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Determinants of the non-life insurance market in Brazil☆

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Abstract

The objective of this study is to analyse the relationship of economic growth and financial development as determinants of NLI premium consumption, using data from a highly volatile economic environment. The empirical results revealed a positive relationship among economic growth, credit, and the NLI market in Brazil. Results also suggest Granger bi-causality between economic growth and NLI premiums in Brazil.

Keywords: Insurance premiums; Economic Growth; Financial Development; Brazil

1. Introduction

The insurance market is one of the largest investors in the world, concentrating around 12% of all financial assets, or USD24 trillion (IMF, 2016). According to SUSEP (2016), Brazilian insurers had USD230 billion in financial assets in 2016. Besides having a large volume of financial assets, the insurance segment is highly influential in the financial market by allowing the individual access to a wider range of financial products, by transferring the indemnity risk as indicated by Ward and Zurbruegg (2000), and by encouraging long-term savings that enable reinvestment of substantial sums in public and private projects as indicated by Beck (2003).

In the macroeconomic context, the role of the insurance market in mitigating the effects of economic crises, or even reducing the probability of their occurrence, has been analysed in recent studies such as Harrington (2009), Bernoth and Pick (2011), and Lee et al. (2016b). However, even with such worldwide importance, it was not until after 2000 that there began to be more interest in investigating the relationship among the insurance market, economic growth (EG), and financial development (FD), whereas less recent literature dealt mainly with the relationship between the financial market and economic/development growth.

There is empirical evidence that suggests the insurance market has a positive impact on EG and FD, such as Outreville (1996), Ward and Zurbruegg (2000), Arena (2008), Lakštutienė (2008), Ćurak et al. (2009), Adams et al. (2009), Han et al. (2010), Lee (2011), Zhou et al. (2012), among others. However, despite the observed relevance, it is still the recent studies that aimed to identify the economic determinants that drive insurance consumption. According to Trinh et al. (2016, p. 5640), the research in this direction should help policymakers to promote the increase of insurance consumption and, consequently, to boost EG and the FD.

Hussels et al. (2005) pointed out the positive effects that increased consumption of insurance products can have on trade and in the whole economy. This increase promotes risk transfer, according to Ćurak et al. (2009), and also encourages the industry to increase innovation and the production of goods and services, and the financing of large projects. Given that the insurance industry can take higher risks, there is an increase in demand for financial services that facilitates risk underwriting and, as highlighted by UNCTAC (1987), many insurance products are necessary for the production of goods and services and the generation of jobs.

Outreville (2000) suggested that developing countries have fewer alternatives to provide markets with the ability to hedge domestic risks began to have a greater retention capacity in the market when there is an increase in EG and FD. This impact relationship, although varying according to country or product (Hussels et al., 2005), confirms the existence of a demand-leading phenomenon (Patrick, 1966) as the main characteristic

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of developing countries, such as Brazil. This phenomenon is exemplified as regards the specificities of the insurance market. Alhassan and Fiador (2014) suggested that growth in the real economy may directly influence insurance consumption, as higher incomes for individuals and higher profits for businesses will lead to greater ability to consume insurance products. In a growing economy, businesses expand their operations, increasing risk as well as the need to transfer exposure by buying insurance Alhassan and Fiador (2014).

There are few studies that seek to identify the determinants of non-life insurance (NLI) consumption, specifically for coverage of civil liability risk, despite its relevance in the economy both in quantitative terms and in terms of coverage for increasing risks and uncertainties, as outlined by Outreville (1990).

One of the first empirical studies of the impact of EG and FD on consumption of NLI was carried out by Outreville (1990), who used cross-sectional analysis with data from 1983 in 55 developing countries and identified that the demand for NLI is predominantly driven by the development of the country. Continuing the work of Outreville (1990), Garcia (2012) investigated the impact of EG and DF on NLI awards between 1962 and 2003 using Portuguese data. Her findings revealed that in Portugal, GDP is the only factor that explains the volume of NLI demand.

Considering the relevance of the topic and the low volume of research that addresses the determinants of NLI consumption, this paper seeks to investigate the relationship among economic growth, financial development, and consumption of premiums of non-life insurance by replicating the study conducted by Garcia (2012) using Brazilian data. Although Brazil and Portugal have distinct characteristics, it is believed that the results to be obtained in this study will approximate those observed by Garcia (2012) that found that although FD is a relevant determinant for the insurance market, according to the literature, it is not relevant when measured by the ratios M2/GDP and M1/M2, EG being the only factor that positively and significantly impacts the NLI market in Portugal. For this reason, this work will also measure FD through the volume of credit operations.

Aiming to confirm the importance of promoting increased NLI consumption as a driver of EG and FD, this paper's complementary objective is to analyse the causal relationship among the insurance market, EG, and FD using the Granger causality test.

The rest of this paper is organized as follows: the next section addresses the theoretical framework; followed by a presentation of the method, data, and results; and concluding with a discussion of some final considerations.

2. Theoretical framework

In 1996, due to governmental regulations, the Brazilian market was reopened to international insurers, and the impact described by Cummins and Venard (2008) was immediate, with an increase in foreign company participation in the insurance market from 6% in 1996 to 30% in 2008. In 2007, the Brazilian Reinsurance Institute (IRB) monopoly break also significantly altered the reinsurance market in Brazil. According to data released by SUSEP (2016), in the year following the opening of the market, 49 foreign reinsurers had obtained authorization to start operations in Brazil; in December 2016 these already totalled 132 companies.

Another milestone in the Brazilian insurance market was the economic stability attained from the Real Plan implemented in the country in 1994. According to SUSEP (2016), the stabilization program reduced chronic high inflation and the uncertainties of the Brazilian market, which, together with the regulatory improvements established by SUSEP, boosted the insurance market.

In the international context, the relevance of the insurance market was associated with the nature of its risks, which may have significant and undesirable financial consequences. International bodies developed strong regulations to minimize the risk of insurance companies' not honouring their commitments, such as a project developed by the European Union called Solvency II (EIOPA, 2017). The new regulation was adopted by Brazil and since 2006 has been modifying the practices of insurers. The implementation of Solvency II nationally and internationally is a gradual process and is in progress; important modifications are still being drawn by the regulatory bodies.

From an economic-financial point of view, Patrick (1966) pointed to three ways of strengthening the consumption of financial products, including the insurance market: (1) demand-leading phenomenon; (2) supply-leading phenomenon; and (3) bi-causality, where there is an interaction between both phenomena, supply and demand. According to Patrick (1966), in the case of bi-causality, the supply of investments first drives economic growth, and in a second moment, of greater stability and maturation of the economy, the demand side becomes predominant.

Ward and Zurbruegg (2000) argued that promoting the insurance market may drive EG and FD. Understanding relationships among these variables involves comprehending the dynamics of the complex interaction between the insurance and banking markets and its impact in the development of government policies. Taking the insurance market into account helps formulate strategic government policies that promote EG and FD more efficiently.

The insurance market is closely tied to the banking market (Liu and Zhang, 2016), as the banks may offer credit more easily when insurance is available, such as home and car loans, which require the financed asset as collateral. In turn, insurers reduce their costs and raise their insurance sales through direct distribution of their products by banks (Cummins and Venard, 2008). In the Brazilian context, in this close operational relationship, many banks have internalized insurance companies, generating concentration such that 62% of the country's insurance market is held by the main banks. Oligopoly generated in the insurance market reduces competition among companies; consequently, the development and improvement of the sector may be compromised.

Competition is also compromised by the actions of regulators. According to Pasiouras and Gaganis (2013), measures such as the requirement of high minimum capital to operate reduce the risk of bankruptcy, but create entry barriers, result-

ing in further reduced competition. Another risk exemplified by Pasiouras and Gaganis (2013)—which points out the importance of the challenge of policy-makers who endorse regulations aimed at reducing insolvency in the insurance sector and promoting confidence and financial stability—concerns investment limits, whose purpose is to protect the interests of policyholders but as a consequence reduce the benefits of portfolio diversification and financial gains, which can lead insurance operations to seek higher risks.

The relevance of understanding the dynamics among insurers, banks, and government, proposed at the beginning of this section, reveals the importance of competition. As described by Schwab (2016–2017), the lack of competition becomes a restriction for EG, so it is necessary that government institutions engage in actions that boost competition and, consequently, economic growth.

According to Ward and Zurbruegg (2000), Skipper and Klein (2000), Arena (2008), and Ćurak et al. (2009), the insurance market promotes the economy in different ways: either by creating incentive to increase internal savings that, in turn, are invested when transferred to companies through loans; by underwriting risks through property-liability insurance, thereby allowing industries to assume greater risk, which can increase innovation, the production of goods and services, and the financing of large projects that; even by reducing government social security spending, considering that studies carried out by Skipper and Klein (2000) confirmed that the higher the spending on private insurance the lower are the social security costs of the government, due to the change in individuals' behaviour when they perceive that the insurance premium rises when the risk is greater.

The results of empirical analysis confirm the existence of relationships among the insurance market, EG, and/or FD for a wide range of countries. The absence of a relationship was observed punctually for some countries or regions, such as in the work carried out by Hu et al. (2013). The authors identified a positive relationship between insurance and EG in the eastern regions of China, and between EG and insurance for the central regions (they found no relationships in western regions).

Arena (2008), Lakštutienė (2008), Ćurak et al. (2009), Adams et al. (2009), Han et al. (2010), Lee (2011), Zhou et al. (2012), Lee et al. (2013), Alhassan and Fiador (2014), and Liu et al. (2015) analysed the impact of the insurance market on EG, and the empirical evidence confirms that the insurance market causes EG. Results of Han et al. (2010), Lee (2011), and Alhassan and Fiador (2014) revealed that in the NLI market, the relationship with EG is more significant than in the life insurance market. Lee et al. (2016a), Liu et al. (2015), and Hou and Cheng (2017) suggested that the insurance market has a negative relation with EG depending on the country and the type of insurance segment-life or non-life.

Lee's (2011) study identified that OECD countries have a relationship starting from the insurance market for EG in the life and non-life sectors, and that only in total insurance is there a bi-directional relationship. Chang et al. (2013), who also analysed the OECD countries, pointed out that the direction of relations is diverse and depends on the countries involved: the directions can be from EG to insurance; from insurance to EG; bi-directional; or even unrelated.

Chang et al. (2013) found that in France, Japan, the Netherlands, Switzerland, and the United Kingdom, the relationship is only from insurance market to EG, the causality from EG to insurance market being non-existent, regardless of analysing the whole market, only the life insurance, or just NLI. In contrast, Chang et al. (2013) found that for Canada and Italy, the direction of the relation runs only from EG to the insurance market, which is compatible with the result found by Sibindi and Godi (2014), who analysed South Africa.

Outreville (1990), Outreville (1996), Beck (2003), Li et al. (2007), and Trinh et al. (2016) presented evidence of a positive and significant relationship between FD and the insurance market. However, when applying the same test used by Outreville (1990) in the case of Portugal, Garcia (2012) identified that although FD is a determinant of the consumption of NLI products, this assertion is not true when considering the variables M1 and M2.

Many authors have used the Granger causality test to analyse bi-directional relations, such as Ward and Zurbruegg (2000), Adams et al. (2009), Hu et al. (2013), Su et al. (2013); Pradhan et al. (2014), Sibindi and Godi (2014), Chang et al. (2013), Pradhan et al. (2015), Liu et al. (2016), Pradhan et al. (2016), Kaushal and Ghosh (2016), Alhassan and Biekpe (2016), and Pan et al. (2016). However, only for some countries was a bi-directional result found, which may be due to the temporal cut of the tests. Patrick's (1966) findings showed that bi-causality direction first comes from the supply of investments propelling EG, and only subsequently, the demand-leading mechanism becomes predominant.

In summary, the diversity of results presented in different studies, which vary from country to country and in type of insurance market analysed (life and non-life), demonstrate the need for more studies on the relationships among the insurance market, EG, and FD. Therefore, using data from the Brazilian market, we seek to investigate how EG, FD, and the insurance market, more specifically, the NLI market, are related.

3. Empirical analysis

This research empirically analyses the relationship among EG, FD, and consumption of NLI premiums through replication of the study developed by Garcia (2012) for the Brazilian case. We consider the same variables used in Garcia (2012), with the exception of the credit operations variable. The data used were extracted in February 2016 from primary sources. We used quarterly data, inflation adjusted, from 1996 to 2016. GDP as representative of EG was obtained from the Brazilian Institute of Geography and Statistics (IBGE); the series M1, M2, and credit operations were considered as proxy variables for the FD and were obtained from the Central Bank of Brazil (BACEN). The series of direct premiums of NLI was obtained from the Superintendence of Private Insurance (SUSEP). In December 2013, SUSEP changed the direct premium calculation method. To avoid distortions in the data analysis, we used in the regres-

Table 1
ADF test results.

	Statistic			
	At Level		In 1st difference	
lpremium.	(0.84)	Do not reject H_0	(3.88)	Reject H_0
lgdp.	(1.88)	Do not reject H_0	(3.16)	Reject H_0
lmg.	(0.08)	Do not reject H_0	(4.20)	Reject H_0
lmm.	0.17	Do not reject H_0	(1.59)	Do not reject H_0
lcred.	(2.35)	Do not reject H_0	(3.58)	Reject H_0

sion models a dummy variable that assumes a unity value starting from 2014.

The model used to evaluate the determinants of NLI in Brazil is a linear regression with quarterly data between 1996 and 2016. The real NLI premiums (*lpremium*) are considered dependent variables, and the explanatory variables are the real, i.e. inflation-adjusted GDP (*lgdp*), the ratio of real M2 over GDP (*lmg*), the ratio of real M1 over real M2 (*lmm*), and real credit operations (*lcred*). The natural logarithm was applied in all series used in this research, except for the dummy variable. The statistical tests and estimated models were applied using the *R* language. The level of statistical significance used in this study was 5% for all hypothesis tests.

To avoid spurious regression, the series were examined by applying commonly used statistical tests. Analysis of stationarity and determination of the order of integration of series *lpremium*, *lgdp*, *lmg*, *lmm*, and *lcred*, follow the augmented Dickey–Fuller test (ADF). Results presented in Table 1, with the critical value of 2.89 for a 5% significance level, show that, with the exception of the *lmm* series, all other series are non-stationary and integrated of order one.

For cointegration analysis, the Johansen test was performed considering the series *lpremium*, *lgdp*, *lmg*, and *lcred*, in order to confirm that the presence of a unit root will not compromise results. Table 2 demonstrates the existence of cointegration for sets of series {*lpremium* and *lgdp*}; {*lpremium*, *lgdp* and *lmg*}; and {*lpremium*, *lgdp* and *lcred*}, suggesting one or two cointegration relations. It is possible to work with the in-level variables without incurring spurious regression and without losing the long-term relationship between them. However, when the variables *lmg* and *lcred* were grouped together, the result confirmed that there is no cointegration for at least two series; consequently, no continuity is given in the tests with the grouping of the series {*lpremium*, *lgdp*, *lmg*, and *lcred*}.

In addition to the tests performed by Garcia (2012), the direction of Granger causality was analysed for the set of series {*lpremium* and *lgdp*}, {*lpremium* and *lmg*}, and {*lpremium* and *lcred*}. The null hypothesis of the test is that one variable does not Granger cause the other, so it is desirable to reject it. If both hypotheses are rejected, we conclude that there is bi-causality when both variables influence each other.

The tests revealed bi-causality between the *lpremium* and *lgdp* variables. The insurance market causes EG, and vice versa. This result shows that there is support for both the supply-leading hypothesis, in which the increase in supply of insurance drives the EG, and the hypothesis of the demand-leading phenomenon, in which EG generates an increase in household income and corporate profits and, consequently, the demand for insurance increases.

In the case of the causal relationship between *lpremium* and FD, Granger's bi-causality is only identified when the *lmg* ratio is used as representative of the FD. When using *lcred*, the direction of causality appears only on the demand phenomenon, that is, the consumption of insurance is driven by credit operations, but the reverse is not true.

Granger's causality result reinforces the importance of EG and FD research as determinants of NLI consumption, since, as in a virtuous circle, FD and EG boost the demand for insurance, which, in turn, feeds back economic activity.

To test the hypothesis that *lgdp* causes *lpremium*, we study a linear regression model using ordinary least squares (OLS) estimators, considering as explanatory variables *lgdp* and a dummy variable, related to the regulatory change in the calculation of direct premium, as discussed earlier.

$$lpremium_t = \beta_0 + \beta_1 lgdp_t + \delta_1 dummy_t + \mu_t \quad (1)$$

where

- β_0 = intercept;
- *lpremium* = logarithm of premium;
- *lgdp* = logarithm of GDP;
- *dummy* = dummy; and
- t = quarters between 1996 and 2016.

The result of Eq. (1) is presented in Table 4 and shows that the adjusted R^2 is high, indicating a good degree of adjustment of the model. The estimated coefficients of $\hat{\beta}_1$ and $\hat{\beta}_2$ presented statistical significance but the intercept did not prove to be significant. We also tested the model without the intercept, as presented in Eq. (2):

$$lpremium_t = \beta_1 lgdp_t + \delta_1 dummy_t + \mu_t \quad (2)$$

We observe in Table 4 that the adjusted R^2 of Eq. (2) remains high at 0.94, indicating that the model is well adjusted, and all estimated coefficients presented statistical significance. Additionally, the *F* statistic demonstrates highly significant results of the joint analysis of the parameters. The result shows a positive causality relation of GDP over the premium of 0.83. For each 1% of GDP increase the NLI premium increases 0.83%, confirming the importance of EG to the NLI market in Brazil. Due to the relevance of the financial market, besides the EG, the variables *lmg* and *lcred* were introduced to represent FD in Eqs. (3) and (4), respectively:

$$lpremium_t = \beta_1 lgdp_t + \beta_2 lmg_t + \delta_1 dummy_t + \mu_t \quad (3)$$

$$lpremium_t = \beta_1 lgdp_t + \beta_2 lcred_t + \delta_1 dummy_t + \mu_t \quad (4)$$

where,

- *lmg* = logarithms of M2/PIB; and
- *lcred* = logarithm of credit operations;

Table 2
Johansen test results.

	Trace		Maximal Eigenvalues		
Cointegration relationship	Statistics	Critical value	Statistics	Critical value	Result
lpremium and lgdp					
$r = 0$	61.18	19.96	58.35	15.67	Reject H_0
$r \leq 1$	2.83	9.24	2.83	9.24	Do not reject H_0
lpremium, lgdp, and lmg					
$r = 0$	73.29	34.91	60.56	22.00	Reject H_0
$r \leq 1$	12.73	19.69	8.73	15.67	Do not reject H_0
$r \leq 2$	4.00	9.24	4.00	9.24	Do not reject H_0
lpremium, lgdp, lmg, and lcred					
$r = 0$	71.30	34.91	56.38	22.00	Reject H_0
$r \leq 1$	14.91	19.96	10.92	15.67	Do not reject H_0
$r \leq 2$	3.99	9.24	3.99	9.24	Do not reject H_0
lpremium, lgdp, lmg, and lcred					
$r = 0$	107.89	53.12	63.42	18.14	Reject H_0
$r \leq 1$	44.47	34.91	25.48	22.00	Reject H_0
$r \leq 2$	18.99	19.96	13.32	15.67	Do not reject H_0
$r \leq 3$	5.68	9.24	5.68	9.24	Do not reject H_0

Table 3
Granger causality test results.

			F statistics	*p* value	Results
lgdp.		*lpremium.*	12.693	8.84E−07	Reject H_0
lpremium.		*lgdp.*	18.019	7.06E−09	Reject H_0
lmg.	Does not cause	*lpremium.*	31.361	0.03	Reject H_0
lpremium.	Granger	*lmg.*	8.362	7.38E−05	Reject H_0
lcred.		*lpremium.*	29.775	0.04	Reject H_0
lpremium.		*lcred.*	0.7258	0.54	Do not reject H_0

Table 4
Results of the application of Eqs. (1) and (4).

Equation	(1)	(2)	(3)	(4)
	−1.03141 (0.20200)			
lgdp.	0.86460 (2.20E−16)	0.82517 (2.20E−16)	0.82506 (2.20E−16)	0.77354 (2E−16)
lmg.			0.05447 (0.08370)	
lcred.				0.05122 (0.02490)
dummy.	0.12617 (3.99E−11)	0.13648 (1.15E−14)	0.11924 (1.28E−09)	0.11129 (0.00000)
R^2.	0.9451	0.9439604	0.9460045	0.9473544
	0.9437	0.943277	0.944671	0.946054
F Statistic.	697	9E+06	6215000	6.37E+06
p-Value.	2.20E−16	2.20E−16	2.20E−16	2.00E−16

Table 3 depicts the result of Eq. (3), when *lmg* is established as representative of FD in the regression model. Results do not show the existence of a causal relationship between it and NLI premiums. However, when FD is represented by *lcred*, we observe individual and joint significance of the parameters, evidencing a positive causality relation. Results suggest that a 1% increase in credit operations leads to a 0.05% increase in NLI consumption, and that a 1% increase in EG leads to an increase of 0.77% in NLI consumption, reinforcing the importance of economic growth for the Brazilian NLI market. The Breusch Pagan and LM tests suggest that potential heteroscedasticity and serial correlation problems are not relevant.

4. Conclusion

This study analysed the relationship of economic growth (EG) and financial development (FD) as determinant drivers of non-life insurance (NLI) consumption in Brazil, considering quarterly data sets between 1996 and 2016. The justification for this research lies in the importance of the NLI market as a relevant figure for EG and FD, so that, as in a virtuous circle, these drive the demand for insurance, which, in turn, feeds back economic activity.

In order to confirm the existence of this virtuous circle, the first step was identifying the Granger causality relationship

among EG, FD, and NLI premiums. The results demonstrated the existence of a Granger bi-causal relationship between EG and NLI premiums, supporting the existence of the supply-leading phenomenon, in which the growth of the NLI market drives EG, and the demand-leading phenomenon, in which EG drives the insurance market in Brazil. The causality tests also showed that credit operations cause NLI awards in a unidirectional way, thereby also highlighting the occurrence of the demand-following phenomenon in which FD, represented by credit, drives the Brazilian insurance market.

The estimated linear regression model used NLI premiums as the dependent variable, and the following variables as explanatory: GDP, representing economic growth; credit operations, representing financial development; and a dummy variable to capture the effect of changing the direct premium calculation method at the end of 2013. The ADF test showed that the first three variables listed are non-stationary and integrated of the same order; and the Johansen test showed that they are cointegrated, in other words having a long-term relationship, allowing the estimation of the model considering series in level without incurring spurious regression and without losing the long-term relationship among variables.

The estimated model presented a high level of individual and joint statistical significance of the parameters, and showed a good degree of adjustment with the adjusted R^2 above 0.9, besides presenting an estimated homoscedastic residual without serial correlation, as verified through the tests of Breusch Pagan and LM. A positive relationship of EG and FD on the NLI premium was observed, as expected. For each 1% increase in GDP, an estimated increase of 0.77% was expected in the NLI premium, evidencing the relevance of EG to the Brazilian insurance market. In the case of credit, for each 1% increase the NLI premium responded with 0.05% expansion. It was also observed that the causal relationship between NLI premium and FD, when measured by *lmg*/*lmm*, is not significant. These findings are similar to those obtained by Garcia (2012) in the case of Portugal.

The relevance of the results is based on the point that, now that the existence of long-term causal relationships among determinant drivers of the NLI market has been confirmed, more attention can be given to the sector through the formulation of economic policies that aim to develop the insurance market and, consequently, to promote EG more efficiently. Future studies may also seek to analyse the impact of the insurance market on economic development in Brazil, which is a broader variable compared to economic growth.

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