GDP_{i,t-2}^{Nom}$	---	0.0449*** (0.088)
$U_{i,t-2}$	-1.511*** (0.402)	
$IR_{i,t}$	---	-0.013*** (0.002)
R-squared	0.642	0.830
Adj. R-squared	0.538	0.775

Source: EIOPA calculations

Note: Standard errors of the respective coefficients are presented in parentheses, stars represent coefficients' significance (<1% ***, <5% **, <10%*), only the variables significant at least at 10% level that were included into the final models.

The remaining part of the empirical analysis is focused on insurers operating globally. We test the hypothesis that insurers move to markets with high market

growth opportunities as a response to the weak macroeconomic environment and low domestic growth opportunities. We employ a fixed-effect GMM panel regression where the dependent variable is defined as the growth rate in the ratio between GWP abroad and total premiums (underwritten domestically and abroad). We run two separate models for life and non-life insurance where the dependent variable is explained by the difference between economic growth in emerging and domestic markets (see Table A1.3).

Our results suggest that both life and non-life insurers are expanding their business in emerging markets when growth in those markets is favourable compared to domestic opportunities. This effect seems to be stronger for non-life insurance, whereas some other important determinants not captured by our data set might drive the results for life insurance. Moreover, the results indicate one year lag in response to the growing opportunities for life insurers. On the other hand, non-life insurers tend to react to the gap between emerging market and domestic growth in real time.

Table A1.3: Models for share of GWP underwritten abroad for life and non-life insurance

	Dependent variable: Share of GWP abroad in life insurance	Dependent variable: Share of GWP abroad in non-life insurance
Constant	0.110** (0.053)	-0.027 (0.105)
$S_{i,t-1}^L$	-0.091 (0.092)	---
$S_{i,t-1}^{NL}$	---	-0.316*** (0.107)
$GDP_t^{Em} - GDP_{i,t}^{Real}$	-0.063 (0.601)	2.793* (1.467)
$GDP_{t-1}^{Em} - GDP_{i,t-1}^{Real}$	1.203** (0.569)	-0.760 (1.440)
R-squared	0.283	0.290
Adj. R-squared	0.075	0.105

Note: Standard errors of the respective coefficients are presented in parentheses, stars represent coefficients' significance (<1% ***, <5% **, <10%*).

5. Policy Implications

The conducted empirical analysis suggests a strong cyclicity of the insurance business. While non-life business seems to react more strongly to economic growth, the overall link to the macroeconomic development tends to be stronger for life insurance when unemployment is taken into account. Part of the explanation may lay in the compulsory third party liability business lines. Although our models are country-specific, they remain fairly aggregate. However, this research clearly shows that macroeconomic models which reasonably explain premiums developments could be developed, in particular by national supervisors with detailed firm-level information. Such models might be used by regulators as well as insurance companies to test the impact of different macroeconomic scenarios on the balance sheet. It could also help to deviate from the static balance sheet assumption, presently used often in stress test methodologies.

Furthermore, expansion of insurance companies outside their national boundaries, especially to emerging markets, is nowadays often discussed. Due to currently very limited growth opportunities especially in more mature EU markets, insurance companies are expanding to faster growing markets outside Europe. We find empirical evidence for this trend, both for life and non-life insurers. This research suggests that insurers tend to expand their business to markets with higher growth potential. The share of premiums underwritten in emerging markets might significantly increase in the short to medium-run. This trend needs to be carefully monitored by supervisors as insurers might be exposed to new risks in these markets like political or legal risks.

6. Conclusion

The insurance sector is an important part of the financial sector with a substantial impact on the overall financial stability. Hence, the macro-prudential oversight of insurance companies needs to be properly conducted and systemic risk needs to be monitored. Quantitative macro-prudential frameworks need to be built up to capture key risks that might threaten financial stability. In order to arrive at such a framework, projections of the main insurance balance sheet items based on macroeconomic developments have to be available. Understanding premium growth is one important element.

This study elaborates on econometric models linking GWP with key macroeconomic variables. We provide two models that are able to explain GWP growth for life and nonlife insurers. We show that life insurance is more sensitive to the macroeconomic environment than non-life. Our analysis further suggests that the nominal GDP is the key driver for non-life insurance, while

unemployment is a driving factor for premium growth on the life side. Such models could provide a projection of insurance market growth under different macroeconomic scenario and help to assess key risks for the insurance sector.

Finally, our empirical results indicate a positive impact of the difference between emerging markets and domestic economic growth on the share of premiums underwritten abroad. While these growth opportunities seem to impact an insurer's expansion outside its national boundaries with some lag in life sector, non-life insurers tend to respond in real time. Our research offers a framework for testing the strength of these effects.

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