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ALLIANZ RESEARCH

DRIVERS OF GROWTH: PROPERTY AND CASUALTY INSURANCE

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EXECUTIVE SUMMARY

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In general, property and casualty insurance demand has reflected the development stage of an economy: The higher the GDP per capita, the higher the gross written premiums per capita and premium income as a percentage of GDP, indicating a positive correlation between economic and P&C insurance market development. However, against the background of new technologies and distribution channels, changing customer behavior and demographic change, the question arises: Does this correlation still hold or have other explanatory variables already replaced GDP as the decisive factor for insurance market growth in recent years?

Our analysis of the P&C insurance market developments in 61 countries between 2000 and 2019 shows that:

Nominal GDP growth explains 61% of global gross written P&C insurance premium development between 2009 and 2019. At the country level, however, results are more dispersed: In 30 of the 61 analyzed countries, the explanatory strength of nominal GDP is higher in the first decade; in 31 it is higher in the second decade and only in 25 of the countries is the explanatory power of GDP above 50%. The maturity level of an insurance market has no influence on the explanatory strength of nominal GDP growth.

The development of the Dow Jones index explains 64% of global premium growth between 2009 and 2019 and that of the MSCI World Index 40%, albeit in each case with a time lag of one year. The correlation of total P&C premium growth and stock market developments in the second decade is positive.

There is no decisive exogenous factor for the development of motor insurance premium income. Even the number of motor vehicles was in most cases not the best indicator for motor insurance premium growth.

In most countries, property premium growth since 2000 was influenced by national stock market developments, though the explanatory strength of this exogenous factor was rather low. In the first decade, private consumption expenditures were the dominating explanatory variable, while we could not identify a decisive exogenous factor for the development in the second decade.

INTRODUCTION AND METHODOLOGY

In general, property and casualty insurance demand reflects the development stage of an economy. The higher the level of prosperity in a country, measured in GDP per capita, the higher the insurance density and penetration, i.e., gross written premiums per capita and in percent of GDP. This indicates a positive correlation between economic and P&C insurance market development. However, against the background of new technologies and distribution channels, changing customer behavior and demographic change the question comes up, how strong this correlation still is and if there are other explanatory variables that might have replaced GDP as decisive factor for insurance market growth in recent years.

In order to answer this question, we run single linear regression models with GDP and other various exogenous factors. First for the total gross written premium income at global and country[1] level, then for different lines of business, namely motor and property insurance, in ten countries. Furthermore, we analyzed not only the development over the whole time period since the turn of the century but also split it into two subperiods: the first ten years up to the financial crisis from 2000 to 2009 and the second decade between 2009 and 2019. In all cases we run the regression model not only with current but also lagged values of the respective explanatory variable.

However, our analysis of potential influencing factors beyond GDP had to be confined to measurable explanatory variables for which time series of at least twenty years were available. We chose the MSCI World Index, the respective national stock market benchmark indices and 10-year benchmark bonds, consumption expenditures and disposable income of private households, the number of new car registrations, the total number of vehicles and in one case the number of mileage per year. Of course, factors like financial literacy and the access to financial services, changes in legislation or the occurrence of natural disasters are important for insurance demand, while market regulation, competition and last but not least interest rate and capital market developments influence insurance prices and supply. But very slow changes or one-time events can hardly be modeled or forecast, while data about price developments is not available in most countries.

1. *We took into account the development of nominal GDP and insurance premiums of the following 61 countries: Argentina, Australia, Austria, Bahrain, Belgium, Brazil, Bulgaria, Canada, Chile, China, Colombia, Croatia, Czech Republic, Denmark, Egypt, Finland, France, Germany, Greece, Hong Kong, Hungary, India, Indonesia, Ireland, Italy, Japan, Kazakhstan, Kenya, Laos, Lebanon, Malaysia, Mexico, Morocco, Netherlands, New Zealand, Nigeria, Norway, Pakistan, Peru, Philippines, Poland, Portugal, Romania, Russia, Saudi Arabia, Singapore, Slovakia, South Africa, South Korea, Spain, Sri Lanka, Sweden, Switzerland, Taiwan, Thailand, Turkey, Ukraine, United Arab Emirates, United Kingdom, United States of America and Vietnam.*

IMPACT OF NOMINAL GDP & CAPITAL MARKET DEVELOPMENTS ON P&C PREMIUM GROWTH

In order to analyze the impact of nominal GDP growth on P&C premium development in general we used a single linear regression model with the sum of P&C premium income and nominal GDP of the 61 countries[2] as proxy for the global P&C insurance market and economic development. For the analysis of the influence of capital market developments on global premium growth we chose the MSCI World Index and the Dow Jones Index as well as the US treasury 10-year benchmark bond[3] as explanatory variables.

I. The correlation of nominal GDP and total P&C premium growth

When taking into account the whole time period from 2000 to 2019, our model shows no correlation at all between GDP growth and insurance market development. However, the results look different when running the regression model for each of the two decades separately.

In the first decade, which was marked by the terrorist attacks of September 11th and the bursting of the tech bubble, GDP growth explained only 23% of insurance premium development, albeit with a time lag of one year and a negative sign. While P&C insurance premium growth peaked at more than 10%, the world economy tumbled in the aftermath of these events. Thus, in the time span from 2000 to 2005, the two variables were almost perfectly negatively correlated, with an R^2 of 95%. In the second half of the first decade, when the world economy started to recover, the development of the global P&C market and GDP growth were more in line and also positively correlated, with R^2 amounting to 80%.

For the second decade the regression results were markedly higher: R^2 was 61% for the whole time period. The correlation was strongest in the second half of the decade: In the sub-period between 2015 and 2019, nominal GDP growth explains more than 90% of premium growth (see Figure 1).

Figure 1: GDP and P&C GWP growth (nominal, in %)

Sources: National financial supervisory authorities and insurance associations, IMF, Refinitiv, Allianz Research.

2. *In 2019 Euro exchange rates.*
3. *The explanatory strength of the respective national benchmark bonds is described in the paragraph about the regression results in single countries.*

Although the result is rather obvious at the global level with respect to the strength of the correlation between GDP and premium growth before and after the financial crisis, at country level the results are more dispersed. We observe the same development pattern in only 31 of the 61 countries, while in the others the correlation was stronger in the first decade. The GDP development explained at least 50% of insurance premium growth over the entire time period only in 13 countries, namely Argentina, Brazil, Bulgaria, China, Croatia, Greece, Hungary, Lebanon, Portugal, Romania, South Africa, Spain and Turkey, albeit in the cases of Greece and Romania with a time lag of one year. In 14 countries, the R^2 values for the whole time period ranged between 27% and 42% and in 24 it was even below 10%.

Unfortunately, the results are not significantly better when the two subperiods are analyzed separately. The correlation was in most cases rather weak: Only in 10 of the 30 countries[4] where the explanatory strength of nominal GDP was stronger in the first decade than in the second, the R^2 values were 50% or higher (see Table 1). The insurance penetration in these countries ranged between 0.9% in Romania and 3.0% in Denmark.

The same holds true for only 13 of the 31 countries[5], where regression results were higher in the second decade. Albeit, among these are some of the 10 biggest insurance markets of the world, like the USA, China, Germany and Spain (see Table 2, next page). The combined premium income of these 13 countries accounted for more than 60% of the 61 countries' total premium income in 2019, thus influencing the outcome at the global level markedly. The insurance penetration in these 13 countries ranged from 0.3% in Egypt to 3.2% in the US.

Thus, at the country level, idiosyncratic influences play a bigger role than at the global level where they might cancel each other out to a certain degree.

Table 1: Test: $\Delta P\&C = \alpha + \beta * \Delta GDP_t$ and $\Delta P\&C = \alpha + \beta * \Delta GDP_{t-1}$

	2000 – 2019			2000 – 2009			2009 – 2019		
	R^2	β	t-statistic	R^2	β	t-statistic	R^2	β	t-statistic
Argentina	0.72	0.76	6.86	0.71	0.90	4.41	0.49	0.42	2.96
Croatia	0.64	1.16	5.67	0.77	0.85	5.16	0.38	1.33	2.34
Denmark[a, b, c]	0.06	0.53	1.12	0.59	2.22	3.37	0.03	-0.33	-0.50
Hungary[b]	0.68	1.47	6.17	0.91	2.13	9.18	0.50	1.49	3.00
Ireland[b]	0.31	0.64	2.81	0.55	1.61	3.10	0.44	0.40	2.64
Italy	0.39	1.20	3.37	0.50	0.96	2.85	0.09	0.62	0.95
Morocco[c]	0.33	0.91	2.97	0.64	1.69	3.81	0.10	0.18	1.02
Poland	0.33	0.96	3.00	0.70	1.02	4.28	0.18	1.16	1.43
Romania[a, c]	0.79	1.22	8.20	0.59	0.88	3.40	0.16	0.35	1.30
Turkey	0.80	1.18	8.38	0.87	1.22	7.40	0.18	0.63	1.39

(a) 2000-2019: ΔGDP_{t-1}, (b) 2000-2009: ΔGDP_{t-1}, (c) 2000-2019: ΔGDP_{t-1}

Sources: National financial supervisory authorities and insurance associations, IMF, Refinitiv, Allianz Research.

4. *In Table 1 only those insurance markets where R^2 is 50% or above are listed. Further countries are: Austria, Bulgaria, Hong Kong, India, Indonesia, Kazakhstan, Kenya, Malaysia, the Netherlands, Pakistan, Saudi Arabia, Singapore, South Africa, South Korea, Sri Lanka, Switzerland, Ukraine, UAE, UK and Vietnam.*
5. *In Table 2 only those insurance markets where R^2 is 50% or above are listed. Further countries are Australia, Bahrain, Belgium, Canada, Czech Republic, Finland, France, Japan, Laos, New Zealand, Nigeria, Norway, Peru, Philippines, Russia, Slovakia, Taiwan and Thailand.*

Table 2: Test: $\Delta P\&C = \alpha + \beta * \Delta GDP_t$ and $\Delta P\&C = \alpha + \beta * \Delta GDP_{t-1}$

	2000 – 2019			2000 – 2009			2009 – 2019		
	R^2	β	t-statistic	R^2	β	t-statistic	R^2	β	t-statistic
Brazil	0.67	1.12	6.00	0.48	1.04	2.73	0.71	1.34	4.64
Chile[a,b]	0.15	0.74	1.76	0.11	0.67	1.01	0.53	1.58	3.20
China	0.53	1.09	4.53	0.43	0.93	2.46	0.54	1.41	3.28
Colombia[a,c]	0.29	3.30	2.65	0.30	-1.83	-1.72	0.60	7.02	3.67
Egypt	0.42	1.09	3.64	0.21	0.89	1.48	0.70	1.35	4.57
Germany[a,c]	0.35	0.63	3.13	0.23	-0.37	-1.56	0.79	0.84	5.87
Greece[a,b,c]	0.57	1.49	4.90	0.01	0.46	0.29	0.85	1.73	7.12
Lebanon[b]	0.54	0.97	4.36	0.64	1.08	3.26	0.81	0.92	6.17
Mexico[c]	0.10	-0.60	-1.40	0.21	-0.65	-1.45	0.50	1.58	3.01
Portugal	0.59	1.16	5.04	0.61	1.44	3.51	0.70	1.24	4.60
Spain[b]	0.66	1.09	5.98	0.49	2.69	2.78	0.91	1.08	9.77
Sweden	0.05	0.44	1.02	0.03	0.40	0.51	0.72	0.61	4.82
USA	0.09	0.64	1.36	0.10	0.65	0.92	0.66	1.13	0.27

(a) 2000-2019: ΔGDP_{t-1}, (b) 2000-2009: ΔGDP_{t-1}, (c) 2000-2019: ΔGDP_{t-1}

Sources: National financial supervisory authorities and insurance associations, IMF, Refinitiv, Allianz Research.

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II. The correlation between capital market developments and total P&C premium growth

Like in the case of nominal GDP, for the entire period and the first decade, the models showed a rather weak influence of capital market developments on global P&C premium growth. In contrast, for the 10-year period from 2009 to 2019, the development of the US treasury 10-year benchmark bond and of the MSCI World Index explained in each case around 40% of the gross written premium development. However, in the case of the MSCI World Index it was with a time lag of one year (see Figure 2).

However, the Dow Jones Index was the strongest explanatory variable, with a R^2 of 64% for the time period between 2009 and 2019, albeit also with a time lag of one year (see Figure 3).

Like in the case of the MSCI World Index, the model showed a positive correlation between premium growth and stock market developments in this time period, supporting the hypothesis that rising stock markets are an indicator for strong economic activity and thus spurring demand[6]. The development of benchmark bond yields and premium growth, however, were negatively correlated: Falling yields are not only a sign for a subdued economic outlook but could also lure more capital into (re)insurance markets, depressing prices.

Like in the case of the influence of GDP growth on P&C market developments, we also found marked differences with respect to the influence of capital market developments at the country level when analyzing the two decades separately. Only in one country, Chile, was the R^2 for the entire period above 50%.

In 33 countries, the correlation was stronger in the second decade, above all in Sweden and Nigeria. In Sweden, the development of the MSCI Index explained 81% of P&C insurance growth between 2009 and 2019 and in Nigeria 55%, albeit here with a time lag of one year (see Table 3 following page). However, in most other countries, the explanatory level of the development of the MSCI World index was rather low: In 10 countries[7] the R^2 values ranged between 26% and 44% and in the remaining 21 countries[8] it was below 20%.

Figure 2: Differing influence of bond and stock market developments

Sources: National financial supervisory authorities and insurance associations, IMF, Refinitiv, Allianz Research.

6. *The antitheses would say that booming equity markets could boost the investment income of insurers and thus become a trigger for slackening underwriting discipline, fueling price wars that are likely to depress nominal premium growth. But this might be more of an issue for mature national markets than the global market.*
7. *These are Argentina, Austria, France, Japan, Mexico, Philippines, Sri Lanka, Switzerland, Taiwan and the USA.*
8. *Australia, Belgium, Colombia, Czech Republic, Denmark, Greece, India, Italy, Kazakhstan, Kenya, Laos, Lebanon, Morocco, Pakistan, Romania, Russia, Slovakia, Spain, Turkey, Ukraine and UK.*

Figure 3: Premium growth follows stock market developments

Sources: National financial supervisory authorities and insurance associations, IMF, Refinitiv, Allianz Economic Research.

In the other 28 countries, we found a stronger correlation in the first decade. However, only in three of them, Chile, Peru and Poland, did the development of the MSCI World Index explain more than 50% of insurance premium growth between 2000 and 2009 (see Table 4). In eight of these countries[9], the R^2 values ranged between 25% and 49%, while it was below 20% in the remaining 12 countries[10].

The bottom line: Capital market developments influence P&C markets to a lesser degree than economic activity, measured by nominal GDP. This is particularly true at the national level. But combining both variables increases the explanatory power significantly. On the global level, for example, a multiple linear regression model with GDP and capital market developments as explanatory variables explains more than 90% of the global insurance market growth since 2009 and around 60% of the developments in the first decade of the century.

Table 3: Test: $\Delta P\&C = \alpha + \beta * \Delta MSCI_t$ and $\Delta P\&C = \alpha + \beta * \Delta MSCI_{t-1}$

	2000 – 2019			2000 – 2009			2009 – 2019		
	R^2	β	t-statistic	R^2	β	t-statistic	R^2	β	t-statistic
Nigeria[c]	0.22	-0.31	-2.26	0.49	-0.30	-2.78	0.55	-0.25	-3.35
Sweden[a, b, c]	0.02	-0.03	-0.63	0.06	-0.06	-0.69	0.81	0.09	6.12

(a) 2000-2019: $\Delta MSCI_{t-1}$, (b) 2000-2009: $\Delta MSCI_{t-1}$, (c) 2000-2019: $\Delta MSCI_{t-1}$

Sources: National financial supervisoy authorities and insurance associations, IMF, Refinitiv, Allianz Research.

Table 4: Test: $\Delta P\&C = \alpha + \beta * \Delta MSCI_t$ and $\Delta P\&C = \alpha + \beta * \Delta MSCI_{t-1}$

	2000 – 2019			2000 – 2009			2009 – 2019		
	R^2	β	t-statistic	R^2	β	t-statistic	R^2	β	t-statistic
Chile	0.58	-0.35	-4.97	0.67	-0.37	-4.00	0.41	-0.34	-2.48
Peru[a, b, c]	0.27	-0.27	-2.60	0.51	-0.37	-2.88	0.16	-0.16	-1.32
Poland[a, b, c]	0.03	0.04	0.72	0.57	0.11	3.25	0.02	-0.04	-0.43

(a) 2000-2019: $\Delta MSCI_{t-1}$, (b) 2000-2009: $\Delta MSCI_{t-1}$, (c) 2000-2019: $\Delta MSCI_{t-1}$

Sources: National financial supervisory authorities and insurance associations, IMF, Refinitiv, Allianz Research.

9. These were Bahrain, Brazil, Bulgaria, Germany, Hong Kong, Indonesia, Norway and Singapore.

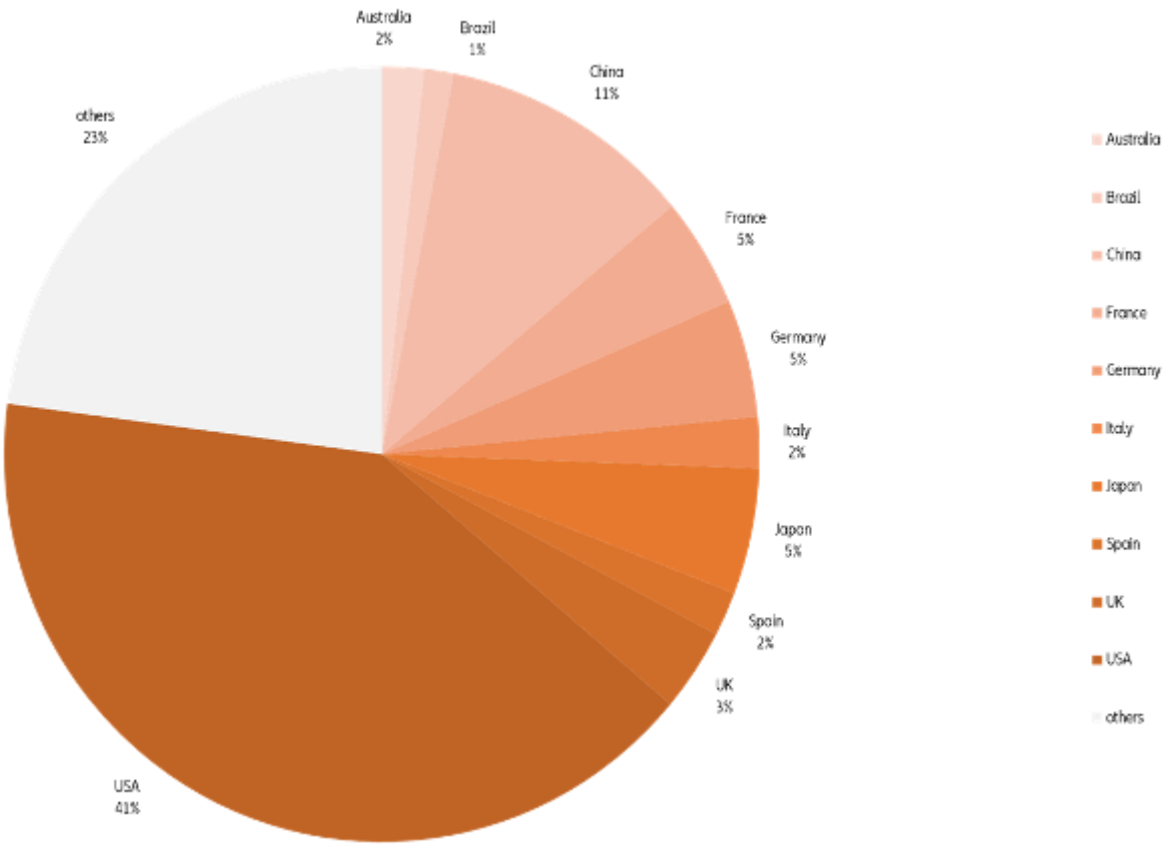
10. Finland, Hungary, Ireland, Malaysia, Netherlands, New Zealand, Portugal, Saudi Arabia, South Africa, South Korea, Thailand, UAE and Vietnam.

OTHER POSSIBLE DRIVERS OF TOTAL P&C MARKET GROWTH

Based on data availability, we chose 10 countries to analyze the explanatory strength of further exogenous factors of total P&C insurance premium development: Australia, Brazil, China, France, Germany, Italy, Japan, Spain, the UK and the US. The combined premium income of these 10 countries accounted for more than 75% of global P&C gross written insurance premiums[11] in 2019 (see Figure 4).

All in all, we test the impact of four variables: the national stock market index (NBI); the national 10-year-benchmark bond, private consumption expenditures and disposable income.

Figure 4: 10 countries account for 75% of the global P&C insurance market



Sources: National financial supervisory authorities and insurance associations, Refinitiv, Allianz Research.

11. In 2019 Euro exchange rates.

I. The influence of national stock market and yield developments on P&C premium growth

Over the whole time period from 2000 to 2019, the explanatory strength of the NBIs is slightly better than that of the MSCI in six countries, namely in Australia, Brazil, China, Germany, Italy and the US, but on a rather low level. The highest R^2 was 25% in Germany. The explanatory strength is better if the two decades are analyzed separately: In four of the 10 countries (Australia, China, the UK and the US), the NBIs had a stronger impact on the insurance market development than the MSCI World index in both decades.

The development of the Dow Jones, for example, explains 43% of the premium growth in the US between 2009 and 2019, with a time lag of one year, while the resulting R^2 with the MSCI World Index as an explanatory variable was only 30%. The development of the Shanghai Stock Index could explain 36% of the insurance market development in China between 2000 and 2009; the R^2 in the regression model with the MSCI World Index as an explanatory variable was only 14% for this time period.

In the other countries, the correlation between the NBI and P&C premium development was stronger than the influence of the MSCI World Index in at least one decade. For example, in Brazil, the development of the national Bovespa Index could explain 50% and that of Italy's FTSE MIB 41% of the respective P&C premium income growth between 2009 and 2019. In Germany, the development of the national index had a markedly higher explanatory strength than the MSCI World Index in the first decade: the R^2 with the DAX 30 as an exogenous factor was 52% compared to 43% when choosing the MSCI (see Table 5).

In most countries, interest rate developments had only a minor influence on the P&C premium growth. The highest R^2 was 31% in Australia for the time period from 2009 to 2019. This is hardly surprising, given the long and chilling yield winter of recent years.

Table 5: Test: $\Delta P\&C = \alpha + \beta * \Delta NBI_t$ and $\Delta P\&C = \alpha + \beta * \Delta NBI_{t-1}$ vs. $\Delta P\&C = \alpha + \beta * \Delta MSCI_t$ and $\Delta P\&C = \alpha + \beta * \Delta MSCI_{t-1}$

	$\Delta P\&C = \alpha + \beta * \Delta NBI_{t \text{ or } t-1}$						$\Delta P\&C = \alpha + \beta * \Delta MSCI_{t \text{ or } t-1}$					
	2000-2009			2009-2019			2000-2009			2009-2019		
	R^2	β	t-stat.	R^2	β	t-stat.	R^2	β	t-stat.	R^2	β	t-stat.
Australia[a, b, d]	0.06	-0.06	-0.70	0.26	-0.08	-1.80	0.01	0.02	0.32	0.18	-0.06	-1.39
Brazil[c, d]	0.28	-0.05	-1.78	0.50	-0.16	-2.99	0.44	0.11	2.49	0.27	0.18	1.82
China[b,d]	0.36	0.06	2.13	0.10	0.06	1.01	0.14	0.10	1.16	0.02	0.06	0.48
France	0.17	-0.04	-1.27	0.39	-0.05	-2.41	0.08	-0.03	-0.84	0.44	-0.06	-2.66
Germany[a, b, c, d]	0.52	-0.04	-2.94	0.14	-0.04	-1.21	0.43	-0.05	-2.47	0.18	-0.05	-1.40
Italy	0.02	-0.02	-0.44	0.41	-0.15	-2.49	0.05	-0.03	-0.63	0.21	-0.14	-1.57
Japan[b, d]	0.14	0.02	1.15	0.24	0.05	1.69	0.05	0.01	0.62	0.29	0.07	1.90
Spain	0.01	-0.02	-0.28	0.12	-0.07	-1.13	0.01	-0.03	-0.30	0.10	-0.08	-1.00
UK[b, d]	0.12	-0.12	-1.03	0.12	0.08	1.08	0.07	-0.08	-0.80	0.09	0.06	0.95
USA[b, d]	0.04	-0.02	-0.18	0.43	0.10	2.60	0.02	-0.04	-0.44	0.30	0.07	1.95

(a) 2000-2009: ΔNBI_{t-1}, (b) 2009-2019: ΔNBI_{t-1}, (c) 2000-2009: $\Delta MSCI_{t-1}$, (d) 2009-2019: $\Delta MSCI_{t-1}$

Sources: National financial supervisory authorities and insurance associations, IMF, Refinitiv, Allianz Research.

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II. The influence of private consumption expenditures and disposable income development on P&C premium growth

Against the backdrop of the large share of retail lines in the overall P&C market, private consumption is expected to have a significant impact on P&C premiums. However, considering the whole time period, the explanatory strength of private consumption is weaker than that of GDP in most countries; the exceptions are the UK and US. The R^2 value is above 50% for only two countries, namely in Spain with 52% and in Brazil with 63%. In the remaining countries, it ranges between 1% in Japan and 33% in China. A comparison of the regression results for the first and the second decade shows that in half of the countries the correlation was stronger in the years from 2000 to 2009 while in the other five countries it was stronger in the second decade. However, while R^2 is only in one country above 50% during the first decade, namely in the UK with 52%, this holds true for three countries in the second decade, i.e. the USA, Brazil and Spain with an R^2 of 54%, 67% and 82% respectively (see table 6).

Modeling total P&C gross written premium growth with disposable income[12] as the sole explanatory variable also shows mixed results. Taking into account the whole time period, the resulting R^2 is only higher than 50%, in two countries, again Spain with 54% and Brazil with 67%. In the remaining countries, it ranges between 3% in Australia and 44% in Germany. i.e. the explanatory strength of disposable income is slightly higher than that of private consumption expenditures at least when taking into account the whole time period. Between 2000 and 2009 R^2 was also above 50% in only two countries, Italy and the UK, with 63% and 62%, respectively. But the overall variation was smaller than over the complete time period, with R^2s ranging between 13% in France, Germany and the US and 46% in Spain. In the second decade R^2 is in only in Spain (59%), Brazil (74%) and Germany (83%) markedly above 50%, while it ranges between 2% and 28% in the remaining countries (see Table 7 next page).

Table 6: Test: $\Delta P\&C = \alpha + \beta * \Delta \text{Private Consumption}_t$ and $\Delta P\&C = \alpha + \beta * \Delta \text{Private Consumption}_{t-1}$

	2000 – 2019			2000 – 2009			2009 – 2019		
	R^2	β	t-statistic	R^2	β	t-statistic	R^2	β	t-statistic
Australia[c]	0.14	-1.17	-1.70	0.11	-1.15	-1.01	0.42	2.96	2.58
Brazil	0.63	1.44	5.59	0.09	0.57	0.89	0.67	1.64	4.29
China	0.33	1.19	2.99	0.45	1.22	2.56	0.21	1.04	1.54
France[a, b]	0.09	-0.16	-1.36	0.39	-0.39	-2.26	0.21	0.16	1.55
Germany[a, c]	0.14	0.83	1.71	0.18	-0.83	-1.30	0.35	1.78	2.19
Italy[a, c]	0.27	1.38	2.60	0.22	1.36	1.52	0.18	0.94	1.42
Japan[a, b, c]	0.01	0.21	0.37	0.28	0.97	1.75	0.22	0.85	1.61
Spain	0.52	1.40	4.44	0.37	1.32	2.18	0.82	1.08	6.38
UK[b]	0.27	1.70	2.58	0.52	3.55	2.96	0.08	0.60	0.88
USA	0.22	1.38	2.28	0.26	1.54	1.69	0.54	1.51	3.27

(a) 2000-2019: ΔPrivate Consumption$_{t-1}$, (b) 2000-2009: ΔPrivate Consumption$_{t-1}$, (c) 2000-2019: ΔPrivate Consumption$_{t-1}$

Sources: National financial supervisory authorities and insurance associations, IMF, Refinitiv, Allianz Research.

12. *For Japan there was no disposable income data available.*

Table 7: Test: $\Delta P\&C = \alpha + \beta * \Delta Disposable\ Income_t$ and $\Delta P\&C = \alpha + \beta * \Delta Disposable\ Income_{t-1}$

	2000 – 2019			2000 – 2009			2009 – 2019		
	R^2	β	t-statistic	R^2	β	t-statistic	R^2	β	t-statistic
Australia[c]	0.03	0.27	0.73	0.41	1.59	2.37	0.04	0.23	0.60
Brazil[b]	0.67	1.12	5.93	0.41	1.59	2.37	0.74	1.39	5.10
China	0.33	1.39	2.95	0.27	1.14	1.73	0.28	1.62	1.87
France[a]	0.26	0.52	2.51	0.13	0.47	1.08	0.12	0.34	1.12
Germany[a, c]	0.44	1.25	3.76	0.13	-0.49	-1.10	0.83	1.75	6.74
Italy[b]	0.35	1.21	3.08	0.63	3.19	3.47	0.02	0.36	0.47
Spain[a, b]	0.54	1.06	4.45	0.46	3.76	2.44	0.59	0.92	3.60
UK[b]	0.19	1.28	2.08	0.62	3.31	3.60	0.10	0.60	1.01
USA	0.08	0.61	1.25	0.13	0.96	1.09	0.28	0.67	1.85

(a) 2000-2019: $\Delta Disposable\ Income_{t-1}$, (b) 2000-2009: $\Delta Disposable\ Income_{t-1}$, (c) 2000-2019: $\Delta Disposable\ Income_{t-1}$

Sources: National financial supervisory authorities and insurance associations, IMF, Refinitiv, Allianz Research.

III. Comparison of regression results for total P&C premium growth

A comparison of the results of the different regression models by explaining variables and time periods shows that nominal GDP is still in most countries the dominating influencing factor. This applies in particular to the second decade between 2009 and 2019, with R^2s ranging between 44% in Japan and 91% in Spain. But there are exceptions: In Brazil and Germany, for example, disposable income as an explanatory variable yields slightly better results than GDP. In Italy, the development of the national stock market explained premium growth best, with R^2 amounting to 41%. And in the UK no model seems to work. In the first decade between 2000 and 2009, however, the picture is murkier. Nominal GDP is the dominant explanatory variable in only two countries, Brazil and Spain. In the other countries, the development of personal income or private consumption explained the premium growth best, with the only exception of Germany (national stock market). For the whole period, nominal GDP turned out to be the strongest explanatory variable in four countries, while disposable income showed the best results in three of them (see Table 8).

Table 8: Overview R^2, Test: $\Delta P\&C = \alpha + \beta * \Delta X_t$ and $\Delta P\&C = \alpha + \beta * \Delta X_{t-1}$

	2000-2019						2000-2009						2009-2019					
	A	B	C	D	E	F	A	B	C	D	E	F	A	B	C	D	E	F
Australia	0.09	0.03	0.11	0.23	0.14	0.03	0.34	0.01	0.06	0.23	0.11	0.41	0.49	0.18	0.26	0.31	0.42	0.04
Brazil	0.67	0.16	0.19	0.00	0.63	0.67	0.48	0.44	0.28	0.00	0.09	0.45	0.71	0.27	0.50	0.00	0.67	0.74
China	0.53	0.12	0.18	0.00	0.33	0.33	0.43	0.14	0.36	0.00	0.45	0.27	0.54	0.02	0.10	0.00	0.21	0.28
France	0.23	0.14	0.21	0.03	0.09	0.26	0.17	0.08	0.17	0.11	0.39	0.13	0.47	0.44	0.39	0.03	0.21	0.12
Germany	0.35	0.24	0.25	0.02	0.14	0.44	0.23	0.43	0.52	0.08	0.18	0.13	0.79	0.18	0.14	0.03	0.35	0.83
Italy	0.39	0.12	0.13	0.06	0.27	0.35	0.50	0.05	0.02	0.05	0.22	0.63	0.09	0.21	0.41	0.17	0.18	0.02
Japan	0.28	0.06	0.20	0.11	0.01	0.00	0.15	0.05	0.14	0.08	0.28	0.00	0.44	0.29	0.24	0.04	0.22	0.00
Spain	0.66	0.04	0.00	0.01	0.52	0.54	0.49	0.01	0.01	0.08	0.37	0.46	0.91	0.10	0.12	0.04	0.82	0.59
UK	0.08	0.06	0.09	0.02	0.27	0.19	0.13	0.07	0.12	0.05	0.52	0.62	0.07	0.09	0.12	0.14	0.08	0.10
USA	0.09	0.03	0.01	0.01	0.22	0.08	0.10	0.02	0.00	0.08	0.26	0.13	0.66	0.30	0.43	0.09	0.54	0.28

X: A = GDP, B= MSCI, C = NBI, D= BB, E = Private Consumption, F = Disposable Income

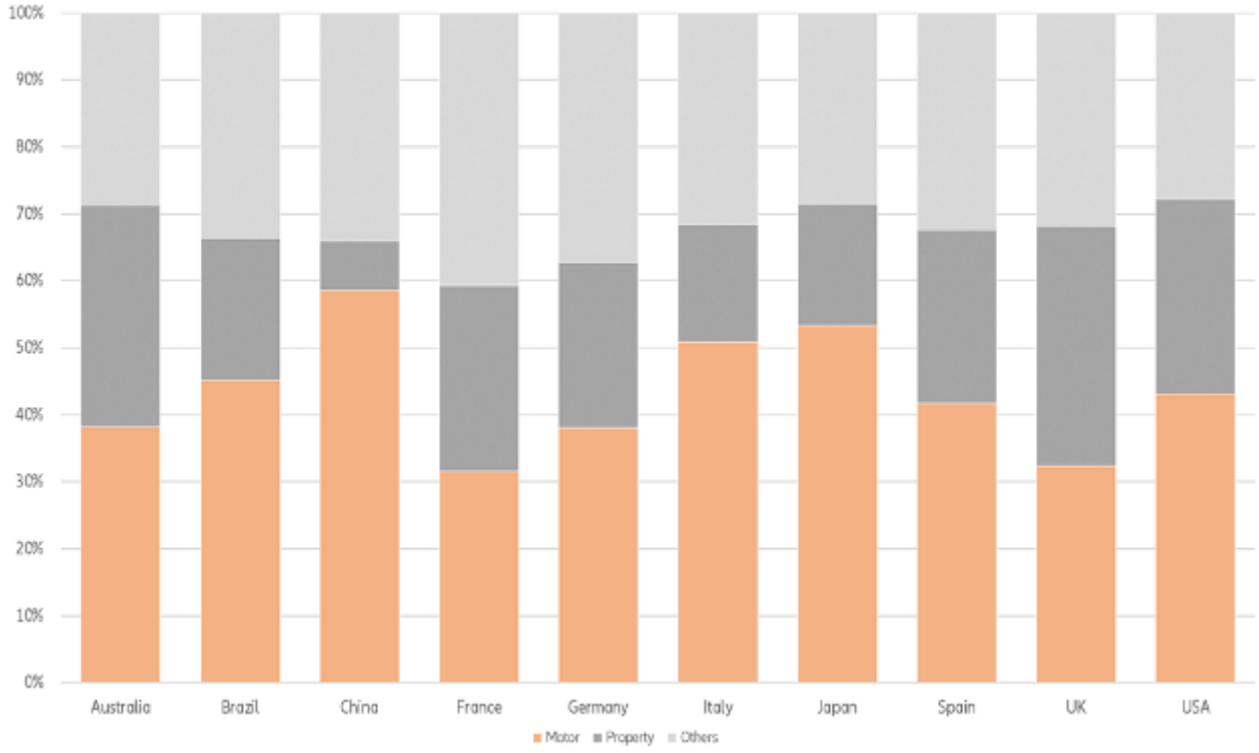
Sources: National financial supervisory authorities and insurance associations, IMF, Refinitiv, Allianz Research.

DRIVERS OF GROWTH FOR MOTOR AND PROPERTY INSURANCE

The total P&C market is quite heterogeneous: insurance demand is fueled by different activities and agents. Zooming in on specific business lines allows for a more granular approach and might lead to better results. Thus, we run single linear regression models for the business lines motor and property insurance. Both lines combined make up 70% of the total premium income of the 10 markets, with shares ranging from 59% in France to more than 70% in Australia, Japan and the US (see Figure 5).

As further exogenous factors besides nominal GDP and the MSCI World Index we again took the respective national stock market index and the 10-year-benchmark bond, private consumption expenditures and disposable income. In the context of motor insurance, we also took into account the number of registered cars, new car registrations and in the case of the US additionally the distance travelled per year.

Figure 5: Motor and property insurance account for more than 60% of premium income



Sources: National financial supervisory authorities and associations, Allianz Research.

11. In 2019 Euro exchange rates.

Nominal GDP as an explanatory variable of motor insurance premium growth.

The explanatory strength of nominal GPD growth for motor insurance premium developments differs markedly between the countries and the three time periods.

Only in four of the 10 countries, Australia, Brazil, France and Spain, did nominal GDP growth explain 50% or more of motor premium growth, at least in one period. Spain stands out as the country with the highest R^2, namely 60%, over the whole time span and the only one where the development of GDP could explain more than 50% of insurance premium growth in all three time periods. In Australia, the explanatory strength of nominal GDP was markedly higher in the first decade, with an R^2 of 57%; however, the correlation of the two variables was negative in this time span, thus contradicting the hypothesis that motor insurance demand increases with a higher GDP per capita in this case. The strongest correlation was observed in France, where R^2 was 69% in the years from 2009 to 2019 (see Table 9).

Table 9: Test: $\Delta Motor = \alpha + \beta * \Delta GDP_t$ and $\Delta Motor = \alpha + \beta * \Delta GDP_{t-1}$

	2000 – 2019			2000 – 2009			2009 – 2019		
	R^2	β	t-statistic	R^2	β	t-statistic	R^2	β	t-statistic
Australia[c]	0.11	-0.40	-1.38	0.57	-1.29	-2.82	0.18	0.46	1.41
Brazil	0.41	1.22	3.54	0.13	0.81	1.08	0.50	1.50	3.00
China	0.39	1.30	3.17	0.31	1.21	1.88	0.29	1.23	1.70
France	0.07	0.27	1.09	0.05	0.25	0.68	0.69	0.61	4.18
Germany[a, b, c]	0.05	0.30	0.90	0.03	-0.34	-0.48	0.29	0.42	1.80
Italy[c]	0.46	1.36	3.88	0.49	1.14	2.75	0.16	0.70	1.29
Japan[b]	0.12	0.44	1.58	0.09	-0.59	0.39	0.18	0.38	1.39
Spain	0.60	1.29	5.24	0.59	1.40	3.37	0.52	1.42	3.15
UK	0.04	0.90	0.80	0.10	1.24	0.92	0.19	1.68	1.37
USA[b]	0.02	0.24	0.54	0.02	-0.37	-0.39	0.41	0.99	2.49

(a) 2000-2019: ΔGDP_{t-1}, (b) 2000-2009: ΔGDP_{t-1}, (c) 2000-2019: ΔGDP_{t-1}

Sources: National financial supervisory authorities and insurance associations, IMF, Refinitiv, Allianz Research.

The impact of financial market developments on motor insurance premium growth.

The impact of global capital market developments on motor insurance growth, measured as the influence of the development of the MSCI World index on insurance premium development, is in most countries rather low. The exceptions are Australia and Brazil, where R^2 was 77% and 76% respectively, albeit only for the time period from 2000 to 2009 and with different signs: While the regression result for Australia supports the hypothesis that positive capital market developments tend to lower premium income via the price mechanism, as higher investment income reduces the need for price increases to cover claims (slackening underwriting discipline), the positive sign in Brazil hints to the fact that higher capital market income spurs demand.

In seven of the 10 analyzed countries, the explanatory strength of the MSCI World index was stronger in the second decade than in the first. The exceptions are Australia, Brazil and China. For the years from 2009 to 2019, the R^2 values ranged between 6% in China and 40% in the UK.

For the whole period, the results were even lower with the R^2 values ranging from 0% in Germany to 36% in Australia (see Table 10).

The influence of national stock market developments is quite similar. For the whole time period, the explanatory strength of the development of the respective national benchmark stock indices was rather low: It explained about one third of the motor premium development in Australia and between 10% and 20% in Japan, Brazil, the UK, China and France. In the US, the regression model did not show any marked influence. However, in the first decade R^2 was close to or markedly above 50% in Australia and Brazil for the first decade, again with a negative sign in Australia.

In seven out of the 10 analyzed countries, the correlation in the second decade was markedly higher than in the first. In addition, our regression models show that in most countries during this time period the national stock market development had a stronger influence on insurance demand than the development of the MSCI World Index. France and the UK were again the countries with the strongest correlation of capital market and insurance market growth: France was the country where the national stock market development had the highest explanatory value during the 10 years since the financial crisis, with an R^2 of 60%. In the UK, R^2 is 47% (see Table 11 following page).

Like in case of total premium development, the correlation between the interest rate development and motor insurance premium income is rather weak. The exception is again Australia, where the correlation was 89% for the time period from 2000 to 2009, albeit with a negative sign and a time-lag of one year.

Table 10: Test: $\Delta Motor = \alpha + \beta * \Delta MSCI_t$ and $\Delta Motor = \alpha + \beta * \Delta MSCI_{t-1}$

	2000 – 2019			2000 – 2009			2009 – 2019		
	R^2	β	t-statistic	R^2	β	t-statistic	R^2	β	t-statistic
Australia[a, b, c]	0.36	-0.10	-3.00	0.77	-0.14	-4.45	0.24	-0.07	-1.68
Brazil[a, b, c]	0.30	0.22	2.75	0.76	0.21	5.06	0.27	0.23	1.81
China[a]	0.17	0.21	1.81	0.25	0.21	1.62	0.06	0.19	0.66
France	0.09	-0.03	-1.32	0.08	-0.03	-0.85	0.38	-0.06	-2.23
Germany[c]	0.00	0.00	-0.12	0.07	-0.03	-0.79	0.20	0.05	1.41
Italy	0.07	-0.06	-1.17	0.03	-0.03	-0.46	0.10	-0.08	-1.00
Japan[b, c]	0.01	0.02	0.50	0.01	-0.01	-0.23	0.16	0.05	1.32
Spain	0.11	-0.12	-1.52	0.09	-0.08	-0.88	0.15	-0.16	-1.27
UK[c]	0.12	-0.17	-1.52	0.13	-0.16	-1.07	0.40	0.25	2.31
USA[a, b, c]	0.04	-0.04	-0.89	0.09	-0.06	-0.89	0.16	0.06	1.33

(a) 2000-2019: $\Delta MSCI_{t-1}$, (b) 2000-2009: $\Delta MSCI_{t-1}$, (c) 2000-2019: $\Delta MSCI_{t-1}$

Sources: National financial supervisory authorities and insurance associations, IMF, Refinitiv, Allianz Research.

12. For Japan there was no disposable income data available.

Table 11: Test: $\Delta Motor = \alpha + \beta * \Delta NBI_t$ and $\Delta P\&C = \alpha + \beta * \Delta NBI_{t-1}$

	2000 – 2019			2000 – 2009			2009 – 2019		
	R^2	β	t-statistic	R^2	β	t-statistic	R^2	β	t-statistic
Australia[a, b, c]	0.32	-0.10	-2.74	0.62	-0.14	-3.15	0.24	-0.07	-1.69
Brazil[b]	0.15	-0.09	-1.81	0.56	0.07	3.16	0.41	-0.19	-2.50
China[b, c]	0.18	0.08	1.86	0.03	0.03	0.46	0.09	0.07	0.84
France	0.19	-0.05	-2.02	0.16	-0.04	-1.24	0.60	-0.08	-3.50
Germany[c]	0.02	-0.02	-0.62	0.17	-0.04	-1.30	0.23	0.05	1.56
Italy[b]	0.06	-0.05	-1.07	0.01	0.02	0.32	0.21	-0.09	-1.54
Japan[b, c]	0.10	0.03	1.40	0.02	0.01	0.40	0.18	0.04	1.41
Spain	0.03	-0.06	-0.78	0.12	-0.09	-1.06	0.06	-0.09	-0.75
UK[c]	0.17	-0.24	-1.88	0.17	-0.22	-1.28	0.47	-0.47	-2.65
USA[b, c]	0.00	0.01	0.24	0.02	-0.04	-0.44	0.26	0.09	1.79

(a) 2000-2019: ΔNBI_{t-1}, (b) 2000-2009: ΔNBI_{t-1}, (c) 2000-2019: ΔNBI_{t-1}

Sources: National financial supervisory authorities and insurance associations, IMF, Refinitiv, Allianz Research.

The influence of private consumption and disposable income on motor insurance premium growth

Considering the whole time period, private consumption had a stronger impact on motor insurance premium growth than financial market developments but was still marginally weaker than nominal GDP: The R^2 values ranged from 3% in the UK to 58% in Spain. We found the strongest correlation in the US, with 69% in the time period from 2009 to 2019; the highest R^2 in the first decade was 60% in Spain. Nevertheless, the explanatory strength of private consumption was higher in the first decade than the second in six of the 10 countries. However, the difference between the regression results for the two decades were rather marginal in France and Spain. Furthermore, we found a peculiarity in Australia and France: In both countries, the correlation between the two variables was negative over the whole time period and between 2000 and 2009; only in the second period did the sign change to positive (see Table 12).

In most countries, the explanatory strength of the disposable income development was lower than that of personal consumption: Considering the whole time period, private households' disposable income growth had the highest explanatory strength in Spain, where R^2 was 54%, though with a time lag of one year. In Brazil and Italy, the R^2 values were 49% and 44%, respectively. In all other countries, the R^2 values ranged below 15%. The strongest correlations between the development of private households' disposable income and motor insurance premium growth were observed in the first decade, namely in Spain, where R^2 for this period was 68%, as well as in Italy and the UK, where R^2 was in both cases 56%. In the second decade, we had the highest results in Brazil and France, with 49% and 47%, respectively (see Table 13).

Table 12: Test: $\Delta Motor = \alpha + \beta * \Delta Private\ Consumption_t$ and $\Delta Motor = \alpha + \beta * \Delta Private\ Consumption_{t-1}$

	2000 – 2019			2000 – 2009			2009 – 2019		
	R^2	β	t-statistic	R^2	β	t-statistic	R^2	β	t-statistic
Australia[a, b, c]	0.15	-0.87	-1.67	0.37	-1.54	-1.87	0.05	1.02	0.70
Brazil	0.46	1.70	3.93	0.02	0.40	0.39	0.56	2.00	3.41
China	0.14	1.04	1.59	0.30	1.52	1.83	0.02	0.43	0.42
France[a, b]	0.16	-0.22	-1.77	0.38	-0.44	-2.20	0.37	0.24	2.18
Germany[a, b, c]	0.21	1.34	2.13	0.12	0.85	1.02	0.37	1.56	2.18
Italy[a, c]	0.40	1.75	3.49	0.25	1.72	1.62	0.49	1.31	2.96
Japan[c]	0.08	0.64	1.22	0.39	1.54	2.26	0.31	0.94	2.02
Spain[a, c]	0.58	1.76	5.02	0.60	1.94	3.46	0.58	1.56	3.52
UK[b, c]	0.03	0.98	0.78	0.45	4.93	2.57	0.01	-0.47	-0.31
USA[c]	0.20	0.22	2.10	0.11	0.18	1.00	0.69	0.27	4.51

(a) 2000-2019: $\Delta Private\ Consumption_{t-1}$, (b) 2000-2009: $\Delta Private\ Consumption_{t-1}$, (c) 2000-2019: $\Delta Private\ Consumption_{t-1}$

Sources: National financial supervisory authorities and insurance associations, IMF, Refinitiv, Allianz Research.

Table 13: Test: $\Delta Motor = \alpha + \beta * \Delta Disposable\ Income_t$ and $\Delta Motor = \alpha + \beta * \Delta Disposable\ Income_{t-1}$

	2000 – 2019			2000 – 2009			2009 – 2019		
	R^2	β	t-statistic	R^2	β	t-statistic	R^2	β	t-statistic
Australia[b, c]	0.02	-0.18	-0.62	0.35	1.29	1.79	0.33	0.66	2.12
Brazil[a]	0.44	1.28	3.53	0.19	0.95	0.25	0.49	1.51	2.95
China	0.13	1.25	1.58	0.08	0.95	0.83	0.09	1.12	0.85
France[a, b]	0.05	0.24	0.95	0.07	0.58	0.80	0.47	0.76	2.64
Germany[a, b]	0.09	0.74	1.27	0.03	0.47	0.50	0.24	0.79	1.59
Italy[b]	0.49	1.50	4.15	0.56	3.55	2.99	0.07	-1.04	-0.77
Japan[a]	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Spain[b]	0.54	1.32	4.62	0.68	4.45	3.81	0.39	1.28	2.39
UK[a, b]	0.02	0.69	0.65	0.56	4.71	3.22	0.07	-1.04	-0.77
USA	0.01	0.20	0.44	0.04	0.41	0.55	0.19	0.62	1.45

(a) 2000-2019: $\Delta Disposable\ Income_{t-1}$, (b) 2000-2009: $\Delta Disposable\ Income_{t-1}$, (c) 2000-2019: $\Delta Disposable\ Income_{t-1}$

Sources: National financial supervisory authorities and insurance associations, IMF, Refinitiv, Allianz Research.

New car registrations, number of vehicles in use and motor insurance premium growth

Somewhat counter-intuitively, the development of new car registrations hardly had an impact on motor premium growth. Taking into account the whole time period between 2000 and 2019, R^2 was below 5% in eight of the 10 countries. The regression models showed the highest explanatory strength of new car registrations in China and Spain, with R^2s of 40% and 35%, respectively, though with a time lag of one year.

The correlations were stronger when we analyzed the two decades separately. In the first decade, the R^2 values ranged from 2% in Italy and the US to 44% in Spain. The lowest correlation in the second decade was 4% in Australia and the US, while it reached 63% in Spain and 80% in China (see Table 14). Thus, new car registrations play a role mainly in markets like China where car ownership is rising rapidly.

In contrast, in most countries, the development of the number of vehicles in use proved to provide a much better explanation for motor insurance premium growth than that of the number of new car registrations: Taking into account the whole time period, the R^2 values ranged from 8% in Japan to 52% in Italy, apart from the UK, where the correlation, like in the case of new car registrations, was zero. We found the strongest correlation of 74% in the second decade in China. Overall, R^2 was above 50% in four countries for this time period, namely Spain, Germany, Italy and China. The highest correlation in the first decade was 72% in France, followed by 69% in Australia; in the remaining countries R^2 was below 50% (see Table 15).

For the US, we also took into account the development of distance traveled as an exogenous factor, which turned out be the best explanation for motor insurance premium growth. The R^2 was above 40% for all time periods and reached 82% in the second decade when we factored in a time lag of one year. The respective regression with the current value resulted in an R^2 of 59%.

Table 14: Test: $\Delta Motor = \alpha + \beta * \Delta Car\ Registrations_t$ and $\Delta Motor = \alpha + \beta * \Delta Car\ Registrations_{t-1}$

	2000 – 2019			2000 – 2009			2009 – 2019		
	R^2	β	t-statistic	R^2	β	t-statistic	R^2	β	t-statistic
Australia[c]	0.01	-0.05	-0.37	0.26	-0.36	-1.47	0.04	0.09	0.59
Brazil[c]	0.04	0.12	0.90	0.10	0.18	0.96	0.05	0.14	0.68
China[a, b, c]	0.40	0.43	2.84	0.32	0.55	1.37	0.80	0.46	5.22
France	0.05	-0.07	-0.91	0.17	-0.21	-1.30	0.08	-0.05	-0.81
Germany[a, b]	0.03	-0.09	-0.75	0.03	0.11	0.54	0.29	-0.15	-1.80
Italy[a]	0.02	0.07	0.61	0.02	0.10	0.39	0.09	-0.09	-0.95
Japan[c]	0.02	0.04	0.59	0.27	0.24	1.71	0.06	0.21	0.77
Spain[a, b, c]	0.35	0.30	3.14	0.44	0.37	2.52	0.63	0.26	3.95
UK	0.00	-0.08	-0.23	0.14	0.64	1.15	0.19	-0.52	-1.36
USA[c]	0.01	-0.05	-0.46	0.02	0.09	0.44	0.04	0.05	0.57

(a) 2000-2019: $\Delta Car\ Registrations_{t-1}$, (b) 2000-2009: $\Delta Car\ Registrations_{t-1}$, (c) 2000-2019: $\Delta Car\ Registrations_{t-1}$

Table 15: Test: $\Delta Motor = \alpha + \beta * \Delta Vehicles_t$ and $\Delta Motor = \alpha + \beta * \Delta Vehicles_{t-1}$

	2000 – 2019			2000 – 2009			2009 – 2019		
	R^2	β	t-statistic	R^2	β	t-statistic	R^2	β	t-statistic
Australia[b, c]	0.11	-1.77	-1.34	0.69	5.19	3.35	0.09	1.70	0.93
Brazil	na.	na.	na.	na.	na.	na.	na.	na.	na.
China[b]	0.22	1.22	2.14	0.24	1.63	1.58	0.74	1.79	4.51
France[a, b, c]	0.13	0.63	1.51	0.72	3.29	4.22	0.01	-0.09	-0.24
Germany[c]	0.19	0.43	1.98	0.15	0.27	1.18	0.55	0.38	3.11
Italy[a, b, c]	0.52	3.23	4.42	0.25	2.08	1.64	0.61	3.87	3.72
Japan	0.08	1.54	1.27	0.49	2.84	2.75	0.34	3.71	2.14
Spain	0.50	2.52	4.14	0.36	2.17	2.12	0.52	3.11	2.96
UK[b]	0.00	0.17	0.10	0.13	3.28	1.09	0.06	1.46	0.73
USA[a, b]	0.11	0.95	1.50	0.12	1.27	1.06	0.47	1.91	2.68

(a) 2000-2019: $\Delta Vehicles_{t-1}$, (b) 2000-2009: $\Delta Vehicles_{t-1}$, (c) 2000-2019: $\Delta Vehicles_{t-1}$

Sources: National financial supervisory authorities and insurance associations, IMF, Refinitiv, Allianz Research.

Comparison of regression results for motor insurance premium growth

A comparison of the regression results for the various exogenous variables does not reveal a single strong exogenous factor.

The same strongest explanatory variable was in each time period only found in three countries. For the whole time period it was private consumption; between 2000 and 2009 it was disposable income and from 2009 to 2019 it was the number of vehicles in use.

However, the nominal GDP development in Spain had the highest explanatory value for the whole time period, with an R^2 of 60%. In the first decade, it was the 10-year benchmark bond in Australia with an R^2 of 89% and in the second decade it was the number of new car registrations in China with an R^2 of 80%.

Only in two countries was the strongest explanatory variable in all three time periods the same exogenous factor. While in China the number of new car registrations proved to be the strongest explanatory variable in all of the three time periods, it was disposable income in the US. In Australia, it was capital market developments in a broader sense. In all other countries, the respective strongest influencing factor varied (see Table 16).

Table 16: Overview R^2, Test: $\Delta Motor = \alpha + \beta * \Delta X_t$ and $\Delta Motor = \alpha + \beta * \Delta X_{t-1}$

	2000-2019								2000-2009								2009-2019							
	A	B	C	D	E	F	G	H	A	B	C	D	E	F	G	H	A	B	C	D	E	F	G	H
Australia	0.11	0.36	0.32	0.25	0.15	0.02	0.01	0.11	0.57	0.77	0.62	0.89	0.37	0.35	0.26	0.69	0.18	0.24	0.24	0.28	0.05	0.33	0.04	0.09
Brazil	0.41	0.30	0.15	0.00	0.46	0.44	0.04	0.00	0.13	0.76	0.56	0.10	0.02	0.19	0.10	0.00	0.50	0.27	0.41	0.08	0.56	0.49	0.05	0.00
China	0.39	0.17	0.18	0.00	0.14	0.13	0.40	0.22	0.31	0.25	0.03	0.00	0.30	0.08	0.32	0.24	0.29	0.06	0.09	0.00	0.02	0.09	0.80	0.74
France	0.07	0.09	0.19	0.04	0.16	0.05	0.05	0.13	0.05	0.08	0.16	0.22	0.38	0.07	0.17	0.72	0.69	0.38	0.60	0.15	0.37	0.47	0.08	0.01
Germany	0.05	0.00	0.02	0.01	0.21	0.09	0.03	0.19	0.03	0.07	0.17	0.03	0.12	0.03	0.03	0.15	0.29	0.20	0.23	0.01	0.37	0.24	0.29	0.55
Italy	0.46	0.07	0.06	0.12	0.40	0.49	0.02	0.52	0.49	0.03	0.01	0.03	0.25	0.56	0.02	0.25	0.16	0.10	0.21	0.45	0.49	0.07	0.09	0.61
Japan	0.12	0.01	0.10	0.02	0.08	0.00	0.02	0.08	0.09	0.01	0.02	0.02	0.39	0.00	0.27	0.49	0.18	0.16	0.18	0.06	0.31	0.00	0.06	0.34
Spain	0.60	0.11	0.03	0.06	0.58	0.54	0.35	0.50	0.59	0.09	0.12	0.15	0.60	0.68	0.44	0.36	0.52	0.15	0.06	0.17	0.58	0.39	0.63	0.52
UK	0.04	0.12	0.17	0.02	0.03	0.02	0.00	0.00	0.10	0.13	0.17	0.07	0.45	0.56	0.14	0.13	0.19	0.40	0.47	0.09	0.01	0.07	0.19	0.06
USA	0.02	0.04	0.00	0.00	0.20	0.01	0.01	0.11	0.02	0.09	0.02	0.03	0.11	0.04	0.02	0.12	0.41	0.16	0.26	0.01	0.69	0.33	0.04	0.47

X: A = GDP, B= MSCI, C = NBI, D= BB, E = Private Consumption, F = Disposable Income, G = Car Registrations, H = Vehicles

Sources: National financial supervisory authorities and insurance associations, IMF, Refinitiv, Allianz Research.

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Nominal GDP growth as explanatory variable for property insurance premium development

As in the case of motor insurance, we analyzed the impact of nominal GDP growth, international and national capital market developments, private consumption expenditures and disposable income on property insurance premium growth.

Nominal GDP turned out to be a rather weak explanatory variable for property insurance premium growth. Taking into account the whole period, R^2 was not above 50% in any country. It was highest in Spain with 49% and reached 42% in China and Italy, but it was below 10% in five of the 10 countries.

The regression results were higher when we calculated them separately by decade. In the first decade, R^2 was below 5% only in three countries and ranged in the majority of countries from 13% in Brazil to 54% in China.

We observed the strongest correlations in the second decade, with nominal GDP growth explaining 64% of China's and 70% of France's property insurance premium growth, albeit with a one-year time lag in the case of France. In the other countries, the R^2 values ranged from 4% in Japan and the UK to 29% in Australia and Germany (see Table 17).

Table 17: Test: $\Delta Property = \alpha + \beta * \Delta GDP_t$ and $\Delta Property = \alpha + \beta * \Delta GDP_{t-1}$

	2000 – 2019			2000 – 2009			2009 – 2019		
	R^2	β	t-statistic	R^2	β	t-statistic	R^2	β	t-statistic
Australia[a, b, c]	0.16	0.68	1.76	0.30	1.76	1.59	0.29	0.83	1.90
Brazil	0.08	0.48	1.23	0.13	1.29	1.09	0.25	0.47	1.75
China	0.42	1.84	3.39	0.54	2.81	3.08	0.64	1.21	3.55
France[a, c]	0.31	0.91	2.75	0.01	0.14	0.31	0.70	0.99	4.31
Germany[a]	0.05	0.23	0.93	0.17	-0.43	-1.30	0.29	0.27	1.81
Italy[a, b, c]	0.42	0.95	3.63	0.37	1.64	2.17	0.15	0.46	1.26
Japan[a, b, c]	0.04	0.48	0.81	0.00	-0.12	-0.19	0.04	0.52	0.65
Spain[a, b, c]	0.49	1.13	4.18	0.18	1.53	1.32	0.06	0.27	0.74
UK	0.07	1.16	1.17	0.25	1.31	1.61	0.04	0.95	0.61
USA[a, c]	0.09	0.64	1.37	0.05	0.41	0.66	0.26	0.59	1.77

(a) 2000-2019: ΔGDP_{t-1}, (b) 2000-2009: ΔGDP_{t-1}, (c) 2000-2019: ΔGDP_{t-1}

The impact of financial market developments on property insurance premium growth

Financial market developments could influence property insurance demand via the real estate market: as stock market booms often go hand in hand with rising house prices, this development could also propel demand and prices for property insurance. The data, however, give only scant evidence for this relation.

International stock market developments played only a minor role for the development of property insurance premiums. The correlation was markedly stronger in the first decade than in the second in all but two countries, namely Spain and the UK.

Over the whole time period, the R^2 values ranged between 2% in Japan and 18% in Brazil. For the time period between 2000 and 2009 we found the highest explanatory values in Australia (48%) and Brazil (39%); in the other countries, the R^2 ranged between 5% and 18%. In the second decade, the highest regression result was also 48% in Spain, but in seven of the remaining countries R^2 was below 5%. The exceptions were Brazil and the UK with an R^2 of 13% and 15%, respectively (see Table 18 next page).

Table 18: Test: ΔProperty = α + β*ΔMSCIt and ΔProperty = α + β*ΔMSCIt-1

	2000 – 2019			2000 – 2009			2009 – 2019		
	R^2	β	t-statistic	R^2	β	t-statistic	R^2	β	t-statistic
Australia[a]	0.14	-0.09	-1.64	0.48	-0.13	-2.37	0.04	0.06	0.65
Brazil[a, b]	0.18	-0.16	-2.01	0.39	-0.24	-2.25	0.13	0.10	1.14
China[a, b]	0.07	0.18	1.07	0.10	0.23	0.95	0.00	-0.03	-0.15
France[a, b]	0.13	-0.06	-1.57	0.05	-0.03	-0.68	0.05	-0.03	-0.65
Germany[a, b, c]	0.07	-0.03	-1.10	0.18	-0.05	-1.33	0.02	0.01	0.37
Italy	0.14	-0.06	-1.73	0.18	-0.06	-1.31	0.03	-0.03	-0.51
Japan[c]	0.02	0.04	0.62	0.06	0.02	0.72	0.01	0.04	0.35
Spain[a, c]	0.15	-0.13	-1.77	0.15	-0.09	-1.19	0.48	-0.12	-2.90
UK[c]	0.06	-0.11	-1.07	0.06	-0.07	-0.74	0.15	0.18	1.19
USA[a, b, c]	0.09	-0.07	-1.33	0.05	-0.05	-0.64	0.02	0.02	0.41

(a) 2000-2019: $\Delta MSCI_{t-1}$, (b) 2000-2009: $\Delta MSCI_{t-1}$, (c) 2000-2019: $\Delta MSCI_{t-1}$

Sources: National financial supervisory authorities and insurance associations, IMF, Refinitiv, Allianz Research.

In most countries, the development of the national stock market had a stronger but still relatively weak impact on the property insurance premium development. The R^2 values for the whole time period ranged between 6% and 34%. In two countries, Australia and Italy, R^2 was below 10%, in six of the 10 countries, it was between 15% and 23% and it peaked at 34% in China.

The influence was also in most countries markedly stronger in the first decade (which was generally marked by booming housing markets). For the time period from 2000 to 2009, the R^2 values ranged between 12% in Italy and 49% in China, albeit with a time lag of one year. The highest regression result for the second decade was 47% in Spain, also calculated with a one-year time lag. However, in six of the remaining countries R^2 for this time period was below 10% (see Table 19).

The correlation between the interest rate development and property insurance premium income is rather weak. The highest R^2 was 26% for Germany when taking into account only the first decade.

Table 19: Test: ΔProperty = α + β*ΔNBI_t and ΔP&C = α + β*ΔNBI_{t-1}

	2000 – 2019			2000 – 2009			2009 – 2019		
	R^2	β	t-statistic	R^2	β	t-statistic	R^2	β	t-statistic
Australia[c]	0.09	-0.07	-1.23	0.41	-0.12	-2.02	0.04	-0.04	-0.58
Brazil[a, b]	0.23	-0.07	-2.32	0.34	-0.09	-2.04	0.11	-0.04	-1.04
China[a, b]	0.34	0.15	2.85	0.49	0.20	2.79	0.21	-0.08	-1.35
France[a, b, c]	0.18	-0.06	-1.91	0.15	-0.04	-1.18	0.10	-0.03	-0.94
Germany[a, b, c]	0.11	-0.03	-1.47	0.24	-0.04	-1.58	0.03	0.01	0.46
Italy[c]	0.06	-0.04	-1.07	0.12	-0.05	-1.05	0.05	0.02	0.68
Japan	0.15	0.08	1.76	0.36	0.05	2.12	0.06	0.08	0.78
Spain[a, c]	0.23	-0.07	-2.32	0.24	-0.10	-1.58	0.47	-0.12	-2.84
UK	0.15	-0.20	-1.70	0.15	-0.14	-1.20	0.27	-0.41	-1.70
USA[a, c]	0.18	-0.06	-1.91	0.41	-0.12	-2.02	0.04	-0.04	-0.58

(a) 2000-2019: ΔNBI_{t-1}, (b) 2000-2009: ΔNBI_{t-1}, (c) 2000-2019: ΔNBI_{t-1}

Sources: National financial supervisory authorities and insurance associations, IMF, Refinitiv, Allianz Research.

The influence of private consumption expenditures and disposable income on property insurance premium growth

Taking into account the whole time period, the explanatory strength of private consumption expenditures also seems quite weak. The R^2 values range between 2% in Germany and 15% in Italy and the US. The exceptions are Spain, where R^2 was 36%, and China, with an R^2 of 60%.

However, the regression results are markedly higher for the first decade: The development of private consumption expenditures explained 78% of the premium growth in China and of 59% in the UK, albeit with a time lag of one year. In most other countries, it ranged between 19% and 41%.

The second decade showed mixed results: In one half of the countries, the regression results were higher than for the first period, in the other half they were lower. However, the overall explanatory strength of the exogenous factor seems to be weaker in this second decade. We found the strongest correlation for this time period in Germany with an R^2 of 61% (see Table 20).

Disposable income developments had the highest explanatory strength in China: For the whole time period, the R^2 was 55%. Taking into account only the first decade it was 67% and for the second decade it was even 73%.

In the whole time period and the second decade, China was the only country, where R^2 was above 50%; next came Italy and Spain with R^2 values of 44% and 43%, respectively, albeit calculated with a time lag of one year. In the second period, the regression results in Germany were closest with 45%, however also including a one-year time lag.

Taking into account only the time span from 2000 to 2009, we also found a high explanatory strength of the disposable income development in France and the UK, with the R^2 in both countries amounting to 55%, albeit in the case of the UK calculated with a one-year time lag (see Table 21).

Table 20: Test: $\Delta Property = \alpha + \beta * \Delta Private\ Consumption_t$ and $\Delta Property = \alpha + \beta * \Delta Private\ Consumption_{t-1}$

	2000 – 2019			2000 – 2009			2009 – 2019		
	R^2	β	t-statistic	R^2	β	t-statistic	R^2	β	t-statistic
Australia[c]	0.14	-1.17	-1.62	0.37	-1.60	-1.89	0.40	4.09	2.45
Brazil	0.12	0.77	1.54	0.19	1.96	1.35	0.31	0.65	2.01
China	0.60	2.96	4.91	0.78	4.30	5.39	0.47	1.26	2.50
France[b, c]	0.06	-0.22	-1.04	0.36	-0.53	-2.13	0.27	0.32	1.73
Germany[c]	0.02	-0.29	-0.53	0.41	-1.71	-2.35	0.61	1.27	3.51
Italy[a, b, c]	0.15	0.77	1.79	0.05	0.61	0.65	0.10	0.40	1.01
Japan[a, c]	0.05	1.11	1.01	0.07	-0.63	-0.77	0.20	2.13	1.49
Spain[a, b]	0.36	1.38	3.21	0.19	1.38	1.37	0.05	-0.28	-0.71
UK[b, c]	0.06	1.14	1.01	0.59	3.72	3.38	0.02	-0.67	-0.39
USA[a, c]	0.15	1.05	1.81	0.17	1.05	1.27	0.06	0.36	0.73

(a) 2000-2019: $\Delta Private\ Consumption_{t-1}$, (b) 2000-2009: $\Delta Private\ Consumption_{t-1}$, (c) 2000-2019: $\Delta Private\ Consumption_{t-1}$
Sources: National financial supervisory authorities and insurance associations, IMF, Refinitiv, Allianz Research.

Table 21: Test: $\Delta Property = \alpha + \beta * \Delta Disposable\ Income_t$ and $\Delta Property = \alpha + \beta * \Delta Disposable\ Income_{t-1}$

	2000 – 2019			2000 – 2009			2009 – 2019		
	R^2	β	t-statistic	R^2	β	t-statistic	R^2	β	t-statistic
Australia[a, b, c]	0.06	0.43	1.05	0.31	1.36	1.64	0.05	0.37	0.69
Brazil	0.10	0.52	1.40	0.08	0.94	0.76	0.35	0.56	2.21
China	0.55	3.42	4.43	0.67	4.80	4.03	0.73	2.09	4.36
France[a, b, c]	0.31	0.91	2.76	0.05	0.56	0.63	0.20	0.78	1.43
Germany[a, c]	0.08	0.54	1.25	0.12	-0.64	-1.05	0.45	0.71	2.53
Italy[a, b]	0.44	1.03	3.66	0.55	2.74	2.92	0.18	0.56	1.41
Japan	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Spain[a, c]	0.43	1.12	3.60	0.16	0.97	1.24	0.09	0.32	0.93
UK[b, c]	0.01	0.34	0.34	0.55	3.09	3.15	0.15	-1.73	-1.18
USA[a, c]	0.15	0.83	1.75	0.10	0.72	0.94	0.17	0.44	1.34

(a) 2000-2019: $\Delta Disposable\ Income_{t-1}$, (b) 2000-2009: $\Delta Disposble\ Income_{t-1}$, (c) 2000-2019: $\Delta Disposable\ Income_{t-1}$

Sources: National financial supervisory authorities and insurance associations, IMF, Refinitiv, Allianz Research.

Property Insurance: Comparison of regression results for property insurance

A comparison of the regression results reveals that the development of nominal GDP is of only minor relevance for property insurance premium growth. Instead, the development of the national stock market was in most countries decisive for premium growth over the whole time, though, the correlation was rather weak. In fact, private consumption expenditures were the exogenous factor that had the highest impact on premium growth with an R^2 of 60% in China for this period. Private consumption expenditures were also the dominating exogenous factor in five countries in the time period from 2000 to 2009, with R^2 values ranging between 17% in the US and 78% in China. In the second decade, there was no dominating exogenous factor; disposable income had the highest explanatory strength with R^2 amounting to 73% in China (see Table 22).

Table 22: Overview R^2, Test: $\Delta Property = \alpha + \beta * \Delta X_t$ and $\Delta Property = \alpha + \beta * \Delta X_{t-1}$

	2000-2019						2000-2009						2009-2019					
	A	B	C	D	E	F	A	B	C	D	E	F	A	B	C	D	E	F
Australia	0.16	0.14	0.09	0.13	0.14	0.06	0.30	0.48	0.41	0.10	0.37	0.31	0.29	0.04	0.04	0.11	0.40	0.05
Brazil	0.08	0.18	0.23	0.02	0.12	0.10	0.13	0.39	0.34	0.04	0.19	0.08	0.25	0.13	0.11	0.11	0.31	0.35
China	0.42	0.07	0.34	0.00	0.60	0.55	0.54	0.10	0.49	0.00	0.78	0.67	0.64	0.00	0.21	0.00	0.47	0.73
France	0.31	0.13	0.18	0.00	0.06	0.31	0.01	0.05	0.15	0.16	0.36	0.05	0.70	0.05	0.10	0.02	0.27	0.20
Germany	0.05	0.07	0.11	0.01	0.02	0.08	0.17	0.18	0.24	0.26	0.41	0.12	0.29	0.02	0.03	0.08	0.61	0.45
Italy	0.42	0.14	0.06	0.01	0.15	0.44	0.37	0.18	0.12	0.17	0.05	0.55	0.15	0.03	0.05	0.05	0.10	0.18
Japan	0.04	0.02	0.15	0.11	0.05	0.00	0.00	0.06	0.36	0.14	0.07	0.00	0.04	0.01	0.06	0.09	0.20	0.00
Spain	0.49	0.15	0.23	0.01	0.36	0.43	0.18	0.15	0.24	0.03	0.19	0.16	0.06	0.48	0.47	0.03	0.05	0.09
UK	0.07	0.06	0.34	0.01	0.06	0.01	0.25	0.06	0.15	0.07	0.59	0.55	0.04	0.15	0.27	0.01	0.02	0.15
USA	0.09	0.09	0.18	0.03	0.15	0.15	0.05	0.05	0.01	0.09	0.17	0.10	0.26	0.02	0.03	0.09	0.06	0.17

X: A = GDP, B= MSCI, C = NBI, D= BB, E = Private Consumption, F = Disposable Income

Sources: National financial supervisory authorities and insurance associations, IMF, Refinitiv, Allianz Research.

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FORWARD-LOOKING STATEMENTS

The statements contained herein may include prospects, statements of future expectations and other forward-looking statements that are based on management's current views and assumptions and involve known and unknown risks and uncertainties. Actual results, performance or events may differ materially from those expressed or implied in such forward-looking statements.

Such deviations may arise due to, without limitation, (i) changes of the general economic conditions and competitive situation, particularly in the Allianz Group's core business and core markets, (ii) performance of financial markets (particularly market volatility, liquidity and credit events), (iii) frequency and severity of insured loss events, including from natural catastrophes, and the development of loss expenses, (iv) mortality and morbidity levels and trends, (v) persistency levels, (vi) particularly in the banking business, the extent of credit defaults, (vii) interest rate levels, (viii) currency exchange rates including the EUR/USD exchange rate, (ix) changes in laws and regulations, including tax regulations, (x) the impact of acquisitions, including related integration issues, and reorganization measures, and (xi) general competitive factors, in each case on a local, regional, national and/or global basis. Many of these factors may be more likely to occur, or more pronounced, as a result of terrorist activities and their consequences.

NO DUTY TO UPDATE

The company assumes no obligation to update any information or forward-looking statement contained herein, save for any information required to be disclosed by law.