Insurance regulations, risk and performance in Ghana

Baah Aye Kusi
Department of Finance, University of Ghana, Accra, Ghana

Abdul Latif Alhassan
Development Finance Centre, Graduate School of Business, University of Cape Town, Cape Town, South Africa

Daniel Ofori-Sasu
Banking and Finance Department, Data Link University College, Tema, Ghana, and

Rockson Sai
Xiamen University School of Economics, Xiamen, China

Received 14 September 2018
Revised 4 March 2019
29 April 2019
Accepted 20 June 2019

Abstract

Purpose – This study aims to examine the hypothesis that the effect of insurer risks on profitability is conditional on regulation, using two main regulatory directives in the Ghanaian insurance market as a case study.

Design/methodology/approach – This study used the robust ordinary least square and random effect techniques in a panel data of 30 insurers from 2009 to 2015 to test the research hypothesis.

Findings – The results suggest that regulations on no credit premium and required capital have insignificant effects on profitability of insurers. On the contrary, this study documents evidence that both policies mitigate the effect of underwriting risk on profitability and suggests that regulations significantly mitigate the negative effect of underwriting risk to improve profitability.

Practical implications – The finding suggests that policymakers and regulators must continue to initiate, design and model regulations such that they help tame risk to improve the performance of insurers in Ghana.

Originality/value – This study provides first-time evidence on the role of regulations in controlling risks in a developing insurance market.

Keywords Regulations, Liquidity risk, Insurers' performance, Underwriting risk

Paper type Research paper

1. Introduction

The financial sector of most economies provides essential functions and services that propel economic growth and development. The functions and services performed by the financial sector include mobilization of funds, efficient and effective allocation of these funds, risk sharing and reduction, monitoring of corporate insiders and provision of credit information for informed investment decision (Mishkin, 1999; Bain and Howells, 2009). Given the dynamism and ever-changing and increasing competition in the operations of the financial sector in most economies, financial institutions are pressured to meet the fierce competition by developing new and innovative products and services which are riskier. Thus, the competitive financial environment pressures financial institutions to assume risky operations and dealings which increase their risk-taking behavior and risk appetite and tolerance, leading to less financial system stability and performance. In the awake of the

Journal of Financial Regulation and Compliance
© Emerald Publishing Limited
1358-1988
DOI 10.1108/JFRC-09-2018-0126

2007-2008 global financial crisis, lessons show that excessive risk (including liquidity and credit risk) (Cai and Zhang, 2017; Imbierowicz and Rach, 2014; Varotto, 2011; Crotty, 2009) are cited as major contributors to the crises. In conjunction with the 2007-2008 global financial crises, international and national agencies propose an array of regulations in an attempt to shape risk taking behavior in the financial sector. For instance, Bouyon (2014) posits that financial sector regulations and reforms are introduced with the objective of achieving financial stability objective which reinforces stability at the firm level and the economic efficiency objective which also reinforces stability in the entire economic system.

The Ghanaian insurance sector has undergone three main regulatory changes within the past two-and-half decades. The first required the separation of life business from non-life businesses leading to the abolishment of composite insurance business since 2006 with passage of the Insurance Act 2006[1]. The second major development relates to the abolition of premium credit in the market in 2014 because of the high levels of outstanding premiums in the books of insurance companies, resulting in indebtedness of primary insurers to reinsurers and increased credit risk. Under the campaign headline "no premium no cover," the policy was to safeguard the funds/policy holder of the profitable businesses from the non-profitable ones. The third policy was related to increases in the capital base of insurers by the end of 2015. Together with the first and third policy directives, the no premium no cover directive was aimed at protecting the fund holders through the reduction in underwriting risk that insurers assume by providing insurance cover for clients that do not pay premiums (NIC, 2014)[2]. The question of the effectiveness of these regulatory directives enhancing profitability through risk reduction remains unanswered empirically. Hence, this study seeks to examine how regulation has affected profitability in the Ghanaian insurance market. Because of the importance of insurance in the absorption of risk to promote a "sense of peace within the business world" (Oscar Akotey *et al.*, 2013) and its positive effect on the Ghanaian economy (Alhassan and Fiador, 2014), the current investigation will enhance the understanding of the regulator and other stakeholders by providing an empirical assessment of effects of regulatory directives.

Although there is ample empirical evidence[3], several studies respond to the call on investigating how regulations moderate risk taking in the financial sector, majority of these studies focus on banks ignoring other financial institutions such as insurance firms. Similarly, many studies investigate how regulations affect performance but have focused on mainstream banking sector (Rachdi and Ben Bouheni, 2016; Ozkan *et al.*, 2014; Hagendorff *et al.*, 2010; Ahmad and Hassan, 2007; Barth *et al.*, 1998). The few studies focusing on regulations in the insurance market (Lee *et al.*, 2016; Swain and Swallow, 2015; Gaganis *et al.*, 2016; Gaganis *et al.*, 2015) appear to be concentrated on developed markets, with very limited empirical studies on how regulations influence risk-taking behaviors of insurers' affect insurance profit performance especially in Ghana and Africa at large. Despite the growing literature on the microeconomic analysis of insurance markets in Africa (Alhassan *et al.*, 2015; Oscar Akotey *et al.*, 2013; Alhassan and Biekpe, 2018, 2017, 2016a, 2016b, 2015; Alhassan, 2018), they do not focus on regulations and insurers' performance; hence, there are limited or scanty studies on how regulations influence risk-taking behaviors of insurers' affect insurers' performance. It is in this regard that these studies attempts to explore how regulations affect insurers' profitability through insurer risks. It is argued that regulations may tame or shape risk-taking behavior of corporate entities (including insurers) to affect performance.

The rest of the paper consists of a brief overview of the Ghanaian insurance sector, overview of no premium no cover policy, literature review and hypothesis development,

methodology and empirical estimation, empirical results, robustness checks and diagnostics and conclusions and policy recommendations.

2. Brief overview of insurance sector in Ghana

At present, the Ghanaian insurance sector consists of life, non-life, reinsurance and brokerage companies. Specifically, the sector is made up of 24 life insurance, 27 non-life insurance, 3 reinsurance and 78 insurance brokerage companies [National Insurance Commission (NIC) Report, 2016]. The sector between 2011 and 2016 has seen 35 additional company establishments representing about 36 per cent growth in the number of companies operating in the sector. However, the brokerage companies tend to have grown faster compared to life, non-life and reinsurance companies. That is, while the brokerage companies have increase by 25 companies between 2011 and 2016 (representing 47.17 per cent growth), life, non-life and reinsurance companies have increased by six, three and one companies between 2011 and 2016 (representing 33.33, 12.5 and 50 per cent) respectively (Table I).

Insurance institutions	2016	2015	2014	2013	2012	2011	Average growth (%)
Life	24	24	20	18	18	18	33.33
Non-life	27	27	25	25	25	24	47.17
Brokers	78	74	70	60	57	53	12.50
Reinsurers	3	3	3	2	2	2	50.00
Total companies	132	128	118	105	102	97	35.75

Note: Figures from 2010 to 2016 are in millions of Ghana Cedi
Source: National Insurance Reports

Table I. Trends in the establishment of companies in the insurance sector of Ghana

Symbol	*Indicator*	*Measurement*	*Expected signs*
Dependent variable			
ROA	Return on assets	Earnings before interest and tax/ total assets	
Independent variables			
Insurance regulation (INSREG)			
NO PREMIUM NO COVER	No premium no cover	Assume a value of 1 if the regulation of no premium no cover was in existence, otherwise 0	+/−
LOG OF REQUIRED CAPITAL	Capital adequacy	Natural log of required capital	+/−
Controls			
INSLEV	Insurance leverage	Mathematical reserves/[capital + surplus]	−/+
LNSIZE	Insurance size	Natural log of net premium	+/−
PREGRO	Premium growth	[Current premium − previous premium]/previous premium	−/+
INSILLIQ	Insurance liquidity	1 − [current assets/current liability]	+/−
UNDRISK	Underwriting risk	Benefits paid/ net premium	+/−

Table II. Summary of variables

2.1 Regulatory developments: no premium no cover and capitalization

The concept of "No premium No Cover" applies to all players operating in the insurance sector. It is simply to prohibit or subordinate the granting of cover or the issuance of an insurance policy or contractual documents by the insurance companies that are invalid unless the premium has been paid by the insured or perceived by the broker processing the transaction. In cases where a broker is involved, the broker has access to the insurer's policy documents, which reflects the amount or benefits to be settled by the insurer within the insured period. A violation of the above regulation, in whatever form, will attract a penalty ranging from fines to the revocation of the operating license of the company broker or insurance company. Consumers benefit greatly from regulatory compliance by all parties involved, as the political obligations or benefits under the insurance contract can be accessed on time, without undue delay, while the benefits paid can be much more generous and satisfactory. And above all, consumer confidence on the insurance will be strengthened (NIC Annual Report, 2014). In accordance with the Insurance Act 2006 (Act 724), "No Premium No Cover" is an insurance policy or regulation that allows insurance companies to collect premiums annually, usually in the short term, but cannot provide coverage, except after receipt of premiums from clients.

In terms of capitalization of insurers in Ghana, an attempt to upgrade the capital regulation to suit standard international insurance regulation saw the coming into force the 2006 Insurance Act (Act 724). The institution of Act 724 marked the start of efficiency in the capital regulation in the insurance sector of Ghana. The Act aligned the core principles of the International Association of Insurance Supervisors to the practice of insurance in Ghana leading to an upgrade in the minimum capital requirement of $1m. The Act also abolished the non-participation of foreign entities in the sector. Upon the discovery of oil and gas, industry regulators saw the need to recapitalize insurers to financially position insurers to benefit and take advantage of the opportunities in the oil and gas sector which was emerging. This saw the minimum capital moved to cedi equivalence of $1m. Thus, the huge underwriting risks associated with the oil and gas is deemed to have partly influenced the increase in the capital requirement. Subsequently, in 2011 the cedi equivalence of $1m was moved to $5m (NIC, 2010)[4] of which local and foreign insurers were to meet by 2013 and 2012, respectively. It is argued that the decision to increase the minimum capital to $5m was geared toward improving the efficiency of insurers through adequate investment in information and communication technology to improve operations and reporting capacities, building strong governance and risk management structures and acquiring other infrastructure and resources in readiness for the adoption of risk-based supervision by the Commission. Furthermore, minimum capital in 2015 was moved to GHC 15m in an attempt to strengthen the capitalization insurers (NIC, 2014)[5].

3. Literature review: theoretical framework

Theories in the regulation (public and private theory of regulation) literature argue on the grounds that regulations and reforms are introduced to enhance the performance of institutions in an industry (Bouyon, 2014). However, Hosono *et al.* (2004) argue the opposite stating that regulations may deprive institutions the opportunities of diversifying, exploiting risky opportunities and taking advantage of economies of scale and scope; hence reducing performance and increasing incidence of institutional failure especially in the financial sector. These argues above are explained by the public and private interest of regulation. The public interest theories which advance that regulations seeks to protect and benefit the public at large in terms of best possible allocation of scarce resources for collective and individual goods (Hantke-Domas, 2007). Further, regulations are implemented

seeking to advance the welfare of the society through the realization of like allocation efficiency, stabilization and fair or just income distribution.

However, den Hertog (2012) also projects the private interest theory (also called the economic interest theory) which is built on the capture theory. The theory emphasize that regulations push the interest of dominate individuals and groups in society but not the public interest. Thus, through lobbying and standard setting or self-regulation, groups and individuals dominate the regulation process and push their own interest at the expense of public interest (Gaffikin, 2005). The private interest theory holds the view that regulations are implemented in response to demands from interest groups to maximize the interest of their members. These perspectives to regulations implies that regulations tame, curtail, impedes and slows down risk-taking behavior of firms to enhance the performance of private (groups or individuals) and public interest (society at large). Ultimately, regulations feed into improving the performance of private interest or the public interest or both.

Again, the literature argues on the grounds that prudential regulation reforms have three different paradigms that are integrated. These include the agency paradigm, paradigm of externalities and the paradigm of mood swings (Aiyar *et al.*, 2014; Watanabe, 2007; Garber, 1996). While the agency paradigm of prudential regulation reforms focused on promoting firm level performance (micro prudential regulations), the externalities and mood swing paradigms mostly emphasize on promoting entire financial system performance (macro prudential regulation). That is, while the agency paradigm of prudential regulation ensures effective and efficient operation of individual firms in a system or sector, the externalities and mood swings paradigms ensure that an entire system or sector is operating effectively and efficiently. Macro prudential regulation is an approach to financial regulation that aims to mitigate systemic risk or risk of the financial system as a whole while micro prudential regulation is firm-level oversight or financial regulation that ensures the balance sheets of individual institutions are robust to shocks or uncertainties (Aiyar *et al.*, 2014). Given the focus of this paper, it is advanced that regulations (capital requirement and "no premium on cover" regulations) will promote the private interest of the insurance sector through the taming of liquidity and underwriting risks in the Ghanaian insurance sector.

3.1 Empirical review

This section summarizes the empirical literature into two strands; the first is related to studies on determinants of insurers' profitability while the second focuses on the implications of regulation on risk and on insurance profitability determinants. In the first strand, Adams and Buckle (2003) appear to have provided the first empirical evidence on the determinants of corporate financial performance in the Bermuda insurance market between 1993 and 1997. From the results of the panel data estimations, it is evident that, highly leveraged, lowly liquid and reinsurers have better operational performance than lowly leveraged, highly liquid and direct insurers. Again, underwriting risk was positively related to performance which was much surprising. On the other hand, size and scope of the insurers were not important determinants of performance. Connelly and Limpaphayom (2004) extended the study by Adams and Buckle (2003) to explore the role of board characteristics on firm performance measured as return on assets (ROA) among life insurance companies in Thailand. The empirical results suggest that while board composition significantly improved and reduce profitability and risk-taking behavior of insurers respectively, board size had no significant relation with life insurance firm profitability. The results add insight on the relation between monitoring mechanisms and firms performance of life insurers in an emerging market. Using insurer level data across Japan, Singapore, Malaysia and Taiwan, Chen and Wong (2004) examined the effect of firm-

and macro-level factors on the financial health (measured as ROA) of general and life insurers. Although they found that different factors drive the financial health of general insurers, firm size, investment performance, liquidity, surplus growth, combined ratio and operating margin were keen in determining financial health of insurers in the four Asian countries. Similarly, changes in asset mix, investment performance and changes in product mix were more applicable to Japan.

Chen *et al.* (2009) provides evidence regarding the influence of capital structure and operational risk on profitability of the life insurance industry in Taiwan. The estimations from the structural equation modeling technique show that capital structure exerts negative and significant effect on operational risks but no reciprocal effect existed from operational risk to capital structure. Again, they find that operational risk exerts a negative and significant influence on profitability. Charumathi (2012) studies the firm characteristics that determine the profitability of life insurance sector in India between 2008 and 2011. Using a panel data of 23 life insurance firms with dependent variable as ROA and independent variables as leverage, size, premium growth, liquidity, underwriting risk and equity capital, the study shows that life insurers profitability is positively influenced by size and liquidity and negatively influenced by leverage, premium growth and equity capital. Lee and Lee (2014) also investigated the relation between firms and macro-specific factors on profitability in Taiwanese property–liability insurance. They used operating ratio and ROA as dependent variables and found that underwriting risk, reinsurance usage, input cost, return on investment and financial holding group have a significant influence on profitability and operating ratio. Further, they reveal that insurance subsidiaries of financial holding group show lower profitability compared to other insurance companies.

Burca and Batrinca (2014) investigated the determinants of financial performance in the Romanian insurance industry between 2008 and 2012. They used a panel data estimate strategy and show that, financial performance of the Romanian insurance market is determined by leverage, size, premium growth, underwriting risk, retention ratio and solvency margin.

In the first paper on insurers' profitability in Ghana, Oscar Akotey *et al.* (2013) investigate the financial performance of life insurance industry in Ghana. Using a panel regression of insurance firms between 2000 and 2010 and three different measures for performance which includes investment income, underwriting profit and net profit they show that whereas gross written premiums have a positive relationship with insurers' sales profitability, its relationship with investment income is a negative one. Also, the results showed that life insurers have been incurring large underwriting losses because of overtrading and price undercutting. Alhassan *et al.* (2015) examine the impact of the regulatory-driven market structure on the pricing behavior in the Ghanaian insurance sector. Using 14 life and 22 non-life companies from 2007 to 2011, the paper concluded that while ample evidence exist for the presence of efficiency–structure hypothesis for both life, conflicting results was found for structure-conduct performance hypothesis in the non-life insurance market and rejected in the life insurance market. The findings also point to an increasing level of competition in both life and non-life insurance industry in Ghana though they still remain concentrated with the life insurance sector having high levels of efficiency compared to the non-life sector. In Asare *et al.* (2017), the authors also documented evidence on the role of intellectual capital on profitability of insurers in Ghana. Using a sample of 36 life and non-life insurers from 2007 and 2011, the paper finds non-life insurers to be characterized by high intellectual capital (IC) performance compared to life insurers. This study finds a significant positive relationship between IC and profitability of insurers in Ghana while human capital efficiency is the main driver of insurers' IC performance.

From the second strand, Pasiouras and Gaganis (2013) provided cross-country evidence on the association between regulatory policies and insurance companies' soundness. The finding shows that the powers of the supervisory authorities and regulations have enforcement and sanctions which have positive and significant effect on insurers' soundness implying that regulations tame risk-taking. However, capital requirements have a negative effect on soundness indicating that capital regulation increases risk-taking and dampens soundness of insurers. In examining the effect of globalization, political institutions and financial liberalization (regulation) on the performance and risk-taking of 1,324 insurance firms from 30 selected Organization for Economic Cooperation and Development countries, Lee and Lin (2016), finds a positive impact of regulation on insurance performance while showing that regulations at the same time reduce risk-taking behavior of insurers. Following the coming into effect of the Solvency II regime in Europe, Swain and Swallow (2015) investigated its implications for an enhanced and more consistent level of protection for policyholders across European countries. They identify that the Solvency II regulation regime will improve a firm's understanding and management of its risks, which should result in improved resilient to shocks. Gaganis *et al.* (2016) examine that role of regulations in the income smoothing behavior of 770 insurance firms in 87 countries over 2000-2009. The findings show that there is evidence of income smoothing and that technical provision and supervisory power constraints income smoothing. However, regulatory factors such as capital requirements, tax deductibility of provisions, auditing and corporate governance have no significant effect. In examining the regulatory effects on insurers profitability and risk-adjusted returns risk, Gaganis, Liu and Pasiouras (2015) documented evidence that there is an inverted U-shape relationship between ROA and regulations relating to capital requirements, accounting and auditing requirements and disclosure to supervisors. In contrast, regulations in the form of technical provisions have a negative effect on ROA while finding no significant relationship regulations relating to investment and supervisory power. Similar findings are observed when risk-adjusted returns are used in place of ROA.

While the review of the prior literature highlights the vast literature of insurance profitability studies, studies on the role of regulation on insurers' profitability and risk appears to be very limited. The few studies have only provided evidence from the perspective of developed insurance markets with stricter regulatory regimes. To date, the only attempt from an emerging market at examining the role of regulation in a developing economy was provided by Alhassan *et al.* (2015). In addition, the prior studies appear to be still silent on the role of regulations in mitigating the effect risks on financial performance. Considering the two most recent regulatory framework in the Ghanaian insurance market relating to credit premium (no premium no cover) and capitalization, this study provides first time evidence on how regulations tames insurance risks to affect performance. Thus, the paper hypothesizes that regulations serve as conduit or pathways through which insurers risk may have reducing effect on profitability of insurers.

4. Data and methodology

This study uses data from the NIC database covering periods between 2009 and 2015 comprising 15 life and non-life insurers each. The study makes use of the panel data technique to shed insights on how financial regulations (capital requirement and "no premium no cover" regulations) affect insurers' performance through liquidity risk and underwriting risks. The panel estimation technique is used because of the nature of the data and the advantages that comes with the use of the panel estimation technique (Brooks, 2008; Wooldridge, 2015). It also helps to control omitted variables and insurance specific effects

and also allows for both long- and short-run effects thereby overcoming the shortcomings of the cross sectional and time series estimation technique (Wooldridge, 2009).

Given the panel nature of the data, the study adopts the empirical models of Oscar Akotey *et al.* (2013) and Alhassan *et al.* (2015). However, the study modifies the baseline model by introducing regulatory policies (capital requirements and "no premium no cover") and their interaction with the risk variables as defined in equation (1).

$$ROA_{i,t} = \omega_0 + \omega_1 insreg_t + \omega_2 risk_{i,t} + \omega_3 (insreg * risk)_{i,t} + \sum_{i=1}^{n} \omega_4 X_{i,t} + \epsilon_{i,t} \quad (1)$$

where $ROA_{i,t}$ is defined as the ROA of insurer i and period t; $insreg_t$ denotes the proxies for insurance regulation defined as capital requirements and "no premium no cover'. *risk* represent proxies for insurance risk defined as insurance illiquidity and underwriting risk. *insreg* * *risk* represents the interaction between regulation and risk variables while X is vector of control variables.

$$ROA_{i,t} = \delta_0 + \delta_1 insreg_t + \delta_2 inslev_{i,t} + \delta_3 size_{i,t} + \delta_4 pregro_{i,t} + \delta_5 insilliq_{i,t} + \delta_6 (insreg * insilliq)_{i,t} + \delta_7 undrisk_{i,t} + \delta_8 year_t + \vartheta_{i,t} \quad (2)$$

$$ROA_{i,t} = \varphi_0 + \varphi_1 insreg_t + \varphi_2 inslev_{i,t} + \varphi_3 size_{i,t} + \varphi_4 pregro_{i,t} + \varphi_5 insliq_{i,t} + \varphi_6 undrisk_{i,t} + \varphi_7 (insreg * undrisk)_{i,t} + \varphi_9 year_t + \tau_{i,t} \quad (3)$$

where $ROA_{i,t}$ and $insreg_t$ are as previously defined for equation (1). *inslev* is insurance leverage; *size* denotes size of insurers; *pregro* , *insilliq* and *undrisk* represent premium growth, insurance illiquidity and underwriting risk respectively. Equation (2) represents the model with the interaction between the proxies for insurance regulation and liquidity (*insreg* * *insilliq)* while equation (3) represents the model with the interaction between the proxies for insurance regulation and underwriting risk (*insreg* * *undrisk*). All models include a time dummy to capture the time fixed effects.

In respect of the interaction between the regulatory variables and the risk variables, the study follows the arguments in Brambor *et al.* (2006) and estimates the marginal effect of risk on insurance profitability conditioned on regulation. To achieve this, the partial derivate of equation (1) with respect risk as specified below:

$$\frac{\partial ROA_{i,t}}{\partial risk_t} = \omega_1 + \omega_3 insreg_{i,t} \quad (4)$$

In line with Brambor *et al.* (2006), the marginal effect of risk on profitability is conditioned on substantial meaningful values for regulation. Hence, in the case of no premium no policy regulation, the marginal effect is estimated at *insreg* = 0 which reflects the effect of risk on profitability during regime of credit premiums and *insreg* = 1 for no premium no policy regime. In respect of capital regulation, which is a continuous variable, the marginal effect of risk on profitability is estimated at the mean value of capital requirements. The conclusion about the existence of conditional effect or otherwise is determined by the test of significance for the joint coefficients in equation (4).

4.1 Variables definition and hypotheses development

4.1.1 Profitability (return on assets). Insurer profitability is measured as ROA and used as dependent variable. ROA is computed as earnings before interest and tax divided by total assets. Following Goddard *et al.* (2004) ROA is a better measure of profitability because of its ability to capture leverage usage effect which return on equity (ROE) ignores. Hence, the ROA is used ahead of ROE.

4.1.2 Insurance regulations (no premium no cover and required capital regulations). The effect of insurance regulation on insurance firm performance is examined using the capital requirement ratio and the "no premium no cover" regulations. Thus, the "no premium no cover" regulation is captured as a dummy where one signifies periods before 2015 when the regulation was in existence and zero signifies periods when the regulation was not inexistence. The capital adequacy ratio is also obtained as the natural log of required capital. The effect of regulations on insurers' performance is mixed. Though a number of studies finds a positive effect of regulations (Lee and Lin, 2016; Malik, 2011; Born, 2001), there are also studies that find negative (Pasiouras and Gaganis, 2013), both positive and negative (Gaganis *et al.*, 2015; Pasiouras and Gaganis, 2013) and no significant (Gaganis *et al.*, 2016) effect of regulations. The preamble for the institution of the two regulatory regimes sought to reduce risks in the Ghanaian insurance market. Hence, this study hypothesizes that the no premium no cover and capital adequacy regulations in the insurance market should serve as a premise or conduit through which insurer risk is suppressed to improve profitability in the insurance market. Hence, interaction between the proxies for insurance regulations (no credit premium and required capital regulations) and risks (underwriting and liquidity risks) will be examined to test our hypothesis.

4.1.3 Illiquidity (INSILLIQ). Illiquidity of insurance firms in this study is computed as one minus current ratio (current assets divided by current liability). The illiquidity of an insurance firm signifies the inability of insurance firms to fulfill their immediate commitments to policyholders without increasing profits on underwriting and investment activities or liquidated financial assets. Adams and Buckle (2003) states that it shows whether insurance firms keep sufficient near-cash item balances to meet immediate liabilities toward claims due. Hence, insurance firm that keep high liquidity (low illiquidity) are likely to attract more clients because of swift and prompt ability to settle claims; hence improving performance. That is to say that illiquid insurers are likely to lose clients because of the inability to settle claims due; hence reducing profitability performance. As prior studies have focused on liquidity of insurers', it is difficult to infer from empirical findings. However, given the trade-off between liquidity and profitability as highlighted in the liquidity management literature, a negative relationship could exist. Hence, we infer from this relationship that illiquidity should dampen performance resulting from the losing of clients.

4.1.4 Underwriting risk (UNDRISK). Adams and Buckle (2003) states that underwriting risk represent the adequacy, or otherwise, of insurance firms underwriting performance. Sound underwriting principles and guidelines are imperative to financial performance of insurance firms and depend on the risk appetite of insurance firms. While Ahmed *et al.* (2011) show that underwriting risk significantly determines performance of insurance firms, Connelly and Limpaphayom (2004) specifically found a negative relationship between underwriting risk and insurance performance.

4.1.5 Leverage (INSLEV). Leverage is used as a measure of the ability of insurance firms to manage their economic exposure to unexpected losses (Adams and Buckle, 2003). Ahmed *et al.* (2011) uses leverage in a life insurance study in Pakistan and found that it positively and significantly determined performance. However, Malik (2011) also found that leverage

negatively affects the performance of insurance firms; hence, the expectation prior to this study is unclear. Leverage is computed as mathematical reserves divided by capital plus surplus.

4.1.6 Size (INSSIZE). The size of insurance firm is used as a determinant of performance. Following the economies of scale and scope and diseconomies of scale, the size of the firm can either improve or slowdown growth. Thus, firms benefit from their size through reduced operations cost and monopolist behavior; hence giving them the opportunity to charge higher prices when they are large. However, large firms may have slower decision-making procedures, bureaucratic levels of management and duplication of functions which leads to diseconomies of scale; hence slowing down performance. Size of insurance firm is computed as natural log of net premiums. The expected relationship between size and performance could be either positive or negative. Burca and Batrinca (2014) reports that size is an important determinant of insurers' profitability performance.

4.1.7 Premium growth (PREGRO). Premium growth is computed as current premium minus previous year premium divided by previous year premium. Premium growth is used to measure the growth potentials of insurance firms. Following the capital budgeting decision techniques and Oscar Akotey *et al.* (2013), growth occurs when firms investment in positive net present value projects; hence improving performance. However, given the nature of insurance business, growth in premiums could mean growth in risk and hence reduce performance of insurance firms. The expected sign is uncertain (Charumathi, 2012).

YTREND is an econometric technique used to capture technological changes and year effects to full capture the true effect of the variables in the models especially regulation variables.

5. Empirical results

Table III presents the summary statistics of all the variables used in the study. From the table, ROA which represents stakeholder return is averagely 1.19 per cent while Asare *et al.* (2017) recorded an average return on equity of 4.65 per cent. Surprisingly, an insurance company reported the lowest stakeholder profitability of −221.03 per cent while another reported the highest of 74.59 per cent. Insurance regulation which is used proxy "no premium no cover" policy in the insurance sector is averagely 28.57 per cent implying that 28.57 per cent of the entire study period covers the period where "no premium on cover policy" is in existence. However, capital requirement is 34.24 per cent of total assets implying that capital constitutes 34.24 per cent of the total financing options used by insurers. Size is a logged variable and shows an average growth of 16.88 per cent. Also, Asare *et al.* (2017) reports an average insurer size of 16.66 per cent which is close to ours. Illiquidity within the insurance industry appears to be low given that insurers had the ability to settle their current liabilities to the tune of 6.5055 units on the average. Thus, there is nearly surplus of 6.5055 units of current assets to settle it on the average implying low liquidity risk. However, an insurance company within the period under review recorded the highest illiquidity of 0.75 units while another insurance company within the period under review recorded the lowest illiquidity of −89.5543 units. Underwriting risk is on the average of 40.68 per cent implying that about 41 per cent of net premiums are exposed to underwriting risk, higher than the figure (32.1 per cent) reported by Asare *et al.* (2017) for the same market in an earlier period. However, these are lower than the same figure (66.92 per cent) reported by Alhassan and Biekpe (2016c) for the largest general insurance market in Africa (South Africa). Similarly, insurance companies at some points in time recorded lowest and highest underwriting risk of −19.89 per cent and 186.27 per cent. However, on the average, underwriting risk seems to be high in the industry. Leverage on the average is

Table III.
Summary statistics

	Whole Sample						PRE-NPNCREG			POST-NPNCREG		
Variable	Mean	Std. Dev.	Min	Max	VIF	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	Obs
ROA	0.012	0.197	−2.203	0.746	–	208	0.028	0.126	149	−0.029	0.31	59
NO PREMIUM NO COVER	0.286	0.453	0.000	1.000	1.15	210	–	–	–	–	–	–
LOG REQUIRED CAPITAL	15.658	0.968	14.166	16.556	1.11	209	0.363	0.233	149	0.291	0.265	60
INSILLIQ	−6.918	13.965	−91.100	0.754	1.31	204	−7.102	14.152	144	−5.074	8.079	60
UNDERISK	0.407	0.288	−0.199	1.863	1.33	209	0.377	0.268	149	0.48	0.324	60
LNSIZE	16.885	1.273	13.958	19.824	1.48	209	16.675	1.15	149	17.407	1.417	60
LEVERAGE	0.023	2.427	−34.109	5.168	1.16	209	0.202	0.593	149	−0.421	4.428	60
PREGROWTH	2.848	2.492	6.818	−0.992	3.24	197	1.796	5.615	139	5.371	12.63	58

Notes: ROA – return on assets; capital – capital adequacy requirement; NPNCREG – no premium on cover policy; INSILLIQ – liquidity; LNSIZE – size; LEVERAGE – leverage; UNDERISK – underwriting risk; PREGROWTH – premium growth

2.32 per cent implying that the use of debts to supplement equity capital is low. However, our computation for leverage is different for prior studies; hence making it difficult to compare. Premium growths over the periods under review have grown 2.85 times averagely implying that premium has increased about nearly four times within the periods under study. However, the insurance company with the lowest premium growth recorded a negative premium growth of 0.99 indicating a reduction in premium growth of 0.99 times. On the other side, the insurance company with the highest premium growth recorded a premium growth of 72 indicating a premium growth of 134.73 times. Furthermore, the nature of business show that about 50 per cent of the total insurers over the periods under review operated as life insurers in the Ghanaian insurance industry. Finally, comparing the summary statistics before and after the introduction of "no premium no cover" regulatory policy (Table III), it appears that insurers' performance indicators are stronger or better before the introduction of "no premium no cover" regulatory policy than after the introduction of "no premium no cover" regulatory policy.

The Pearson's correlation matrix (Table IV) which is used as a mechanism for checking and controlling multicollinearity is shown in Table III. Following Kennedy (2008), the study sets the multicollinearity threshold to 0.7; hence, the results presented in Table III show no evidence of multicollinearity. Table V presents the results on the effect of regulations and risks on ROA in the insurance sector of Ghana between 2009 and 2015. While Model 1 presents the baseline model without the regulatory effects, Models 2-4 and Models 4-7 present the effect of capital requirements and "no premium no cover" regulatory policies on insurers' profitability in Ghana.

Table V presents the results on the effect of risk (illiquidity and underwriting risk), regulations (no credit premium and capital) on the profitability of insurers' in the Ghanaian insurance sector. The results from Model 1 excludes the interaction terms while Models 2 and 3 present the modified model, includes no premium no cover and capital requirement regulations respectively. Both regulations are introduced in Model 4. The interaction terms are introduced in Model 5 (no premium no cover regulation and liquidity risk) and Model 6 (capital requirement regulation and liquidity risk). Similarly, In Model 7 the interacted term of no premium no cover regulation and underwriting risk is introduced while in Model 8 the interacted term of capital requirement regulation and underwriting risk is introduced. From the stepwise estimations using the ordinary least square (OLS) and random effect techniques, we introduce the regulation variables and their interactive terms with the risk variables one after the other. It is observed that changes in the coefficient of the risk

Variables	1	2	3	4	5	6	7	8
ROA (1)	1	–	–	–	–	–	–	–
LOG REQUIRED CAPITAL(2)	−0.037	1	–	–	–	–	–	–
NO PREMIUM NO COVER(3)	−0.1296*	0.3080*	1	–	–	–	–	–
ILLIQUIDITY(4)	−0.0099	0.0489	0.0852	1	–	–	–	–
LNSIZE (5)	0.2914*	0.3303*	0.2608*	0.0125	1	–	–	–
UNDERISK (6)	−0.0927	0.4000*	0.1606*	0.0449	0.2573*	1	–	–
LEVERAGE (7)	0.075	−0.057	−0.1163*	0.058	−0.0612	−0.2992*	1	–
PREGROWTH (8)	−0.0094	−0.0743	0.0951	−0.1310*	0.2612*	0.0153	0.0047	1

Table IV.
Pearson's correlation matrix

Notes: ROA – return on assets; capital – capital adequacy requirement; NPNCREG – no premium on cover policy; INSILLIQ – liquidity; LNSIZE – size; LEVERAGE – leverage; UNDERISK – underwriting risk; PREGROWTH – premium growth. Significance level: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$

Table V.
OLS – effect of regulations and risks on insurers' profitability

VARIABLES	MODEL 1	MODEL 2	MODEL 3	MODEL 4
LOG CAPITAL REQUIREMENT	–	0.0138 (0.0221)	–	−0.00182 (0.0246)
NO PREMIUM NO COVER	–	–	− 0.0820* (0.0456)	−0.0824* (0.0477)
LOG CAPITAL REQUIREMENT × ILLIQUIDITY RISK	–	–	–	–
NO PREMIUM NO COVER × ILLIQUIDITY RISK	–	–	–	–
LOG CAPITAL REQUIREMENT × UNDERWRITING RISK	–	–	–	–
NO PREMIUM NO COVER × UNDERWRITING RISK	–	–	–	–
ILLIQUIDITY RISK	0.000124 (0.000297)	0.000130 (0.000304)	0.000261 (0.000292)	0.000261 (0.000292)
UNDERWRITING RISK	−0.124* (0.0658)	−0.122* (0.0671)	−0.146** (0.0697)	−0.147** (0.0718)
Controls Variables				
LNSIZE	0.0716*** (0.0226)	0.0717*** (0.0226)	0.0750*** (0.0238)	0.0751*** (0.0239)
LEVERAGE	0.00321 (0.00237)	0.00329 (0.00242)	0.00107 (0.00286)	0.00105 (0.00300)
PREMIUM GROWTH	−0.00210*** (0.000588)	−0.00207*** (0.000596)	−0.00178*** (0.000385)	−0.00179*** (0.000386)
YEAR TREND	−0.0162 (0.00992)	−0.0224 (0.0148)	−0.00794 (0.00672)	−0.00709 (0.0132)
CONSTANT	−1.074*** (0.345)	−1.267*** (0.460)	−1.132*** (0.366)	−1.107*** (0.410)
Net Effect	–	–	–	–
Significance of interactive term	–	–	–	–
Observations	197	197	197	197
R^2	0.166	0.167	0.192	0.192

Notes: Robust standard errors in parentheses; *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$

(*continued*)

Table V.

VARIABLES	MODEL 5	MODEL 6	MODEL 7	MODEL 8
LOG CAPITAL REQUIREMENT	− 0.00730 (0.0281)	0.00218 (0.0236)	− 0.00175 (0.0273)	−0.00897 (0.0252)
NO PREMIUM NO COVER	−0.0842* (0.0494)	−0.101 (0.0625)	−0.0824* (0.0475)	0.0128 (0.0349)
LOG CAPITAL REQUIREMENT × ILLIQUIDITY RISK	−0.000329 (0.000515)	–	–	–
NO PREMIUM NO COVER × ILLIQUIDITY RISK	–	−0.00431 (0.00404)	–	–
LOG CAPITAL REQUIREMENT × UNDERWRITING RISK	–	–	−0.000363 (0.0472)	–
NO PREMIUM NO COVER × UNDERWRITING RISK	–	–	–	−0.233* (0.121)
ILLIQUIDITY RISK	0.00530 (0.00792)	0.000422 (0.000324)	0.000261 (0.000293)	9.97e − 05 (0.000313)
UNDERWRITING RISK	−0.147** (0.0720)	−0.156** (0.0789)	−0.141 (0.727)	−0.0911 (0.0637)
Controls Variables				
LNSIZE	0.0751*** (0.0240)	0.0746*** (0.0233)	0.0751*** (0.0240)	0.0747*** (0.0235)
LEVERAGE	0.00110 (0.00297)	0.00173 (0.00266)	0.00105 (0.00342)	−0.00543 (0.00526)
PREMIUM GROWTH	−0.00173*** (0.000386)	−0.00174*** (0.000387)	−0.00179*** (0.000421)	−0.00198*** (0.000454)
YEAR TREND	−0.00564 (0.0137)	−0.0104 (0.0134)	−0.00707 (0.0131)	−0.00184 (0.0129)
CONSTANT	−1.028** (0.399)	−1.144*** (0.428)	−1.108** (0.495)	−1.030*** (0.383)
Net Effect	*0.000015*	*−0.003889*	*−0.146683*	*−0.324100*
Significance of interactive term	*0.31*	*1.40*	*2.53**	*2.21**
Observations	197	197	197	197
R^2	0.193	0.200	0.192	0.207

variables when the regulatory variables are introduced. Also, we test for the significant of the interactive terms introduced and the net effect of the interactive term models (Models 5-8) which becomes the bases of our conclusion. In testing for the significance of the interactive terms (capital requirement regulation and liquidity risk; no premium no cover regulation and liquidity risk; no premium no cover regulation and underwriting risk; and no premium no cover regulation and liquidity risk), we observe that capital requirement and no premium no cover regulations in Models 7 and 8 are significant conduits through which insurer risks can affect profitability of insurer.

From Table V we observe that required capital (capital adequacy requirement in Models 2,4,5,6,7 and 8) to be insignificant across the models. This surprisingly implies that increasing required capital for insurers had no significant effect on profitability. However, the presence of required capital regulation tames underwriting risk. In terms of "no premium no cover" regulation which prohibited insurers from rendering premiums on credit, we observe a significant negative effect on profitability of insurers implying that no credit premium policy reduced the performance of insurers (Models 3, 4, 5 and 7).

However, following the results on the interactive term of liquidity risk and no credit premiums (Model 6) and liquidity risk and required capital requirement (Model 5), we find no significant effect of these interactive terms on profitability of insurers. Moreover, following the results on the interactive term while the interactive term of underwriting risk and required capital requirement (Model 7) have insignificant effect on profitability, no credit premiums and underwriting risk (Model 8) have significant negative effect on profitability of insurers. Furthermore, liquidity (illiquidity) and underwriting risks have insignificant positive (Models 1-8) and significant negative (Models 1-6) effects respectively. However, in Models 7 and 8 where the interactive terms of underwriting risk and required capital and underwriting risk and no credit premium are present, the negative effect of underwriting risk is nullified.

As explained in the methodology, the evidence for the existence of conditional effect of regulation on the relationship between risk and profitability is examined through the estimation of marginal effects. The results of the marginal effects are also presented in Table V (columns 5-8). Columns 5 and 6 present the results on the effect of liquidity risk on profitability conditional on the two regulatory variables. First, the estimated marginal effect of illiquidity risk on ROA conditional on the mean value of capital regulation was 0.000015. This indicates that capital requirement regulation suppresses the effect of insurer risk on profitability from 0.00530-0.000015. With respect to the use of the no premium no policy as a conditioning variable, the estimated marginal effect for periods with the policy was estimated at −0.003889 implying that when illiquidity risk is conditioned on no premium no cover regulation the effect of illiquidity risk reduces from 0.000422 to −0.003889.

The marginal effect of underwriting risk on ROA condition on regulations is also presented in columns 7 and 8. In terms of the conduit effect where the net effect (Models 7 and 8) is computed, we observe that required capital and no credit premium regulations serve as conduits through which the negative effect of underwriting risk on profitability is mitigated and nullified. This implies that these regulatory requirements moderate the repressing effect of risk specifically underwriting risk on profitability of insurers. Hence our finding is consistent with studies (Salah and Souissi, 2016; Parlatore, 2016; Gaganis *et al.*, 2015; Borio and Zhu, 2012) that argue that regulations are mechanisms through which risks can be well-managed to improve performance.

On the control variables, the coefficient of size is observed to be positive and significant all the models estimated and suggests that increase in the size of insurers improves the performance of insurers. Thus, insurers benefit from their size because of economies of scale

and scope gains that is achieved through reduced operations cost (efficiency) and monopolist behavior; hence giving them the opportunity to charge higher prices when they are large. The finding is consistent with the economies of scale and scope concept. Finally, we report that premium growth is significantly and negatively related to insurers' profitability across all the models. This finding suggests that growth in premiums means growth in risk and hence reduce performance of insurance firms (Charumathi, 2012).

5.1 Diagnostics and robustness checks

To ensure consistency, reliability and efficiency of the models, a number of tests and actions were undertaken. First, outliers were screened for by examining the summary statistics table. No outliers were detected. Second, Pearson's correlation (Table IV) and variance inflation factor (VIF) (Table III) were also used to check for multicollinearity. Following Kennedy (2008) who set the threshold of multicollinearity to 0.7, there was no evidence of multicollinearity which the VIF confirm eligibility of all the variables used. Third, we used the Breusch and Pagan Lagrangian multiplier test for random effects to justify the use of either OLS or generalized least squares (Appendix 4) models. Given the null of OLS id preferred and the p-value of 1.00, we fail to reject the null hypothesis concluding that the OLS is preferred. Fourth, as a means obtaining a model for robustness check, the Hausman test is used to make a choice between fixed and random effect models. The results from the Hausman test show a chi2 (6) value of 2.92 with p-value of 0.7127 (Appendix 1) indicating a failure to reject the null hypothesis (Ho: difference in coefficients not systematic). This implies that the random effect is preferred to the fixed effect. Fifth, we check for heteroscedasticity and found evidence of heteroscedasticity (Appendix 2); hence we used robust standard random models to ensure consistent, efficient, reliable and unbiased results. Sixth, we check for autocorrelation and found no evidence of autocorrelation (Appendix 3). Seventh, we used year trend dummy to control for technological changes and year effects to ascertain the coefficients of the variables used. Finally, to a very large extent, the signs of the variables in the OLS (Table V) and random effect (Appendix 5) models are consistent across the models indicating the consistency and reliability of the results and findings. Hence, our models are good and fit for generalization.

6. Conclusion and policy recommendation

This study explores how regulations affect the profitability of insurers through insurance underwriting and liquidity risks in Ghana. This study is motivated by the lack of empirical studies on whether or not the impact of insurer underwriting and liquidity risks on profitability can be tamed through. Also, the introduction of the "no premium no cover" regulatory policy (no credit premium policy) in the Ghanaian insurance sector is a key motivator of this study. The study uses data covering 30 insurers companies in Ghana between 2009 and 2015. The study uses robust OLS models with year trend dummy to control the year and technological effects to arrive at robust results and findings while using random effect models as robust model to check for consistency.

From the results we find that although "no premium no cover" and capital requirement regulations do not have significant propelling effect on profitability, their presence helped curbed the negative effects of liquidity and underwriting risks on profitability of insurers. Again, we find that "no premium no cover" and capital requirement regulations served as significant conduits through which underwriting risk affect profitability of insurers. Thus, in the presence of the conduit effects underwriting risk through "no premium no cover" and capital requirement regulations, the significant repressing effect of underwriting risk on insurer profitability is neutralized. These findings suggest that although regulation may not

have a significant positive desired conduit effect on profitability of insurers, the presence of the conduit effect may help tame risk to improve the profitability of insurers.

Given the findings, the following implication and recommendations are highlighted for policymakers, regulators and researchers. Policymakers and regulators must initiate, design and model regulations such that they help tame risk to improve the performance of insurers in Ghana given that the present state of required capital and no credit premium regulation do not propel insurer profitability. Second, researchers have to consider both direct and indirect (conduit effect) effects when investigating regulations and performance as regulations may go through other factors to impact performance of firms.

Notes

1. http://nicgh.org/wp-content/uploads/2016/07/Insurance_Act_724_2006_CV_toC.pdf
2. http://nicgh.org/wp-content/uploads/2016/07/Replacement_GUIDELINES-ON-INSURANCE-PREMIUM-PAYMENT.pdf
3. Refer to Salah and Souissi, 2016; Parlatore, 2016; Spratt, 2016; Klomp and De Haan, 2015; Ongena, Popov and Udell, 2013; Borio and Zhu, 2012; Houston, Lin and Ma, 2012; Behr, Schmidt and Xie, 2010; Laeven and Levine, 2009; Boyd and De Nicolo, 2005; Gonzalez, 2005; Furlong and Keeley, 1989)
4. http://nicgh.org/wp-content/uploads/2016/07/NIC_Annual_Report_2010.pdf
5. http://nicgh.org/wp-content/uploads/2018/02/NIC_Annual-Report_2014.pdf

References

Adams, M. and Buckle, M. (2003), "The determinants of corporate financial performance in the Bermuda insurance market", *Applied Financial Economics*, Vol. 13 No. 2, pp. 133-143.

Ahmad, A.U.F. and Hassan, M.K. (2007), "Regulation and performance of Islamic banking in Bangladesh", *Thunderbird International Business Review*, Vol. 49 No. 2, pp. 251-277.

Ahmed, N., Ahmed, Z. and Usman, A. (2011), "Determinants of performance: a case of life insurance sector of Pakistan", *International Research Journal of Finance and Economics*, Vol. 61 No. 1, pp. 123-128.

Aiyar, S., Calomiris, C.W. and Wieladek, T. (2014), "Does macro-prudential regulation leak? Evidence from a UK policy experiment", *Journal of Money, Credit and Banking*, Vol. 46 No. s1, pp. 181-214.

Alhassan, A.L. (2018), "Loss reserving behaviour in insurance markets: evidence from mauritius", *Managerial & Decision Economics*, Vol. 39 No. 7, pp. 805-813.

Alhassan, A.L. and Biekpe, N. (2015), "Efficiency, productivity and returns to scale economies in the non-life insurance market in South Africa", *The Geneva Papers on Risk and Insurance – Issues and Practice*, Vol. 40 No. 3, pp. 493-515.

Alhassan, A.L. and Biekpe, N. (2016a), "Determinants of life insurance consumption in Africa", *Research in International Business and Finance*, Vol. 37, pp. 17-27.

Alhassan, A.L. and Biekpe, N. (2016b), "Insurance market development and economic growth: Exploring causality in 8 selected African countries", *International Journal of Social Economics*, Vol. 43 No. 3, pp. 321-339.

Alhassan, A.L. and Biekpe, N. (2016c), "Competition and efficiency in the non-life insurance market in South Africa", *Journal of Economic Studies*, Vol. 43 No. 6, pp. 882-909.

Alhassan, A.L. and Biekpe, N. (2017), "Liberalization outcomes and competitive behaviour in an emerging insurance market", *African Development Review*, Vol. 29 No. 2, pp. 122-138.

Alhassan, A.L. and Biekpe, N. (2018), "Competition and risk-taking behaviour in the non-life insurance market in South Africa", *The Geneva Papers on Risk and Insurance-Issues and Practice*, Vol. 43 No. 3, pp. 492-519.

Alhassan, A.L. and Fiador, V. (2014), "Insurance-growth nexus in Ghana: an autoregressive distributed lag bounds cointegration approach", *Review of Development Finance*, Vol. 4 No. 2, pp. 83-96.

Alhassan, A.L., Addisson, G.K. and Asamoah, M.E. (2015), "Market structure, efficiency and profitability of insurance companies in Ghana", *International Journal of Emerging Markets*, Vol. 10 No. 4, pp. 648-669.

Asare, N., Alhassan, A.L., Asamoah, M.E. and Ntow-Gyamfi, M. (2017), "Intellectual capital and profitability in an emerging insurance market", *Journal of Economic and Administrative Sciences*, Vol. 33 No. 1, pp. 2-19.

Bain, M.K. and Howells, P. (2009), *Monetary Economics: policy and Its Theoretical Basis*, Macmillan International Higher Education.

Barth, J.R. Caprio, G. and Levine, R. (1998), "Financial regulation and performance: cross-country evidence", World Bank Policy Research Working Paper, (2037).

Behr, P., Schmidt, R.H. and Xie, R. (2010), "Market structure, capital regulation and bank risk taking", *Journal of Financial Services Research*, Vol. 37 Nos 2/3, pp. 131-158.

Borio, C. and Zhu, H. (2012), "Capital regulation, risk-taking and monetary policy: a missing link in the transmission mechanism?", *Journal of Financial Stability*, Vol. 8 No. 4, pp. 236-251.

Born, P.H. (2001), "Insurer profitability in different regulatory and legal environments", *Journal of Regulatory Economics*, Vol. 19 No. 3, pp. 211-237.

Bouyon, S. (2014), "A review of policy options for monitoring household saving", *European Credit Research Institute*, Vol. 16, pp. 1-24.

Boyd, J.H. and De Nicolo, G. (2005), "The theory of bank risk taking and competition revisited", *The Journal of Finance*, Vol. 60 No. 3, pp. 1329-1343.

Brambor, T., Clark, W.R. and Golder, M. (2006), "Understanding interaction models: improving empirical analyses", *Political Analysis*, Vol. 14 No. 1, pp. 63-82.

Brooks, C. (2008), *RATS Handbook to Accompany Introductory Econometrics for Finance*, *Cambridge Books*.

Burca, A.M. and Batrinca, G. (2014), "The determinants of financial performance in the Romanian insurance market", *International Journal of Academic Research in Accounting, Finance and Management Sciences*, Vol. 4 No. 1, pp. 299-308.

Cai, R. and Zhang, M. (2017), "How does credit risk influence liquidity risk. Evidence from Ukrainian banks", *Visnyk of the National Bank of Ukraine*, Vol. 2017 No. 241, pp. 21-32.

Charumathi, B. (2012), "On the determinants of profitability of Indian life insurers – an empirical study", *Proceedings of the World Congress on Engineering*, *London*, Vol. 1, No. 2, pp. 4-6.

Chen, J.S., Chen, M.C., Liao, W.J. and Chen, T.H. (2009), "Influence of capital structure and operational risk on profitability of life insurance industry in Taiwan", *Journal of Modelling in Management*, Vol. 4 No. 1, pp. 7-18.

Chen, R. and Wong, K., A. (2004), "The determinants of financial health of Asian insurance companies", *Journal of Risk and Insurance*, Vol. 71 No. 3, pp. 469-499.

Connelly, J.T. and Limpaphayom, P. (2004), "Board characteristics and firm performance: evidence from the life insurance industry in Thailand", *Chulalongkorn Journal of Economics*, Vol. 16 No. 2, pp. 101-124.

Crotty, J. (2009), "Structural causes of the global financial crisis: a critical assessment of the 'new financial architecture", *Cambridge Journal of Economics*, Vol. 33 No. 4, pp. 563-580.

den Hertog, J. (2012), "Economic theories of regulation", *In Encyclopedia of Law and Economics*, Edward Elgar Publishing Limited.

Furlong, F.T. and Keeley, M.C. (1989), "Capital regulation and bank risk-taking: a note", *Journal of Banking and Finance*, Vol. 13 No. 6, pp. 883-891.

Gaffikin, M. (2005), "Regulation as accounting theory".

Gaganis, C., Hasan, I. and Pasiouras, F. (2016), "Regulations, institutions and income smoothing by managing technical reserves: international evidence from the insurance industry", *Omega*, Vol. 59, pp. 113-129.

Gaganis, C., Liu, L. and Pasiouras, F. (2015), "Regulations, profitability, and risk-adjusted returns of european insurers: an empirical investigation", *Journal of Financial Stability*, Vol. 18, pp. 55-77.

Garber, P.M. (1996), "Managing risks to financial markets from volatile capital flows: the role of prudential regulation", *International Journal of Finance and Economics*, Vol. 1 No. 3, pp. 183-195.

Goddard, J., Molyneux, P. and Wilson, J.O. (2004), "The profitability of European banks: a cross-sectional and dynamic panel analysis", *The Manchester School*, Vol. 72 No. 3, pp. 363-381.

Gonzalez, F. (2005), "Bank regulation and risk-taking incentives: an international comparison of bank risk", *Journal of Banking and Finance*, Vol. 29 No. 5, pp. 1153-1184.

Hagendorff, J., Collins, M. and Keasey, K. (2010), "Board monitoring, regulation, and performance in the banking industry: Evidence from the market for corporate control", *Corporate Governance: An International Review*, Vol. 18 No. 5, pp. 381-395.

Hantke-Domas, D. (2007), "Common legal principles of advanced regulatory systems".

Hosono, K., Iwaki, H. and Tsuru, K. (2004), "Bank regulation and market discipline around the world", Research Institute of Economy, Trade and Industry (RIETI) Discussion Paper Series, 4.

Houston, J.F., Lin, C. and Ma, Y. (2012), "Regulatory arbitrage and international bank flows", *The Journal of Finance*, Vol. 67 No. 5, pp. 1845-1895.

Imbierowicz, B. and Rauch, C. (2014), "The relationship between liquidity risk and credit risk in banks", *Journal of Banking and Finance*, Vol. 40, pp. 242-256.

Kennedy, P. (2008), *A Guide to Econometrics*, Blackwell, Malden, MA.

Klomp, J. and De Haan, J. (2015), "Bank regulation and financial fragility in developing countries: does bank structure matter?", *Review of Development Finance*, Vol. 5 No. 2, pp. 82-90.

Laeven, L. and Levine, R. (2009), "Bank governance, regulation and risk taking", *Journal of Financial Economics*, Vol. 93 No. 2, pp. 259-275.

Lee, H.H. and Lee, C.Y. (2014), "The effects of total quality management and organisational learning on business performance: evidence from taiwanese insurance industries", *Total Quality Management and Business Excellence*, Vol. 25 Nos 9/10, pp. 1072-1087.

Lee, C.C. and Lin, C.W. (2016), "Globalization, political institutions, financial liberalization, and performance of the insurance industry", *The North American Journal of Economics and Finance*, Vol. 36, pp. 244-266.

Lee, C.C., Lin, C.W. and Zeng, J.H. (2016), "Financial liberalization, insurance market, and the likelihood of financial crises", *Journal of International Money and Finance*, Vol. 62, pp. 25-51.

Malik, H. (2011), "Determinants of insurance companies profitability: an analysis of insurance sector of Pakistan", *Academic Research International*, Vol. 1 No. 3, p. 315.

Mishkin, F.S. (1999), "Global financial instability: framework, events, issues", *Journal of Economic Perspectives*, Vol. 13 No. 4, pp. 3-20.

NIC (2014), "Annual report", available at: http://nicgh.org/wp-content/uploads/2018/02/NIC_Annual-Report_2014.pdf

NIC (2016), "Annual report and financial statements", available at: http://nicgh.org/wp-content/uploads/2018/02/NIC_Annual-Report_2016.pdf (accessed May 2016).

Ongena, S., Popov, A. and Udell, G.F. (2013), "When the cat's away the mice will play": does regulation at home affect bank risk-taking abroad?", *Journal of Financial Economics*, Vol. 108 No. 3, pp. 727-750.

Oscar Akotey, J., Sackey, F.G., Amoah, L. and Frimpong Manso, R. (2013), "The financial performance of life insurance companies in Ghana", *The Journal of Risk Finance*, Vol. 14 No. 3, pp. 286-302.

Ozkan, S., Balsari, C.K. and Varan, S. (2014), "Effect of banking regulation on performance: evidence from Turkey", *Emerging Markets Finance and Trade*, Vol. 50 No. 4, pp. 196-211.

Parlatore, C. (2016), "Fragility in money market funds: sponsor support and regulation", *Journal of Financial Economics*, Vol. 121 No. 3, pp. 595-623.

Pasiouras, F. and Gaganis, C. (2013), "Regulations and soundness of insurance firms: international evidence", *Journal of Business Research*, Vol. 66 No. 5, pp. 632-642.

Rachdi, H. and Ben Bouheni, F. (2016), "Revisiting the effect of regulation, supervision and risk on banking performance: evidence from European banks based on PSTR model", *Journal of Financial Regulation and Compliance*, Vol. 24 No. 1, pp. 24-40.

Salah, H. and Souissi, M. (2016), "Financial stability and macro prudential regulation: policy implication of systemic expected shortfall measure", In Economic Research Forum Working Papers (No. 985).

Spratt, S. (2016), "Financial regulation, stability and growth in low-income countries: a review of the evidence and agenda for research", In *Achieving Financial Stability and Growth in Africa*, (pp. 37-61). Routledge.

Swain, R. and Swallow, D. (2015), The prudential regulation of insurers under Solvency II, Bank of England Quarterly Bulletin, Q2.

Varotto, S. (2011), "Liquidity risk, credit risk, market risk and bank capital", *International Journal of Managerial Finance*, Vol. 7 No. 2, pp. 134-152.

Watanabe, W. (2007), "Prudential regulation and the credit crunch: evidence from Japan", *Journal of Money, Credit and Banking*, Vol. 39 Nos 2/3, pp. 639-665.

Wooldridge, J. (2015), *Introductory Econometrics: A Modern Approach*, Nelson Education.

Wooldridge, J.M. (2009), *Introductory Econometrics: A Modern Approach*, Publisher: South-Western.

Further reading

Almajali, A.Y., Alamro, S.A. and Al-Soub, Y., Z. (2012), "Factors affecting the financial performance of Jordanian insurance companies listed at Amman stock exchange", *Journal of Management Research*, Vol. 4 No. 2, pp. 266-289.

Kozak, S. (2011), "Determinants of profitability of non-life insurance companies in Poland during integration with the European financial system", *Electronic Journal of Polish Agricultural Universities*, Vol. 14 No. 1, p. 1.

Mehari, D. and Aemiro, T. (2013), "Firm specific factors that determine insurance companies' performance in Ethiopia", *European Scientific Journal*, Vol. 9 No. 10.

Mwangi, M. and Murigu, J.W. (2015), "The determinants of financial performance in general insurance companies in Kenya", *European Scientific Journal, Esj*, Vol. 11 No. 1.

Pervan, M., Curak, M. and Marijanovic, I. (2012), *Dynamic Panel Analysis of Bosnia And Herzegovina Insurance Companies' Profitability. Recent Researches in Business and Economics*, ISBN: 978-1-61804-102-9.

Corresponding author

Baah Aye Kusi can be contacted at: baahkusi@gmail.com

Appendix 1

Variables	Coefficients (b) roafe	(B) roare	(b − B) Difference	sqrt[diag(V_b − V_B)] S.E.
illiquidity1	0.000178	0.000124	0.0000541	0.000079
underisk	−0.12672	−0.12367	−0.0030492	0.0085145
lnsize1	0.07135	0.071647	−0.0002962	0.0010129
leverage	0.001684	0.003205	−0.0015214	0.0009924
pregrowth	−0.00206	−0.0021	0.0000402	0.0001533

Notes: b = consistent under Ho and Ha; obtained from xtreg B = inconsistent under Ha, efficient under Ho; obtained from xtreg Test: Ho: difference in coefficients not systematic chi2(5) = (b − B)'[(V_b − V_B)^(−1)] (b−B) = 2.92 Prob > chi^2 = 0.7127

Table AI. Hausman test

Appendix 2. Breusch–Pagan/Cook–Weisberg test for heteroskedasticity

Ho: Constant variance

Variables: fitted values of roa1

$chi^2(1)$ = 651.93

Prob > chi2 = 0.0000

Appendix 3. Wooldridge test for autocorrelation in panel data

H0: no first order autocorrelation

F (1, 6) = 0.017

Prob > F = 0.8992

Appendix 4. Breusch and pagan lagrangian multiplier test for random effects

$$\text{roa1}[\text{year}, t] = \text{Xb} + \text{u}[\text{year}] + \text{e}[\text{year}, t]$$

Estimated results:

	Var	sd = sqrt(Var)
roa1	0.0413353	0.203311
e	0.035735	0.1890372
u	0	0

Test: Var (u) = 0

chibar2(01) = 0.00

Prob > chibar2 = 1.0000

Table AII.
Random effect – effect of regulations and risks on insurers' profitability

VARIABLES	MODEL 1	MODEL 2	MODEL 3	MODEL 4
LOG REQUIRED CAP	–	0.0138 (0.0150)	–	−0.00182 (0.0213)
NO PREMIUM NO COVER	–	–	−0.0820** (0.0368)	−0.0824** (0.0391)
LOGREQUIRED ×ILLIQUIDITY RISK	–	–	–	–
NOPREMIUM × ILLIQUIDITY RISK	–	–	–	–
LOGREQUIRE × UNDERWRITING ISK	–	–	–	–
NO PREMIUM × UNDERWRITING ISK	–	–	–	–
ILLIQUIDITY RISK	0.000124 (0.00034)	0.000130 (0.000346)	0.000261 (0.000330)	0.000261 (0.000331)
UNDERWRITING RISK	−0.124* (0.0704)	−0.122* (0.0706)	−0.146* (0.0771)	−0.147* (0.0779)
Controls Variables				
LNSIZE	0.072*** (0.0205)	0.0717*** (0.0205)	0.0750*** (0.0202)	0.0751*** (0.0203)
LEVERAGE	0.00321 (0.00282)	0.00329 (0.00288)	0.00107 (0.00348)	0.00105 (0.00354)
PREMIUM GROWTH	−0.002*** (0.00059)	−0.00207*** (0.000603)	−0.00178*** (0.000355)	−0.00179*** (0.000366)
YTREND	−0.0162** (0.00682)	−0.0224** (0.0100)	−0.00794* (0.00444)	−0.00709 (0.0128)
CONSTANT	−1.074*** (0.305)	−1.267*** (0.331)	−1.132*** (0.308)	−1.107*** (0.329)
Net Effect	–	–	–	–
Observations	197	197	197	197
Significance of interactive Term	–	–	–	–
Number of year	7	7	7	7

Notes: Robust standard errors in parentheses. Significance level: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$

(*continued*)

Table AII.

VARIABLES	MODEL 5	MODEL 6	MODEL 7	MODEL 8
LOG REQUIRED CAP	−0.00730 (0.0277)	0.00218 (0.0219)	−0.00175 (0.0235)	−0.00897 (0.0209)
NO PREMIUM NO COVER	−0.0842** (0.0414)	−0.101* (0.0548)	−0.0824** (0.0380)	0.0128 (0.0183)
LOGREQUIRED ×ILLIQUIDITY RISK	−0.000329 (0.000505)	–	–	–
NOPREMIUM × ILLIQUIDITY RISK	–	−0.00431 (0.00382)	–	–
LOGREQUIRE × UNDERWRITING ISK	–	–	−0.000363 (0.0443)	–
NO PREMIUM × UNDERWRITING ISK	–	–	–	−0.233*** (0.0852)
ILLIQUIDITY RISK	0.00530 (0.00752)	0.000422 (0.000335)	0.000261 (0.000332)	9.97e − 05 (0.000365)
UNDERWRITING RISK	−0.147* (0.0784)	−0.156* (0.0890)	−0.141 (0.637)	−0.0911* (0.0551)
Controls Variables				
LNSIZE	0.0751*** (0.0203)	0.0746*** (0.0196)	0.0751*** (0.0205)	0.0747*** (0.0203)
LEVERAGE	0.00110 (0.00348)	0.00173 (0.00326)	0.00105 (0.00427)	−0.00543 (0.00553)
PREMIUM GROWTH	−0.00173***	−0.00174***	−0.00179***	−0.00198***
	(0.000339)	(0.000351)	(0.000413)	(0.000498)
YTREND	−0.00564	−0.0104	−0.00707	−0.00184
	(0.0145)	(0.0139)	(0.0126)	(0.0107)
CONSTANT	−1.028*** (0.359)	−1.144*** (0.347)	−1.108** (0.454)	−1.030*** (0.318)
Net Effect	*0.00497*	*−0.06706*	*−0.14114*	*−3.73941*
Observations	197	197	197	197
Significance of interactive Term	*2.29*	*1.15*	*45.45***	*7.92***
Number of year	7	7	7	7