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ORIGINAL RESEARCH PAPER

Discontinued business in non-life insurance: an empirical test of the market development in the German-speaking countries

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Abstract Although every company has discontinued business, its active management is a relatively new topic in practice and an entirely new field of study in academia. Based on a survey of 85 non-life insurers from Germany, Switzerland, Austria, and Luxembourg, we empirically test the market development and find indication that Swiss insurers seem to have more experience with the active management of discontinued business than insurers in other countries. We explain this phenomenon by that country's more advanced solvency capital requirements that better reflect the risk of discontinued business activities. We thus conclude that with the introduction of Solvency II, active management of discontinued business will become more important since insurers will have to hold higher equity capital for discontinued business portfolios. We illustrate this fact within a numerical example which shows that 23 % of the Solvency II non-life premiums and reserve risk can be traced back to discontinued business.

Keywords Discontinued business · Run-off · Non-life insurance · Solvency II · Risk-based capital · Risk management

1 Introduction

Current market studies estimate that 20–30 % of the technical provisions in European property/casualty insurance are related to portfolios in discontinued business (see KPMG [13] and PwC [19]). In the insurance context, 'discontinued

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business' refers to business for which there are still obligations from previous years, but no new business is being written and thus no premium income is being generated. Virtually every insurer has such 'inactive business', also known as 'run-off' or 'discontinued business'.[1]

In the past, most insurance companies in the German-speaking countries did not pay too much attention to their discontinued business portfolios. Unlike in the U.K. or U.S. insurance markets, where various instruments for actively managing discontinued business (e.g., portfolio transfer, commutation) are used, this issue has only recently become important in the German-speaking countries. One potential driver for the increasing importance of discontinued business is the planned introduction of Solvency II in 2016 (see e.g., Financial Times [10]). Under Solvency I, in general, discontinued business was not important for capital requirements. However, as we show in this paper, this situation will change significantly with the introduction of Solvency II.

To our knowledge, the issue of discontinued business is virtually absent from the existing academic literature. A number of consulting firms and other practitioners analyse the market from time to time (see KPMG [12, 13], PwC [18, 19] and Quane et al. [20]). The only on-topic academic paper we are aware of is by Kwon et al. [14], who analyse market exit strategies from an international perspective, i.e., how insurers go about stopping their business in an entire country. Our focus is on the active reduction of discontinued business within a country, i.e., without leaving the whole market.

We present results of a market survey on discontinued business which was conducted in continental Europe. Specifically, we focus on the German-speaking countries of Germany, Austria, Switzerland, and Luxembourg. Using multivariate regression models, we empirically test four hypotheses that relate the company characteristics of insurance type (primary vs. reinsurance), legal form, domiciliary country, and size to the portion of business in run-off and experience with active management of discontinued business. Moreover, the impact of Solvency II on the future importance of discontinued business is analysed. To this end, we present a numerical analysis which shows the amount of the solvency capital requirements (SCR) in the 'non-life premium and reserve risk' attributable to discontinued business.

Our results based on the market survey show that Swiss insurers seem to have more experience with discontinued business than insurers in other German-speaking countries. This result might be attributable to the fact that Switzerland introduced risk-based capital standards in 2006. Germany, Austria, and Luxembourg still rely on the old Solvency I rules, under which discontinued business typically is unimportant. We also document that reinsurers and stock insurers are likely to have more experience with discontinued business, whereas the topic seems not to be on the agenda of most mutual companies.

[1] Run-off in the sense of discontinued business should not be confused with the so called run-off-triangle in the chain ladder procedure indicating the expected claims in the future (see Pater [16] and Salzmann and Wüthrich [22]).

One of the major conclusions from the analysis is that discontinued business is likely to become a much more important topic when Solvency II is introduced. We underline this result with a numerical example in which we compare an insurer with and without discontinued business. In this example, nearly one-quarter of the Solvency II 'non-life premium and reserve risk' is due to discontinued business. This finding emphasizes the increasing importance of discontinued business in the context of Solvency II. Every insurer must critically review inactive business as part of a value-based management system. Our findings are thus especially important for insurance managers and regulators, but also relevant to academics and policymakers interested in this new management topic.

The remainder of the paper is organised as follows. In Sect. 2 we examine the definition of discontinued business and provide a classification scheme for various management techniques. In Sect. 3 we provide an overview of the discontinued business market, discuss its development based on our market survey, and present regression results that empirically test our hypothesis. In Sect. 4 we discuss the possible implications of the new Solvency II regulation on the future management of discontinued business. We conclude and discuss directions for future research in Sect. 5.

2 Definition and classification of discontinued business

2.1 Definition of discontinued business

Discontinued business is still a relatively new field, and thus characterized by a variety of terms and varying definitions. Thus it is important to first clarify which definition we use in the following analysis. We define discontinued business as business for which there are still obligations from previous years, but for which no new premiums are written. Other terms for the concept of 'discontinued business' include 'run-off', 'legacy business', and 'inactive business', and we use these four terms as synonyms in this paper.

Discontinued business can be managed either actively or passively. By passive management, we mean that no focused attempts are made to decrease the amount of discontinued business. In contrast, active management involves proactively trying to reduce discontinued business. Active management can be further differentiated into internal and external solutions. Internal solutions are when the business is actively reduced, but no third party is involved (i.e., commutation or portfolio transfer within the group). External solutions occur when a third party is involved in the active reduction of the reserves (i.e., share deal, portfolio transfer or retrospective reinsurance).

Figure 1 summarizes the definition of discontinued business and its management.

2.2 Motivation for active management of discontinued business

As indicated above, there are many reasons for actively managing discontinued business and these are discussed in more detail and systematized below. In Fig. 2

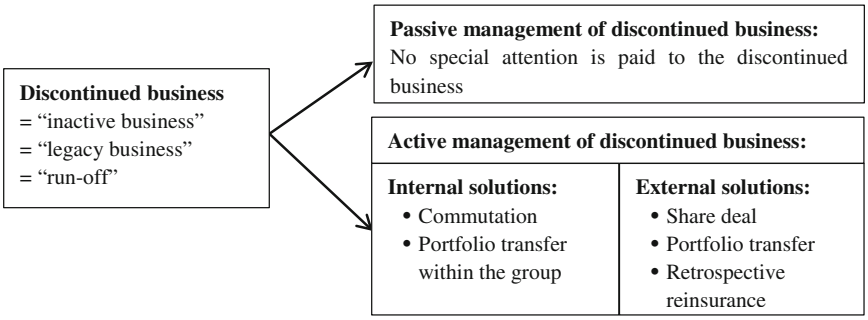

Fig. 1 Definition of discontinued business

Internal Solutions:		External Solutions:		
Motives for commutation: • Reputational risks • Run-off is core business	**Motives for intragroup portfolio transfers:** • Reduction of complexity • Profit enhancement • Tax advantages • Ring-fencing	**Motives for retrospective reinsurance:** • Reputational risks • Solvency improvement • Freeing up resources • Speed of execution	**Motives to cede portfolios/share deal:** • Reduction of complexity • Solvency improvement • Freeing up resources • Saving administrative costs	**Motives to buy discontinued business :** • Profit seeking • Specialization • Expertise in claims handling • Negotiating advantage towards third party • Improvement of diversification

Fig. 2 Motives for active management of discontinued business

we differentiate between potential motives for internal and external solutions; i.e., commutation and the intragroup portfolio transfer versus the retrospective insurance, the share deal and the portfolio transfer. For a further discussion of discontinued business portfolio transfers see Quane et al. [20].

The main motive for handling discontinued business portfolios in-house is reputational risk. Externalising discontinued business could be interpreted as a distress signal by the market since doing so makes it clear that certain lines of businesses are actively abandoned. Hence, it could distract business partners, customers, and investors. Furthermore, such behaviour could have the effect of undermining customer trust in the insurance company. There is no study which analyses these reputational risks so that the empirical relevance of these aspects is unclear. Nevertheless, reputational risks can be seen as a major argument for handling discontinued business without the help of a third party. Of course, there are also companies who actually specialize in managing discontinued business and thus see run-off as their core business. These companies not only have an interest in retaining their existing discontinued business portfolios, but even want to extend them.

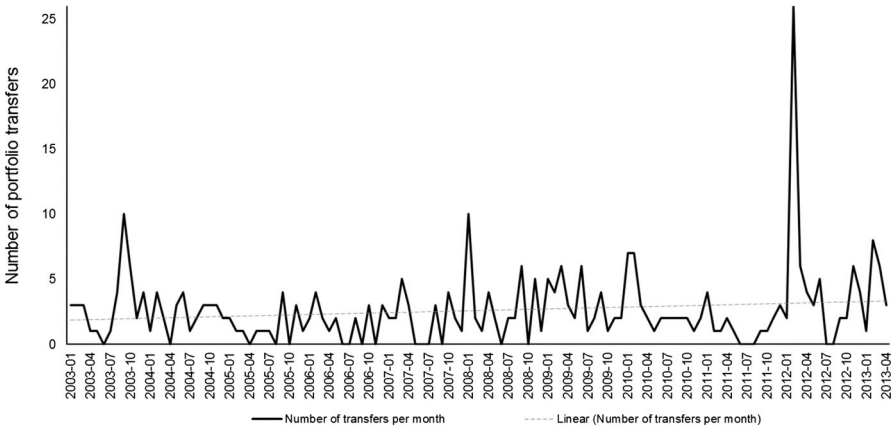

Fig. 3 Number of portfolio transfers in Germany according to the BaFin journal

Another aspect relevant to internal management of discontinued business is the intra-group transfer. Empirically, a major fraction of portfolio transfers is within a group, e.g., in Germany it accounts for about 50 % of all discontinued business transfers (see Fig. 3). In general, there are three motives for intra-group transfer. The so-called ring-fencing of existing liabilities means that particular businesses (e.g., asbestos) are outsourced to a third company within the group so as to relieve other group companies of these liabilities. At the group level, complexity reduction could be a second reason for a transfer. And finally, tax considerations can be important.

From the perspective of a ceding company, there are five main arguments for externalising discontinued business: reducing risk, improving solvency, freeing up resources, saving administrative costs, and reducing complexity. Furthermore, being able to reduce the discontinued business portfolio in a short period of time is especially a motive for retrospective reinsurance. All these motives reflect the increasing importance of value-based management. For example, a portfolio transfer and the subsequent transfer of insurance contracts result in a reduction of risk, which in turn may lead to a more solvent company. Under Solvency I, this line of reasoning is not considered in determining capital requirements. Most cases of discontinued business under Solvency I have no impact as long as the premium index is higher than the claims index (the maximum of the two gives the capital requirement). This will change significantly with Solvency II, as we show in Sect. 4. In addition, for the management of discontinued business, the release of resources and, consequently, administrative savings can be important considerations. Another argument for the externalisation of discontinued business is reduction in complexity of the business structure and, therefore, simplification of management.

What are potential motives to buy portfolios in run-off? In fact, accepting old business might be profitable. For example, in continental Europe inactive portfolios are typically conservatively reserved so that settlement gains between buyer and seller can be distributed. Other benefits can be achieved if the acquiring company

Table 1 Four techniques for active management of discontinued business

Method	Definition	Economic finality	Judicial finality	Regulatory approval
Share deal	A whole company with discontinued business is sold	Yes	Yes	Yes
Portfolio transfer	A portfolio with discontinued business is transferred to another company	Yes	Yes	Yes
Retrospective reinsurance	A retrospective reinsurance contract is set up for the portfolio with discontinued business which covers all underwriting liabilities arising from the portfolio	Contingent*	No	No
Commutation	Insurer and policyholder(s) agree to cancel insurance coverage for a single payment	Yes	Yes	No

* Economic finality is contingent on the reinsurer's solvency

has the necessary specialization and know-how to better manage and assess the risk of the business than the ceding company. Also, the buyer may have a number of comparable portfolios, which can lead to synergies, better risk pooling, or diversification.

2.3 Techniques for active management of discontinued business

Table 1 sets out the four main techniques for actively managing discontinued business: sale of the company (share deal), transfer of a portfolio (portfolio transfer), retrospective reinsurance, and commutation.[2]

Under the first method, sale of the company (share deal), an entire company which has stopped writing new business is sold. Legally, the sold company can no longer be prosecuted. Thus, the transfer is final (so-called finality). The sale of the company is subject to regulatory approval.

In the second method, a portfolio consisting of discontinued business is transferred to another company within or outside an insurance group. Thus, portfolio transfers can be either an internal or an external solution to discontinued business. This process is also subject to regulatory approval. Most jurisdictions within the European Union have a uniform regulation for this procedure (see the European Parliament and Council of the European Union [8]). This method is also 'final'.

Retrospective reinsurance is a third way to actively manage discontinued business. A retrospective reinsurance contract is set up for the discontinued business portfolio which covers all underwriting liabilities (i.e., claim payments). In this case, the transferring company continues to be liable, so the transfer is not final. The reinsurer's default risk is of importance and often can be secured via a letter of

[2] For another comparison of management techniques, see DARAG [9].

credit. Compared with the share deal and the portfolio transfer, the retrospective reinsurance method is faster and more inconspicuous, neither does it require regulatory approval. In practice, the reinsurance solution frequently is realized by the combination of a loss portfolio transfer and an adverse development cover.

The fourth implementation method—commutation—involves a company reaching an agreement with the policyholder to cancel the insurance cover against a payment. Generally, such an agreement is employed only between primary insurers and reinsurers or between reinsurers. In individual cases, however, such an agreement may also be made between an insurer and a customer, especially with large-volume industrial insurance policies. Legally, the transferring company is no longer liable (finality), and no regulatory approval is necessary.[3]

In evaluating the different options for active management, relevant criteria are finality (from both an economic and legal perspective), effects on risk, capital, and costs, default risk and reputational risk. With regard to finality, any form of active management, except retrospective reinsurance, leads to finality from an economic perspective. If this solution is chosen, default risk might be a problem which will need to be secured by instruments such as a letter of credit. For the other management options, default risk of the ceding company is not relevant. From a legal perspective, however, finality can be achieved only with the share deal, portfolio transfer, or commutation. Retrospective reinsurance does not change the legal responsibility of the ceding insurer. Risk reduction and reduction of capital requirements are accomplished directly and immediately by the reinsurance solution, whereas the share deal and portfolio transfer have to await regulatory approval. Reputational risk is not a problem in the reinsurance solution or for commutation, since there is no public action. However, in a portfolio transfer and for the share deal it should be noted, since the risks taken are settled by the acquiring company. Settlement and claims processing standards are important then.

3 Market development in the German-speaking countries

3.1 Market overview

The discontinued business market has evolved significantly in recent years. An important milestone in Germany was the implementation of the Insurance Supervision Act amendment in July 2007, particularly § 121f VAG, which regulates portfolio transfers in Germany (See Parliament of the Federal Republic of Germany [15]). As a result, some companies now specialize in actively managing discontinued business portfolios, as is the case in other countries.

[3] In the United Kingdom, there is a special type of commutation, the so-called scheme of arrangement. Within rules predefined by the U.K. legislator, an insurer offers to waive the insurance coverage by paying a fee to the policyholder. Once 75 % of the policyholders agree, the repeal is made compulsory for all policyholders. The legality of this approach in Germany is questionable (see Bundesgerichtshof [BGH] [4–6]). For a further discussion of scheme of arrangements in Germany, see e.g., Schaloske [23] and Schröder and Fischer [24].

Table 2 Players in the discontinued business market

Company	Gross technical reserves in 1,000€ (December 2011)	Headquarters
Berkshire Hathaway Reinsurance Group (BHRG)[a]	≈24,266,399	Stamford, USA
Enstar	≈3,300,543	Hamilton, Bermuda
Axa Liability Managers	≈3,000,000	Paris, France
Catalina Holdings	≈446,735	Hamilton, Bermuda
Randall and Quilter	433,693	London, United Kingdom
Riverstone group	244,732[b]	Manchester, USA
Inceptum Insurance Company/Syndicate Holding Corp	214,900	London, United Kingdom
Tawa	136,402	London, United Kingdom
DARAG	66,393	Wedel, Germany
Compre	47,201	London, United Kingdom
Hochrhein Internationale Rückversicherung[c]	31,617	Büsingen, Germany
HIR/Chiltington[c]	21,434	Hamburg, Germany
Ruxley Group	0[d]	London, United Kingdom
Amour Group Holdings	n.a	Hamilton, Bermuda

Data are from annual reports and company web pages. Currency conversion rates are based on December 30, 2011

[a] Strictly speaking, BHRG is not a discontinued business specialist, but it is the biggest player in the market and therefore included in the list

[b] Reserves only for the European market

[c] Hochrhein Internationale Rückversicherung is a subsidy of Axa Liability Managers and HIR/Chiltington was acquired by Tawa in 2012

[d] Annual reports from 2011 show no technical reserves for the Ruxley Group

In Table 2 we present an overview of some main players in the global discontinued business market. The table includes both discontinued business specialists (risk carriers only focusing on discontinued business) as well as discontinued business consulting firms and is not meant to be a complete list. For example, in the UK there are a number of smaller discontinued business consulting firms, some of which also might be risk carriers. In addition to these specialized companies, reinsurers are counterparties in discontinued business transactions. Moreover, according to PwC [19], new entrants, such as private equity firms, can be expected in the future.

Not only has the number of firms in this market been increasing, but there have been some very significant transactions in recent years. Just a few examples are the sale of BF Rückversicherung Anstalt to AXA Liability Managers (December 2009), the transfer of Hamburger Versicherungs-AG to DARAG (March 2010), the acquisition of the reinsurance portfolio of Alte Leipziger Versicherung by the Hochrhein Internationale Rückversicherung (October 2010), the acquisition of the Swiss reinsurer Glacier Re by Catalina Holdings (May 2011), and the acquisition of the inactive insurance business of Quantum Insurance Belgium SA by DARAG

(September 2011). Recently, the Zurich Insurance Company sold its Eagle Star discontinued business portfolio to the Riverstone Group (January 2013).

Perhaps not surprisingly, the current environment of increasing value orientation in corporate management, the implementation of Solvency II, and the current interest rate environment, has led to the stopping of writing new business. In Germany, companies now regularly announce that they are stopping new business in certain areas. Examples include Hamburg Versicherungs-AG (December 2008), Victoria Versicherung (November 2009), Delta Lloyd Life Insurance (March 2010), and Zurich Leben (February 2013).

Recent figures estimate the discontinued business market in Europe at €220 billion (see PwC [19]). In the German-speaking area, 29.6 % of technical provisions (property/casualty insurance and reinsurance business) are assigned to discontinued business (see KPMG [13]). Even assuming that only a portion of this volume is amenable to external solutions such as portfolio transfer, there is great potential for external discontinued business solutions in the next years. Data on portfolio transfers in Germany can be found in the BaFin journal that is published monthly (see BaFin [3]). Figure 3 shows the number of portfolio transfers that occurred between January 2003 and April 2013.

Figure 3 reveals a slight upward trend over time, although there is an outlier in February 2012. It is estimated that about half the transactions are intra-group transfers.[4] The introduction of Solvency II is expected to significantly increase interest in this topic and it is thus likely that a significant increase in the frequency of transactions will be observed.

3.2 Market survey

To analyse the status quo and potential of discontinued business in the German-speaking countries we conducted a market survey and designed a questionnaire focusing on (a) motives for discontinuing business and its relevance in different insurance lines, (b) the relevance of active discontinued business management and the experience of insurers in this field, and (c) the implications of Solvency II/Swiss Solvency Test on discontinued business. We invited 527 property/casualty insurers from Germany, Switzerland, Austria, and Luxembourg to participate online or by mail. We received answers from 85 companies. Descriptive statistics for the participating insurers are shown in Table 3.

The concept of discontinued business and, especially, its active management is still new in German-speaking countries. We believe that the utilization of discontinued business as a management instrument is at different stages across the insurance industry. Table 4 summarizes our four main hypotheses. The first hypothesis is that stock companies generate more discontinued business than mutual

[4] British insurers were involved in almost every transfers during February 2012. This was the month in which a decision regarding the legal treatment of the U.K. schemes of arrangement in Germany was made. The so-called Equitable Life judgement of the BGH rejected the legality of the schemes, but it also clarified other issues in dealing with them. It is likely that this ruling had implications for the recognition of transfers by the BaFin and therefore influenced the number of transfers in this month (see also Footnote 3).

Table 3 Survey participants

Insurance type		Legal form		Domiciliary country		Average size of insurer	
Primary insurer	72 %	Stock	65 %	Germany	39 %	Premiums	0.7 bn €
Reinsurer	26 %	Mutual	26 %	Switzerland	44 %	Gross tech. reserves	2.9 bn €
Captive	2 %	Other	9 %	Austria	10 %	Share premiums ceded	22 %
				Luxembourg	7 %		

Table 4 Decomposition of hypotheses

Hypothesis	Rationale
H_1	
Stocks generate more discontinued business than insurers with other legal forms and have more experience in its active management	Stocks are profit oriented and abandon businesses not meeting with their profit targets
H_2	
Discontinued business is more relevant in Switzerland than in the other German-speaking countries and Swiss insurers have more experience in its active management	Switzerland already has a risk-based regulatory regime with capital requirements for discontinued business. In the rest of Europe, this will only be the case after the introduction of Solvency II
H_3	
Discontinued business is more relevant for reinsurers and they have more experience in actively reducing discontinued business than do primary insurers and captives	The active management of run-off and the core business of reinsurers overlap
H_4	
The relevance of discontinued business and experience with its active management increases with the size of the insurance company	Comparatively, larger companies have more resources for active management than do smaller ones. The larger the company, the more lines and products it provides, which increases the likelihood for discontinued business. Also, complexity is higher in larger companies

insurers or companies with other legal forms. Furthermore, we believe stocks, compared to other insurers, more often actively reduce discontinued business portfolios. The rationale behind this hypothesis is the assumption that stock companies are, on average, more profit oriented than other insurers and therefore are more likely to wind up nonperforming business lines. The second hypothesis is that discontinued business is more relevant in Switzerland and that Swiss insurers have more experience in the active management of discontinued business portfolios than insurers in Germany, Austria, or Luxembourg. The underlying reason is that Switzerland introduced a risk-based regulatory regime in 2006 which has been mandatory since 2011. Therefore, Swiss insurance companies had to adapt to new requirements which might have triggered portfolio reconstructions. In contrast, Solvency II will not be introduced before 2016 and its final design is still not clear. The third hypothesis is that discontinued business is more relevant to reinsurers than it is to primary insurers and that they have more experience in actively managing it

than do primary insurers or captives. The rationale is that the core business of reinsurance companies and the active management of discontinued business overlap, e.g., in the case of retrospective reinsurance. Furthermore, by actively buying discontinued business portfolios, reinsurers can further diversify existing insurance portfolios. The fourth hypothesis is that the relevance of discontinued business and experience with its active management increases with the size of the insurance company. The rationale is that an insurer has to have different business lines in order to have discontinued business. Thus, under a going concern assumption, an insurer has to be of a certain size before it will have discontinued business portfolios on its balance sheet. Also, the active management of discontinued business portfolios requires resources which might not be available in small insurance companies. Moreover, complexity reduction is one of the motives for active management of discontinued business, and this is more likely to be necessary or desired in large companies.[5]

To test the hypotheses, we build linear multivariate regression models based on several variables generated by the survey. An overview and explanation of the variables used in the models are given in Table 5.

The regression models are shown in Eqs. (1)–(4). Dependent variables are the amount of discontinued business and amount of actively managed discontinued business.[6] We interpret the amount of discontinued business as an indicator of the *relevance* of discontinued business and the amount of actively managed discontinued business as an indicator of *experience* with discontinued business. Moreover, we control for the effect of companies specialized in discontinued business by adding a dummy variable for companies that denote discontinued business as their key business.

$$\mathrm{RO} = \alpha + \beta_1 STOCK + \beta_2 CH + \beta_3 RE + \beta_4 SIZE + \varepsilon \tag{1}$$

$$\mathrm{ARO} = \alpha + \beta_1 STOCK + \beta_2 CH + \beta_3 RE + \beta_4 SIZE + \varepsilon \tag{2}$$

$$\mathrm{RO} = \alpha + \beta_1 STOCK + \beta_2 CH + \beta_3 RE + \beta_4 SIZE + \beta_5 SPEC + \varepsilon \tag{3}$$

$$\mathrm{ARO} = \alpha + \beta_1 STOCK + \beta_2 CH + \beta_3 RE + \beta_4 SIZE + \beta_5 SPEC + \varepsilon \tag{4}$$

where α is a constant, $\beta_1, \beta_2, \beta_3, \beta_4$, and β_5 are the regression coefficients for the independent variables, and ε the error term. The estimation results are presented in Table 6.

In Table 6 the results for models (1) and (2) show that the variable STOCK explains the relevance of discontinued business and experience at a significance

[5] Next to these four hypotheses we also determine the relevance of run-off for different lines of business. The results show that long tail lines such as liability insurance are more pronounced than other lines of business. Furthermore, we find that the main motives for stopping writing new premiums are that the insurer is leaving a specific line of business, is confronted with an unexpected claims experience and/or plans to concentrate on its core business.

[6] We also employ logistic regression models which are the same as the ones presented in Eqs. (1)–(4) with the difference that we use dummy variables as dependent variables. The dependent variable is 1 if the company has discontinued business/actively managed discontinued business; 0 otherwise. Results are presented in Table 8 in the Appendix.

Table 5 Survey variables used in the multivariate linear regression models

Survey variable	Model variable	Scale	Explanation
Dependent variables			
Amount of discontinued business	RO	Cardinal	Participants were asked if their company has discontinued business and, if yes, what its share of technical reserves is. RO indicates the proportion of reserves relating to discontinued business
Amount of active discontinued business	ARO	Cardinal	Participants were asked if their company has discontinued business which is actively managed and, if yes, what its share of technical reserves is. ARO indicates the proportion of reserves relating to discontinued business which is actively managed
Independent variables			
Legal form (H_1)	STOCK	Binary	Participants were asked which legal form their company has. STOCK is 1 if the company is a stock company; 0 otherwise
Domiciliary country (H_2)	CH	Binary	Participants were asked in which country their company is located: Germany, Switzerland, Austria, or Luxembourg. CH is 1 if the company is located in Switzerland; 0 otherwise
Insurance type (H_3)	RE	Binary	Participants were asked if their company is a primary insurer, reinsurer, or captive. RE is 1 if the company is a reinsurance company; 0 otherwise
Size (H_4)	SIZE	Cardinal	Participants were asked for the size of their company. SIZE indicates the natural logarithm of gross technical reserves of the insurer
Discontinued business specialist (control)	SPEC	Binary	Participants were asked if discontinued business is their core business. SPEC is 1 if the active management of discontinued business is the core business of the company; 0 otherwise

level of 5 %. This could be due to the higher profit orientation of stock companies in comparison with mutuals. However, if we control for discontinued business specialists, the variable is not significant (see models (3) and (4)). Thus, the results regarding our first hypothesis are mixed. The variable CH explains the relevance of discontinued business and experience of the insurer in active discontinued business management at a significance level of 5 %. In this case, controlling for discontinued business specialists increases the significance levels to 1 % (see models (3) and (4)). We conclude that these findings are support for our second hypothesis. For Swiss insurance companies, discontinued business seems to be more relevant and they are likely to have more experience in dealing with it than other European insurers. The variable RE explains the relevance and experience of discontinued business at a confidence level of 1 % in models (1) and (2). However, after controlling for companies specialized in discontinued business (models (3) and (4)), RE also is no longer significant, but SPEC is

Table 6 Regression results

Dependent variable	Independent variable	Estimated β_i	Standard error	T-statistic	Adjusted R^2
Linear multivariate regression models (without control variable)					
Model (1)					
RO	STOCK	16.92	8.45	2.00**	0.23
	CH	14.63	7.16	2.04**	
	RE	25.05	8.43	2.97***	
	SIZE	−1.49	1.37	−1.09	
Model (2)					
ARO	STOCK	18.00	8.40	2.14**	0.22
	CH	16.36	7.16	2.29**	
	RE	22.55	8.45	2.67***	
	SIZE	−1.82	1.44	−1.27	
Linear multivariate regression models (with control variable)					
Model (3)					
RO	STOCK	4.53	9.23	0.49	0.68
	CH	21.36	7.46	2.87***	
	RE	11.43	10.39	1.10	
	SIZE	2.60	1.51	1.72*	
	SPEC	62.88	10.89	5.78***	
Model (4)					
ARO	STOCK	11.54	8.54	1.35	0.71
	CH	19.60	6.97	2.81***	
	RE	7.73	9.88	0.78	
	SIZE	1.82	1.43	1.27	
	SPEC	68.51	10.34	6.62***	

*, **, and *** indicate a significance level of 10, 5, and 1 %, respectively

significant at a 1 % level.[7] Thus, the third hypothesis receives ambiguous support. Reinsurance companies are not more engaged in discontinued business or its active management than are primary insurers when we control for discontinued business specialists; rather, it seems that there is a certain group of reinsurers which focusses on this segment and is driving these results. SIZE is only significant in one of the presented regression models, i.e., model (3). There is thus only little evidence for the relevance of the forth hypothesis.

4 Implications of Solvency II for discontinued business

As indicated by the empirical tests, the development of risk-based capital standards seems to be an important driver of run-off activity. How does discontinued business affect the solvency capital requirements (SCR) under Solvency II?

[7] For both RE and SPEC the variance inflation factor is below 5 and we assume there is no multicollinearity.

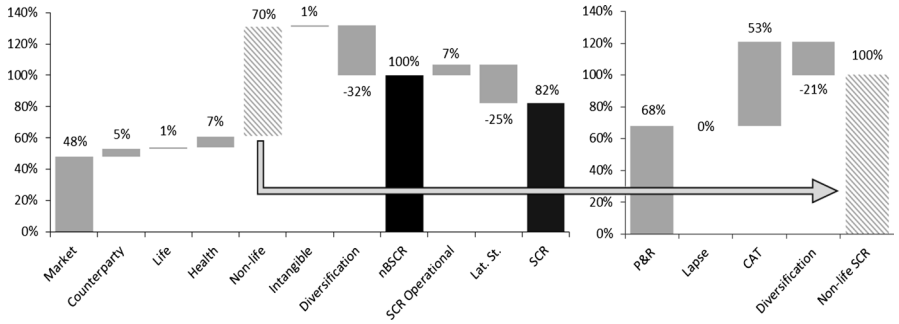

Fig. 4 Risk reserve within Solvency II model

To analyse the importance of discontinued business in the context of Solvency II, we first look at the results of the fifth Quantitative Impact Study (QIS 5). This shows that for a property/casualty insurance company, the 'non-life underwriting risk' module is, at 70 %, the main driver of the SCR. Within this module, 68 % of the capital requirement is due to the premium and reserve risk (P&R) (see Fig. 4).[8] The P&R module contains capital requirements for premiums from the current fiscal year and for reserves from the current fiscal year and fiscal years before. Through the SCR for reserves, discontinued business becomes a relevant element.

In the following we analyse a numerical example to illustrate the importance of discontinued business in the context of Solvency II. We consider a sample company with three lines of business: motor liability, motor, and other third-party liability. We assume that the line of third-party liability is the discontinued business. For simplicity, we consider only the SCR from the non-life premium and reserve risk (P&R) and abstract from the diversification effects, which may yet arise at the upper levels. Our sample company is active in only one geographical area and the example is without reinsurance. The company generates a premium volume of 1,000€ in the two active lines and has reserves of 2,000€ in all three lines.[9] Table 7 shows the necessary inputs, together with references to the technical specifications (TS) of QIS 5 and the results of our calculations.

The results in Table 7 can be interpreted as follows. The SCR for all three lines of business totals 1,565€. Excluding discontinued business would result in an SCR of 1,200€. The proportion of discontinued business on the SCR is thus 23.3 %. In other words, the necessary capital for the non-life premium and reserve risk (P&R)

[8] See BaFin ([2], p. 21).

[9] The share of discontinued business of total reserves here approximately corresponds to the proportion which KPMG [13] has estimated for the total market (where it is 29.6 %). Calibration of the premium vs. reserve volume could also be based on the market average for Germany or an actual company. An Excel spreadsheet with the corresponding calculations is available from the authors upon request.

Table 7 Numerical example on the importance of discontinued business

	Lines of business			
	Motor liability	Motor other	3rd-party liability (in run-off)	References
Premiums	1,000€	1,000€	0	
Reserves	2,000€	2,000€	2,000€	
QIS 5 inputs				
Premium risk	10 %	7 %	15 %	QIS 5, TS, SCR.9.25
Reserve risk	9.50 %	10 %	11 %	QIS 5, TS, SCR.9.29
Proposed correlations				
Motor liability	1	0.5	0.5	QIS 5, TS, SCR.9.34
Motor other	0.5	1	0.25	
3rd-party liability	0.5	0.25	1	
QIS 5 results				
σ_{lob}	8.50 %	8.09 %	11.00 %	QIS 5, TS, SCR.9.31
V_{lob}	3,000€	3,000€	2,000€	QIS 5, TS, SCR.9.33
σ_{total}	7.04 %			QIS 5, TS, SCR.9.32
$\sigma_{without\ discontinued\ business}$	10.00 %			
NL $P\&R_{total}$	1,565€			QIS 5, TS, SCR.9.16
NL $P\&R_{without\ discontinued\ business}$	1,200€			
Total difference	−365€			
Relative difference	−23.30 %			

σ indicates the standard deviation. Lob means line of business and V is the volume measure which incorporates the best estimate for claims outstanding. NL P&R stands for the capital requirement for 'non-life premium and reserve risk'. QIS 5, TS indicates the technical specifications of the fifth quantitative impact study (see CEIOPS [7])

can be lowered from 1,565 to 1,200€, i.e. by 23.3 %, if the discontinued business is actively reduced.[10,11]

The non-life premium and reserve risk (P&R) is only one part of the total capital requirements and the present calculation is restricted to core elements for simplicity. It thus must be noted that the capital requirements in reality will be lower due to additional diversification effects. Furthermore, in the numerical example we neglect the impact of discontinued business on the

[10] The capital requirement for the 'non-life premium and reserve risk' is calculated as follows. First, for each line of business (lob) the standard deviation (σ) and volume measure/best estimate for claims outstanding (V) is calculated. In our case: 8.50, 8.09, and 11.00 % for σ and 3,000, 3,000, and 2,000€ for V. Second, overall σ and V are derived including all lob. In our case: 7.04 % and 8,000€. Third, a function f (σ) is multiplied with V and results in the capital requirement. In our case: 1,565€ for all lob and 1,200€ if just motor liability and motor other are considered. The transformation of σ ensures that the capital requirement is calibrated corresponding to a value-at-risk level of 99.5 %. For the exact formulas of the calculation, see CEIOPS [7, pp. 197–203].

[11] Note that the Solvency I SCR using the premium index would be 321€ (57.5 × 18 % + (2,000 − 57.5×16.0 %)). So we also see in this example a significant increase in capital requirements under Solvency II compared to Solvency I. See Sandström [21] for details regarding the calculation of the Solvency I SCR.

Own Risk and Solvency Assement (ORSA) of the second pillar which might expose a significant burden on insurance companies as well [17]. However, the results clearly highlight the increasing relevance of discontinued business in the context of Solvency II.

5 Conclusions and directions for future research

The active management of discontinued business is a relatively new topic in the insurance sector in continental Europe and an entirely new field of study in academia. Until recently, it was only on the agenda of U.S. and U.K. insurers. However, lately there has been an upswing of interest in this issue in continental Europe. Our regression results show that the country variable for Swiss insurers can explain the amount of discontinued business as well as the amount of discontinued business which is actively reduced. Therefore we conclude that within the German-speaking countries the relevance of discontinued business is especially realized in Switzerland. Furthermore, Swiss insurers also seem to have more experience with actively managing discontinued business. We assume that this is because Switzerland already has a risk-based solvency regime since 2006. Hence, in Switzerland, capital requirements can be decreased by reducing discontinued business, which is not yet the case in the other countries.

In the European Union, we believe Solvency II will make the cost of discontinued business explicitly visible. By means of a simple numerical example, we show in this paper that capital requirements can be significantly lower if discontinued business is actively reduced—whether by internal or external approaches. Thus, managing discontinued business is likely to attract more management attention in the future and therefore one can expect that the market for discontinued business solutions will increase. How to deal effectively with discontinued business will become significantly more important over the next years.

Thus, future research should focus on the advantages and disadvantages of each method for actively reducing discontinued business. For example, at this point in time it is assumed that there is a reputational risk to publicly abandoning business, but whether this is indeed the case and, if so, its relevance and magnitude have not been empirically tested. A second research topic is additional investigation of how Solvency II will impact discontinued business. We illustrate the theoretical impact in this paper, but left the practical impact for future empirical work. For example, which lines of business will be affected most or which insurers will benefit or lose from the new regulation? Finally, research should take a global look at the topic and expand the focus beyond the western hemisphere.

Appendix

See Table 8.

Table 8 Regression results

Dependent variable	Independent variable	Estimated β_i	Standard error	Wald statistic	Nagelkerke R^2
Logistic regression models (without control variable)					
Model (5)					
RO_L	STOCK	0.56	0.64	0.78	0.19
	CH	1.25	0.54	5.37**	
	RE	0.76	0.62	1.49	
	SIZE	0.06	0.11	0.30	
Model (6)					
ARO_L	STOCK	0.30	0.74	0.16	0.18
	CH	0.75	0.61	1.55	
	RE	0.90	0.65	1.92	
	SIZE	0.16	0.13	1.49	
Logistic regression models (with control variable)					
Model (7)					
RO_L	STOCK	−2.70	1.45	3.45*	0.65
	CH	4.14	1.66	6.23**	
	RE	1.79	1.57	1.30	
	SIZE	0.69	0.33	4.23**	
	SPEC	3.42	2.39	2.05	
Model (8)					
ARO_L	STOCK	−4.58	3.26	1.97	–
	CH	7.41	4.12	3.24*	
	RE	−1.56	1.73	0.81	
	SIZE	2.43	1.35	3.22*	
	SPEC	–	–	–	

*, **, and *** indicate a significance level of 10, 5, and 1 %, respectively. RO_L and ARO_L are 1 if the company has discontinued business/actively managed discontinued business; otherwise 0. Due to the sample structure in Model (8) there is no observation where ARO_L = 0 and SPEC = 1, thus quasi complete separation occurs and the maximum likelihood estimate for SPEC does not exist. However, results for the other variables in the model are still valid (see e.g., Albert and Anderson [1] and Heinze and Schemper [11] for further discussions about separation in logistic regression models)

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