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ABHANDLUNG

Stock investments for German life insurers in the current low interest environment: more homework to do

Christoph Schwarzbach · Frederik Kunze · Norman Rudschuck · Torsten Windels

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Abstract Currently a stock market rally and at the same time extremely low interest rates can be observed. This coincides with more volatile risk premiums for interest baring assets like government bonds. The mixture makes life harder for investment managers of (especially life) insurances. They have to continuously find profitable investments with good returns for the customers' money, in case of the life insurers, in order to be able to pay at least the promised returns of the contracts. After the stock market burst around the turn of the century the levels of stock investments by German insurers have declined significantly, therefore also missing out on the rises leading up to the Lehman crash and also not participating in recent developments. With insurance asset managers avoiding stocks in the past years the questions can be raised, if they are forfeiting a good opportunity for their portfolio and if there is still time to participate in possible future gains. On the other hand the upcoming regulatory environment, namely Solvency II, will play an important role in the future and likely already has an impact on the investment decisions of the companies. Higher capital requirements for stock investments make it even harder to earn the so-called "Garantiezins". Without ignoring the risks related to stock investments, effectively banning equities from asset managers' buy lists might lead to missing out on desperately needed returns for the life insurance industry. So policy makers probably should reconsider their directives.

The paper is based on the working paper "Solvency II and the investment policy of German life insurers: still more homework to do" presented at the Jahrestagung des Deutschen Vereins für Versicherungswissenschaft e. V. 2013 in Berlin.

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This paper evaluates the attractiveness of stock investments from a long term as well as a risk adjusted perspective using e.g. different indicators and commonly used measurements for stocks with a rather conservative focus, in order to possibly get some insight into the future performance of stocks. Looking back to a decade of boom and bust cycles in the equity markets does not necessary rule out stocks as an important source for returns. The results are discussed comprehensively also in face of the regulatory changes to come. In the end timing plays a major role and due to that the current valuation of stocks as well as the look ahead are of vital importance. Assessing the reliability of professional forecasts for financial market time series—in this context especially for stocks as well as interest rates—plays an important role for asset managers.

Zusammenfassung Derzeit können zeitgleich eine Boomphase an den Aktienbörsen und weltweit extrem niedrige Zinssätze beobachtet werden. Gleichzeitig sind die Risikoaufschläge für zinstragende Anlagen wie z.B. Staatsanleihen volatiler geworden. Diese Konstellation stellt ein schwieriges Umfeld für Assetmanager bei Versicherungen im Allgemeinen und Lebensversicherern im Speziellen dar. Ihre Aufgabe besteht darin, auch in der aktuellen Situation profitable Investitionen für die von den Versicherungskunden eingezahlten Gelder zu tätigen und im Fall der Lebensversicherer damit zumindest die gegebenen Zinsversprechen einzuhalten. Nach dem Platzen der New-Economy-Blase Anfang der 2000er Jahre haben die deutschen Versicherer ihre Aktieninvestments stark reduziert. Dadurch haben sie natürlich weder an den Wertsteigerungen vor der Finanzmarktkrise noch von den Höchstständen 2013 profitiert. Daher lassen sich die Fragen stellen, ob die Assetmanager der Versicherer damit tendenziell eine Chance auf gute Renditen für ihr Portefeuille verpassen und ob es jetzt noch möglich ist, von eventuellen zukünftigen Wertsteigerungen zu profitieren. Andererseits wird die kommende Regulierung mit Solvency II einen großen Einfluss schon auf aktuelle aber erst recht auf zukünftige Investitionsentscheidungen der Firmen haben. Die für Aktien im Standardmodell geforderten hohen Eigenkapitalanforderungen erschweren das Erwirtschaften des geforderten Garantiezinses zusätzlich. Trotz der möglichen Risiken könnte der effektive Ausschluss von Aktienanlagen für Versicherer zu dem Verpassen von dringend erfordelichen Renditen führen. Eine Anpassung der aufsichtsrechtlichen Vorschriften wäre vor diesem Gesichtspunkt überlegenswert.

Es wird die Attraktivität bzw. die Entwicklung von Aktien sowohl als langfristige als auch risiko-adjustierte Investition betrachtet. Dafür werden verschiedene Indikatoren und häufig verwendete Maße mit einer eher konservativen Ausrichtung betrachtet. Das letzte Jahrzehnt war von wiederholten Bullen- und Bärenmärkten geprägt. Dies schließt allerdings Aktien nicht als mögliche Renditebringer aus. Die Ergebnisse werden ebenfalls vor dem Hintergrund der zukünftigen Regulierung durch Solvency II diskutiert. Letztlich spielt das schwierige Thema des Investmenttimings eine entscheidende Rolle. Daher erscheinen die jeweils aktuellen Bewertungen und mögliche Voraussagen sehr wichtig. Dies wiederum zeigt, dass es für Assetmanager zentral ist, die Zuverlässigkeit professioneller Prognosen – im vorliegenden Fall für Aktien und auch Zinsen – zu erfassen und zu bewerten.

1 Introduction

After all we have heard and seen it seems that the financial crisis is still virulent and has not stopped to show the importance of advanced risk management processes in the financial services industry. Remembering the beginnings, the so-called subprime mortgage crisis and its successors (e.g. the European sovereign debt crisis) obviously did and still have massive negative effects on capital markets as well as on global economic growth. As a consequence, not only the stocks of banks and insurers dropped considerably; the equity market in general suffered huge losses.

After the all-time highs in mid and late 2007, stock markets have had hard times for several years compared to other asset classes, for example, German 10 year government bonds (so-called 'Bunds'). Insurance companies did not suffer much from the downturn since their stock exposure was actively—and unfortunately also "passively"—reduced after the burst of the New economy bubble at the turn of the century. The decrease of life insurers' equity investment has continued since then (see e.g. Appendix 5 and Fig. 1).

As a matter of fact the maximal allowed quotas following the investment regulation for insurers (AnlV)[1] are far above the current levels. These adjustments could also be seen in the light of the upcoming regulation through Solvency II which in the standard model will require quite a big amount of solvency capital in order to cover the risks of the stock investments (see e.g. European Commission (2010)). Solvency II is more or less based on the three-pillar-structure of the so-called Basel banking regulation. That is why Schubert and Grießmann (2004) have defined the equation Solvency II = Basel II + X. With the current implementation of Basel III in progress and the repeated delay of the insurance regulation, the formula seems to be obsolete or might even have to be converted to Solvency II = Basel III − X. Eling and Pankoke (2013) provide a discussion of the proposed Solvency II equity risk module. A very good assessment of the architecture of the new supervisory framework in general is given by Romeike (2013).

On the other hand, to earn the return promised to life insurance customers (German: 'Garantiezins'), there might be some needed potential for higher returns through

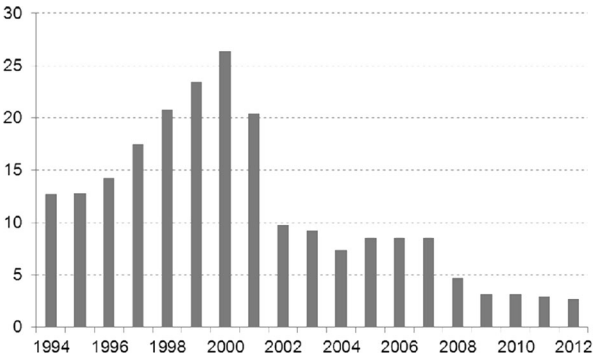

Fig. 1 Stock ratio of German life insurers 1994 to 2012 (GDV)

[1] AnlV: Anlageverordnung – Verordnung über die Anlage des gebundenen Vermögens von Versicherungsunternehmen. http://www.bafin.de/SharedDocs/Aufsichtsrecht/DE/Verordnung/AnlV_va.html.

risky assets. This holds especially true when compared to the yields of German 10Y Bunds, which are in an extended period of low interest rates and might remain there for some time. This is an issue of great interest for asset managers in the insurance industry as well as academia (see e.g. Schmeiser and Wagner 2012 as well as Basse et al. 2012). The continuous period of low interest rates even increases these difficulties because life insurers have to build up a premium reserve (Zinszusatzreserve, see DeckRV)[2] in order to cover the difference between the return promised to the customer and the actual interest income and also due to a generally weaker market position—especially in comparison to mutual funds. Especially practicioners might pose the question it stocks are a viable investment alternative in the current environment.

The paper is organized as follows: After introducing the relevance of this topic in Sect. 1, in the second part the underlying data as well as the applied methodologies are shown. This paper focuses on the risk measurement by simple means (i.e. the mean return and standard deviation) as well as on standard risk adjusted performance indicators (i.e. the Sharpe Ratio and the Calmar Ratio), and the long-run relationship between stock prices and economic fundamentals. Afterwards within Sect. 2 the application of the Price-to-book-ratio as well as the Price-to-earnings-ratio will be shown. Section 3 starts with a presentation of the results of the risk assessment and evaluates the long-run relationship of stock prices and economic fundamentals. A comparison of dividend and bond yields follows. After the presentation as well as application of the Fed-model as a device for comparing stock respectively bond valuations Sect. 4 discusses the results and the relevance of the stock market as well as interest rate forecasts for insurers. The final Sect. 5 concludes.

2 Data and methodology

The analysis starts by comparing the monthly returns of stock respectively bond investments for the sample period January 1999 to September 2013 and follows the approach of Rudschuck et al. (2010) in examining the monthly return of the Euro Stoxx 50 index with the mean returns on the broad REXP and on the REXP 10 years (including only German government bonds with a maturity of 10 years). Rudschuck et al. (2010) did analyze a data sample ranging from January 1999 until December 2009 and due to that they have not been able to incorporate the whole time frame including the post Lehman crisis which somewhat let to the European sovereign debt crisis. As done by Rudschuck et al. (2010) we also measure risk by using the rather simple concept of calculating the standard deviation of returns. In addition to that we use the more sophisticated but risk adjusted performance measure Sharpe Ratio (see for example Sharpe 1966 as well as Eling and Schuhmacher 2007) to compare the monthly returns of the Euro Stoxx 50 index as well as long term bond investments (REXP 10 years) using the REXP 1 year as the risk free rate for the data sample

[2]DeckRV – Deckungsrückstellungsverordnung (DeckRV) – Verordnung über Rechnungsgrundlagen für die Deckungsrückstellungen. http://www.bafin.de/SharedDocs/Aufsichtsrecht/DE/Verordnung/DeckRV_960506_va.html.

January 2003 to September 2013. As, for example, Eling and Schuhmacher (2007) stretch out the Sharpe Ratio (*SR*) is widely known by practioners and due to that of relevance for the focus of this paper. As shown for example by Lo (2002) the SR can be defined as follows:

$$SR = \frac{R_i - r_f}{\sigma_i}$$

R_i is the average return of the asset i, r_f the risk free rate and σ_i the standard deviation of the monthly excess returns of asset i.

Lo (2002) also mentioned the difficulties related to the *SR* in case of non-normal returns. For example σ_i understates the risks related to a sudden market movement as this volatility estimator implicitly assumes a symmetrical distribution without fat tails. Testing for normality using the Jarque Bera procedure leads to the rejection of the H_0 of normality on the 1 %, 5 % as well as 10 % confidence level (the detailed results are not reported here in order to preserve space). Due to that we conclude the risk and return evaluation of stock investments by calculating a performance indicator based on the maximum drawdown. We use an approach similar to the so called Calmar Ratio (see Young 1991) for the Euro Stoxx 50 total return index using monthly stock prices from September 2010 until September 2013. The Calmar Ratio (*CR*) is defined as follows:

$$CR = \frac{S_i}{MDD_i}$$

We define S_i as being the annualized return of stock i and MDD_i the maximum daily drawdown of that stock. As the *CR* is also a rather old performance measure there do exist a lot of different representations. For example Eling and Schuhmacher (2007) also incorporate a risk free rate into the Calmar Ratio's numerator. In this paper we only focus on the underlying stock price index and do not incorporate any risk free target rate. Young (1991) mentioned that the Calmar Ratio may work as an early warning system. Following the author the beginning of a downward trend should alert investors to re-evaluate their portfolio allocation. Due to that we also examine the 36 months rolling Calmar Ratio from January 1st, 1999 to September 30th, 2013.

To further take into account the distorting (short term) influences of bubbles and crashes with respect to stock market prices we test for a long-run relationship between stock prices and dividends. In the context of asset allocation this makes sense because a linkage between market value of equities and economic fundamentals (i.e. dividend payments) at least indicates that stock market crashes are more an exception than the rule (see Rudschuck et al. 2010). Hence, the amount of dividends paid to the stock-holders is of great relevance. A company's stock represents a claim on future dividends. Following the well-known work of Miller and Modigliani (1961), the dividend discount model, the current stock price (P) is equal to the discounted sum of all expected dividend payments. More recently this valuation approach has been used by Diamond (2000) as well as Boldrin and Peralta-Alva (2009). This can

be expressed in the following formula:

$$P_t = \sum_{n=1}^{\infty} \frac{E(D_{t+n})}{(1+R_t)^n}$$

$E()$ is the expectations operator, D are the dividends paid and R is the required return. The subscripted indices indicate the respective period. In Sect. 3 we will present a simplification of this dividend discount model.

We examine quarterly data on stock prices and dividends per index share from 1993/I to 2013/III. This data is based on the FTSE Eurotop 100 Index, which is a modified capitalization-weighted index of the most actively traded and highly capitalized stocks in the pan-European markets. The dividend time series is seasonally adjusted. In addition to the evaluation of stock returns with regard to risk adjusted performance as well as the long-term relationship between economic fundamentals (i.e. dividends) and stock prices, we will focus on the analysis of the current valuation of stocks. In order to assess this current valuation of stocks we decided to use two rather conservative measures: the Price-to-Book-Ratio and the Price-Earnings-Ratio. All of them are regularly used by practitioners in the financial industry for the valuation of listed companies as well as for IPOs, while the P/E ratio is clearly the most popular one (e.g., Campbell and Shiller 1987; Pohlücke 2006).

The first measure—the Price-to-Book-Ratio—is rather conservative being associated with the idea of value investing in comparison to growth investments. It is calculated by dividing the price of a single stock by the book-value of the company per stock. The intuition behind it being that a stockholder owns a proportionate part of the replacement value of the company. If the current valuation of the company is below the replacement value of the respective company assets, the stock is assumed to be undervalued and an adjustment should be expected. If the ratio is (way) above one, the stock is considered to be rather expensive, expecting a price decline. Capaul et al. (1993) show that an investor following the idea of value-investing associated with low Price-to-Book-Ratios was better off for a period from 1981 to 1992. As Jensen et al. (1997) show, low price-to-book-ratios are indicative of higher returns in an environment of expansive monetary policy—as is clearly the case in recent years. The ratio has also been used as an explanatory variable in the well-known Three-factor-model by Fama and French (1992). The Fama and French Three-factor-model is a multi-factor model extending single-factor models such as the widely used CAPM-Model (Fama and French 2004). In this specific case the price-to-book-ratio is one factor used in the regression, adding to size of the firm, and, somewhat similar to the CAPM, excess return in comparison to the market.

Our second measure is the classic Price-Earnings-Ratio (P/E ratio) which is frequently used to estimate the valuation of stocks or in our case a whole index. It is also applied to compare valuations of companies in the same sector and across those. The somewhat complaisantly extended intuition behind the ratio is that each share represents a claim to the discounted present value of the future company earnings. The popularity of the figure also lies within its simplicity and transparency (Warburg 2004). As simple as the calculation of the measure looks at first, quite a few

adjustments to both enumerator and denominator are proposed (see e.g. Laffer and Miles 2003 and Pohlücke 2006). The basic and most often used ratio joins current prices with last year's earnings, wherefore it is called trailing. Since current stock prices are supposed to reflect future earnings, a way to possibly improve the ratio is the use of consensus estimates for the earnings. This will usually be estimates of operating earnings which exclude accounting effects like one-time write-offs. Still the conflict between exact realized earnings on the one hand and uncertain extrapolated/estimated but forward-looking earnings on the other comprises the possibility of bad timing of the indicated investments. Quite a few other adjustments are proposed and can be made. Logically, but still it has to be mentioned, the ratio is limited to companies actually having earnings and also the descriptive ability of the P/E ratio is assumed to decrease for values above 30 (Pohlücke 2006). Here we will focus on the two straight-forward versions, putting a little more emphasis on the forward-looking measure. As already Basu (1975, 1977, 1983) shows, portfolios chosen for their low P/E ratio exhibit absolute and risk-adjusted higher returns than high P/E ratio portfolios therefore offering the chance of "abnormal" returns. Independently of this result it is believed that the P/E ratio simply substitutes for other relevant valuation information (Ball 1978). We conclude the empirical section of this paper with the widely known Fed model to examine the current pricing of stocks respectively bonds.

Our measure of stock market activity regarding the mean return, standard deviation, Sharpe Ratio, Calmar Ratio, P/B ratio as well the P/E ratio is also the EuroStoxx 50 index which is Europe's leading blue-chip index for the euro zone. It provides a representation of super-sector leaders in the euro zone. The index covers 50 stocks from 12 countries and is licensed to financial institutions to serve as underlying for a wide range of investment products such as Exchange Traded Funds (ETF), futures, options, and other structured products.

The risk related performance indicators as well as the first two mentioned measures (i.e. the P/B ratio and the P/E ratio) will be analyzed descriptively while for the dividends more sophisticated techniques of time series analysis are applied using the same framework as Rudschuck et al. (2010).

3 Results

For the mean returns and the standard deviation of the Euro Stoxx 50 total return index as well as the two bond indices (REXP and REXP 10 years) our results are quite similar to the previous work of Rudschuck et al. (2010): As can be seen in Fig. 2 for our data sample—whose time horizon includes 45 additional observations—the mean return of the Euro Stoxx 50 total return index is still smaller than the returns of the REXP as well as the REXP 10 years. In addition to that the risk of stock investments measured by the standard deviation still seems to be rather high compared to the bond investments. From this first result one might draw the conclusion that stock investments are less attractive than bond investments.

Focusing on the more sophisticated performance measures delivers a slightly different conclusion. To begin with the Sharpe Ratio, Table 1 shows the results of this

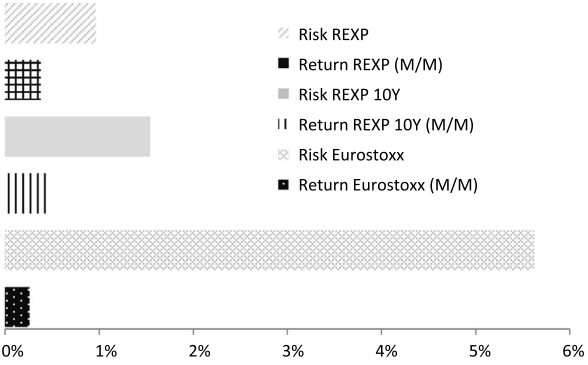

Fig. 2 Risk and return (M/M)—equities versus bonds (1999/01–2013/09)

Table 1 Sharpe Ratios

	September 2010–September 2013		January 1999–September 2013		March 2003–March 2006	
	Euro Stoxx 50	REXP 10Y	Euro Stoxx 50	REXP 10Y	Euro Stoxx 50	REXP 10Y
Excess Return	0.0061	0.0030	0.0017	0.0028	0.0168	0.0023
SD of Excess Return	0.0514	0.0165	0.0570	0.0144	0.0385	0.0122
Sharpe Ratio	0.1185	0.1833	0.0299	0.1979	0.4375	0.1892

performance measure for the Euro Stoxx 50 total return index as well as the REXP 10 year performance index for different time periods.

For the shorter time horizon (first column) with respect to the excess return it can be said that the stock investment would have led to a higher excess return than the REXP 10 years. But after consideration of the risk component (i.e. the standard deviation of the excess return) it has to be noted that the REXP 10 year Sharpe Ratio indicates a better risk adjusted performance of the examined three year period. From a long term perspective the results are even more obvious. The excess return over the risk free asset would have been negative. These results might also lead to the conclusion that stock investments are less attractive than bond investments. Following the Sharpe Ratio, this can be said to be true with respect to the periods considered. When selecting a different three year time horizon (March 2003 to March 2006 in the last column) markedly different results are observed. In that period stock investments would have been superior to bond investments according to the Sharpe performance measure.

Due to the volatility of stock markets the results so far are not surprising at all. As e.g. Rudschuck et al. (2010) point out, past equity returns are not always a good indication for future movements of stock prices and hence for the attractiveness of stock investments. Looking back to the boom and bust history of the past 15 years it is obvious that for stock investments timing plays a major role. Due to that we examined an additional performance measure (the Calmar Ratio) over a longer period of time. As proposed by Young (1991) we utilize the Calmar Ratio as an early warning indicator. From our point of view not only a worsening of that ratio should be con-

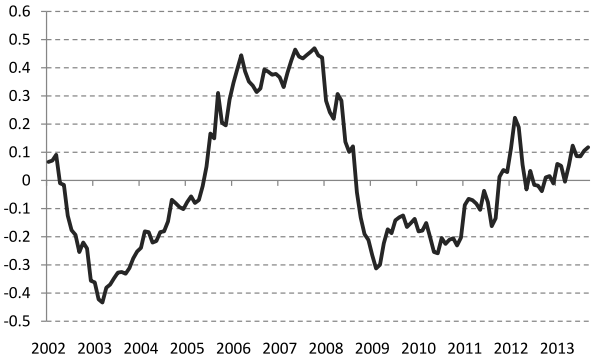

Fig. 3 Calmar Ratio Euro Stoxx 50: 2002–2013

sidered as a signaling measure for investments. A rising Calmar Ratio should also be interpreted as an indicator for an investment decision. Figure 3 shows the three year rolling Calmar Ratio calculated on a monthly basis.

The interpretation of the Calmar Ratio in the context of this paper is straightforward: A rising ratio indicates an improvement and hence might be interpreted as an investment opportunity. For the Euro Stoxx 50 index from Fig. 3 one might draw the conclusion that as the Calmar Ratio is on a rising trend so currently asset managers should at least consider buying equities. Putting it the other way around: especially during the stock market crashes in the aftermath of the bursting of the Internet bubble as well as the Lehman default stock investments have been rather unattractive. This result is not surprising at all—appropriate timing is of high relevance.

Before looking at the current dividend yields we will analyze the joint characteristics of a stock's price and the dividends paid out to the investors. According to ADF-tests (not reported in order to conserve space) the two variables seem to be non-stationary time series. Given this result, we test for cointegration among dividends and stock prices. As a matter of fact, the existence of a cointegration relationship between two time series indicates that the variables share a common stochastic trend. Therefore, there is a close equilibrium relationship between these variables. Cointegration of dividends and stock prices would imply that stock prices in the long run are closely related to the economic fundamentals. Johansen (1991) has suggested a cointegration test which is very popular now. This test procedure is based on the technique of vector autoregressions (VAR). In (1) z is a vector of m variables, which might be integrated of order one:

$$z_t = A_1 z_{t-1} + A_2 z_{t-2} + \cdots + A_n z_{t-n} + c_0 + c_1 t + e_t. \tag{1}$$

A_i is a $m \times m$ matrix (with $i = 1, \ldots, n$). c_0 is a vector of constant coefficients and c_1 is a vector of the trend coefficients. Finally, e_t represents an error term. Simple rearrangement of (1) produces:

$$\Delta z_t = (A_1 - I) z_{t-1} + A_2 z_{t-2} + \cdots + A_n z_{t-n} + c_0 + c_1 t + e_t, \tag{2}$$

$$\Delta z_t = (A_1 - I)\Delta z_{t-1} + (A_1 + A_2 - I) z_{t-2} + \cdots + A_n z_{t-n} + c_0 + c_1 t + e_t, \tag{3}$$

$$\begin{aligned}\Delta z_t &= \Pi_1 \Delta z_{t-1} + \Pi_2 \Delta z_{t-2} + \cdots + \Pi z_{t-n} + c_0 + c_1 t + e_t \\ &= \sum_{i=1}^{n-1} \Pi_i \Delta z_{t-i} + \Pi z_{t-n} + c_0 + c_1 t + e_t, \end{aligned} \tag{4}$$

where:

$$\Pi_i = -\left(I - \sum_{h=1}^{i} A_h \right),$$

$$\Pi = -\left(I - \sum_{i=1}^{n} A_i \right).$$

The rank of the matrix (Π) is critical for our analysis. The test statistic applied within this study will be the trace test whose statistic is shown in (5), where T represents the sample size and the m–k ordered eigenvalues from the reduced rank regression are represented by λ_i. The Null hypothesis of this likelihood ratio test for the reduced rank of the matrix Π is that the number of cointegration relationships is not higher than k. This is the case as long as the rank of the matrix Π is $k < m$.

$$Trace\ Stat = -T \sum_{i=k+1}^{m} \ln(1 - \lambda_i). \tag{5}$$

The results reported in Table 2 signal that dividends and stock prices seem to be cointegrated. We use the critical values tabulated by MacKinnon et al. (1999). This empirical finding does depend on deterministic trend assumptions. This common trend of the two variables leads us to looking at the dividend yield at the current valuation, thereby leaving out any (additional or not) return created by changes in price. This can be interpreted as a long-term buy-and-hold strategy. Besides a small peak in 2008, where dividends were (still) relatively high in comparison to the steep declines in prices, the dividend yield as recently surpassed government and corporate bond yields (see Fig. 4).

Finally we assess the current valuation of stocks with the P/B and P/E ratio. Figure 5 shows the price-to-book ratio and the long-term average as well as the average for the current crisis. While the current valuation has already passed the short-term average (1.23), indicating a rise above recent lows, the valuation in comparison to the long-run average (1.71) shows still a decent gap. This is generally interpreted as stocks being priced rather attractively. Keep in mind that a ratio of 1.0 would indicate that the companies are traded at their replacement value. Interestingly the time between the burst of the dotcom-bubble and the highs before the current crises are not as marked as expected.

The Price-Earnings-ratios are shown in Fig. 6. Interestingly the forward-looking estimated P/E ratio always lies below the trailing ratio, indicating higher estimated than realized earnings. Here the two stock market crashes of this century can be seen clearly, indicated by a faster decline in prices than in the respective earnings.

Table 2 Cointegration results

Sample (adjusted): 1993Q4 2012Q4;
Included observations: 77 after adjustments
Trend assumption: Linear deterministic trend (restricted)
Series: E100_INDEX
LAST_DPS_GROSS
Lags interval (in first differences): 1 to 2

Unrestricted cointegration rank test (trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace statistic	0.05 Critical value	Prob.[b]
None[a]	0.718622	102.4589	25.87211	0.0000
At most 1	0.060660	4.818486	12.51798	0.6226

Unrestricted cointegration rank test (maximum eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-eigen statistic	0.05 Critical value	Prob.[b]
None[a]	0.718622	97.64044	19.38704	0.0000
At most 1	0.060660	4.818486	12.51798	0.6226

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level. Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

[a]Denotes rejection of the hypothesis at the 0.05 level

[b]MacKinnon et al. (1999) p-values

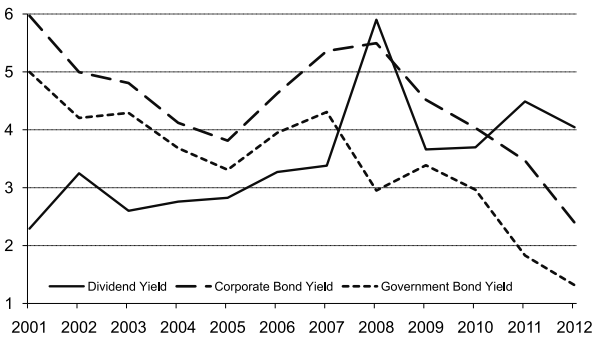

Fig. 4 Yields in %

Nevertheless the current prices with respect to earnings are already past the post-Lehman average as well as the long-run average.

Further assessing the relative attractiveness of stock respectively bond investments we use a simplification of the above shown dividend-discount-model: the so called Fed-model. This model stresses an equality relationship between the P/E ratios of the bond and the stock market, where the so called bond-P/E ratio is simply the inverse of the current return on 10 year government bonds. The intuition behind the model therefore is based on a comparison of the two investment alternatives bonds and stocks. In the long run both ratios are supposed to be equal, signaling valuation

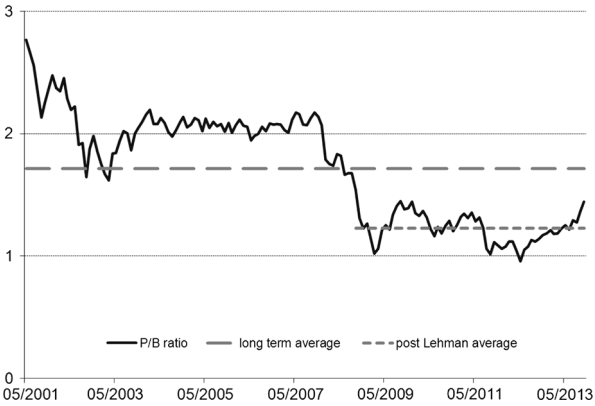

Fig. 5 Price-to-book ratio

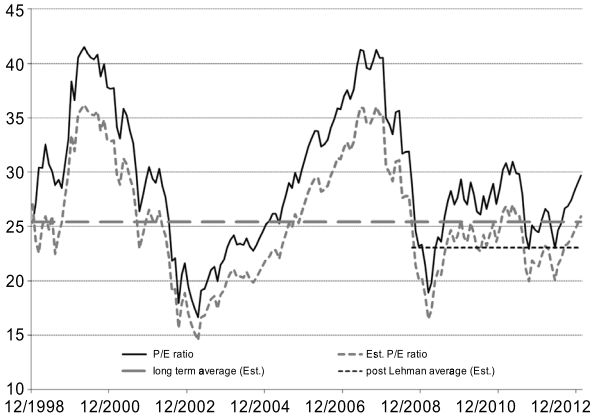

Fig. 6 P/E ratio vs. Est. P/E ratio

differences and therefore supposedly lucrative investments if the numbers differ. The "Fed-model" can be derived from the dividend-discount-model already presented in Sect. 3:

$$P_t = \sum_{n=1}^{\infty} \frac{E(D_{t+n})}{(1+R_t)^n}$$

The resulting stock price (P) is largely depended on the assumptions about future dividend payouts and the discount rate. Gordon (1959) suggested the usage of a constant dividend growth rate g (for a more recent application see also Basse and Reddemann 2010). Additionally including a constant rate of return (R) and in a next step dividing it into the risk-free rate (R_f) and the risk premium (RP) brings us to another simplification of the dividend discount model:

$$P_t = \frac{D_t(1+g)}{R-g} = \frac{D_t(1+g)}{R_f + RP - g}.$$

Dividing both sides by earnings (E) and assuming that the company's earnings equal the dividends ($E = D$), a zero growth rate $g = 0$ as well as risk free returns (i.e. a

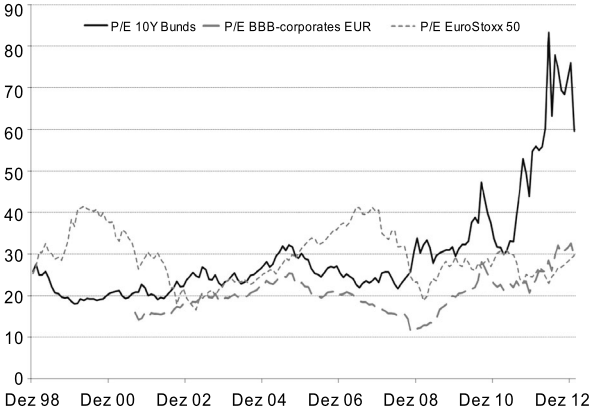

Fig. 7 Different P/E ratios in comparison

zero risk premium, $RP = 0$) the Fed-model's equation finally results:

$$\frac{P}{E} = \frac{1}{R_f}$$

With the help of the above stated formula we can compare the P/E ratios of stocks (Euro Stoxx 50) and bonds (10Y Bunds respectively BBB corporates (EUR)). Based on the data set used, the Fed-model indicates an obvious difference between the two ratios (as can be seen in Fig. 7), suggesting a convergence in the long run.

The big difference can be attributed either to a rather attractive pricing of stocks or a strong overpricing of bonds. In our earlier analysis above especially the P/E ratios were the ones showing already comparatively high ratios, which leads to the conclusion—following the "Fed-model"—that 10-year government bonds are momentarily quite expensive. This has important implications for insurance companies which are heavily invested in interest-based assets (see e.g. Basse et al. 2007). Before any fast conclusion is drawn, caution is necessary. In part owing to its simplicity the so-called Fed-model has found some support on the one hand and has been heavily criticized as being too simplistic and lacking theoretical as well as empirical evidence on the other (e.g. Koivu et al. 2005 as well as Estrada 2006 and 2009 and especially Asness 2003). Theoretical critisism is linked among other things to the above mentioned simplifying assumptions (i.e. $g = 0$ and $RP = 0$ as well as $E = D$) and to the fact that real values (P and E) are compared to a nominal value (R_f). Nevertheless it has some popularity among practitioners, see e.g. Gatzen et al. (2004).

4 Discussion

Taken together, the empirical and descriptive results presented here, indicate that stock prices, at least in the long run, are closely linked to the economic fundamentals and that they currently are far from their highest levels. Additionally although the backward looking measures of risk adjusted returns are not favorable for stock

investments this does not necessarily have to rule them out completely. It much more shows that timing plays a vital role. Furthermore our empirical results show that speculative bubbles and their burst are rather an exception to the rule. Further summing up and focusing on the rather conservative measures, the dividend yield and the price-to-book ratio imply that at current levels stocks are not to be considered unduly expensive—especially in comparison to government and even corporate bonds.

The result, that prices and dividends share a common trend leads to the conclusion that equity returns of this century—having experienced two stock market crashes—are not to be considered the best predicator for future returns. This leaves the prospect of positive future equity premiums and highlights the relevance of accurate stock price or dividend payment forecasts for asset managers in the life insurance industry.

Summing up all indicators used above seem to imply that stocks at their current level have already gone a long way but are not unduly expensive, possibly leaving room for further returns. From the perspective of asset managers at insurance companies these returns must look rather attractive. Nevertheless the measures used here are only part of a multitude of possible methods, therefore requiring a cautious interpretation and leaving room for completion with other methods. Especially in the context of evaluating the attractiveness of stock investments for insurance companies the always inherent uncertainty (no matter what method was used) of future stock prices resulting from different earnings respectively dividends per share plays a vital role.

There exists a broad literature dealing with quality respectively accuracy of stock market forecasts. In this context asset managers in the insurance industry have to be cautious. Although it is not purely unrealistic to assume that professional forecasters try to perform as good as possible there exist strong reasons or even incentives for biased forecasts or predictions subject to herding behavior (see for example Olsen 1996; Pons-Novell 2003; Beckers et al. 2004; Guedj and Bouchaud 2005). This may without doubt lead to suboptimal investment decisions. Due to the long-term liabilities of life insurers the underlying investment strategy has to take into account long-term investments as well. As for example Rastogi and Dhar (2012) have shown the correlation between actual and predicted returns is decaying with increasing forecast horizons. This shows that asset managers have to be cautious when using professional forecasters' predictions for individual stocks as well as stock indices. Focusing on the European stock market and financial crisis events the asset managers' task at German life insurance companies becomes even more complex. For example Bohl et al. (2008) did examine the reaction of the Euro Stoxx 50 index on unanticipated interest rate moves by the European Central Bank. These results demonstrate the relevance not only of accurate or at least unbiased stock market forecasts but also for the predictions of interest rate moves of the monetary policy makers. Hence, this demonstrates the relevance of interest forecasts for at least two reasons: Firstly the level of current interest rates does influence the excess return of stock investments as for example measured in the Sharpe Ratio. And secondly, the return of the alternative investment in bonds may also change due to interest rate decisions. As the interest decisions by central bankers do not only influence the short term interest rates but the whole maturity spectrum asset managers do also have to rely on interest rate forecasts for different maturities. Schwarzbach et al. (2012) for example did

evaluate the quality of interest forecasts done by financial market professionals for the 10 year German government bond yield and did find strong evidence that professional forecasters fail to deliver relevant information about the future development of the government bond yield. In addition Kunze et al. (2013) recently showed, that especially in times of financial crisis forecasters may fail. Taken together the outlined difficulties which have to be taken into account it has to be stated that asset managers in life insurance companies do have to fulfill a complex task. To put it in a nutshell: They have to do a lot of homework. But after considering the relevant aspects it should come as no surprise that stock investments might be more than a useful additional asset. They might add significantly to the portfolios performance and therefore we still think that even after years of discussion, additional quantitative impact studies (QIS) and first implementations Solvency II will change the paradigms of risk and asset management in the European insurance industry. The standard model for Solvency II differentiates so-called type 1 and type 2 stocks. Type 1 stocks are traded on stock markets within the OECD or the European Economic Area. Other stocks, private equity investments and funds, at least the ones that cannot be entangled for the "look-through" approach, are considered to be of type 2. The correlation coefficient between the two types is assumed to be $\rho = 0.75$. Based on predefined stress simulations, the required solvency capital for type 1 and type 2 stocks amounts to 39 % or 49 % respectively (QIS5, European Commission 2010). These high capital requirements make up one reason for life insurers' reducing their equity holdings, because when facing Solvency II insurance companies, especially Germans, are lacking solvency capital anyway (see e.g. Die Welt (editor) 2013).

Here government bonds of EU countries look attractive, because they do not have to be backed with additional capital. But in times of crisis or even financial haircuts, the insurers may already do so today. Basse and Friedrich (2008) have already assessed the impact of Solvency II regarding the Asset-Liability-Management in the context of the European bond market. More recently, Basse et al. (2012) have briefly discussed the consequences of low interest rates for European insurers and have argued that buying Italian government debt could be helpful due to the attractive yields. However, this investment strategy obviously would increase sovereign credit risk in their portfolios. For the influence of solvency requirements and interest rate guarantees on the strategic asset allocation of life insurers see also Schmeiser and Wagner (2012). Taking everything together the development will likely turn out to be problematic for asset managers in insurance companies resulting in rather small returns—especially in comparison to the performance of fund managers at mutual funds who usually face fewer constraints.

Given today's market environment asset managers in the life insurance most likely will not be able to solve this problem. Recent discussions by CEOs, regulators and umbrella organizations about changes in the guarantees given with endowment policies originate from similar thoughts, but tackling the problem from the liability side. By looking at absolute guarantees the basis of calculating the contracts might (have to) change to limited guarantees or at least money-back guarantees as actually discussed by practitioners. So, taken together, the new regulatory framework requiring a slow approximation and the prevailing financial crisis coincide,

intensifying the already complicated situation for life insurers. The existing contracts and portfolios as well as the established product range having found a market position among possible competitors make any sudden adjustments impossible requiring a lot of effort (e.g. also for the marketing department) for a longer time period.

5 Conclusion

Taking everything together our analysis shows that stocks are a rather volatile and accordingly risky asset, at least when compared to most of the interest bearing assets. Nevertheless attractive and—in case of the German insurance industry—needed returns can be achieved. At the current state, stocks have obviously already gone a long way from their past lows after the Lehman crash. When looking at indicators commonly used by practitioner's they possibly still offer some chances for additional returns. Furthermore our findings indicate that stock prices, at least in the long run, are closely linked to the economic fundamentals. This also implies that although the backward looking measures of risk adjusted returns are not favorable for stock investments the asset class does not necessarily have to be ruled out completely—especially in the long run. Still the timing of the investment is likely crucial and stocks certainly require a lot of attention by the manager—there is still homework lying ahead.

Nevertheless the insurance asset managers have actively and passively reduced their stock exposure over the last decade. This could partly be an indication of the expected new regulatory environment—namely Solvency II. In its standard model stocks will require quite a big amount of solvency capital in order to cover the investment risks. This is a further restriction for insurance asset managers. In order for them to be able to achieve competitive returns for their employer and therefore also the clients, especially when compared to mutual funds, these rules might require some adaptation, which would result in homework to be done by the regulative authority.

Appendix: Table 3

Table 3 Investment portfolio of primary insurers[a]

Type of investment (in percentages[b])	2007	2008	2009	2010	2011
Bonds and debentures	81.6	84.7	86.5	86.5	88.6
Mortgages	6.2	6.0	5.6	5.3	5.1
Loans	25.6	26.0	26.7	25.6	26.2
Loans to credit institutions	16.8	17.0	16.0	14.4	15.1
Loans to states	7.2	7.5	9.3	9.7	9.8
Loans to companies	0.8	0.9	0.8	0.9	0.8
Policy loans	0.5	0.6	0.5	0.5	0.4
Other	0.4	0.1	0.0	0.1	0.1
Mortgage bonds	25.2	24.8	25.3	24.4	23.9
Government bonds	2.7	2.3	2.8	3.4	3.6
Corporate bonds	1.1	1.4	1.5	1.6	1.6
Bonds and debentures included in funds	14.3	17.5	18.2	19.9	20.6
Subordinated loans and profit participation rights	3.3	3.1	2.7	2.5	2.3
Call money, time and fixed deposits	1.5	1.9	1.7	1.6	2.0
Other bonds and debentures	1.5	1.7	1.9	2.1	3.2
Shares	8.4	4.6	3.3	3.3	2.8
Directly held	1.3	0.9	0.5	0.5	0.3
Held in funds	7.1	3.7	2.8	2.8	2.5
Participating interests	3.5	3.7	3.4	3.5	3.6
Real estate	3.3	3.3	3.3	3.3	3.5
Directly held	2.2	2.2	2.1	2.1	2.4
Held in funds	1.1	1.1	1.2	1.2	1.1
Other investments	3.2	3.7	3.6	3.4	1.6
Total	**100**	**100**	**100**	**100**	**100**

[a]Without Pensionskassen and pension funds; as per end of year

[b]Without deposit receivables from the insurance business assumed as reinsurance cover and investments where the investment risk is carried by the policyholder (in particular from unit-linked life insurance)

Source: BaFin; GDV

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