

# **Sustainability and Capital Conservation in Corporate and Individual Finance**

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Für meine Eltern - Danke!

## Zusammenfassung

Das Ziel dieser kumulativen Dissertation zum Thema der Nachhaltigkeit - spezialisiert auf die Fragestellung der Kapitalkonservierung im unternehmerischen und auch privaten Kontext - ist es, zu bestehenden Theorien und empirischen Forschungsarbeiten beizutragen. Kapitalkonservierung, also die nachhaltige Verwendung des "Rohstoffes" Kapital, ist für alle Bereiche des gesellschaftlichen Lebens von außerordentlicher Bedeutung und deckt ein Spektrum von Themen wie Kapitalausstattungen von Versicherungen bis hin zu individuellen Versicherungsentscheidungen ab.

Die empirischen Studien mit unternehmerischem Fokus legen dabei den Schwerpunkt auf die Wirkung von Schwankungen in den Dividendenzahlungen auf zukünftige Erträge. Die dabei beobachteten Zusammenhänge werden im Anschluss, unter Berufung auf die Signaltheorie, auf die in den jeweiligen Märkten vorherrschenden Transparenzgrade zurückgeführt, was parallel auch in theoretischen Überlegungen vorhergesagt wird.

Der zweite Teil der Arbeit beschäftigt sich mit der Fragestellung, inwieweit verschiedene Einflussfaktoren die Risikowahrnehmung von Individuen beeinflussen. Dabei wird insbesondere die Einführung der Pflegepflichtversicherung in Deutschland 1995 als Faktor fokussiert.

Zusammenfassend sind die folgenden Fragen Schwerpunkte der vorliegenden Arbeit:

Teil I:

- Wie können Versicherungsunternehmen in Krisenzeiten ihre Kapitalisierung stärken?
- Haben gekürzte oder gestrichene Dividenden einen negativen Effekt auf die künftige Entwicklung?
- Warum ist dieser Effekt nicht homogen in allen Rechtsräumen und Industrien beobachtbar?
- Welchen Einfluss hat Transparenz auf die Dividendenpolitik von Unternehmen?

Teil II:

- Wie hat sich die Einführung der Pflegepflichtversicherung auf die Risikowahrnehmung von Privatpersonen ausgewirkt?
- Ist die Höhe der Eventualschäden neben der Eintrittswahrscheinlich ein signifikanter Treiber der individuellen Risikowahrnehmung?

Schlagworte:

Nachhaltigkeit, Transparenz, Kapitalstruktur von Versicherungen, Dividendenpolitik, Signaltheorie, Risikowahrnehmung

## Abstract

The aim of this dissertation thesis is to contribute to existing theories and empirical research with respect to sustainability. Throughout the thesis the broad term sustainability is understood as the special case of capital conservation, i.e. the sustainable use of the “resource” capital. This is of utmost importance for all fields of societal life and covers a range from capital adequacy of insurance companies to individual insurance decisions.

The empirical studies on corporate questions in this thesis focus on the impact of variation in dividend policy on future earnings. The observed dependencies are subsequently explained by variations in the transparency of the applicable legal regime for the respective markets. In parallel this is predicted by an extension to existing signalling theories.

The second part of this thesis deals with the question how different triggers or factors influence individual's risk perception. As one main focus serves the 1995 introduction of an obligatory long-term care insurance scheme in Germany.

To briefly recap, the following questions are key aspects of the thesis at hand:

Part I:

- How can insurance companies recapitalise in times of crisis?
- Do cut or even discarded dividend payments have a measurable effect on future development?
- Why is this effect not observed homogeneously throughout all legal regimes and industries?
- What is the impact of transparency on corporate dividend policy?

Part II:

- How did the introduction of a public long-term care insurance scheme impact individual's risk assessment or risk perception?
- May the expected loss be a major driver for risk perception, possibly even on par or more important than the assessment of loss probabilities?

Keywords:

sustainability, transparency, capital structure of insurance companies, dividend policy, signal theory, risk perception

## Sustainability and capital conservation in corporate and individual finance

This year - 2013 - the term *sustainability* ("Nachhaltigkeit" in German) commemorates its 300th anniversary. Ever since it was originally coined in 1713 by Hans-Carl von Carlowitz<sup>1</sup> in the context of forestry, it was used with a wide range of connotations.

Carlowitz was originally inspired by observations he made during the wood market crisis, working at the court of Augustus the Strong, as well as during his 5 year lasting travels through Europe, where he witnessed the strict forestry policies of Jean Baptiste Colbert in France. Saxony was a region of high mining activity with an even higher demand for wood. Mining tunnels, drilling deeper and deeper into the mountains to extract precious silver and iron ores needed stabilizing constructions. Insatiable smelting furnaces pushed that demand even further, resulting in large deforestations.

A similar observation of reckless exploitation of natural resources was made even 200 years before Carlowitz introduced a term for a counter-strategy. In his *Iudicium Iovis*<sup>2</sup>, published in the 1490s in Leipzig, Paul Schneevogel (his latinized name later being Paul Niavis) tells a tale about an eremite witnessing the trial of a mining worker in front of the court of antique gods, the charge being "rape of mother earth by penetration of her intestines". In his allegory Paul Niavis even uses the linguistic Latin predecessors *sustentare* and *conservare*, describing the function of the earth, which is threatened by the severe interferences in the wake of the silver mining rush that started in the second half of the 15th century.

This motive can also be found in yet another classic, celebrating its 500th birthday this very year. In his book "The prince", first distributed in 1513, Niccolo Machiavelli states:

"But from want of foresight men make changes which relishing well at first do not betray their hidden venom, as I have already observed respecting hectic fever."<sup>3</sup>

About 200 years after this observation, massive industrial mining led to peaks in wood prices and as a consequence to increased deforestations to meet the demand. Carlowitz deemed this behavior to be fueled only by greed and short-sightedness. This inspired him to write the *Sylvicultura oeconomica*, his treatise about sustainable forestry, where he defines a preferential strategy:

"Wird derhalben die größte Kunst/Wissenschaft/Fleiß und Einrichtung hiesiger Lande darinnen beruhen / wie eine sothane Conservation und Anbau des Holtzes anzustellen / daß es eine

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<sup>1</sup> *Sylvicultura oeconomica* - Carl von Carlowitz - 1713

<sup>2</sup> *Iudicium Iovis* oder Das Gericht der Götter über den Bergbau: ein literarisches Dokument aus der Frühzeit des deutschen Bergbaus - Paul Niavis - Akademie-Verlag Berlin, Freiburger Forschungshefte, D3 - 1953

<sup>3</sup> *The Prince* - Niccolo Machiavelli - Chapter XIII, No. 8, The Harvard Classics 1909-14

continuierliche beständige und nachhaltige Nutzung gebe / weiln es eine unentberliche Sache ist / ohne welche das Land in seinem Esse nicht bleiben mag.“<sup>4</sup>

This is the first known text passage where the term “nachhaltend” was used with this notion and is the beginning of an evolution of a key phrase far beyond forestry. But while “sustainability” was initially referring to sound cultivation and lumbering of forests, reflecting the self-evident principle *you cannot extract more wood from a forest than what grows back again*, recent usage of the term is usually describing a more abstract concept.

If nowadays someone uses the term “sustainability” or “sustained”, he is usually referring to the *capacity of a development to endure* (see below). Since the second half of the 20th century the term was rediscovered by a rising ecological movement. The United Nations started dealing with ecological concerns of the international community. A major milestone in this regard was the definition of “sustainable development” in the “Brundtland-Report” by the Brundtland Commission (formally known as World Commission on Environment and Development - WCED) in 1987:

“[...] sustainable development, which implies meeting the needs of the present without compromising the ability of future generations to meet their own needs, should become a central guiding principle of the United Nations, Governments and private institutions, organisations and enterprises”<sup>5</sup>

At the time memories of Chernobyl and several other man-made catastrophes across the globe were still fresh and the need for sustainable (ecological) development was well perceived and supported by the wide public. A couple of years later, in 1992, the UN held the Earth Summit in Rio de Janeiro. One of its global landmark results was drafting a non-binding, voluntary action plan, the agenda 21 with regard to sustainable development. Also the Commission on Sustainable Development was installed in accordance with chapter 38 of agenda 21. <sup>6</sup> Other landmark discussions were initiated in this forum as well, as was an agreement on the Climate Change Convention, eventually resulting in the Kyoto protocol in 1997 (going into force in 2005). Interestingly, closing the circle spanning centuries, that very conference also published a document, the forest principles, giving several recommendations for sustainable forestry, as Carl von Carlowitz envisioned nearly 300 years before.

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<sup>4</sup> Sylvicultura oeconomica - Carl von Carlowitz - pages 105-106 - 1713 - Loose translation: “Therefore the most pressing art/science/effort of these lands will entail / to ensure a conservation and cultivation of wood / that there is a continuous and sustainable utilization / because it is essential / and without it the nature can not stay in good form.”

<sup>5</sup> Report of the World Commission on Environment and Development - United Nations - General Assembly Resolution 42/187 - 1987

<sup>6</sup> Institutional arrangements to follow up the United Nations Conference on Environment and Development - United Nations - General Assembly Resolution 47/191 - 1993

From that moment the word “sustainable” was used inflationary as can be seen in the graph below.<sup>7</sup> Looking at the phrase’s occurrence in german and english literature, its usage in both languages seems to have grown exponentially between the 1990s till 2005. In 1998 the german word for “sustainable” (“nachhaltig”) was even in the final round for the word of the year award.<sup>8</sup>



**Figure 1:** Frequency of the usage of the terms “Sustainability” and its german origin “Nachhaltigkeit” from 1700 till today

Even though since the 1980s the usage of “sustainability” was strongly associated with environmental and green policies, the term is of economical rather than ecological heritage. This ecological framing is probably due to a lot of pressing situations, where natural resources are the scarce quantity to be optimally - i.e. sustainably - utilized. Actually, while one of the major intents of economics is the "allocation of a scarce resource" (think sovereign budgets on health, defense or education), this is not capturing the full scope of economic thought. Rather allocation of a scarce resource over a given time horizon, capturing the dynamic nature of all economic decisions, is appropriate. If economics is understood likewise, the term "sustainability" is of primarily economic nature. This economic facet of sustainability, a trade-off between short-term profits and long-term growth, can be quantitatively interpreted as a trade-off between expected value and variance. Any actor might sacrifice some expected value (not reaping short-term profits decreases the expected value as they would receive a weight of about 1 in the calculation) to smooth out the future growth path. How this applies to the different actors of interest will be explicated below.

This is the interpretation of "sustainability" I will refer to throughout this introductory text, connecting the superficially distinct spheres of dividend policy of financial institutions and long-term care insurance coverage decisions of individuals by the common theme of minimizing the long-run negative impact on a scarce resource (or minimizing the standard deviation of the growth process) - *capital conservation*.

<sup>7</sup> Quantitative Analysis of Culture Using Millions of Digitized Books - Michel\*, Shen, Aiden, Veres, Gray, Brockman, The Google Books Team, Pickett, Hoiberg, Clancy, Norvig, Orwant, Pinker, Nowak and Aiden\* - Science, 331(6014) - p. 176-182 - 2010

<sup>8</sup> It ended up second only to “rot-grün”, the german phrase for the coalition under Gerhard Schröder that took over in Germany after 16 years of conservative rule in that very year



## Layers of capital conservation

Three levels of actors are or should be in pursuit of capital conservation and hence of a sustainable development in their respective sphere of influence, sorted by scale, listing the parameters at their discretion:

- Governments - the household budget (tax regime and level of benefits)
- Corporations - supply side (equity) and demand side (business)
- Individuals - savings, insurance coverage

I will discuss specific aspects of capital conservation in both the corporate as well as the individual sphere. Starting with corporations, financial institutions will be brought into focus, as the case for capital conservation is most obvious. On the individual level I want to focus on insurance coverage decisions, securing a living standard in the uncertain future by some structured capital conservation.

While I will not extensively discuss the macro-level, governments, I still want to add some brief comments on governments. It should be obvious how capital conservation has to be understood in the sovereign context. On a macro-prudential level, sovereigns sacrifice some portion of growth to enter a more stable growth path. For instance, the 3% of GDP deficit threshold for countries in the European Union anchored in the stability and growth pact (first regulation - the preventive arm - entered into force in 1998, the second one in 1999) is designed to cap the debt ratio, such that future generations (this is adding the time component as explained above) find more or less stable debt conditions to live with. Sustainability is also the main driver for most current discussions on austerity measures throughout Europe, since an increasing number of sovereigns in the EMU is hard-pushed financially. The aftermath of the financial crisis is endangering the cohesion within the political and therefore also the monetary union. An interesting analysis about sustainability in the context of the financial crisis and the sovereign debt crisis as a consequence was published by Contessi (2012)<sup>9</sup>.

While most social security systems are designed as pay-as-you-go systems, financing parts of the coverage by federal funds is common. Sustainability in this specific context can be interpreted as restrictions imposed on benefits to avoid debt getting out of hand while maintaining a desired minimum level of benefits. Failure to appropriately set sustainability requirements can be observed in some US pension schemes. Rauh and Novy-Marx (2010) calculate a gap of us much us 2.5 trillion dollars comparing the present value of state employee liabilities and the fund's assets.<sup>10</sup> This will put severe pressure on future generations, which is further elevated by the demographic change in most developed countries.

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<sup>9</sup> An Application of Conventional Sovereign Debt Sustainability Analysis to the Current Debt Crises - Contessi - Federal Reserve Bank of St. Louis Review, 94(3) - p. 197-220 - 2012

<sup>10</sup> Public Pension Promises: How Big Are They and What Are They Worth? - Novy-Marx and Rauh - Journal of Finance, 66(4) - p. 1211-1249 - 2011

## **Sustainability on Corporate Level**

Arguably, the core of corporate economics is the observation that firms come into existence because of lower transaction costs when internalizing certain steps of the production process.<sup>11</sup> Resources can be managed more efficiently and transaction costs can be reduced: Companies exist to exploit the benefits of being big and not needing contracts for every step in the production process.

As mentioned in the example of forestry above, this entails not just maximizing short-term profits, but to strike a balance between short-term profit and long-term development or growth of the business. Rather than chopping down the forest today to reap the one-off benefits, a manager should ensure a *sustained* use of resources, if only not to make the initial investment into machines and employees obsolete as soon the resource is depleted. This can be generalized to most producing industries and to a certain extent to service industries as well. In the latter case the resource at the manager's discretion would be human capital - the employees and effective service providers, alongside facilities and infrastructure (transportation, telecommunication etc.).

This is obviously also applicable to financial institutions as service providers, but they can be taken as producing companies in another sense as well, transforming raw (and sometimes even virtual) money or cash-flows into financial products - securities and insurance contracts subject to the respective regulatory regime. This regulation can be interpreted as an external force trying to assure the sustainability of the financial sector. The path current regulation across all jurisdictions is treading is that of minimum capital requirements (Basel and Solvency directives issued by the BIS<sup>12</sup>), effectively establishing a mandatory level of capital conservation. Again, the predominant rationale is forcing a prudent balancing of the trade-off between short and long term profit and growth targets. Regulators impose these restrictions as they feel that currently corporate governance has a dominant short-term focus. This is one of the many lessons taken away from the crisis. Still, regulators should be aware that an overly conservative approach, i.e. requiring excessively high CET1<sup>13</sup> ratios for banks might have adverse effects. Banks and insurances alike may push up this ratio not only by increasing their capital base, but also by a downsizing of business activities. This could eventually lead to a credit crunch, like the one Lehman fell victim to in 2008. Even worse, downsizing insurance's and bank's business could result in market failures, severely impairing risk transfer mechanisms and capacities.

## **Sustainability and Capital Conservation for Financial Institutions**

But what does sustainability mean in this context? In today's financial markets the volume of derivatives, bonds and other (structured) securities seems unlimited. When the monetary resource became effectively virtual once the gold standard was abandoned in favor of a pure fiat money in 1976, the financial and real economies essentially decoupled<sup>14</sup>.

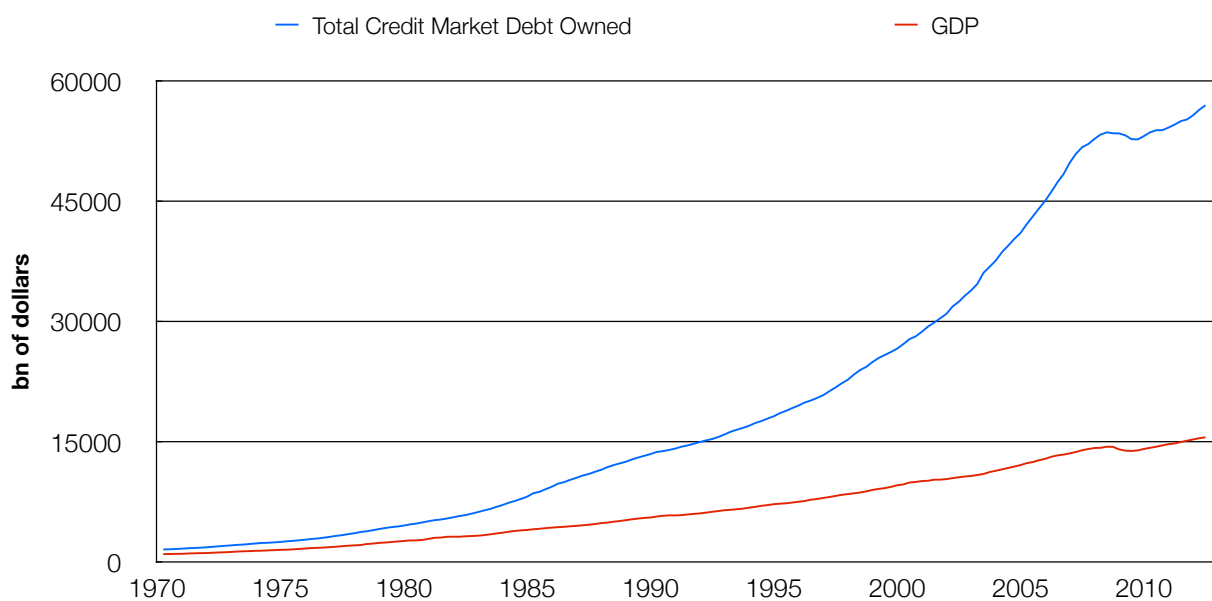
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<sup>11</sup> The Nature of the Firm - Coase - *Economica*, 4(16) - p. 386-405 - 1937

<sup>12</sup> Bank of International Settlements - <http://www.bis.org/bcbs/basel3.htm>

<sup>13</sup> CET1 (Common Equity Tier 1) is a regulatory defined measurement of core equity of a financial institution and a central part of Basel III and its objective to set minimum requirements. It is related to the institution's risk weighted assets (RWA) to provide a proxy for the financial state of the bank.

<sup>14</sup> Data provided by [research.stlouisfed.org](http://research.stlouisfed.org) (US GDP and TCMDO quarterly time series from 1970 to 2013)



**Figure 2:** Development of Total Credit Market Debt Owed vs Gross Domestic Product since 1970

If a resource is not subject to any constraints, sustainability might become an empty phrase, as there seems to be no necessity to limit usage of that freely producible resource. But in case of money it is an illusion uncovered as early as 1622 when the Holy Roman Empire decided to debase its coinage. Ever since, bank runs, major financial crashes and asset price bubbles pushed banks and insurances into bankruptcy, as the due liabilities could outsize the assets at hand by a large margin. This is neatly illustrated by leverage ratios<sup>15</sup> of today's banks, which can be lower than 2%. The latest example is the financial crisis originating from the US subprime mortgage market where losses quickly melted off capital cushions of financial institutions, rendering them unable to continue to operate. Eventually this resulted in a credit crunch that disintegrated Lehman Brothers, a major investment bank and extended the crisis to a global scope.

Regulators and also risk managers of banks and insurances always tried to estimate the necessary size of the capital cushions needed to cover not just expected losses, but even unexpected losses. A successful risk management is vital to the business model of financial institutions. But while risk managers merely can give recommendations, regulators have the clout to force institutions to assess their risk and reserve a fraction thereof as loss provisions. In Basel III, including all additional buffers, up to 10.5% of risk weighted assets (RWA) have to be held as Core Tier 1 capital. So, especially in times of crisis, when the means of refinancing an institution's positions are highly constrained (or too expensive), financial institutions essentially have two options to increase their capitalization independently of debt markets (convertibles can count towards CET1 in specific cases):

- I. Issue additional equity, diluting current shareholders investments
- II. Increase retained earnings, i.e. decrease or cancel dividends paid to shareholders

<sup>15</sup> The leverage ratio is defined of the quotient of equity and total assets (in contrast to risk-weighted assets for the capital ratio)

Both options do not appeal to existing investors, I want to put my focus on option II., as its effect are not as pre-determined as are those of the first option (dilution of stakes): In the aftermath of a financial crisis, keeping free cash flows within the company may be the better option, as raising new capital proves to be rather costly. Still, changes in a company's payout policy are heavily disputed and their effect has to be closely monitored. As corporate finance suggests, dividend payments, while being more costly than capital gains in most tax regimes, serve the additional purpose of signaling the soundness of a company to markets.<sup>16</sup> A reduction of payments might be perceived as sign of weakness and lowered earnings expectations. The three predominant hypotheses concerning payout policies are:<sup>1718</sup>

- i. Dividend Irrelevance Hypothesis
- ii. Dividend Signaling Hypothesis
- iii. Dividend Smoothing Hypothesis

While i. supposes that capital gains and dividend payments are interchangeable from the investor's perspective. But this only holds in perfect markets without any taxes: both assumptions are in conflict with reality. Therefore, only ii. and iii. are worthwhile investigating in an empirical setting. While both hypotheses agree that changes in dividend policy convey signals to the market, they differ structurally regarding the predicted relationship between dividends and earnings of a company. That is, the dividend signaling hypothesis predicts that dividend changes precede earnings-changes. In this scenario the manager wants to actively communicate future earning changes (either direction) to the markets. On the other hand, the dividend smoothing hypothesis would be supported by observing earnings leading dividends.<sup>19</sup> Managers would, even in highly profitable years, only prudently raise dividends to assert that the company is in the position to keep a stable level of payouts. Also this behavior tries to eliminate the misperception that the manager wants to signal some future developments, possibly leading to missed expectations, even while keeping constant earnings. As worked out above, to test which of these hypotheses applies, the temporal relation between earnings and dividends is key. Arguably, time-series techniques are most appropriate; as any cross sectional data is stripped of crucial chronological information. Furthermore, any analysis of corporate dividend strategies is subject to a multitude of factors and especially the macroeconomic environment might complicate meaningful econometric studies.<sup>20</sup> The publication "Inflation and the Dividend Policy of U.S. firms" (see module 1) tackles the problem that inflation might distort the proper assessment of the predominant hypotheses described above. This is hardly a new theme in finance research.<sup>21</sup> The study still adds to the existing literature, as it applies appropriate statistical tools on a sufficiently big amount of recent data.

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<sup>16</sup> Dividend smoothing vs. dividend signaling: evidence from UK firms - Goddard, McMillan and Wilson - *Managerial Finance*, 32, p. 493-505 - 2006

<sup>17</sup> Dividend policy, growth, and the valuation of shares - Miller and Modigliani - *The Journal of Business*, 34(4), p. 411ff. - 1961

<sup>18</sup> Imperfect Information, Dividend Policy and "the bird in the hand" fallacy - Bhattacharya - *The Bell Journal of Economics*, 10(1), p. 259-270 - 1979

<sup>19</sup> Dividend smoothing vs. dividend signaling: evidence from UK firms - Goddard, McMillan and Wilson - *Managerial Finance*, 32, p. 493-505 - 2006

<sup>20</sup> Historical Cost Earnings Versus Inflation-Adjusted Earnings in the Dividend Decision - Bar-Yosef and Lev - *Financial Analysts Journal*, pp. 3-12 - 03/04 1983

<sup>21</sup> Stock Yields, Stock Dividends and Inflation - Gabriel A. D. Preinreich - *The Accounting Review*, Vol. 7(4), p. 273-289 - 1932

Employing cointegration and impulse-response analysis<sup>22</sup> on U.S cross industry time-series data, inflation is identified to yield a significant positive effect on dividends. A positive shock (i.e. an increase) in inflation leads, possibly with lags, to an increment in dividends. This is intuitively comprehensible, as inflation increases nominal earnings. But another interpretation not as obvious might also explain this positive relationship: Managers might follow a dividend strategy preserving the stakeholders returns in real terms. As it is argued, either way inflation has to be considered in an empirical analysis investigating dividend policy if utilizing a time-series framework. Furthermore, taking inflation into account, the study finds that in this broad U.S. cross industry data there is some support for hypothesis iii. from above.

The studies “Bank Dividend Policy and the Global Financial Crisis: Empirical Evidence from Europe” and “Impact of the Financial Crisis on the Dividend Policy of the European Insurance Industry” (see module 2 and 3) further investigate the predominance of the different payout policy paradigms for banks and insurances respectively. Returning to the main theme of capital conservation, this is most crucial for financial institutions, justifying a dedicated analysis for these two building blocks of the financial sector. The data examined in these studies are aggregated numbers on earnings and dividend payments (normalized as per share values) across Europe. The GDP deflator serves as a proxy for inflation to correct for the distortion caused, as described above. A vector error correction model (VECM) was estimated and the different variables were shocked to reveal the temporal relationship between earnings and dividends per share of the top players within the insurance and banking industries.

Both studies cannot find support for either of the two hypotheses of dividend determination which somewhat points at the irrelevance hypothesis from above. Therefore the authors conclude that banks and insurance companies in Europe could be less hesitant to cut dividend payments in the strive to strengthen their respective capital base. This is somewhat surprising, as signaling theory in corporate finance appropriates dividend payments an important role for conveying information to the capital markets. The root cause for this seeming paradox might be the observation that both industries are tightly regulated, an extensive amount of disclosures and minimum requirements are imposed. This might render additional information less effective signals and, as explained in the introduction, incurring taxes might prove too costly for the firm compared to capital gains. In a letter to the two major industry associations in June 2013 the Banco de España even recommended that institutions should not pay out dividends exceeding 25% of the earnings.<sup>23</sup>

To further investigate this relation between regulatory regime and effectiveness of signals conveyed by dividends, the publication “Dividend Policy Issues in the Financial Crisis - The Example of the German Automotive Industry” (see module 4) picks one major European country and a different industry to confirm this effect. And indeed, the data reveals definite support for pre-cautious signaling. This is in line with the conjecture of the regulatory regime being one of the main drivers for signaling effectiveness. To round off the preceding analyses the next study in this block “Dividend Policy and the Global Financial Crisis: Empirical Evidence from the Italian Insurance Industry” (see module 5) varies the country, rather than the industry, which is the second crucial factor determining the regulatory regime. Even though for financial institutions there are supra-national regulations in place, the implementation on federal level is at the national regulators discretion. This might be one explanation for the finding that in Italy signaling actually does have an impact, even though the cross European peer study

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<sup>22</sup> Estimation and hypothesis testing of cointegration vectors in gaussian vector autoregressive models - Johansen - *Econometrica*, 59(6), p. 1551-1580 - 1991

<sup>23</sup> Statement by the Banco de España on the dividend distribution policy of credit institutions - Press release - Madrid, 27.06.2013

did not yield those results. All of the above evidence suggests that another, yet unobserved, variable might be the root cause for the diverging effectiveness of signals in different markets.<sup>24</sup> This does not render the findings from above invalid, as the studies do not observe the signal effectiveness itself, but rather the chronology between earnings and dividends. This structure will not be affected by transparency itself.

This gap is closed by the final paper in this block “Market Transparency and Dividend Policy of Insurance Companies: A global Comparison” (see module 6). While providing further empirical evidence comparing developed insurance markets (U.S., Japan, Europe) the main contribution of the study is the theoretical section identifying *transparency* as the underlying variable, the existence of which was suggested by the studies discussed thus far. The underlying observation is as simple as: “In a fully transparent market signals should not convey additional information”. Starting from this observation a canonical model for dividend signaling is refined by the additional variable transparency. While preserving the corner cases for maximal/minimal transparency, the model supports the conjecture that the future valuation of a company decreases with transparency, given a constant dividend payout. In a second step the study also introduces the cost for the company to increase transparency into this framework. This is motivated by an assumed trade-off between spending money on providing more transparency, reducing the need for signaling and the cost incurred by dissipative signals. The importance for corporate governance is obvious. Neither parameter should be set independently of the other, as this might prove more costly than a joint fixing.

The findings of these studies are twofold. First of all on a rather technical level, any empirical work on dividend theory should include (as endogenous variable) or at least control for inflation. More importantly, the study finds transparency to be an important factor determining dividend signal effectiveness. How markets perceive increased retained earnings (i.e. dividend cuts) is of interest when contemplating to keep cash-flows inside the firm to improve capital levels. It seems to be the root cause why signals substantially vary in effectiveness across jurisdictions and industry sectors.

#### **Limitations of the research and scope for future research:**

The methodology applied the studies listed above - vector error correction modeling - is subject to some limitations. The structure of the model leads to a one way propagation of shocks determined by the order of the input variables and the respective Cholesky composition. This problem is addressed in the econometric study: “Variable-ordering induced problems of impulse-response analysis and other difficulties: the dividend policy of Austrian firms” (see module 7). The study stresses the finding that using a VECM requires additional reasoning about the order of variables to be input to produce meaningful results.

Another limitation is the appropriate proxy for transparency. Transparency is established as a major driver of signaling effectiveness and therefore a consistent measure of transparency should be applied. This is a great field of open questions for future research. So far studies on transparency do not really assess its impact on market signals. Also, given this relation between transparency and signal strength a firm might try to strike the perfect balance between transparency and dividend signaling. While dividend signaling is monetarily expensive (as described above), increasing transparency might only be feasible to a specific level without enclosing

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<sup>24</sup> This is not to be seen as an econometric missing variable, the effect of it actually can be observed, but rather something that was overseen in most interpretations of results

company internals. The implication that the company should target for maximum, i.e. full transparency to reduce the costs for dissipative signals therefore is a void one in the dynamic market environment. A good balance should be struck. That allows for plenty of subsidiary questions in transparency research. For example it might be of more effect to disclose selected parts of internal data rather than increase the overall amount of disclosure.

There are also implications for policymakers to consider. By increasing the level of disclosure requirements, regulators could make it easier for financial institutions to capitalize without sending costly signals. This has to be considered very cautiously though, as extensive market interventions tend to decrease market efficiency.

### **Sustainability and Capital Conservation for Individuals**

After covering one sphere of the micro-economic sphere with respect to capital conservation, I want to zoom in even further and lay my focus on individuals. While some studies even link demography and dividend payoffs<sup>25</sup>, I want to go down another road, as initially laid out. The last section established dividend cuts as a valid instrument to increase capitalization for corporations in specific cases, effectively smoothing out their prospective growth path. Is there something analogous for individuals? As in the corporate case, where capital is reserved for future expected and to a certain extent even unexpected losses, insurance contracts provision capital for future uncertain losses. The individual gives up some of his income to safeguard himself against future high impact scenarios. While a broken car might be a loss, an individual might cope with, high severity events like major surgery, disability or long-term care need are unlikely to be covered by savings and current income alone. Especially long-term care, being an abstract risk that is believed to only occur in some rather distant scenario, is a substantial risk. Still the long-term care insurance market in Germany is hardly utilized, even though there exist plenty of products to choose from.<sup>26</sup> This insurance puzzle might have different root causes. The statutory insurance scheme in Germany is partially covering the costs caused by long-term care, contingent upon the level of dependency. Providing only partial coverage is a measure that had to be taken as the public long-term care insurance scheme is largely unfunded, financed by a inter-generation redistribution. The demographic change that is especially evident in Germany will exalt this situation even further. This is only one case of sovereign strive for sustainability. To minimize the gap that needs to be financed by raising additional sovereign debt, coverage in health care is getting increasingly restrictive and student have to pay obligatory contributions when attending university. Hence, for long-term care, a partial coverage was the only feasible way to go if a public insurance scheme is politically desired.<sup>27</sup> The resulting partial coverage leaves quite a significant gap, resulting in out-of-pocket payments of up to 50% of the average costs of 3,000€ for the concerned person.<sup>28</sup> Nescience of this gap might lead to the erroneous neglect of complementary insurance coverage.

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<sup>25</sup> Demographics and the Long-Horizon Returns of Dividend-Yield Strategies - Lee - Quarterly Review of Economics and Finance, 2013.

<sup>26</sup> Don't they care? Or, are they just unaware? Risk perception and the demand for long-term care insurance - Zhou-Richter, Browne and Gründl - The Journal of Risk and Insurance 77(4), p.715-747 - 2010

<sup>27</sup> More information about Germany's public LTC insurance scheme can be found in: Krummacker, Zuchandke, Reddemann - Financing Long Term Care in Germany, in: Financing Long-Term Care in Europe: Institutions, Markets and Models - Costa-i-Font and Courbage (eds.) - Palgrave MacMillan - 2011

<sup>28</sup> see module 8

On the other hand, as stated above, expected loss is the metric an individual implicitly bases his demand for additional protection on. That means insurance coverage is some function of expected loss:<sup>29</sup>  $f(\mathbb{E}[L])$  Expected losses or costs are a product of the probability of needing long-term care and the highly individual cost of long-term care.

Combining those two observations, it can be seen that insurance coverage or insurance demand is a function monotonously increasing in both the probability of a risk occurring as well as the severity of the loss incurred in that adverse scenario. Using the relation above and objective data in an insurance economics context gives rise to the insurance puzzle mentioned above: Theoretically coverage of this risk should be significantly higher than observed. The assumption that individuals know the exact individual probability and severity is somewhat unrealistic though. Empirical studies thus turned towards perceived risk, as this is the actual driver for insurance coverage decisions.

They investigate the first factor - indeed, risk perception and an individual's estimate of probabilities seems to be used synonymously - but there exists only a small number of studies assessing the latter factor.

This gap is partly closed by the study "Impact of the Introduction of the Social Long-Term Care Insurance in Germany on Financial Security Assessment in Case of Long-Term Care Need" (see module 8) and the publication "The perception of financial risks - A panel data analysis on perceived financial security in the event of long-term care need in Germany" (see module 9). Both publications take a close look at the variable *perceived financial security contingent on requiring long-term care* taken from the German socioeconomic panel (SOEP) that is conducted by the German Institute for Economic Research (DIW Berlin), a think tank. It is a representative panel survey of households and individuals running annually since 1984. The question we are focusing on is: "How do you individually assess your financial security in the event of long-term care need?" which is only included every 4 years.

The first study only utilizes a cross-sectional regression while the second publication exploits the rich data set also including longitudinal data by applying panel regressions and exploring the results delivered by fixed and random effects estimators.

The first publication (see module 8) specifically focuses on the impact resulting from the introduction of a public social insurance scheme for long-term care in 1995 for all German citizens. The main finding of the study is that the respondents felt better secured after the introduction of the scheme, even though there existed some fallback solutions for individuals in need even before that date. Furthermore, households with an individual in need of long-term care started to perceive their financial protection as improving after the introduction, while it had no influence on the assessment before 1995. Among others, this impact of experience on perceptions is further explored in the second study (see module 9). Again it is shown that experience with a long-term care receiver impacts the perception significantly to the positive. Other factors are found to have an impact on the perception:

Owning assets or being indebted altered perceptions. The effect is highly non-linear, and seems to be dependent on debt maturity, observing mortgages having a higher (negative) influence than other general debt.

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<sup>29</sup> The exact functional relation or other factors do not matter, as long as the demand is monotonously increasing in expected loss



The direct effect of assets on insurance demand (rather than perception, which in turn might drive demand) might oppose this negative relationship, as insurance is not only providing the necessary funds when in need, but furthermore acts as wealth protection. These two countervailing trends might be one factor giving rise to the bell shaped relation between assets and long-term care insurance demand.<sup>30</sup>

One especially interesting finding is that while having children does not affect the perception after 1995 - that is after a public scheme was introduced in Germany - this had a substantial positive effect on the perception of security before the introduction. One obvious explanation is that the state stepped in where traditionally the family provided help or even full-scale care for the needing household member. Additionally the bequest motive might be relevant in this context, but studies do agree neither on the direction nor on the relevance of altruism and bequest motives in this context.

Thus both studies contribute to the empirical literature on risk perception and especially address an area that is currently not well researched (in comparison to perception of event probabilities). They therefore also do stress the importance of perception when trying to apply theoretical concepts that work on the average subjects (i.e. homo oeconomicus) to distinct individuals.

For policymakers, trying to incentivize people to close their individual gap, there is one main lecture to be taken away from these analyses. Rather than investing money in yet another information campaign to educate individuals about the likeliness of needing long-term care, they should provide meaningful information about the consequences of dependence: Financially and socially, stressing the burden put upon the family if the needing person suddenly discovers the existing gap without any chance to fix it retrospectively. This might have a bigger marginal effect, as currently information campaigns mostly focus on probabilities.

#### **Limitations of the research and scope for future research:**

First of all, both studies share the limitation that the answer to the question raised within the SOEP is merely a proxy for the perception of financial security. Additional variables, like purchased insurance coverage would increase the explanatory power of any statistical evaluation of SOEP data.

The first study mentioned does not take full use of the data available, as it only uses cross-sectional techniques. Its results are largely confirmed and furthermore refined by the second study. Unfortunately the question used as a proxy for perceived severity is only included in the SOEP survey every five years, a longer data history might have produced more significant results. This analysis should be revisited once the question is included next time.<sup>31</sup> Also, the fact that detailed data (that is amount) about an individual's assets is only reported for the waves of 2002 and 2007, limiting the research to a binary state quantifying the effect of having assets while not taken into account how many assets/debt and individual actually holds.

All these limitations are data issues that will get lifted with time as more data is acquired, and should spark some similar analyses on different, i.e. bigger datasets, as well. Also conducting a similar analysis for different countries might be interesting to further specify the influence of certain factors. Mass media and its effect on perception is an interesting topic that would greatly enhance the current literature on risk perception.

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<sup>30</sup> The influence of prescription drug use on long-term care insurance ownership - Bernet - Risk Management and Insurance Review, 7(2) - p.107-120 - 2004

<sup>31</sup> The next wave including the respective question will be available in December 2013

List of Modules	
<b>1</b>	<b>Inflation and the Dividend Policy of U.S. firms</b> Basse, T., Reddemann, S. - Managerial Finance 37(1), p. 34-46 - 2011
<b>2</b>	<b>Bank Dividend Policy and the Global Financial Crisis: Empirical Evidence from Europe</b> Basse, T., Reddemann, S., Graf von der Schulenburg, J.-M. - European Journal for Political Economy - 2013
<b>3</b>	<b>On the Impact of the Financial Crisis on the Dividend Policy of the European Insurance Industry</b> Reddemann, S., Basse, T., Graf von der Schulenburg, J.-M. - Geneva Papers for Risk and Insurance: Issues and Practice 35(1), p. 53-62 - 2010
<b>4</b>	<b>Dividend Policy Issues in the Financial Crisis - The Example of the German Automotive Industry</b> Basse, T., Gruppe, M., Reddemann, S., Schwöpe, F. - International Journal of Applied Decision Sciences 4(3), p. 247-259 - 2010
<b>5</b>	<b>Dividend Policy and the Global Financial Crisis: Empirical Evidence from the Italian Insurance Industry</b> Basse, T., Reddemann, S., Riegler, J.-J., Graf von der Schulenburg, J.-M. - Zeitschrift für die gesamte Versicherungswissenschaft 100(1), p. 131-140 - 2011
<b>6</b>	<b>Market Transparency and Dividend Policy of Insurance Companies: A global Comparison</b> Reddemann, S., Basse, T. - Études et Dossiers No. 369 WRIEC 2010, Singapore - 2011
<b>7</b>	<b>Variable-ordering induced problems of impulse-response analysis and other difficulties: the dividend policy of Austrian firms</b> Basse, T., Reddemann, S. - International Journal of Computational Economics and Econometrics 1(3-4), p. 278-293 - 2010
<b>8</b>	<b>Impact of the Introduction of the Social Long-Term Care Insurance in Germany on Financial Security Assessment in Case of Long-Term Care Need</b> Zuchandke, A., Reddemann, S., Krummacker, S., Graf von der Schulenburg, J.-M. - Geneva Papers for Risk and Insurance: Issues and Practice 35(4), p. 626-643 - 2010
<b>9</b>	<b>The perception of financial risks - A panel data analysis on perceived financial security in the event of long-term care need in Germany</b> Zuchandke, A., Reddemann, S. - Risk Management and Insurance Review - To be published 2014

# **MODULE 1**

## **Inflation and the Dividend Policy of U.S. firms**

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# Inflation and the dividend policy of US firms

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## Abstract

**Purpose** – The purpose of this paper is to analyse the dividend policy of firms from a macroeconomic perspective. In order to do so inflation and real growth are also considered.

**Design/methodology/approach** – The paper examines the relationship between dividends, corporate earnings, real growth and inflation in the USA by applying cointegration techniques. In this framework, impulse response analysis is used to test the two most popular theories of dividend determination.

**Findings** – The data indicate three cointegration relations among the four-time series. Impulse response analysis then shows some interesting dynamics. Dividend smoothing seems to be a relevant phenomenon. Furthermore, inflation has a positive effect on dividends.

**Research limitations/implications** – The most important finding of this paper is the indication of a positive relationship between inflation and dividend payments. This can be interpreted in two different ways: managers may try to follow a dividend policy, which is perceived to be optimal, believing that there is a desirable level of real dividend income to be paid to their investors. On the other hand, inflation may simply increase the nominal value of corporate earnings and therefore the dividends paid. Independently from the interpretation of the results, inflation should definitely be considered analysing dividend policy.

**Practical implications** – Managers should also examine the inflationary environment formulating an adequate dividend policy for their firm.

**Originality/value** – The paper provides an as of yet widely ignored link between the micro- and macroeconomic sphere examining one of the most important problems of financial economics. Neglecting the effects of inflation on dividends may, among others, be one reason for the mixed empirical findings testing theories of dividend determination.

**Keywords** United States of America, Dividends, Inflation, Stock markets, Financial economics

**Paper type** Research paper

## 1. Introduction

Recent experiences in the USA and other countries have shown that inflation is not dead at all. Owing to high energy costs prices on different stages of measurement (e.g. consumer price indexes and producer price indexes) have increased considerably in the first half of 2008. In the second half the falling oil price has dampened inflationary pressures dramatically. Until recently, some observers even seemed to believe that there was the danger of an emerging deflation due to the financial crisis and the deleveraging process of the global banking system. As a consequence, the yield on ten year US Treasuries temporarily fell to about 2 per cent in December 2008. However, because of aggressive interest rate cuts implemented by the Federal Reserve and other central banks fears that inflation rates will accelerate again in the medium- and long-term have returned.



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Combined with large fiscal stimulus packages interest rate cuts obviously increase inflationary risks. Therefore, it is probably no surprise that the year on year per cent change in the US consumer price index has returned to positive territory in the end of 2009.

Inflation quite clearly is a macroeconomic phenomenon which has major consequences for capital markets and affects a wide range of important financial variables (e.g. interest rates and corporate earnings). This paper provides empirical evidence regarding the relationship between dividend policy and inflation in the USA by using techniques of cointegration analysis thereby providing a new perspective on two very important problems of financial economics – namely, why firms decide to pay dividends and whether stocks are a useful hedge against inflation. The paper is organized as follows: Section 2 briefly reviews the optimal dividend policy issue. Section 3 then discusses the relationship between inflation and the stock market. Section 4 describes the data sets examined, discusses some methodological issues and also provides some details of a preliminary analysis of the data sets. Section 5 presents the results of impulse response analysis of the vector error correction model (VECM). Based on the theoretical considerations presented in Sections 2 and 3, the final section concludes by discussing the implications of the empirical findings.

## **2. Some thoughts about dividend policy**

In a famous and very controversial paper Miller and Modigliani (1961) have noted that the dividend policy followed by a firm does not affect its value. According to this so-called dividend irrelevancy hypothesis changes in dividend payments have no economic implications. As a consequence, Miller and Modigliani have concluded, that there is no optimal dividend policy for a firm. This theory is based on a number of assumptions. Most importantly, there exist no taxes and capital markets are assumed to be perfect. Under these circumstances and with a given investment policy, higher dividends result in lower capital gains. Assuming that investors do not prefer dividends to capital gains or vice versa, decisions about dividend payouts have no economic relevance at all. Nevertheless, managers in many firms still seem to believe that there exists an optimal dividend policy. According to Miller and Modigliani this fact is hard to explain. Moreover, there are even strong arguments against dividend payments because the tax laws of many countries penalize dividend income by taxing dividends more heavily than capital gains. Thus, there seems to be some kind of a dividend puzzle.

The most popular justifications for the existence of dividend payments are based on agency theory and problems of asymmetrically distributed information between the management and investors. Corporate finance theory suggests that the management of a firm can use dividend changes to overcome information asymmetries by trying to signal revised earnings expectations to its investors. This is the so-called signalling hypothesis. Agency theory does have further interesting implications for dividend policy. Most importantly, principal agent problems between the owners and the management of a firm may affect dividend policy when there is a separation of ownership and control. Gugler (2003), for example, has argued convincingly that higher dividends constrain the management of a firm by reducing free cash flow and by forcing the management to obtain more outside funds from investors trying to finance additional investment projects. Moreover, it is often assumed that managers are reluctant to cut dividends and therefore increase dividend payments only gradually with rising earnings. This is the so-called smoothing hypothesis of dividend determination which predicts

that dividend increases are carried out rather cautiously because firms try to avoid significant dividend cuts when corporate earnings fall. Therefore, it could be quite complicated to correctly identify this strategy in an inflationary environment, as inflation also may cause dividends to grow steadily in nominal terms, making it difficult to identify dividend smoothing in empirical studies.

Goddard *et al.* (2006) have argued that the signalling and smoothing hypotheses make antipodal predictions about the temporal relationship between dividends and corporate earnings. While the smoothing hypothesis suggests that earnings lead dividends the signalling hypothesis predicts the opposite. Those observations may be even more distorted as clientele effects could also be of importance. In fact, numerous firms do tailor their dividend payouts to suite particular groups of investors. Given the tax laws of many countries family-controlled firms may, for example, have an incentive to avoid dividend payments at all. In these firms, there is no separation of ownership and control. Consequently, there is also no principal agent problem and no need to constrain the management.

Even though some econometricians suggest that dividend signalling might have influence under certain circumstances, DeAngelo *et al.* (2000) have noted that the relevance of dividend signalling might in general be overestimated. An excellent survey of the relevant literature has been provided by Allen and Michaely (1995). More recently, Gugler (2003) has examined data from Austria searching for clientele effects and has argued that the ownership structure does influence a firm's dividend policy. He has noted that family-controlled enterprises have lower payout target ratios and are more likely to cut dividends while state-owned firms are most reluctant to do so. These findings are consistent with solutions of the dividend puzzle that are based on agency theory. Moreover, analysing data from the UK Goddard *et al.* (2006) have reported some evidence supporting the signalling hypothesis. However, they have argued that the relationship between dividends, corporate earnings, and stock prices is very complex and therefore cannot be explained by a single theory of dividend determination. Other researchers have produced even less convincing empirical evidence testing the signalling hypothesis (DeAngelo *et al.* (2000) and Bernhardt *et al.* (2005)).

In fact, most economists interested in corporate finance theory seem to believe that additional empirical evidence is needed. Bhattacharyya (2007), for example, has noted that properly conducted empirical research should account for all implications of the underlying economic theories of dividend policy. Our paper therefore also focuses on macroeconomic aspects which are often ignored. Most importantly, we also examine the role of inflation. This possibly important variable is usually neglected, though Modigliani (1982) has noted that the earnings-payout ratio is increased by inflation while stock prices might not change due to different leverage of those effects, giving an obvious motivation to include inflation in empirical work analyzing dividend policy. Furthermore, it may also be helpful to add real economic activity as additional variable.

### **3. Inflation and the stock market**

There is a common belief that the equity market can act as an effective hedge against inflation because stocks are claims on real capital. Accepting this argument, inflation should lead to higher stock prices by increasing the nominal value of real capital. Additionally, inflation magnifies the revenues of the corporate sector leading to higher earnings and an increase of stock prices. These simple theoretical considerations are

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intuitively appealing. However, empirical evidence seems to indicate the existence of a negative contemporaneous correlation of stock returns and inflation (Bodie, 1976; Fama and Schwert, 1977; Schwert, 1981).

The theory of finance has problems to explain this negative correlation. It is sometimes argued that the corporate sector may be unable to pass on higher prices. Moreover, Feldstein (1982) has noted that in the US inflation has increased the real tax burden of firms. There is also a macroeconomic dimension of the problem since inflation distorts the price system and increases transaction costs. As a consequence, high inflation rates may retard economic growth (Barro, 1996; Faria and Carneiro, 2001). This would, of course, hurt the stock market as well. Generally speaking, higher inflation rates may simply be a sign for the existence of other major macroeconomic problems. In fact, Fama (1981) has suggested that the observed negative relationship between inflation and stock returns originates from a positive relationship between stock returns and future economic growth and an inverse relationship between future economic growth and inflation. Accepting this point of view, inflation would only be a proxy for economic growth and the relationship between inflation and stock returns should be interpreted as a more or less spurious one. This is the so-called proxy hypothesis.

Moreover, following Campbell and Shiller (1988) it has been argued by Schotman and Schweitzer (2000) that two countervailing trends are present. First of all – and as already discussed – corporate earnings scale with inflation. Therefore, inflation could increase expected dividend payments in the future. This is positive for stock returns. But there is a second important effect. Higher inflation also tends to increase inflation expectations leading to a higher discount rate thereby reducing stock prices. The existence of these two opposing effects may help to explain why the empirical evidence reported in the literature is mixed. As a matter of fact, while quite a number of empirical studies do suggest that inflation rates and stock returns are negatively related in the short run this is not necessarily true for the long run. In spite of the negative contemporaneous correlation of stock returns and inflation rates inflation may even have a positive effect on stock returns in the long run. Most notably, Boudoukh and Richardson (1993) and Kolari and Anari (2001) have provided empirical evidence indicating that stocks can indeed serve as a long-term inflation hedge.

#### 4. Data, methodology and an initial analysis

Our measure of inflation is the US GDP price deflator which is reported by the Department of Commerce. This price index is a broad gauge of inflation. It is published on a quarterly basis. Taking a macroeconomic perspective, we do not focus on the dividend payments of individual firms but examine the aggregated dividends paid by the S&P 500 members using the dividend per index share concept. The S&P 500 Index is quite commonly used as a proxy for the performance of the US stock market and therefore is also a common benchmark for US equity funds. This index consists of the 500 leading companies in the USA and seems to be the generally accepted measure for US stock market activity. Bloomberg provides data on the volume of dividends paid by the index constitutes of the S&P 500 (dividend per index share). In order to test whether dividend signalling or dividend smoothing are relevant phenomena, we use a methodology suggested by Goddard *et al.* (2006) and therefore also have to consider corporate earnings. Given our measure of dividend payments the S&P 500 earnings per index share seems to be an appropriate variable. This time series is also provided by Bloomberg.

Furthermore, because of the fact that the proponents of the proxy hypothesis believe that there is a relationship between inflation and real growth we additionally do include a measure of real economic activity in the USA as fourth variable of the model (namely US real GDP). Adding real output to the VECM is also useful in order to examine the two main drivers of earnings growth. In fact, Berner (2002) recently has argued that econometricians should focus more strongly on the analysis of corporate profits. Therefore, our approach seems to be promising. We examine data from Q1 1980 through Q4 2008 focusing on the experiences after Paul Volcker's appointment as Chairman of the Federal Reserve Board. Thereby, we do hope to avoid possible problems with structural breaks which are known to cause major problems testing for cointegration (Gregory and Hansen, 1996).

Visual inspection clearly shows that the time series examined do not seem to be  $I(0)$ . Testing for unit roots on the differences is performed after controlling for structural breaks. We therefore use the procedure suggested by Lanne *et al.* (2002). In this approach, first of all the deterministic components and nuisance parameters are estimated and the series then adjusted using those parameters. While applying the test to the first differences, an impulse dummy is used, as suggested by the aforementioned authors. The respective results (Table I) signal quite clearly that all examined time series are integrated of order one (in levels). The break in the dividend time series occurs rather late, leaving only very few data points after the occurrence. Thus, it is also tested without a breakpoint; the results are included in Table I as well.

Structural breaks are – as already noted – a potential problem using cointegration tests. Even more so due to the test procedure suggested by Lanne *et al.* (2002) showing some empirical evidence for structural change. Numerous papers have been devoted to the subject of cointegration and structural breaks (Gregory and Hansen, 1996; Johansen *et al.*, 2000). One possible approach to cope with the difficulties arising from structural change could be testing for structural breaks in bivariate cointegration models and then switch to a multivariate setting. In the case examined here, this is not necessary. In fact, structural breaks quite clearly bias cointegration tests towards rejection even if in reality some form of cointegration relationship between the time series examined does exist. However, given that the results of the Johansen (1991) cointegration tests reported in Table II suggest that there exist three cointegration

**Table I.**  
Lanne test results  
(on adjusted  
differentiated time series)

Variable	D (dividends)	D (earnings)	D (deflator)	D (real growth)
Test' statistic (without break)	- 8,8082 - 8,9367	- 4,5696	- 3,7893	- 2,9856
Level of confidence	> 99%	> 99%	> 99%	> 95%
Date of break	2007Q4 None	1998Q3	2002Q1	2002Q2

**Table II.**  
Johansen test statistics

$H_0$	0	1	2	3
Likelihood ratio	79.34	48.75	24.43	3.62
$p$ -value	0.0000	0.0007	0.0110	0.4830



relationships among the four variables examined here structural breaks seem to be no major problem[1]. Moreover, the results are robust if including the break points deduced by the procedure suggested by Lanne *et al.* (2002). Therefore, we have to conclude that according to our tests the time series follow stable common trends and that there exists a long-term equilibrium relationship between the variables dividends (US\_Dividends), corporate earnings (US\_Earnings), real economic activity (US\_GDP\_Real) and the price level (US\_GDP\_Defl)[2].

The critical values for the test statistics are taken from Doornik (1998). We have considered eight time lags. This is the optimal lag length of the model according to the Akaike information criterion. Dummy variables are used to account for seasonality. The LM tests reported in Table III do not reject the hypothesis of serial correlation in the VECM residuals possibly causing problems regarding the ordering of the variables, as we are going to use the Cholesky decomposition for impulse response analysis. This will be explained in more detail in the following section. To further examine the problem, the cross-correlations of the residuals up to eight lags are inspected. While there are no significant correlations on the residuals, the squared residuals show strong serial correlation (cross- and auto-correlation) resulting in non-biased but inefficient estimators. Thus, a two stage, generalized least squares, approach is utilized. The impulse-response functions discussed in the following are robust to a change of the estimation technique (ordinary least squares (OLS) to generalized least squares), clearly indicating the findings to be consistent.

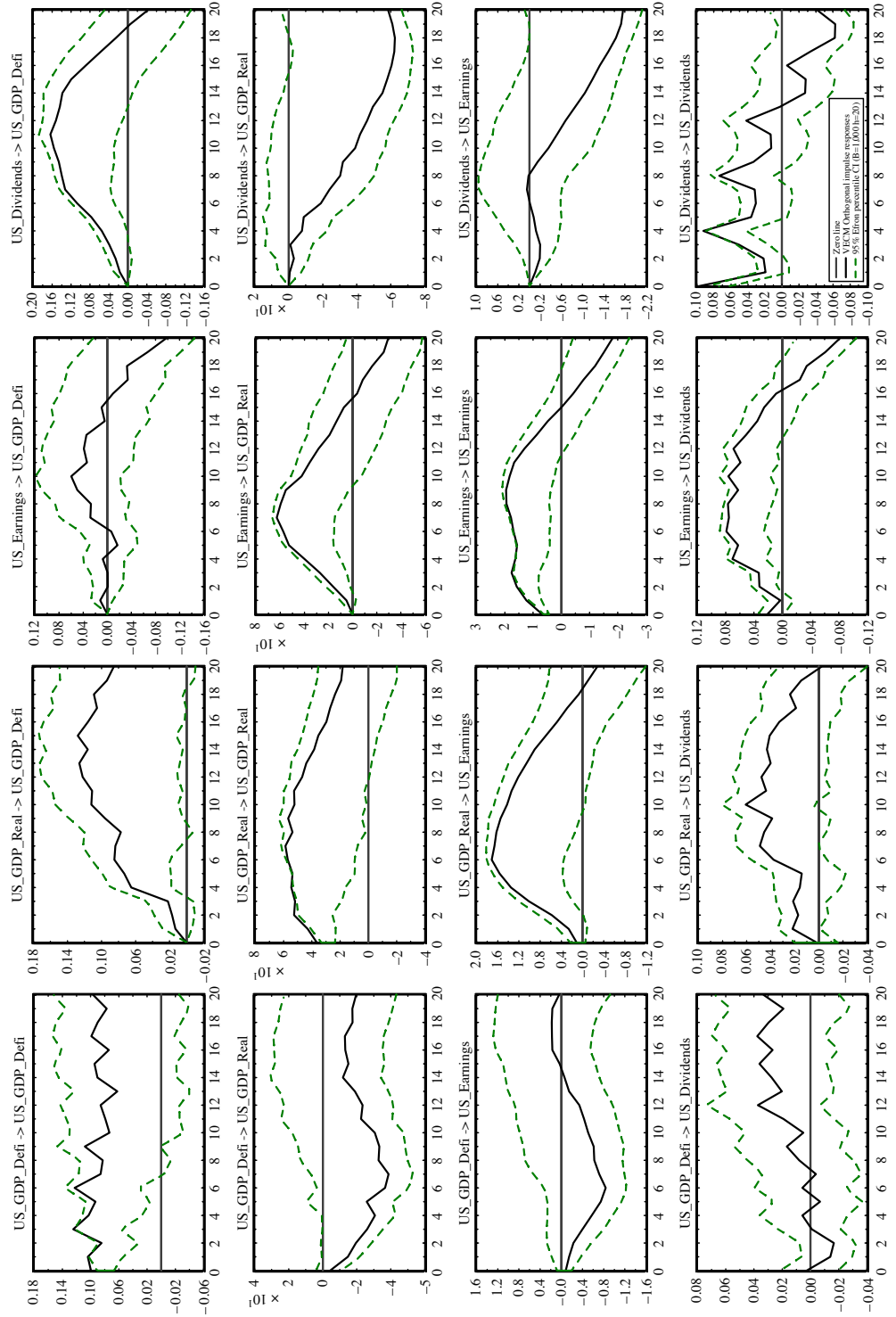
### 5. Impulse response analysis

The dynamics of the model are analysed by computing impulse response functions using the Cholesky decomposition. The ordering of variables is selected according to economic theory, as the Cholesky decomposition is not ordering invariant. The macroeconomic variables quite clearly should be more exogenous than the variables from the financial sphere. Moreover, dividends are paid from earnings. This leaves two possible orderings of variables (US\_GDP\_Defl → US\_GDP\_Real → US\_Earnings → US\_Dividends and US\_GDP\_Real → US\_GDP\_Defl → US\_Earnings → US\_Dividends). The resulting impulse response functions for the OLS estimation are shown in Figures 1 and 2. The confidence intervals are obtained using Efron (Efron and Tibshirani, 1993) bootstrap techniques (95 per cent level). Both orderings lead to remarkably similar results – at least with respect to the financial variables which are at the centre of this empirical investigation, indicating robustness under reordering[3].

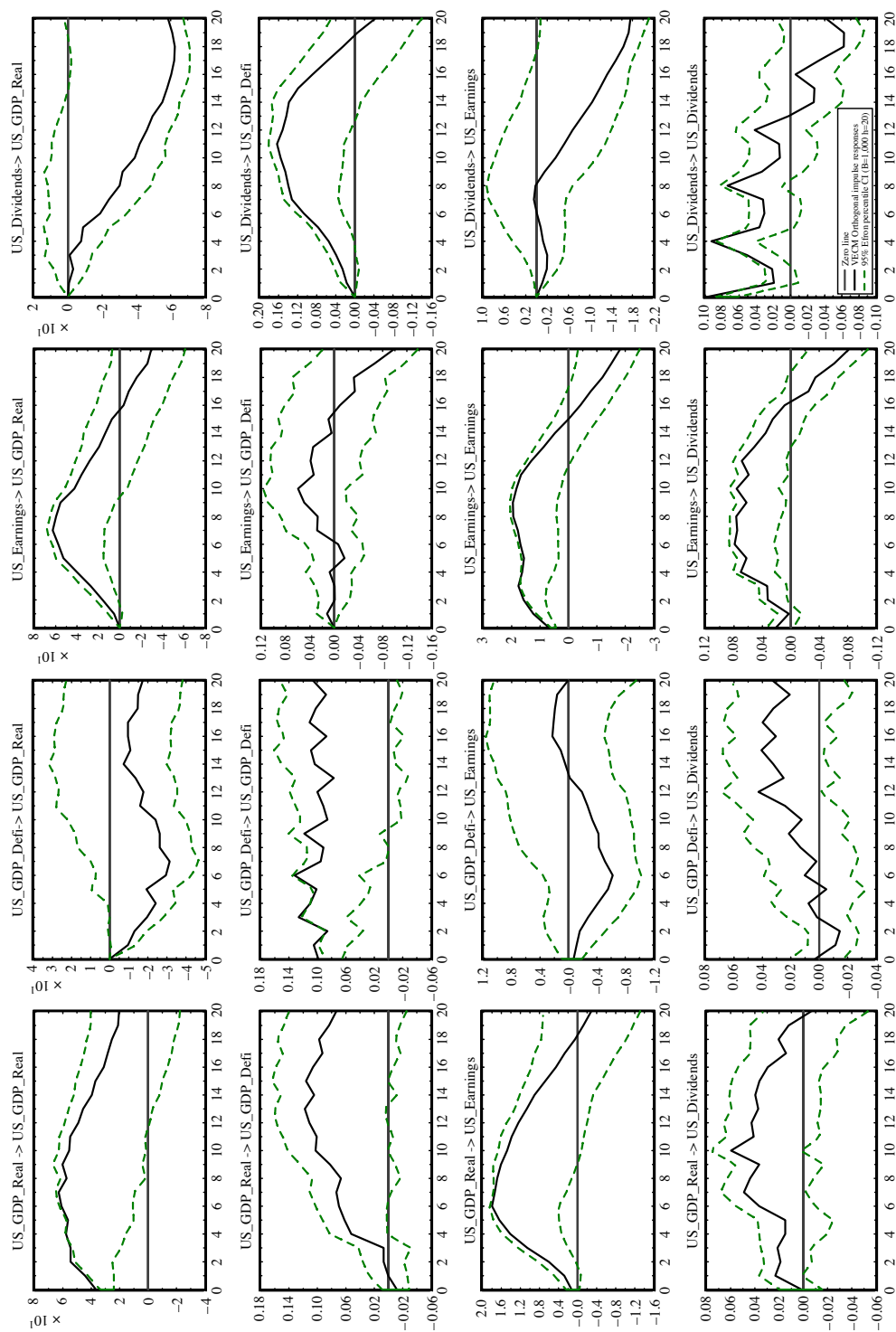
Following Goddard *et al.* (2006) our empirical findings quite clearly imply that dividend smoothing is a relevant phenomenon because corporate earnings lead dividends. There is no empirical evidence for dividend signalling. Turning to the relationship between macroeconomic and financial variables both orderings give unequivocal support for the hypothesis that corporate earnings and dividends react positively to a shock to real economic activity. This is no surprise at all. Explaining the statistically significant

Lags	1	2	3	4	5	6	7	8	9
LM statistic	31.2	63.0	94.3	113.1	137.6	161.3	188.1	223.4	300.2
p-value	0.0129	0.0009	0.0001	0.0002	0.0001	0.0000	0.0000	0.0000	0.0000

**Table III.**  
LM autocorrelation test results



**Figure 1.**  
Impulse responses  
(ordering US\_GDP\_  
Defi → US\_GDP\_  
Real → US\_Earnings  
→ US\_Dividends)



**Figure 2.**  
 Impulse responses  
 (ordering US\_GDP\_Real → US\_GDP\_Defi → US\_Earnings → US\_Dividends)

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negative reaction of real economic activity to an increase in dividend payments is less easy. An exogenous positive shock to dividend may, for example, signal less attractive investment opportunities of the corporate sector and – as a consequence – lower future economic growth. The statistically significant negative reaction of dividends to a shock to corporate earnings to be observed after 16 quarters probably has to be put in this context.

There also is an at least marginally statistically significant positive reaction of dividends to inflation. Dividends are only one source of stock market returns. Therefore, this result does not necessarily imply that stocks are a good hedge against inflation. However, the empirical findings reported above quite clearly do suggest that inflation is indeed contributing to dividend growth. There are different possibilities to interpret these empirical findings. US firms may assume that there is a desirable level of real dividend income to be paid out to their investors. This would imply that the corporate sector does believe in the existence of some sort of optimal dividend policy in real terms. A second interpretation of our results would require a by far less active role of management, as inflation may simply increase the nominal volume of corporate earnings and – given that dividends are paid as a percentage of earnings – thereby also the volume of dividends. Obviously, both explanations are compatible with our empirical findings and have similar implications (higher inflation leads to higher dividends). However, there are some obvious differences. Most importantly, the first explanation requires the management to formulate an optimal real dividend payout policy. Therefore, additional empirical evidence supporting this hypothesis clearly could be interpreted as a further hint suggesting that managers and investors “really” care about dividends. In fact, this hypothesis can even be seen as some kind of new theory of dividend determination which is based on the assumption that investors have a preference for a stable source of continuous real income. Irrespective of these interpretations of the empirical results reported above the findings of this paper do have consequences for econometricians planning to test theories of dividend determination. Most importantly, increases to the volume of dividend payments arising from higher inflation rates could be falsely identified as empirical evidence in favour of dividend smoothing.

## 6. Conclusion

The empirical evidence reported above indicates that in the USA there is a stable long-run equilibrium relationship between dividend payments, corporate earnings, real economic activity and the price level. Moreover, impulse response analysis reveals some interesting facets of dividend policy. There is clear evidence for dividend smoothing. Furthermore, we have established the existence of a positive relationship between dividends and inflation. Interpreting these results is not that easy. First of all, this finding does not necessarily mean that stocks are a useful hedge against inflation. However, it still is noteworthy that companies seem to increase their dividend payments more strongly in an inflationary environment. There are at least two possible explanations for this behaviour. First of all, the management could believe that there is some sort of optimal dividend policy in real terms. As a consequence, there may be an incentive to *ceteris paribus* stabilize the real value of dividend income. On the other hand, inflation may simply increase the nominal volume of corporate earnings and therefore dividend payouts. Analysing whether firms formulate their payout policy in real terms would be interesting. In any case, higher inflation seems to be a major driver of dividend growth. This finding does have a number of interesting implications.

Most importantly, a gradual increase of dividend payments due to higher inflation rates could be falsely identified as empirical evidence supporting the dividend smoothing hypothesis. Therefore, the results reported above are of special importance because we have controlled for inflation. Moreover, a higher variability of inflation may distort the ability of firms to use dividend changes to signal revised earnings expectations to their investors – this would be just another facet of the well documented informational costs of inflation.

The usual negligence of macroeconomic factors may indeed be an important reason why empirical tests often fail to support specific theories of dividend determination. Therefore, the results reported above imply that econometricians studying dividend policy have to consider the effects of inflation. Moreover, given that inflation rates are more volatile in economies classified as emerging markets our findings may also be an additional explanation for the observation that firms in these regions seem to have less stable dividend payments (Adaoglu, 2000; Aivazian *et al.*, 2003). Further empirical research examining data from emerging markets could therefore also be helpful.

This study has some additional implications for further research. In particular, it would certainly be interesting to examine the negative relationship between dividend shocks and real economic activity in more detail. Moreover, it should also be analysed how corporate earnings react to inflation shocks and to shocks to real output. Sharpe (2002), for example, has argued that inflation is negative for stock prices because it lowers expected real earnings growth and increases the real required return. Furthermore, it would be important to include monetary policy as additional variable. On the one hand, monetary policy is a function of real economic activity and the general price level; on the other hand, monetary policy also affects real growth and inflation. Therefore, this is a potentially relevant variable. It would, for example, be possible to combine the approach suggested here with the empirical model of Belke and Polleit (2006) who examine the long-run relationship between dividend growth and monetary policy. Both studies seem to fit together like pieces in a puzzle because the activities of firms commonly called “dividend policy” analysed here are a disturbance in Belke and Polleit (2006) while the activities of central bankers which are usually called “monetary policy” are not observed here.

## Notes

1. We also could have used the ARDL approach. The main advantage of this method is that it is not necessary to a priori determine the order of integration of the examined time series (Bahmani-Oskooee and Ng, 2002; Belke and Polleit, 2006). However, we are quite confident that all four variables in the model are I(1). Therefore, we have used the approach suggested by Johansen. This technique still is the most popular multivariate method estimating a cointegration relationship. This popularity mainly is a result of a simulation study by Gonzalo (1994) indicating the favourable characteristics of the multivariate cointegration test suggested by Johansen.
2. Yet, it may be interesting to note that bivariate cointegration tests quite clearly suggest the existence of a massive structural break in the cointegration relationship between the volume of dividend payments and the general price level in 2000. The empirical evidence for structural change corresponds with the bursting of the dot-com bubble. The test has been performed using the critical values from Johansen *et al.* (2000). However, this finding quite obviously is the result of a missing variable problem. The drop in dividends to be observed

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can be explained by a combination of falling earnings and a reduction of real economic growth. In order to preserve space, we will not report any details of the tests.

3. We have also tested the robustness of the results with regard to different data sets examined. Cointegration among dividend payouts, corporate earnings and macroeconomic variables is a very common phenomenon which can be found analyzing data from many different countries and time periods. It can also be observed examining specific industry sectors (e.g. European insurance companies or German car manufacturers). The following brief discussion of the results of impulse response analysis focuses on dividends per index share and earnings per index share of the members of the Dow Jones Industrial Average in the period Q1/1993-Q4/2009. By analysing this sample, we exclude the experiences of the savings and loan crisis; this prolonged banking crisis quite clearly was an extraordinary event. The 30 firms that comprise the Dow Jones Industrial Average are very large firms that are of special interest for investors and the stock market in general. Consequently, many financial analysts cover these firms. While the smallest firm in the Dow is currently actively covered by 20 analysts according to Bloomberg (using the ANR function) only six analysts follow the smallest member of the S&P 500. A larger number of analysts covering a firm quite clearly helps to increase transparency – which is a key concept with regard to dividend policy issues as the most popular explanations for the existence of dividend payments are based on agency theory. Therefore, it could be assumed that dividend signalling and dividend smoothing are less important for the members of the Dow Jones Industrial Average. Using four time lags and estimating the VECM with the variables real growth, inflation, corporate earnings and dividend payments the impulse response functions show clear evidence of a positive reaction of dividends and earnings to a shock to inflation. Moreover, in this case, there is also no empirical evidence indicating that dividend signalling is a relevant phenomenon. Therefore, it can be concluded that these findings are very similar to the results examining the earnings and dividends of the S&P 500 members. However, there are no signs for dividend smoothing. This deviating result is no surprise and seems to be in accordance with the transparency conjecture derived from economic theory as discussed above. Also note that there is some empirical evidence in favour of dividend smoothing examining the members of the Dow Jones Industrial Average when the variable real growth is neglected.

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## **MODULE 2**

### **Bank Dividend Policy and the Global Financial Crisis: Empirical Evidence from Europe**

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## Bank dividend policy and the global financial crisis: Empirical evidence from Europe

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### ABSTRACT

The global financial crisis has caused controversial discussions about the capital base of the banking industry in Europe. Dividend cuts and omissions have been suggested as one possibility to improve the financial strength of banks by retaining earnings. However, there are fears that investors could interpret a reduction of dividends as a sign for future problems. The dividend signalling and dividend smoothing hypotheses quite clearly are the theoretical basis for these worries. The basic idea of this study is that without empirical evidence supporting the hypothesis dividends did matter in the past, banks should not fear dividend cuts or even dividend omissions. The empirical evidence from the European banking industry reported here does not indicate that dividend signalling and dividend smoothing are relevant economic phenomena.

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### 1. Introduction

The world economy has suffered from the consequences of the global financial crisis. The banking sector was hit especially hard. Therefore, it is no surprise at all that stock prices of banks all over the world have dropped significantly. While the problems clearly originated in the U.S. housing market many European banks have also been affected by the crisis. These major difficulties of the financial services industry resulted in bailouts and nationalizations. There also is a time dimension to the problem. At first, losses at banks were directly related to the U.S. subprime crisis (mortgage backed securities and collateralized debt obligations). Then the global recession increased the volume of nonperforming loans and caused falling stock prices and a widening of credit spreads. Meanwhile, fiscal problems of some European countries even have caused concerns about sovereign credit risk. At the moment, new (and higher) capital requirements as already codified in Basel II, rating downgrades of debtors and expected future loan losses will increase the demand for capital. Moreover, as a reaction to the crisis there are discussions to further tighten bank capital standards (e.g., Rajan, 2009; Bullard et al., 2009). In sum, the banking sector not only in Europe has been, still is and most certainly will be in need of additional capital.

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Banks only have limited possibilities to strengthen their capital base. Given that numerous banks already had issued new equity raising capital from external sources there was a shortage of capital for financial institutions in 2009. Private investors simply did not want to increase the exposure to banks in their equity portfolios. In many countries governments stepped into the breach and even nationalised some banks. Due to harsh criticism of the bank rescue plans in the U.S. and other countries banks would at the moment experience major difficulties to obtain additional help from governments. Especially the U.S. media criticized that banks used “taxpayer funds” to pay dividends. Meanwhile, stock prices have at least partly recovered. The Dow Jones Stoxx 600 Banks Price Index, for example, has risen considerably from its lows in March 2009. However, it could still prove to be quite expensive for banks to obtain additional capital by issuing new equity. Banks might also decide to reduce their exposure to risk. This would imply that the banking sector would have to lower the supply of credit (at least in the short run – see Buch and Prieto (2012) on long and short run effects of changes to bank capital on loans). However, in a recession economic policymakers certainly are not interested in reducing the availability of bank credit because there are fears that a negative shock to credit supply could further hurt the economic activity. Walsh and Wilcox (1995), for example, have shown that loan supply shocks did have a negative effect on the U.S. output examining data from the 1960s and 1970s. Moreover, Akhter et al. (2010) recently also have provided empirical evidence indicating that the availability of credit helps to avoid poverty. Therefore, economic policymakers surely do not favour a reduction to bank lending in an economic crisis. In fact, the government bailouts in Europe and other parts of the world have mainly been intended to stabilize the availability of credit.

Banks can also improve their capitalisation by cutting or even omitting dividend payments. However, some observers seem to fear that investors and financial analysts could interpret a reduction of dividend payments as a negative signal indicating future problems. These discussions do have a history. In fact, Mayne (1980) has noted that U.S. banks used dividend cuts to improve their capital base in the banking crisis of the years 1973 to 1976. More recently, Boldin and Leggett (1995) have argued that retained earnings were the primary source of capital for the U.S. banking industry after the savings and loan crisis. However, Bessler and Nohel (1996) have pointed out that bank managers in the U.S. were reluctant to cut dividends in the 1980s despite suffering losses. After the subprime crisis the Federal Reserve, for example, in early 2012 did not want to permit Citigroup to raise its dividend in order improve the ability of the bank to cope with future financial shocks. Interestingly, the financial press had reported that shareholders back then had been pressuring U.S. banks to pay higher dividends.<sup>1</sup>

Given these controversial discussions about dividend cuts we plan to empirically analyse the dividend policy of the European banking industry using a framework that has recently been suggested by Reddemann et al. (2010) More precisely, we are searching for hints indicating that dividend signalling or dividend smoothing are relevant economic phenomena using vector autoregressive models (VAR) (respectively vector error correction models (VECM)). In short, the basic idea of this study is that without empirical evidence supporting the hypothesis that dividends did matter in the past, analysts and other stakeholders should not react on or fear dividend cuts or even dividend omissions by the respective bank.

The paper is organized as follows: Section 2 discusses dividend policy issues from the perspective of corporate finance theory. Section 3 then provides a literature review focussing on empirical tests of the theories of dividend determination introduced in Section 2. The fourth section describes the data sets examined and discusses some methodological issues. In Section 5 the empirical evidence is presented. The final section concludes.

## 2. Some thoughts about dividend policy issues

In their seminal paper Miller and Modigliani (1961) have argued convincingly that the dividend policy of a firm is irrelevant assuming that the firm's investment policy is given, capital markets are perfect and taxes do not exist. In this environment higher dividends simply result in lower capital gains. Consequently, the dividend policy of a firm does not have any economic relevance when investors do not prefer dividends to capital gains or vice versa. Therefore, it could be argued that the controversial discussions about dividend cuts or omissions of banks are pointless and that banks should reduce the volume of dividend payments to strengthen their capital base without having to fear any negative consequences.

The dividend irrelevancy hypothesis obviously produces major difficulties in trying to explain the existence of dividends. In fact, there is a dividend puzzle because it can be observed that numerous firms in many countries regularly pay dividends. The corporate finance theory has suggested a number of arguments why dividends may not be irrelevant at all. The most popular approaches to explain the existence of dividend payments are based on agency theory. These theoretical concepts rely on the assumption that the management of a firm is not necessarily motivated to act in the best interest of the owners.<sup>2</sup> In fact, it is quite common to argue that dividend payments lead to a reduction of free cash flow and thereby force the management of a firm to obtain capital from external sources more frequently when new investment projects have to be financed. Raising new capital forces a firm to give information to investment bankers, prospective investors and other economic agents. This process of providing information to financial market participants is assumed to reduce agency costs helping the owners to monitor and control the management of the firm. However, obtaining capital from external sources by issuing new equity generates transaction costs. According to this theory the optimal dividend policy of a firm should minimize the sum of the transaction costs and the agency costs.

<sup>1</sup> Reports discussing this problem have, for example, been published by the New York Times and Bloomberg News.

<sup>2</sup> It could also be argued that firms may run out of lucrative investment projects and in this case should return financial funds to investors by increasing dividend payments. However, given that central banks not only in the U.S. and UK have lowered the refinancing costs banks at the moment seem to have many profitable investment opportunities.

It is also very popular to argue that dividend changes can be used to overcome information asymmetries, being dissipative signals. According to this so-called dividend signalling theory – which is one of the most important approaches to explain the existence of dividend payments – managers can reduce or increase dividends to signal revisions to earnings expectations to financial analysts and investors. Moreover, it has also been suggested that firms try to avoid the need to reduce dividend payments because of concerns that dividend cuts or omissions could be perceived to give disturbingly negative signals to external economic agents. According to this so-called dividend smoothing hypothesis dividends are rarely decreased but also not increased to an unsustainable level. Dividend smoothing can be interpreted as dividend signalling with precaution. In order to avoid dividend cuts there should only be increases to dividend payments when the management of a firm believes that future cash flows are strong enough to enable the firm to sustain the new higher level of dividend payouts. This theory does also assume that a strong link between dividend payments and corporate earnings exists. However, [Goddard et al. \(2006\)](#) have argued convincingly that the signalling and smoothing hypotheses make opposing predictions about the temporal relationship between corporate earnings and dividend payments. While the dividend signalling hypothesis assumes that dividends should lead corporate earnings the dividend smoothing hypothesis predicts that earnings should lead dividend payments.

Banks are often seen to be special. [Allen \(2001\)](#), for example, has argued that standard microeconomic theory does have some problems in trying to explain the role of financial institutions and has pointed towards some inconsistencies assuming that there is an agency problem investing directly in firms and no agency problem giving funds to a bank. Macroeconomists, on the other hand, tend to believe that banks are of special importance (e.g. [Himmelberg and Morgan, 1995](#)). The global financial crisis has given some support to this hypothesis as the problems in the banking industry have had major negative consequence for the world economy. This essential macroeconomic role is an important reason for banks being subject to special regulatory requirements. It is quite popular to argue that government regulation may also affect the payout policy of banks (e.g., [Rozeff, 1982](#); [Bessler and Nohel, 1996](#)). Obviously, one of the main goals of bank regulation is to protect the customers. However, it can be argued that bank regulation also reduces the agency costs borne by the shareholders of a firm by providing an external monitoring instance. According to this view dividend payments by banks and other regulated industries are even more puzzling than dividend payments by industrial firms. Similar problems also do arise in the insurance industry. In an attempt to explain dividend payments by insurance companies [Casey et al. \(2007\)](#) have argued that investors in the insurance sector prefer a high degree of leverage since regulation does protect not only customers but also investors against insolvency. This interesting hypothesis predicts that investors can use the dividend income from holding insurance stocks to obtain other financial assets and maintain a high level of relatively risk-free leverage with their portfolio of insurance stocks.

On the other hand, some financial economists argue that it is quite difficult for external economic agents to adequately evaluate the market value of a bank's assets. [Boldin and Leggett \(1995\)](#), for example, have noted that market values are not presented on a continuous basis to external economic agents. Therefore, investors, depositors and creditors cannot easily distinguish well-run from poorly managed banks. As a consequence, dividend signalling could even be more important for banks than for industrial firms. Again, similar arguments have also been made with regard to the insurance industry. [Akhigbe et al. \(1993\)](#), for example, have noted that it is very difficult for external economic agents to assess the true economic condition of any insurance company at a particular point of time. Most importantly, they have argued that accounting procedures frequently hide major changes in the market values of real estate holdings which, of course, are an important asset class for the insurance industry.

Higher dividend payouts also imply a smaller contribution to capital, weakening the financial strength and thereby the ability of a bank to take more risks. Therefore, in the banking industry an increase to dividend payments is not always seen as a positive signal by investors and financial analysts (e.g. [Boldin and Leggett, 1995](#)). Yet again, similar arguments have been discussed in the literature examining the dividend policy of insurance companies (e.g. [Harrington, 1981](#); [Akhigbe et al., 1993](#)).

### 3. Literature review

In economic theory it is very common to discuss dividend policy issues from the perspective of industrial firms. Therefore, empirical research has focussed mainly on this type of companies. In fact, there have been numerous studies reporting empirical evidence for industrial firms and it would certainly be beyond the scope of this paper to provide a survey of this literature. Moreover, this is also not necessary because there already are some excellent review articles (e.g. [Allen and Michaely, 1995](#); [Bhattacharyya, 2007](#)). However, it has to be noted that only few econometricians have focussed on the dividend policy of the banking industry. Given that dividend policy issues often are discussed from the viewpoint of Miller and Modigliani this is probably no major surprise. In this world analysing bank dividend policy means examining irrelevant firms doing irrelevant things. This is hardly a motivation for applied econometricians. [Rozeff \(1982\)](#), for example, has analysed the determinants of the dividend policy of U.S. firms and has omitted banks, insurance companies and other regulated industries from his empirical investigations restricting his analysis to unregulated industries.

Still, there have been some important studies mostly examining U.S. data. Back in the 1970s [Gupta and Walker \(1975\)](#) have shown that bank dividends are related to corporate profits, total asset growth and liquidity. [Mayne \(1980\)](#) has documented that the size of a bank does influence dividend policy examining data from more than 12,000 U.S. banks. Larger banks seem to pay higher dividends. This empirical finding is explained by the facts that the stocks of larger banks are more widely held and that these institutions have better access to external capital and therefore do depend less strongly on internally generated funds. Moreover the study shows that banks affiliated with holding companies tend to pay higher dividends than independent banks. [Boldin and Leggett \(1995\)](#) have found empirical evidence supporting the dividend signalling hypothesis examining data from 207

U.S. banks and employing cross sectional regression techniques. They have used credit ratings as a proxy for expected future earnings and have reported a statistically significant positive relationship between dividends and credit ratings. Collins et al. (1996) have analysed how dividend payout ratios have reacted to changes to insider holdings (which obviously affect agency costs) examining data from the U.S. financial services industry (38 banks and 15 insurance companies). They have argued that there are similarities to the behaviour of firms in unregulated industries. Banks and insurance companies tend to increase their dividend payout ratios when the level of insider holdings decreases. Bessler and Nohel (1996) have documented that banks experience statistically significant negative abnormal returns around the announcement date of dividend cuts or omissions. Financial markets also seem to react more strongly to dividend cuts of banks than to dividend cuts of non-financial firms. More recently, Dickens et al. (2003) have identified a number of possible relevant factors for the dividend policy of U.S. banks and have reported that there are five statistically significant determinants of dividends. According to their study the relevant factors are investment opportunities, size, agency problems, dividend history and risk. These findings have been confirmed by Theis and Dutta (2009). Only very few authors have shown an interest to study the dividend policy of European banks. Most importantly, Eriotis et al. (2007) have shown that the dividend policy of Greek banks differs from the dividend policy of Greek industrial firms in a statistically significant way. More precisely, bank managers in Greece seem to be less interested in paying a stable long run target dividend.

To sum up, the empirical findings reported in the relatively few studies of bank dividend policy do provide some insights but certainly no clear answers to the question why dividends are paid. In spite of far more research efforts this can also be said about results reported for industrial firms. Thus, there are some similarities. In fact, many financial economists seem to believe that an additional empirical evidence is needed (e.g. Allen and Michaely, 1995; Collins et al., 1996).

#### 4. Data and methodology

Bhattacharyya (2007) has noted that properly conducted future empirical research should account for all implications of the underlying economic theories of dividend policy. Most importantly, Basse (2009) has suggested that inflation may be relevant arguing that this important macroeconomic variable is a major driver of dividend growth which is usually neglected in empirical tests of theories of dividend determination. This fact could help to explain why the dividend policy issue is not resolved yet. As a matter of fact, a gradual increase of dividend payments due to higher inflation rates could, for example, be falsely identified as empirical evidence supporting the dividend smoothing hypothesis.

Therefore, this study tries to analyse the dividend policy of European banks by also considering inflation. In order to do so we use a variant of the VAR approach introduced by Goddard et al. (2006) who have examined the relationship between dividend payments and corporate earnings. This variant has been suggested by Reddemann et al. (2010) and employs VECM techniques in conjunction with impulse response analysis. The approach also considers inflation as a third endogenous variable of the model. The approach obviously requires us to take a more macroeconomic perspective examining aggregate data on earnings and dividends. Therefore, we analyse quarterly data on dividends per index share and earnings per index share of the Euro Stoxx Banking Index. These time series are supplied by Bloomberg. Inflation is measured by the EMU consumer price index reported by Eurostat. This is a very popular gauge of inflation in the Euro Zone. As a matter of fact, Fama and Schwert (1977) have noted that eventual consumption is the purpose of investing in financial assets and that therefore the consumer price index is the correct measure of inflation in the context of financial econometrics. In order to avoid possible problems with structural breaks due to the introduction of the Euro in January 1999 our sample is from 1998 Q4 to 2008 Q4.

To test for cointegration we use the procedure suggested by Johansen (1991). This multivariate cointegration test is based on VAR techniques. In Eq. (1)  $y$  is a vector of  $m$  possibly non-stationary variables,  $A_i$  is a  $m \times m$  Matrix (with  $i = 1, \dots, n$ ), and  $c_1$  and  $c_2$  are  $m$  vectors of constants respectively trend coefficients:

$$y_t = A_1 y_{t-1} + A_2 y_{t-2} + \dots + A_n y_{t-n} + c_1 + c_2 t + u_t. \quad (1)$$

The error term  $u_t$  is assumed to be normally distributed. Differentiating and rearranging yields:

$$\Delta y_t = (A_1 - I)y_{t-1} + A_2 y_{t-2} + \dots + A_n y_{t-n} + c_1 + c_2 t + u_t \quad (2)$$

$$\Delta y_t = (A_1 - I)\Delta y_{t-1} + (A_1 + A_2 - I)y_{t-2} + \dots + A_n y_{t-n} + c_1 + c_2 t + u_t \quad (3)$$

$$\begin{aligned} \Delta y_t &= \Pi_1 \Delta y_{t-1} + \Pi_2 y_{t-2} + \dots + \Pi y_{t-n} + c_1 + c_2 t + u_t \\ &= \sum_{i=1}^{n-1} \Pi_i \Delta y_{t-i} + \Pi y_{t-n} + c_1 + c_2 t + u_t \end{aligned} \quad (4)$$

where:  $\Pi_i = -(I - \sum_{h=1}^i A_h)$ ,  $\Pi = -(I - \sum_{i=1}^n A_i)$ .

The cointegration test is based on determining the rank of the so-called long run impact matrix  $\Pi$ . There exist  $k$  cointegration relationships among the variables when the rank of the matrix  $\Pi$  is  $k < m$ . The trace statistic tests the null hypothesis that there

are at most  $k$  cointegration relationships where  $\lambda_i$  are the  $m - k$  ordered eigenvalues from the reduced rank regression.  $T$  is the number of observations:

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

Cointegration describes an equilibrium relationship between non-stationary variables which share common stochastic trends. When cointegration relationships among the variables examined do exist this important information has to be used in the process of model building by estimating a vector error correction model (VECM). The dynamics of this model can then be analysed estimating impulse response functions.

The dividend signalling and dividend smoothing hypotheses quite clearly are the theoretical basis for the argument that banks should be extremely careful when using dividend cuts or omissions to strengthen their capital base. Therefore, it has to be tested whether dividend signalling or dividend smoothing are relevant economic phenomena. Following [Goddard et al. \(2006\)](#) and [Reddemann et al. \(2010\)](#) empirical evidence indicating that dividends lead corporate earnings would be supportive for the dividend signalling hypothesis while the finding that earnings lead dividends would give support to the dividend smoothing hypothesis.

## 5. Results

ADF- and KPSS-tests (not reported) indicate that the three time series examined in this study are non-stationary and integrated of order 1. The cointegration tests reported in [Table 1](#) signal that two cointegration relationships exist between the three variables general price level (EMU\_CPI), corporate earnings (Indx\_Eps\_Before\_XO) and dividend payouts (Dvd\_Sh\_Last). The critical values for the test are from [Doornik \(1998\)](#). Seasonal dummies were included in the testing for cointegration because the dividend time series shows strong seasonality. Different deterministic trend assumptions did not affect the results. Due to the limited amount of data points available we use 4 time lags estimating the model. Analysing the residuals of the VECM does indicate randomness; the Portmanteau test with 12 lags yields a p-value of 0.3418. Given the restrictions to data availability there may be problems with a small sample bias. As a matter of fact, [Hargreaves \(1994\)](#) has performed Monte Carlo experiments indicating some difficulties using the Johansen test with less than 100 data points. However, he has also argued that applied econometricians commonly work with sample sizes of about 50 observations.

Impulse response functions are generated using the Cholesky decomposition. Therefore the results may be sensitive to the ordering of the variables. In this study an economic theory quite clearly dictates the ordering of variables (general price level  $\rightarrow$  earnings  $\rightarrow$  dividends) because the general price level obviously is the most exogenous variable and dividends are paid from corporate earnings so that dividends should be seen as the least exogenous variable (with regard to variable-ordering induced problems of impulse-response analysis see, for example, [Basse and Reddemann, 2010](#)). According to [Hoover and Jordá \(2001\)](#) the VECM can now be considered to be a structural model. The confidence intervals (95% level) are computed using Efron bootstrap techniques (e. g. [Efron and Tibshirani, 1993](#)). Examining the impulse response functions displayed in [Fig. 1](#) does indicate quite clearly that there is no empirical evidence for dividend signalling or dividend smoothing because neither the response of dividends to a shock to corporate earnings nor the reaction of earnings to a shock to dividends is statistically significant.

Interestingly, there is a statistically significant positive reaction of the inflation variable to a shock to dividend payouts. This empirical finding obviously does not imply that dividends “cause” inflation in a philosophical sense. The impulse response function only indicates a Granger causality; firms seem to anticipate future inflation rates and tend to adjust their dividend policy to expected changes to the general price level. This result quite clearly shows that inflation can be an important variable testing the theories of dividend determination.

## 6. Conclusion

In examining the dividend policy of the European banking industry there is no empirical evidence indicating that dividend signalling and/or dividend smoothing are relevant economic phenomena using the approach suggested by [Reddemann et al.](#)

**Table 1**  
Johansen cointegration test results.

Johansen trace test					
Range: 1998Q4–2008Q4					
4 time lags, seasonal dummies					
R0	Trace stat.	90%	95%	99%	p-values
0	47.94	32.25	35.07	40.78	0.0010
1	23.92	17.98	29.16	24.69	0.0134
2	6.19	7.60	9.14	12.53	0.1828

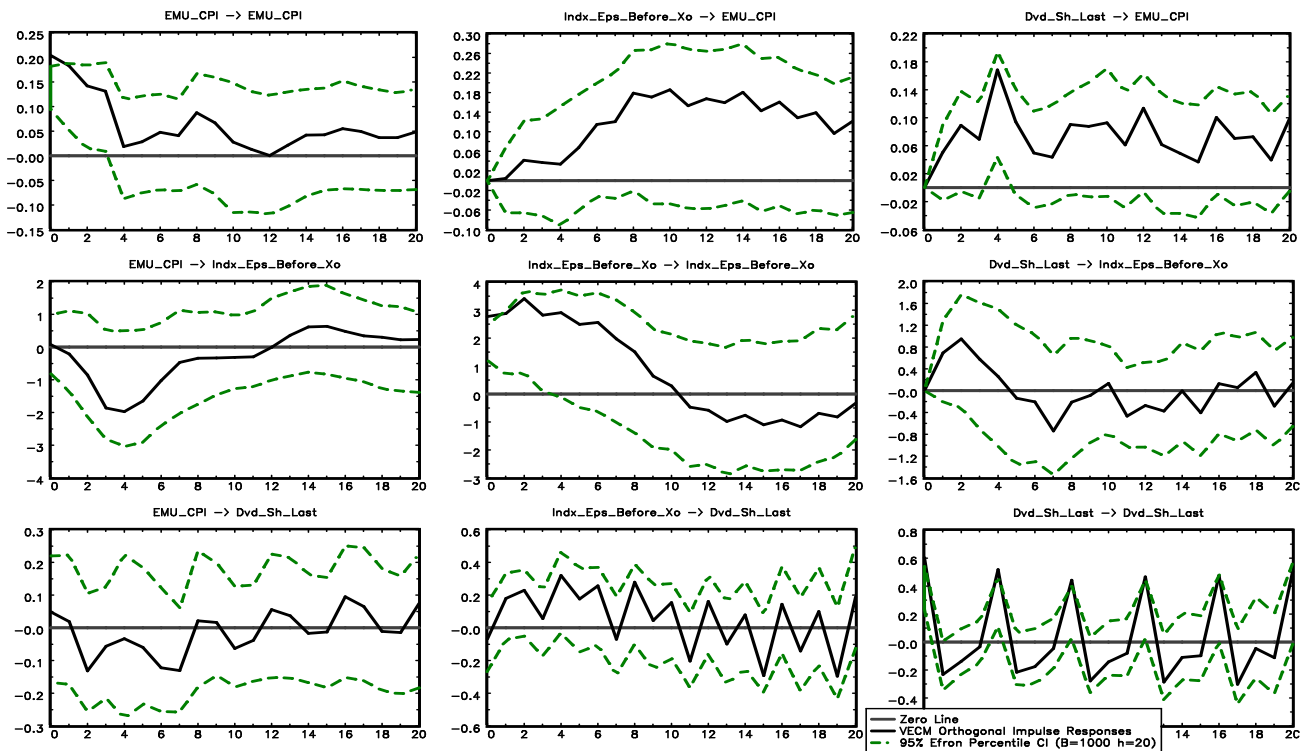


Fig. 1. Impulse response functions (OLS).

(2010). Therefore, facing a severe financial crisis, European banks should definitely consider cutting or omitting dividends to improve their financial strength. The fears of major negative consequences due to investors and financial analysts assuming that dividend reductions are a reliable sign for future problems are not supported by the data sets analysed here.

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## **MODULE 3**

### **On the Impact of the Financial Crisis on the Dividend Policy of the European Insurance Industry**

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## On the Impact of the Financial Crisis on the Dividend Policy of the European Insurance Industry

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The financial crisis has led to controversial discussions about the capital base of the European insurance industry. Dividend cuts have been suggested to preserve capital. However, some observers seem to fear that investors could interpret a reduction of dividends as a sign of future problems. The empirical evidence reported here does not indicate that dividend smoothing or dividend signalling are relevant economic phenomena examining the dividend policy of the European insurance industry. Therefore, insurance companies should not be too concerned about the negative consequences of dividend cuts. *The Geneva Papers* (2010) 35, 53–62. doi:10.1057/gpp.2009.37

**Keywords:** capital base; dividend policy; smoothing; signalling; financial crisis

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### Introduction

The subprime mortgage crisis and its negative effects on capital markets and global economic growth have shattered the financial sector as a whole. Obviously, banks have had to bear the brunt of the crisis. Nevertheless, stock prices of many insurers also have at least temporarily plummeted. In this difficult situation a number of European insurance companies have debated on either capital increases or dividend cuts in order to preserve capital anticipating further write downs or even to comply with minimum capital requirements demanded by regulation. Improving their capitalization and financial strength may be necessary to stabilize the credit ratings of some insurers, avoiding possible downgrades by the rating agencies. Additional pressure may be imposed by the regulators, as there are discussions to react to the crisis by increasing capital requirements not only for banks. Bullard, Neely and Wheelock, for example, recently discussed several proposals of new government regulations laying a special focus on the American International Group (AIG).<sup>1</sup> Even prior to its full implementation Solvency II may already stimulate the demand for additional capital in the European insurance industry.<sup>2</sup> However, raising capital from

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<sup>1</sup> Bullard *et al.* (2009).

<sup>2</sup> Basse and Friedrich (2008).

external sources may be difficult for insurers. This is also a direct consequence of the crisis as numerous international banks already have issued new equity leading to a shortage of additional capital for financial institutions. Meanwhile stock prices have at least partly recovered. The German Prime Insurance Performance Index, for example, has risen more than 70 per cent from its lowest in 2009. Nevertheless, raising capital could still prove to be expensive for insurance companies in the near future.

Therefore, a dividend cut is the option to strengthen the capital base of the European insurance industry this paper deals with. It is assumed to be an appropriate response to liquidity problems and thus a valid tool in the environment of a financial crisis. As a matter of fact, the level of dividends paid by insurers has dropped by nearly 60 per cent in Europe, in the wake of a trend turning out to be the largest cuts since 1938 throughout all economic sectors according to Standard & Poor's.<sup>3</sup> But dividend cuts could be perceived as a negative signal indicating future problems to investors. Given these discussions, this paper plans to empirically analyse the dividend policy issue from the perspective of the European insurance industry, evaluating if dividend cuts may be conducted. The impact of dividend policy on the company's future earnings is evaluated by seeking for dividend smoothing respectively signalling via two econometric approaches while including inflation. If no evidence supporting one of those hypotheses can be found insurers may cut their dividends to strengthen their capital base without necessarily sending a negative signal.

### **Dividend policy issues and the insurance sector**

In their seminal paper Miller and Modigliani have argued that a firm's dividend policy is irrelevant under certain assumptions.<sup>4</sup> Most importantly, capital markets are assumed to be perfect and no taxes exist. Under these conditions and with a given investment policy of the firm, higher dividends result in lower capital gains. Therefore, dividend policy has no economic relevance when investors do not prefer dividends to capital gains or vice versa. Accepting this point of view, there is a dividend puzzle because it can be observed that numerous firms in many countries regularly do pay dividends. Trying to solve this dividend puzzle is an important task of financial economics.

Many explanations for the existences of dividend payments are based on agency theory. It is, for example, quite common to argue that dividends reduce free cash flow and thereby force the firms to obtain capital from external sources more frequently when trying to finance new investment projects. This mechanism provides additional external monitoring and thus reduces agency costs. Rozeff has empirically tested explanations of dividend payments based on agency theory examining U.S. data, but has neglected regulated industries (e. g. insurers and banks) in his analysis, arguing that the financing policies of regulated firms may be affected by their special status.<sup>5</sup> More recently Casey, Smith and Puleo have tested an extend version of Rozeff's model

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<sup>3</sup> Mackenzie and Oakley (2009).

<sup>4</sup> Miller and Modigliani (1961).

<sup>5</sup> Rozeff (1982).

concluding that insurers do not have to employ strong external monitoring by paying high dividends, as this function is executed by the regulators.<sup>6</sup> Thus Rozeff's explanation of dividend payments is neglected in this paper as dividend cuts are discussed as a measure to improve financial stability in troubled times. Many observers do argue that capital is scarce following a major financial crisis that is sometimes even compared to the Great Depression. In fact, as a result of numerous international banks issuing new equity there is a shortage of additional capital for financial institutions rendering the agency theory useless, as the monitoring function cannot be upheld due to market constraints. Therefore, other explanations of dividend policy have to be examined.

Economic theory does suggest that the management of a firm may use dividend changes to overcome information asymmetries by signalling revisions to earnings expectations to current and prospective investors. This is the so-called signalling hypothesis of dividend policy. To avoid investors misinterpreting the management's actions, it may be reluctant to cut dividend payments. Accepting this point of view has a number of consequences for the process of dividend signalling. Most importantly, according to this view dividends should only be increased when management believes that future cash flows are sufficiently strong and enable the firm to sustain the new higher level of dividend payouts. Consequently this second theory, called the dividend smoothing hypothesis, which may be seen as precautionary signalling, does also assume that a strong link between dividend payments and corporate earnings exists. However, Goddard, McMillan and Wilson have argued convincingly that the signalling and smoothing hypotheses make opposite predictions about the temporal relationship between dividends and corporate earnings.<sup>7</sup> While the signalling hypothesis predicts that dividends lead earnings, the smoothing hypothesis suggests that earnings lead dividend payments. In econometrics and more generally in empirical research the question of causality is ambiguous. Here two approaches to this question are followed, namely the concept of Granger causality and the even stronger one of impulse-response analysis. The procedures are further explained in the next section.

Dividend policy is usually discussed from the perspective of industrial firms. An extensive survey of this literature has been presented by Allen and Michaely.<sup>8</sup> However, only few researchers have focused on dividend policy issues with respect to insurance companies. Meanwhile, research with this special focus seems to become increasingly popular. Recently, He and Liang, for example, have modelled the optimal financing and dividend payout strategy of insurance companies assuming that the management of the firm can control dividend policy, equity issuance and the reinsurance rate.<sup>9</sup>

Insurers are often regarded as special because industrialized economies do very much depend on the financial soundness of the insurance sector. Therefore, the insurance industry in Europe and other parts of the world is subject to very tight

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<sup>6</sup> Casey *et al.* (2009).

<sup>7</sup> Goddard *et al.* (2006).

<sup>8</sup> Allen and Michaely (1995).

<sup>9</sup> He and Liang (2009).

government regulation. Obviously, the primary goal of insurance regulation is to guarantee the solvency of insurance companies. As stated previously, Casey, Smith and Puleo have shown that agency costs are not a major factor in strongly regulated markets.<sup>10</sup> So why do insurance companies pay dividends at all? In a second study, Casey, Smith and Puleo have argued that investors probably prefer a high degree of leverage in the insurance sector (while complying with regulation) since not just customers but also investors are protected against insolvency by regulators.<sup>11</sup> According to this hypothesis, investors can use dividend income from insurers to obtain other financial assets and maintain a high level of relatively risk-free leverage, holding a more or less constant amount of funds invested in their portfolio of insurance stocks.

Examining the U.S. property and liability insurance industry by explaining the monthly returns of 34 insurance stocks by the Capital Asset Pricing Model (CAPM) beta and their dividend payouts, Lee and Forbes have documented some empirical evidence indicating that dividend policy does have effects on stock prices of insurance companies.<sup>12</sup> Akhigbe, Borde and Madura have further refined these findings using cross-sectional event studies to compare the stock price response to dividend increases.<sup>13</sup> They find that dividend changes of insurance companies are perceived differently to industrial firms with the special case of life insurers conveying less asymmetric information than those of other insurers as the stock price response to dividend changes was less. This means investors could be interested in non-public information about future cash flows. As a consequence, dividend signalling may have a special importance in the non-life insurance industry. Therefore, investors may have mixed feelings about dividend increases of life insurers because a higher volume of dividend payments reflects a smaller contribution to capital. This kind of reasoning does have some tradition. In his study of the dividend policy of U.S. life insurers Harrington has already argued that high dividend payouts can weaken the financial soundness of insurance companies.<sup>14</sup> Moreover, Akhigbe, Borde and Madura have also noted that the regulation of life insurers could force more public disclosure of information than is available from industrial firms reducing the need for dividend signalling.<sup>15</sup> This argument becomes even more striking within the Solvency II framework and its tightened disclosure requirements for insurance companies.

## Data and methodology

After reviewing the recent empirical evidence on dividend policy, Bhattacharyya has argued that properly conducted empirical research should account for all implications

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<sup>10</sup> Casey *et al.* (2009).

<sup>11</sup> Casey *et al.* (2007).

<sup>12</sup> Lee and Forbes (1980).

<sup>13</sup> Akhigbe *et al.* (1993).

<sup>14</sup> Harrington (1981).

<sup>15</sup> Akhigbe *et al.* (1993).

of the respective underlying economic theories.<sup>16</sup> Given that there are numerous factors affecting a firm's dividend policy, this is difficult to achieve. Basse, for example, has recently noted that inflation may have an effect on dividend payments analysing the dividend policy of Australian firms.<sup>17</sup> However, inflation is generally neglected in empirical work examining dividend policy issues – though Modigliani has noted that the earnings-payout ratio is increased by inflation while stock prices might not change due to different leverage of those effects.<sup>18</sup> Therefore, this article also focuses on the aspect of inflation studying the dividend policy of the European insurance industry.

As a consequence, this study takes a more macroeconomic perspective, analysing the dividend policy of German and European (or—to be more precise—the European Monetary Union (EMU)) insurance companies by examining quarterly data on earnings and dividends reported for the insurance sector indices of the Deutsche Börse Prime All Share Index and the Dow Jones Euro Stoxx stock market indices while also considering inflation. More specifically, the dividend per index share and earnings per index share data provided by Bloomberg are used. Inflation is measured by the GDP price deflator of the respective economic area. Obviously analyses on the more aggregate level of indices have their shortcomings, but the data for individual insurers are heterogeneous and often incomplete. Thus these two indices are adequate proxies for the dividend and earnings levels throughout the insurance sector. Trying to avoid possible problems due to the introduction of the Euro, the sample analysed contains 1999 Q1 to 2008 Q4.

To identify the conjectured causalities between earnings and dividends, two different concepts are used. First of all it is tested for Granger causality, meaning the knowledge of one of the variables is significantly improving the forecast of the other. After that impulse-response techniques in the Vector-Error-Correction Model (VECM) environment are applied to analyse the interdependencies among the three variables, searching for signs of dividend signalling or dividend smoothing. This is accomplished by performing an impulse-response analysis, observing two time series after shocking the third, deducing the causal structure between these three time series. Finding no empirical evidence supporting one of these two theories of dividend determination would imply that insurers have until now not been forced to maintain a somehow stable lead-lag relationship between dividends and earnings. This result would indicate that insurance companies may cut dividends to improve their financial soundness without necessarily having to fear major negative consequences. On the other hand, empirical evidence indicating that dividend signalling or dividend smoothing have been relevant economic phenomena would imply that cutting dividends actually has negative consequences.

## Results

As proposed standard Granger causality tests are performed for the two described differentiated datasets (these are non-stationary time series as indicated by not reported Augmented Dickey–Fuller (ADF) tests), yielding the following results (Tables 1 and 2).

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<sup>16</sup> Bhattacharyya (2007).

<sup>17</sup> Basse (2009).

<sup>18</sup> Modigliani (1982).

**Table 1** Granger causality: Germany

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Test for granger-causality:		
H <sub>0</sub> : Earnings do not Granger-cause dividends		
Test statistic:	$l = 0.8963$	$pval-F(1; 10, 33) = 0.4946$
H <sub>0</sub> : Dividends do not Granger-cause earnings		
Test statistic:	$l = 0.9872$	$pval-F(1; 10, 33) = 0.4399$

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**Table 2** Granger causality: Europe

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Test for granger-causality:		
H <sub>0</sub> : Earnings do not Granger-cause dividends		
Test statistic:	$l = 2.9429$	$pval-F(1; 10, 36) = 0.0236$
H <sub>0</sub> : Dividends do not Granger-cause earnings		
Test statistic:	$l = 0.9838$	$pval-F(1; 10, 36) = 0.4396$

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These results mean the Null-hypothesis of no Granger causality cannot be omitted for Germany in both directions and from Dividends to Earnings in the EMU. Only the hypothesis of Earnings not Granger-causing Dividends has to be dropped, giving a hint at the validity of dividend smoothing, at least on the level of the EMU insurance industry. These first results will now be tested using the more sophisticated framework of impulse-response analysis of a VECM. This model class includes long-term equilibria between variables in a standard VAR by adding this link in the regression equation to be estimated. Thus this technique considers interdependencies not accounted for in standard multi time-series models. Some preliminary standard tests have to be conducted to fix the parameters and to validate the applicability of this model class.

As mentioned, ADF tests suggested all six time series examined are non-stationary and integrated of order one as needed by a VECM. Furthermore, testing for cointegration is required. The test of Johansen<sup>19</sup> is applied in this case yielding the following results for Germany (Table 3), using the critical values for breakpoint scenarios from Johansen, Mosconi and Nielsen.<sup>20</sup>

Seasonal dummies are included to account for the strong seasonal patterns induced by the dividends. Furthermore, a breakpoint in the test is included in 2001 Q4, as a massive shift in earnings due to the events surrounding the terrorist attacks on 9-11 is observed. The questions surrounding terror insurance are dealt with in great depth in a paper by Thomann and Schulenburg.<sup>21</sup> The dividend cuts in that period were not as serious as the ones occurring right now, due to the nature of the incident being different from the inherent problems the financial sector has to deal with in the current crisis. Thus both periods (pre 9-11 and post 9-11) have to be analysed separately.

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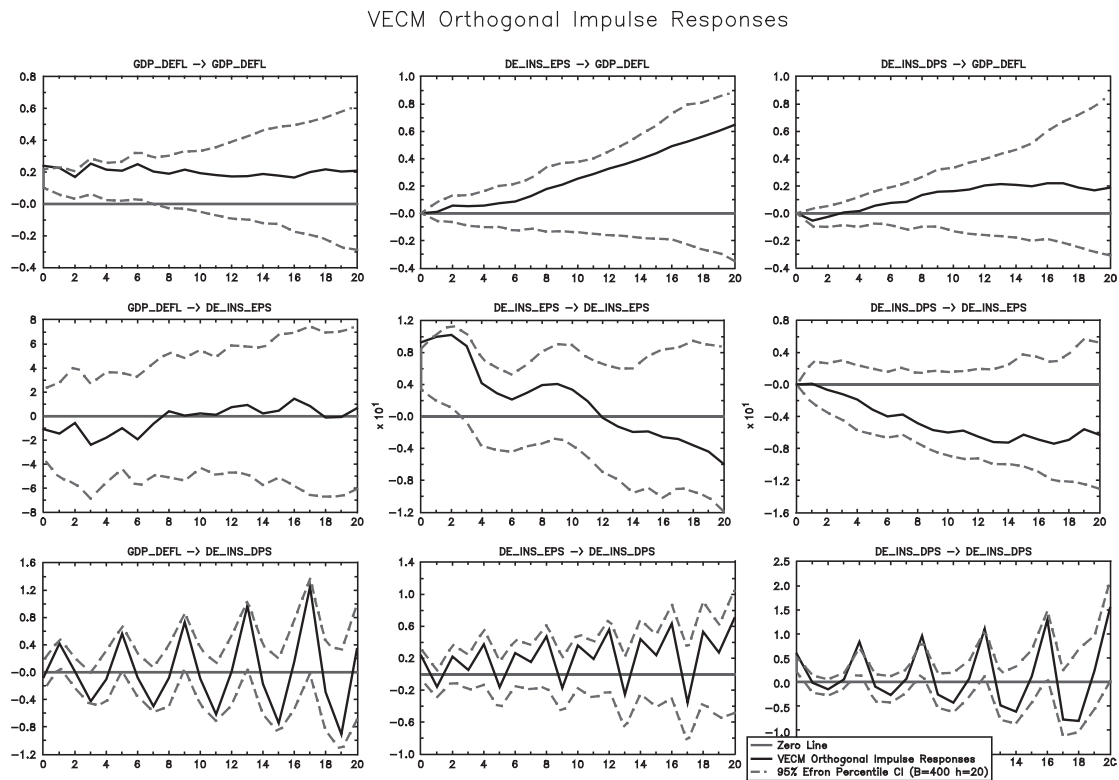
<sup>19</sup> Johansen (1991).

<sup>20</sup> Johansen *et al.* (2000).

<sup>21</sup> Thomann and von der Schulenburg (2007).

**Table 3** Cointegration between earnings, dividends and inflation in Germany

<i>Trace test (seasonal dummies included)</i>					
<i>Hypothesized no. of CE(s)</i>	<i>LR</i>	<i>Pval</i>	<i>90%</i>	<i>95%</i>	<i>99%</i>
0	67.48	0.0000	38.91	41.69	47.25
1	32.20	0.0039	22.83	25.09	29.73
2	7.89	0.2572	10.66	12.50	16.46



**Figure 1.** Impulse-response analysis: Germany.

The cointegration test provides evidence for the existence of two cointegration relationships, meaning the VAR should be augmented by a linear combination of the original variables. While estimating this VECM with the three variables inflation (DE\_GDP\_DEFL), earnings (DE\_INS\_EPS) and dividends (DE\_INS\_DPS) the rank of cointegration is therefore assumed to be two. Seasonal dummies were included and time lags of up to one year (four quarters) are considered in the process. The resulting impulse-response functions with bootstrapped confidence intervals (400 replications) are displayed below (Figure 1).

Using the Cholesky decomposition to orthogonalize the impulses as suggested by Sims, the ordering of variables follows economic theory.<sup>22</sup> We assume that inflation is the most exogenous variable and that dividends are paid from earnings. The graphs

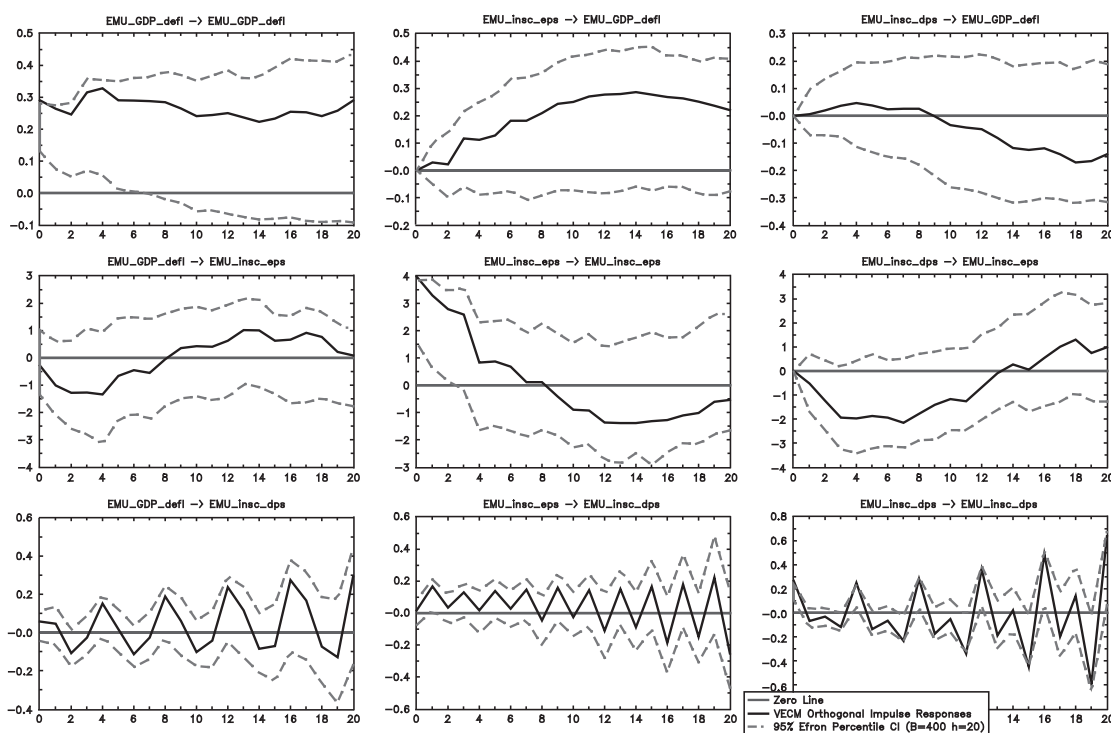
<sup>22</sup> Sims (1980).



**Table 4** Cointegration between earnings, dividends and inflation in Europe

<i>Trace test (seasonal dummies included)</i>					
<i>Hypothesized no. of CE(s)</i>	<i>LR</i>	<i>Pval</i>	<i>90%</i>	<i>95%</i>	<i>99%</i>
0	63.02	0.0000	38.84	41.55	46.97
1	25.76	0.0397	22.83	25.06	29.60
2	7.17	0.3297	10.74	12.57	16.52

VECM Orthogonal Impulse Responses



**Figure 2.** Impulse-response analysis: Europe.

clearly show no significance of dividends to earnings or vice versa, as the confidence intervals do always contain the time-axis, meaning the response is not significantly different from zero. Therefore, following Goddard, McMillan and Wilson no evidence that dividend signalling or dividend smoothing are relevant phenomena could be found.<sup>23</sup>

Now the same techniques are applied to the set of data for the European insurers examining the variables inflation (EMU\_GDP\_DEFL), earnings (EMU\_INS\_EPS) and dividends (EMU\_INS\_DPS). The estimation used four lags (one year) and the breakpoint at 2001 Q4 again. Seasonal dummies were included as well. The results of the cointegration test are presented in Table 4. The respective impulse-response functions are displayed in Figure 2. Again dividends do not react significantly to

<sup>23</sup> Goddard *et al.* (2006).

shocks in earnings and vice versa even though the confidence intervals in the Earnings on Dividends graph scrape the zero.

These results do not support the conjecture of causality between earnings and dividends and the result found in the Granger-causality test could not be backed up by the impulse-response analysis. One explanation for the differing outcomes of the analyses is the inability of standard Granger-causality tests to account for the complex relationship among the three variables, which is explicitly used in the impulse-response analysis. Especially the interdependence with inflation is neglected in the standard tests.

## Conclusion

Dividend cuts are one way to improve the capitalization and financial strength of the European insurance industry. This article examines the dividend policy of European and specifically German insurers using VECM techniques. The basic argument is that without any empirical evidence dividends actually did matter in the past, insurers may reduce or even omit dividend payments if needed. The results of the empirical investigations are quite clear. No convincing evidence was found indicating that dividend smoothing or dividend signalling are relevant economic phenomena examining the dividend policy of the European insurance industry. This result does have major implications. Most importantly, facing a severe financial crisis, European insurance companies cutting dividends and thereby improving their financial strength and complying with regulatory standards do not necessarily have to fear major negative consequences due to investors assuming this measure to be an indubitable sign for future problems.

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## **MODULE 4**

### **Dividend Policy Issues in the Financial Crisis - The Example of the German Automotive Industry**

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## **Dividend policy issues in the financial crisis: the example of the German automotive industry**

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**Abstract:** The global financial crisis has created some problems for car manufacturers and their suppliers. Dividend cuts and omissions have been suggested as one possibility to improve the financial strength of firms in the automotive industry. However, some observers have expressed fears that investors could interpret a reduction of dividends as a sign for future problems. This argument is quite clearly based on the dividend signalling and dividend smoothing hypotheses. Therefore, we use VAR/VECM techniques to analyse the dividend policy of the German automotive industry. The empirical evidence reported in this study does indicate that there is no support for the dividend signalling hypothesis. However, dividend smoothing seems to be a relevant economic phenomenon. As a consequence, firms in this sector of the German economy considering dividend cuts or omissions should at least communicate clearly why they plan to do so.

**Keywords:** dividend policy; automotive industry; dividend signalling; dividend smoothing; economic crisis; cointegration; Germany.

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## 1 Introduction

The global financial crisis has had massive negative effects on the world economy. As a consequence real economic growth rates in the USA, Europe and other parts of the world fell into negative territory. Some sectors were hit especially strong. In fact, banks, insurers and the automotive industry seem to have suffered most. Governments in many countries decided to help companies in these sectors by designing specific rescue packages. Besides of bailouts of banks and insurance companies the US Government, for example, also approved a USD 3 billion scrappage programme intended to give incentives to purchase more cars. Similar measures to help stabilise the demand for cars were also implemented in Germany and other European countries. The German Government initiated a scrappage scheme for cars being older than nine years. The programme started in February 2009 and was at first limited to a maximum of 600, 000 cars and a total amount of EUR 1.5 billion. The unexpected success of the programme prompted the government to increase the budget to EUR 5.0 billion. Given a bonus of EUR 2.500 per car 2 million buyers benefited from the scheme until it was depleted in September 2009. Besides the German scrappage programme, which was one of the first

in Europe in the context of the financial crisis, schemes with at most lower bonuses were initiated in several European countries (e.g., France, Italy and Spain).

Especially the bank rescue plans in the USA and other countries have provoked sceptical comments. The US popular press, for example, has harshly criticised that banks used 'taxpayer funds' to pay dividends. Therefore, it has become increasingly difficult for the corporate sector to obtain additional help from governments in the USA and other parts of the world. In fact, the German Government recently turned down Opel's request for loan guarantees. As a consequence, firms were forced to search for new ways to handle the financial crisis. Obviously, cutting or omitting dividends is one way for companies to save cash and to improve their financial position in a difficult economic environment. Reductions to dividend payments have been particularly common in the financial services industry. However, the recession also put dividend cuts on the agenda of firms in other sectors of the global economy. Before this crisis the German car manufacturers Daimler and Volkswagen, for example, were well known as reliable dividend payers in the last decade. Even when facing economic bad times – as in the early 1990s – VW continued to distribute a (reduced) dividend. Unlike Daimler Volkswagen decided to pay a dividend of EUR 1.60 in 2010 (for the fiscal year 2009) after paying a dividend per ordinary share of EUR 1.93 in 2009. The management of Daimler declared in 2010 to omit its dividend for the fiscal year 2009 due to the disappointing business development in consequence of the financial crisis. In 2009 Daimler distributed a dividend of EUR 0.60 per share. Both companies have paid a dividend in 2011.

While numerous firms have decided to cut or omit dividends as a reaction to the crisis some market participants have warned that investors may have mixed feelings about dividend reductions. As will be discussed later on these fears are based on very popular theoretical concepts – namely the dividend signalling and dividend smoothing hypotheses – which predict that dividend changes provide information about the future development of corporate earnings. In fact, investors may interpret dividend cuts or omissions by a firm as a sign for more problems to come. This study tries to empirically test whether there is support for these hypotheses examining data from the automotive industry in Germany. Without clear empirical evidence pointing in this direction car manufacturers and their suppliers could decide to reduce dividend payments without having to fear major negative consequences due to investors interpreting this measure as an obvious sign for further difficulties. The paper is organised as follows: Section 2, reviews the relevant literature. Then the third section discusses some methodological issues and describes the datasets examined. The empirical evidence is presented and evaluated in Section 4. The final section concludes.

## **2 Literature review**

Miller and Modigliani (1961) have shown that in a perfect market the dividend policy of a firm is irrelevant. In this environment higher dividends simply result in lower capital gains. As a consequence, the dividend policy of a firm is seen to be of no economic relevance when investors do not prefer dividends to capital gains or vice versa. However, it can be observed that numerous firms in many countries regularly do pay dividends. This is puzzling from the perspective of economic theory (e.g., Black, 1976; Mann, 1989). Moreover, dividend income is taxed more heavily than capital gains in a number

of countries (e.g., Easterbrook, 1984; Abrutyn and Turner, 1990). Thus, there even are clear arguments against dividend payments. Trying to solve this puzzle it has been suggested that the management of a firm can use dividend changes to overcome information asymmetries by signalling revisions to earnings expectations to investors. This dividend signalling hypothesis is a very popular explanation for the existence of dividend payments (e.g., Asquith and Mullins, 1986; Denis et al., 1994). It is also quite common to argue that firms try to avoid dividend cuts – which are presumed to give information perceived to be negative by external economic agents (e.g., Jensen and Johnson, 1995; Chen and Wu, 1999). This so-called dividend smoothing hypothesis is of special importance for our paper. The basic idea of this theory is that a firm should only increase dividends when the management believes that future cash flows enable the firm to maintain the higher level of dividend payouts. Therefore, firms are assumed to more frequently increase than lower dividend payments. Moreover, this theory also predicts that dividend cuts are more pronounced than dividend increases. There is some empirical evidence supporting these predictions (e.g., Healy and Palepu, 1988; Michaely et al., 1995). At this point, numerous relevant studies could be discussed. Yoon and Starks (1995), for example, have shown that financial analysts respond to dividend cuts by making statistically significant changes to their future earnings forecasts – however, according to this paper the reaction of earnings forecasts to dividend increases is not statistically significant. Bharati et al. (1998) have also documented a strong link between dividend changes and earnings forecasts and have found weak empirical evidence for dividend smoothing. The most important motivation for dividend smoothing seems to be that managers fear an asymmetric reaction of stock prices to dividend cuts with investors reacting more strongly to dividend decreases than to dividend increases. An excessively negative effect of dividend cuts on stock prices would, for example, imply that obtaining additional capital by issuing new equity would become more costly for a firm. However, the empirical evidence reported by Ackert and Smith (1993) seems to show that in the USA stock prices are more strongly linked to a less narrowly defined time series measuring corporate payouts than to the observed dividend time series. Therefore, the negative effects of dividend reductions on stock prices probably should not be overestimated.

Both theories assume that there is a strong link between dividend payments and corporate earnings. In fact, it has been argued that dividend smoothing can be seen as dividend signalling with precaution (e.g., Basse et al., 2010; Reddemann et al., 2010). However, it has been argued convincingly by Goddard et al. (2006) that the signalling and smoothing hypotheses make opposite predictions about the temporal relationship between dividends and earnings. While the signalling hypothesis suggests that dividends lead corporate earnings the smoothing hypothesis predicts that earnings should lead dividend payments.

Excellent surveys of the relevant literature have been published by Allen and Michaely (1995) as well as Bhattacharyya (2007). Both papers have also elaborately discussed empirical tests of different theories of dividend determination and have clearly documented that the empirical evidence reported in numerous studies does not give a clear picture. In fact, this is probably the only consensus researchers examining dividend policy issues have reached (e.g., Collins et al., 1996; DeAngelo et al., 2000). Recently, Basse (2009) has suggested that inflation may be of relevance because this macroeconomic variable is an important driver of dividend growth that is usually



neglected trying to explain why firms pay dividends. This may be one factor that can help to explain why there is no unquestionable empirical evidence supporting specific theories of dividend determination. A gradual increase of dividend payments due to higher inflation rates could, for instance, be falsely interpreted as support for the dividend smoothing hypothesis.

### 3 Methodology and data

We try to analyse the dividend policy of the German automotive industry testing for dividend signalling and dividend smoothing. As a matter of fact, our study tries to add some insights by focussing on one specific sector – an approach that has become quite popular in recent times (e.g., Akhigbe et al., 1993; Bessler and Nohel, 1996). The basic idea of this paper is that car manufacturers and their suppliers should not necessarily fear dividend cuts or dividend omissions when there is no clear empirical evidence indicating that dividends did matter in the past – which, of course, means that there are no signs for dividend signalling or dividend smoothing. Following Goddard et al. (2006) empirical evidence indicating that dividends Granger cause corporate earnings would be supportive for the dividend signalling hypothesis while the finding that earnings Granger cause dividends would underline the relevance of the dividend smoothing hypothesis. Reddemann et al. (2010) have suggested an improved testing procedure by including the additional variable inflation because Basse (2009) has shown that the negligence of this major driver of dividend growth could bias the findings of tests of theories of dividend determination.

In order to analyse the relationships between the variables examined here we use the econometric technique of vector autoregressions (VAR). The time series used are possibly non-stationary and could be cointegrated. Finding cointegration would imply the existence of a strong long-term equilibrium relationship (e.g., Engle and Granger, 1987; Murray, 1994). In equation (1)  $y$  is a vector of  $m$  possibly non-stationary variables and  $A_i$  is a  $m \times m$  matrix (with  $i = 1, \dots, n$ ):

$$y_t = A_1 y_{t-1} + A_2 y_{t-2} + \dots + A_n y_{t-n} + u_t. \quad (1)$$

The error term  $u_t$  is assumed to be a random variable. Rearranging equation (1) yields:

$$\Delta y_t = (A_1 - I) y_{t-1} + A_2 y_{t-2} + \dots + A_n y_{t-n} + u_t, \quad (2)$$

$$\Delta y_t = (A_1 - I) \Delta y_{t-1} + (A_1 + A_2 - I) y_{t-2} + \dots + A_n y_{t-n} + u_t, \quad (3)$$

$$\Delta y_t = \Pi_1 \Delta y_{t-1} + \Pi_2 \Delta y_{t-2} + \dots + \Pi_n y_{t-n} + u_t = \sum_{i=1}^{n-1} \Pi_i \Delta y_{t-i} + \Pi_n y_{t-n} + u_t, \quad (4)$$

where

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

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

Johansen (1991) has suggested a cointegration test which is based on the determination of the rank of the so-called long run impact matrix  $\Pi$ . The trace statistic tests the null hypothesis that there are at most  $k$  cointegration relationships:

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

In equation (5)  $T$  is the number of observations and  $\lambda_i$  are the  $m - k$  ordered eigenvalues from the reduced rank regression. The test is performed using the critical values suggested by Doornik (1998).

There are three possibilities. The system is stationary when the rank of the matrix  $\Pi$  is  $m$ . The correct modelling strategy in this case is to estimate a VAR in levels. A second possibility is that the system is non-stationary but there are no cointegration relationships among the variables analysed. In this case the rank of the matrix  $\Pi$  is 0 and a VAR in first differences has to be estimated. There is also a third possible result – namely that the rank of the matrix  $\Pi$  is  $k < m$ . Then there exist  $k$  cointegration relationships among the variables examined. This result would indicate that there are long run equilibrium relationships between the time series which have to be considered. In this case the estimation of a vector error correction model (VECM) is the correct empirical research strategy.

After having estimated a VAR/VECM the dynamics of this model have to be analysed. This can be done by using impulse response analysis. As already noted, the dividend signalling and dividend smoothing hypotheses are the theoretical basis for the argument that a firm should be very careful when considering dividend cuts or omissions. Thus, it has to be tested whether there is empirical evidence indicating that dividend signalling or dividend smoothing are of relevance. In Goddard et al. (2006) have argued that the finding that dividends lead corporate earnings would be supportive for the dividend signalling hypothesis while hints that earnings lead dividends would give support to the dividend smoothing hypothesis. In this paper we estimate two models. Following Goddard et al. (2006) we estimate a two variable model examining dividends and corporate profits. Moreover, we also use a variant of this test which has been suggested by Reddemann et al. (2010). In this case we include inflation as third variable.

Therefore, analysing the dividend policy of the German automotive industry we take a more macroeconomic perspective examining aggregate data on corporate earnings and dividends as well as the general level of prices. Consequently, we focus on the dividends per index share and the earnings per index share of the Prime Automobile Index. This index is a gauge for the performance of the automobile sector in the broad German Prime All Share Index. It combines the major German car manufacturers VW, Daimler and BMW with their most important suppliers (e.g., Continental and Leoni). Inflation is measured by the German GDP price deflator. This is a broad gauge of the purchasing power of money.

We examine quarterly data. Trying to prevent problems with structural change, which are known to cause massive problems using cointegration tests (e.g., Gregory and

Hansen, 1996) we have shortened our data sample analysing the period 1999 to 2009. Thereby, we hope to avoid possible structural breaks due to the introduction of the Euro in January 1999. Moreover, selecting this sample also helps to eliminate problems with structural change caused by the merger of Daimler-Benz and Chrysler in 1998. However, the decision to shorten the sample comes at a price. In fact, Hargreaves (1994) has shown that there may be some difficulties using the Johansen test with less than 100 data points. However, he has also argued that it is quite common for applied econometricians to work with sample sizes of 50 or fewer observations. Moreover, Cheung and Lai (1993) have not examined sample sizes below 33 data points studying the finite sample bias of the Johansen procedure because of problems with limited degrees of freedom. Thus, based on these studies we believe that the avoidance of possible structural breaks due to introduction of the Euro and the merger of Daimler-Benz and Chrysler is the correct empirical research strategy even though this decision results in a sample with just enough data points to use the Johansen procedure.

#### 4 Empirical analysis

ADF-tests (not reported) indicate that the three time series examined in this study are non-stationary variables that seem to be integrated of order 1. The results of the cointegration tests reported in Tables 1 and 2 signal that dividends payouts and corporate earnings are cointegrated and that two cointegration relationships exist when the third variable general price level is added. In both cases we have also included seasonal dummies because of the strong seasonality of the dividend payments. The critical values for the tests have been tabulated by Doornik (1998).

**Table 1** Cointegration analysis: the two variable model

<i>Johansen trace test</i>					
<i>R0</i>	<i>Trace stat.</i>	<i>90%</i>	<i>95%</i>	<i>99%</i>	<i>p-values</i>
0	31.34	17.98	20.16	24.69	0.0007
1	4.97	7.60	9.14	12.53	0.0134

Notes: Range: 1999Q2 to 2009Q4. With seasonal dummies.

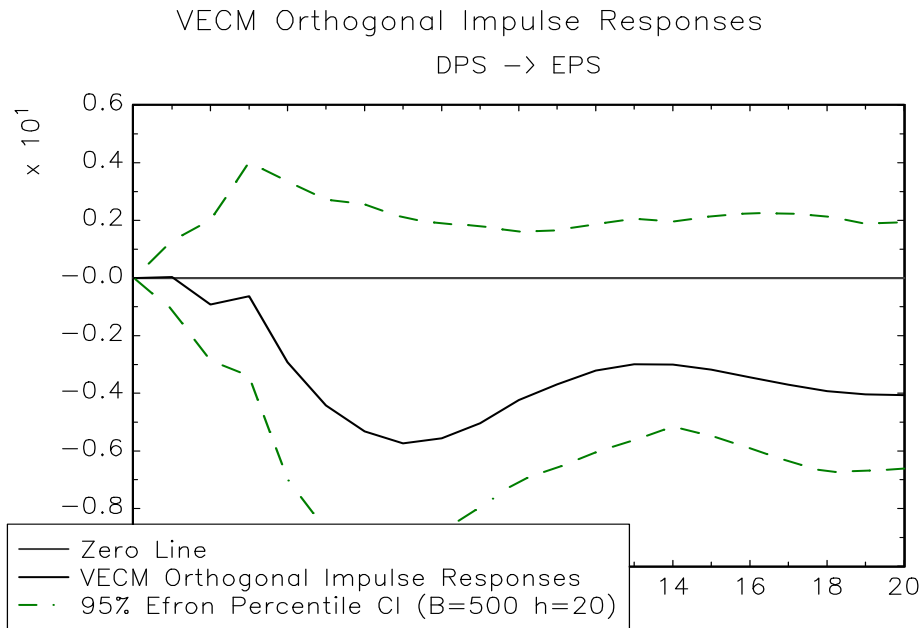
**Table 2** Cointegration analysis: the three variable model

<i>Johansen trace test</i>					
<i>R0</i>	<i>Trace stat.</i>	<i>90%</i>	<i>95%</i>	<i>99%</i>	<i>p-values</i>
0	70.11	32.25	35.07	40.78	0.0000
1	22.82	17.98	29.16	24.69	0.0199
2	7.50	7.60	9.14	12.53	0.1044

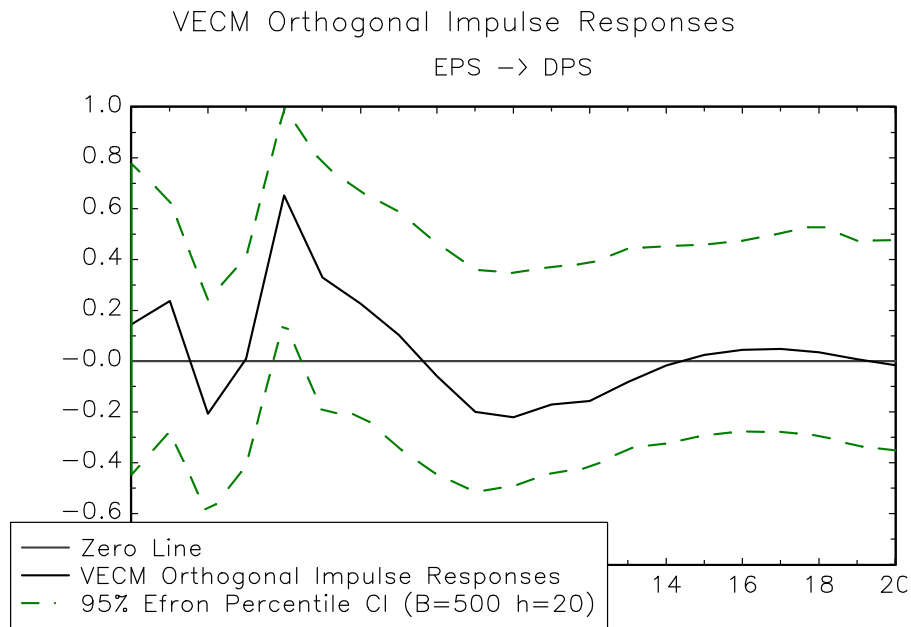
Notes: Range: 1999Q2 to 2009Q4. With seasonal dummies.

These results require the estimation of VECMs with two [earnings (EPS) and dividends (DPS)] respectively three variables [earnings, dividends and the general price level (DEFL)]. We have used four time lags because we believe that a parsimonious model is to be favoured due to the limitations to the available number of observations. Trying to analyse the interrelationships among the variables impulse response functions are used. The orthogonalised shocks are computed using the Cholesky decomposition. This technique is known to produce results that are not invariant to the ordering of variables in the model. In the case examined here, the ordering of variables is chosen on the basis of economic theory. Inflation quite clearly is the most exogenous variable considered in the model. Moreover, dividends are paid from corporate earnings. Thus, our ordering of variables is general price level → earnings → dividends. Following Hoover and Jordá (2001) our model therefore, is a structural VAR/VECM because a particular ordering of variables is selected for the Cholesky decomposition.

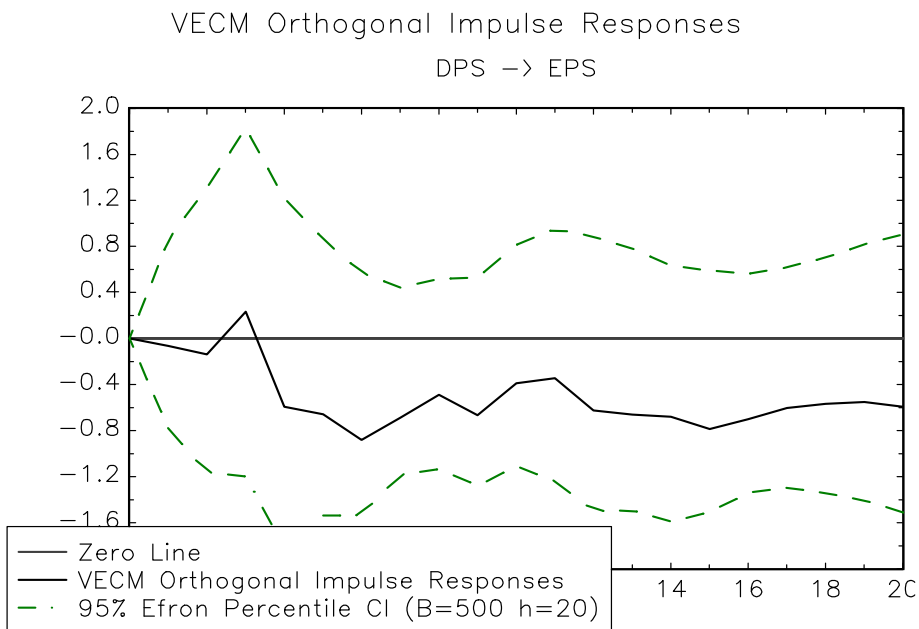
**Figure 1** Impulse response analysis: the two variable VECM (DPS → EPS) (see online version for colours)

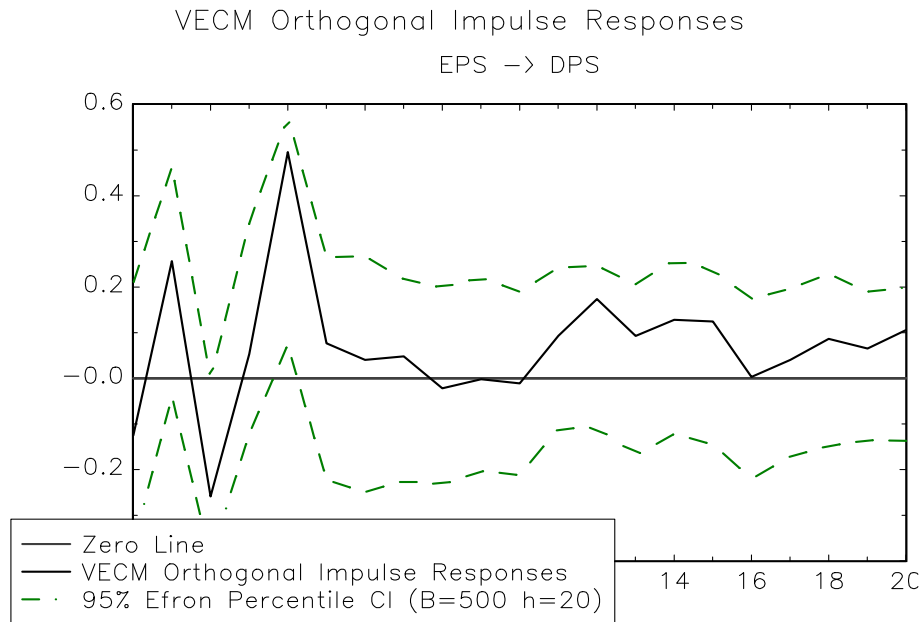


**Figure 2** Impulse response analysis: the two variable VECM (EPS → DPS) (see online version for colours)



**Figure 3** Impulse response analysis: the three variable VECM (DPS → EPS) (see online version for colours)



**Figure 4** Impulse response analysis: the three variable VECM (EPS → DPS) (see online version for colours)

The confidence intervals are computed using bootstrap techniques as suggested by Efron (see, for example, Efron and Tibshirani, 1993) which have proven to be advantageous working with small sample sizes (e.g., Scholz, 1994; Basse and Reddemann, 2010). Both the two and the three variable models give no indication that dividend signalling is a phenomenon of economic relevance because dividends quite clearly do not Granger cause corporate earnings (see Figures 1 and 3). However, corporate earnings seem to Granger cause dividend payments. Therefore, the empirical evidence reported in Figures 2 and 4 does support the dividend smoothing hypothesis. Consequently, managers seem to fear dividend cuts and try to avoid the need to reduce dividends by only slowly increase dividends when corporate profits rise. Interestingly, the two variable model does provide more obvious hints indicating that the members of the Prime Automobile Index smooth their dividends. This finding does give some support to the assumption that the negligence of inflation could distort tests for dividend smoothing and dividend signalling. However, given that the three variable model shows clear signs for dividend smoothing in the case examined here, it can be concluded that German carmakers are following the practice of only gradually increasing dividends.

## 5 Conclusions

Analysing the dividend policy of the German automotive industry we have found no support for the dividend signalling hypothesis. However, there is clear empirical evidence indicating that dividend smoothing is of relevance using both the empirical research strategy proposed by Goddard et al. (2006) and a modification of this approach which

recently has been suggested by Reddemann et al. (2010). Given that dividend smoothing can be interpreted as dividend signalling with precaution the empirical findings reported in this paper show that dividend cuts or omissions could be interpreted as negative signals by financial analysts and investors. This interesting finding does have practical implications. In fact, the German automotive industry should be aware of the possible negative effects of reductions to dividend payments. Assuming that the practice of dividend smoothing is a direct consequence of asymmetrically distributed information between investors and the management of the firms, companies planning to cut or omit dividends at least ought to communicate very clearly why dividends are reduced. This may help to minimise the possible negative effects. There are a number of interesting additional research questions. First of all, it could give new insights to include economic growth as an additional macroeconomic variable (see Basse and Reddemann, 2011). Adding this time series may be useful because using this four variable model would include the two main drivers of earnings growth (inflation and real economic activity). In fact, Berner (2002) recently has argued that econometricians should focus more strongly on the analysis of corporate profits. Therefore, this approach – which would combine macroeconomic and financial variables – could prove to be quite interesting. Moreover, additional sectors should be analysed. This would enable econometricians to compare differences (e.g., the automotive industry and companies from the utility sector).

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## **MODULE 5**

### **Dividend Policy and the Global Financial Crisis: Empirical Evidence from the Italian Insurance Industry**

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## Dividend policy and the global financial crisis: empirical evidence from the Italian insurance industry

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**Abstract** The financial crisis has led to controversial discussions about the capital base of the insurance industry. Dividend cuts and capital increases have been suggested to counter diminishing equity. However, some observers seem to fear that investors could interpret a reduction of dividends as a sign for future problems. The empirical evidence from the Italian insurance sector reported here does indeed indicate that dividend smoothing is a relevant economic phenomenon. Therefore, Italian insurance companies should rethink dividend policy rather carefully due to the possible negative consequences of dividend cuts.

**Zusammenfassung** Die Finanzkrise hat eine Diskussion zur Eigenkapitalbasis von Versicherungsunternehmen ausgelöst. Mögliche Auswege, um schwindende Rücklagen zu konsolidieren sind Dividendenkürzungen oder Eigenkapitalerhöhungen. Allerdings könnten insbesondere Dividendenkürzungen von Beobachtern als negatives Signal gewertet und zukünftige Probleme erwartet werden. Empirische Analysen zeigen, dass für die italienische Versicherungswirtschaft die Signalwirkung durch Dividendenpolitik nicht unterschätzt werden sollte. Daher sollten italienische Versicherer ihre Dividendenpolitik sorgfältig austarieren, um keine falschen Signale zu senden und in Folge mit negativen Folgen konfrontiert zu werden.

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## 1 Introduction

The financial crisis has had major negative effects on the global banking and insurance industries. A number of large financial institutions have collapsed or been bailed out. Banks have, of course, been hit especially hard. Nevertheless, the insurance industry has also had some problems. As a response to the crisis regulators have begun to discuss tougher capital requirements. These new efforts of the regulatory authorities do mainly focus on stricter bank capital rules. However, Bullard et al. (2009) have recently discussed a number of proposals of new government regulations for financial institutions including higher capital requirements using AIG as an example from the insurance industry. Moreover, the new regulatory requirements codified in Solvency II could also force the European insurance industry to increase its capital levels. This is especially true for life insurers that have mainly invested in bonds with rather short maturities (e.g. Basse and Friedrich 2008).

Due to the crisis raising capital from external sources may have been difficult for insurers recently. While stock prices have at least partly recovered it could still prove to be quite expensive for insurance companies to obtain additional capital in the near future. The Dow Jones Stoxx 600 Insurance Price Index, for example, has risen considerably from its lows in March 2009 but still is below its price level in January 2008. As a consequence, European insurance companies do consider dividend cuts in order to preserve capital. In fact, some insurers (e.g., Swiss Re) already have announced dividend cuts or omissions in 2009. However, others seem to fear the negative consequences of dividend cuts because investors could interpret a reduction of dividend payments as a negative signal indicating future problems.

Given these discussions we plan to empirically analyse the dividend policy of the Italian insurance industry using a framework that has recently been suggested by Reddemann et al. (2010). Empirical evidence from Italy is of special interest as Italian insurers are an integral part of the global insurance industry. Many companies have a long tradition. Actually, the “modern” insurance industry has its roots in the maritime insurance contracts invented in Genoa during the 14th century (e.g. Holdsworth 1917 and Greif 1994). More specifically, we search for hints indicating that dividend signalling or dividend smoothing are relevant economic phenomena. The basic idea of this paper is that insurers would not necessarily need to fear dividend cuts or even dividend omissions if empirical evidence did not support the hypothesis dividends did matter in the past.

The paper is organized as follows: Sect. 2 briefly summarizes the discussions about dividend policy issues from the perspective of economic theory. Section 3 then provides a literature review mainly focussing on empirical tests of theories of dividend determination. Section 4 describes the data sets examined and discusses methodological issues. Section 5 presents the empirical evidence. The final section then concludes by outlining the implications of the empirical findings.

## 2 Some thoughts about dividend policy issues

At first sight it may be surprising that there are controversial discussions about dividend cuts or omissions of insurance companies because Miller and Modigliani (1961)

have argued convincingly that the dividend policy of a firm is irrelevant under certain assumptions. Most importantly, they assume that the firm's investment policy is given, capital markets are perfect and taxes do not exist. Then higher dividends result in lower capital gains and the dividend policy of a firm does have no economic relevance when investors do not prefer dividends to capital gains or vice versa. Therefore, there is a dividend puzzle as numerous firms in many countries regularly do actually pay dividends. Trying to solve this dividend puzzle has proven to be quite difficult.

The most popular approaches to explain why firms pay dividends are based on agency theory. The argument that dividend payments reduce free cash flow and thereby force the management of a firm to obtain capital from external sources more frequently when new investment projects have to be financed is one popular example. Raising new capital a firm has to give information to investment bankers, regulators and prospective investors. This process of providing information to external economic agents is assumed to help shareholders monitor and control the management of the firm and thus reducing agency costs. However, obtaining capital from external sources by issuing new equity generates transaction costs. Therefore, it has been argued that the optimal dividend policy of a firm should minimize the sum of the transaction and agency costs.

It has also been proposed that the management of a firm may use dividend changes to overcome information asymmetries by signalling revisions of earnings expectations to financial analysts and investors. This dividend signalling theory is an important approach to explain the existence of dividend payments. However, many financial economists do believe that managers try to avoid dividend cuts—which are presumed to give information perceived to be negative by external economic agents. According to this view dividends should only be increased when the management believes that future cash flows are strong enough to enable the firm to sustain the new higher level of dividend payouts. Thus, this so-called dividend smoothing theory does also assume that a strong link between dividend payments and corporate earnings exists. In fact, dividend smoothing can be interpreted as dividend signalling with precaution. However, Goddard et al. (2006) have argued that the signalling and smoothing hypotheses make opposing predictions about the temporal relationship between corporate earnings and dividend payments. While the signalling hypothesis suggests that dividends lead corporate earnings the smoothing hypothesis predicts that earnings should lead dividend payments.

### 3 Literature review

In the literature dividend policy issues are usually discussed from the perspective of industrial firms. An extensive survey of this literature has been presented by Allen and Michaely (1995). Only few researchers have examined the dividend policy of insurance companies. He and Liang (2009) are a notable exception. They recently have modelled the optimal financing and dividend payout strategy of insurance companies assuming that the management of the firm can control dividend policy, equity issuance and the reinsurance rate. This type of research is very important due to the special role of insurers. As a matter of fact, the insurance industry in Europe and

other parts of the world is subject to very tight government regulation. Analysing the determinants of dividend policy Rozeff (1982), for example, has omitted insurance companies from his empirical investigations concerning dividend policy arguing that government regulation may indeed affect their payout policy. The primary goal of insurance regulation is to guarantee the solvency of insurance companies in order to protect the customers. However, many financial economists seem to believe the special government regulation of the sector could also reduce the agency costs borne by the shareholders of insurance companies. Therefore, dividend payments by insurance companies can be seen to be even more puzzling than dividend payments by industrial firms. Trying to find an explanation Casey et al. (2007) have argued that investors in the insurance sector prefer a high degree of leverage since regulation does protect not only customers but also investors against insolvency. According to their hypothesis investors can use dividend income from insurers to obtain other financial assets and maintain a high level of relatively risk-free leverage holding a more or less constant amount of funds invested in their portfolio of insurance stocks.

Akhigbe et al. (1993) have noted that it is very difficult for external economic agents to assess the true economic condition of any insurance company at a particular point of time because accounting procedures frequently hide major changes in the market values of real estate holdings (which, of course, are an important asset class for many insurers). This lack of complete information could obviously increase the problems with information asymmetries. As a consequence, investors may have a special interest in additional information about future cash flows. According to this hypothesis dividend signalling would quite clearly have a major importance for insurance companies. Testing this theory does not give a clear picture. In fact, the empirical evidence reported in the study seems to indicate that dividend increases by life insurers convey less asymmetric information than dividend increases by industrial firms while the amount of information signalled with dividend increases of property-liability and “other” insurers is quite similar to that of industrial firms. Trying to explain this result is not that easy. First of all, the authors of the study have argued that the regulation of life insurers could force more public disclosure of information than is available from industrial firms reducing the need for dividend signalling. Moreover, they have also noted that U.S. life insurers maintain relatively low levels of capital compared to property-liability insurers. Consequently, investors may have mixed feelings about dividend increases of life insurers because a higher volume of dividend payments reflects a smaller contribution to capital.

This argument is not new. In fact, already Harrington (1981) has noted that high dividend payouts can have negative effects on the financial soundness of insurance companies examining the dividend policy of U.S. life insurers. The empirical evidence reported in this important study does indicate that the dividend policy of U.S. insurance companies in general does react rather slowly to changes in corporate earnings. The study has also shown a tendency of insurers to increase dividend payments following acquisitions by holding companies. This finding can obviously not be explained by traditional agency theoretic models of dividend policy. As a matter of fact, he has argued that the higher dividend payments of acquired U.S. insurers could be a consequence of the demand for investment capital by the parent companies.

While a small number of additional studies does exist (e.g. Lee and Forbes 1980 and Casey et al. 2009) empirical research efforts analyzing the dividend policy of

insurance companies have been quite limited. In sum, the evidence reported in the few empirical studies does not give a clear picture. The situation is quite similar to the results reported for industrial firms where seemingly also no consensus exists in spite of the fact that there have been far more research efforts. In fact, most financial economists tend to believe that additional empirical evidence is needed. Allen and Michaely (1995), for example, have noted that much work remains to be done. Bhattacharyya (2007) recently has argued that properly conducted future empirical research should account for all implications of the underlying economic theories of dividend policy. Most importantly, Basse (2009) has suggested that inflation may be of relevance because this macroeconomic variable is a major driver of dividend growth usually neglected in empirical work testing theories of dividend determination, even though Modigliani (1982) has noted that the earnings-payout ratio is increased by inflation while stock prices might not change due to different leverage of those effects. This fact could help to explain the generally inconclusive findings reported in the literature. A gradual increase of dividend payments due to higher inflation rates could, for example, be falsely identified as empirical evidence supporting the dividend smoothing hypothesis.

Because of the subprime mortgage crisis the dividend policy of the financial services industry obviously is of special importance at the moment. Therefore, Reddemann et al. (2010) recently have analyzed the dividend policy of the European insurance industry examining data from Germany and the European Monetary Union (EMU) as a whole. Considering possible effects of inflation on dividend policy they have used a variant of the test suggested by Goddard et al. (2006) and have found no clear empirical evidence indicating that dividend smoothing or dividend signalling are relevant economic phenomena. Accordingly, they have argued that insurance companies may cut dividends and thereby improve their financial strength as a reaction to the crisis without necessarily having to fear major negative consequences due to investors assuming that this measure is a clear sign for future problems.

#### **4 Data and methodology**

This paper tries to analyse the dividend policy of Italian insurers by also focusing on the aspect of inflation. We use the framework suggested by Reddemann et al. (2010) who have employed cointegration techniques to analyse the dividend policy of the insurance industry of Germany and the EMU as a whole by taking a more macroeconomic perspective examining aggregate data on earnings and dividends as well as the general price level. Therefore, we analyse the dividends per index share and earnings per index share of the Milan Stock Exchange Insurance Companies Index. Inflation is measured by the Italian GDP price deflator. In order to make the results of this study comparable to the empirical findings of Reddemann et al. (2010) our sample is 1999 Q1 to 2008 Q4. This also helps to avoid possible problems with structural breaks due to the introduction of the Euro.

Cointegration describes a long run equilibrium relationship between non-stationary variables which follow common trends. Two time series integrated of order 1, for example, are said to be cointegrated when there is a linear combination of these

variables that is stationary. Johansen (1991) has suggested a multivariate cointegration test based on the econometric technique of vector autoregressions (VAR). In (1)  $y$  is a vector of  $m$  possibly non-stationary variables and  $A_i$  is a  $m \times m$  matrix (with  $i = 1, \dots, n$ ):

$$y_t = A_1 y_{t-1} + A_2 y_{t-2} + \dots + A_n y_{t-n} + u_t. \quad (1)$$

The error term  $u_t$  is assumed to satisfy the usual assumptions. Rearranging this VAR in levels yields:

$$\Delta y_t = (A_1 - I)y_{t-1} + A_2 y_{t-2} + \dots + A_n y_{t-n} + u_t, \quad (2)$$

$$\Delta y_t = (A_1 - I)\Delta y_{t-1} + (A_1 + A_2 - I)y_{t-2} + \dots + A_n y_{t-n} + u_t, \quad (3)$$

$$\begin{aligned} \Delta y_t &= \Pi_1 \Delta y_{t-1} + \Pi_2 \Delta y_{t-2} + \dots + \Pi y_{t-n} + u_t \\ &= \Pi_i \Delta y_{t-i} + \Pi y_{t-n} + u_t, \end{aligned} \quad (4)$$

where:

$$\Pi_i = -(I - A_h),$$

$$\Pi = -(I - A_j),$$

Testing for cointegration is done by determining the rank of the so-called long run impact matrix  $\Pi$ . In fact,  $k$  cointegration relationships among the variables examined exist when the rank of the matrix  $\Pi$  is  $k < m$ . Using the trace statistic the null hypothesis that there are at most  $k$  cointegration relationships is tested:

$$\text{Trace} = -T \ln(1 - \lambda_i). \quad (5)$$

In (5)  $T$  is the number of observations and  $\lambda_i$  are the  $m - k$  ordered eigenvalues from the reduced rank regression. The test is performed using the critical values tabulated by Doornik (1998) in the no-breakpoint scenarios and Johansen et al. (2000) in the breakpoint scenarios.

When cointegration is a relevant phenomenon there are long run equilibrium relationships among the variables examined. This important information has to be used in the process of model building by estimating a vector error correction model (VECM). The dynamics of this model can then be analysed using impulse response analysis. The dividend signalling and dividend smoothing hypotheses quite clearly are the theoretical basis for the argument that insurers should at least be very careful when using dividend cuts or omissions to strengthen their capital base. Therefore, it has to be tested whether dividend signalling or dividend smoothing are relevant economic phenomena. Following Goddard et al. (2006) empirical evidence indicating that dividends lead corporate earnings would be supportive for the dividend signalling hypothesis while the finding that earnings lead dividends would give support to the dividend smoothing hypothesis.

## 5 Results

According to ADF- and KPSS-tests (not reported) the three time series are found to be nonstationary and integrated of order 1. The cointegration tests reported in Table 1



**Table 1** Johansen cointegration test results

Hypothesis	Without break		With break (2003 Q4)	
	Trace statistic	<i>p</i> -value	Trace statistic	<i>p</i> -value
0 or less	34.75	0.0543*	154.84	0.0000***
1 or less	18.16	0.0948*	70.52	0.0000***
2 or less	5.36	0.2548	10.36	0.1286

\* : rejection on 10% level

\*\* : rejection on 5% level

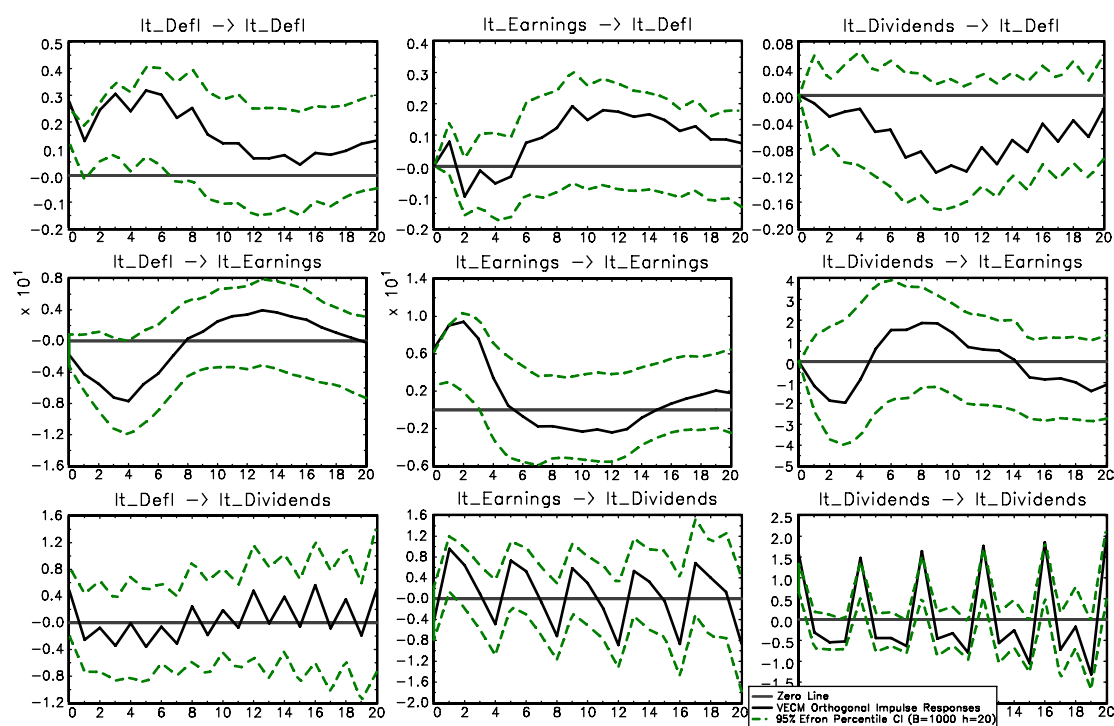
\*\*\* : rejection on 1% level

indicate that two cointegration relationships seem to exist between the three variables general price level (Defl), corporate earnings (Earnings) and dividend payouts (Dividends). We include seasonal dummies for all test specifications, as the dividend payouts have a strong seasonal pattern. Moreover, there also is empirical evidence for a structural break in the end of 2003. Structural change obviously can be a problem testing for cointegration (e.g. Gregory and Hansen 1996). Therefore, it is no surprise at all that the breakpoint scenario produces even stronger evidence indicating that the time series follow common trends.

Before generating the impulse response functions we do some residual analysis on the estimated VECM. Especially the serial autocorrelation is interesting, as it may have effects on the ordering of the variables. The Portmanteau test with 18 lags yielded a *p*-value of 0.2009, indicating randomness of the residual time series. Reducing the lag order provides different results, rejecting the null hypothesis of randomness, as does a LM-test with different lag lengths. This may in particular be accounted to the periodic dividend time series which may severely weaken the power of the tests. Following this reasoning we included up to 18 lags in the Portmanteau test.

Just in case serial autocorrelation may still be present we use an OLS and a GLS approach for the subsequent estimations of the model (both using 4 time lags, as 8 lags which are suggested by the AIC would produce misleading results due to the limited amount of data points available) but only display the impulse response functions generated by using the OLS approach, as when comparing the empirical findings, the results are nearly identical such that serial autocorrelation does not seem to be of importance in the given framework. Given the restrictions to data availability there may be problems with a small sample bias. Monte Carlo experiments performed by Hargreaves (1994) do indeed indicate some difficulties. However, he has argued that applied econometricians commonly work with sample sizes of about 50 observations.

The Cholesky decomposition is used to generate the impulse response functions. This technique does have a number of problems. Most importantly, the results may be sensitive to the ordering of the variables. In the case examined here economic theory dictates the ordering of variables (Defl → Earnings → Dividends) because the general price level quite clearly is the most exogenous variable and dividends are paid from corporate earnings. The confidence intervals are computed using Efron (e.g. Efron and Tibshirani 1993) bootstrap techniques (95% level). While no empirical evidence for dividend signalling can be found the impulse response functions of both regressions do indicate that there is a statistically positive lagged reaction of dividends to a shock to corporate earnings. Consequently, dividend smoothing is a relevant economic phenomenon examining the payout policy of the Italian insurance



**Fig. 1** Impulse response functions (OLS regression)

industry. Phrased somewhat differently, Italian insurance companies seem to try to avoid situations in which they are forced to cut dividends.

This finding may be explained by fears that investors could interpret dividend cuts as a signal indicating future problems. It could be argued that the lagged reaction of dividends might be a consequence of the practice of paying dividends just once a year (which is quite common in Europe). However, this interpretation of the results displayed in Fig. 1 would still imply that dividends are only increased after positive news regarding corporate earnings. Additionally, there also is empirical evidence for a positive reaction of dividends in the following year. While this response to a shock to corporate earnings is not statistically significant at the 5% level loosening this constraint does provide a clear hint indicating that dividend smoothing is of relevance for Italian insurers. In this context a comparison of the results discussed here with the findings reported by Reddemann et al. (2010) may also be of special interest. They have shown that there is no convincing empirical evidence indicating that dividend signalling or dividend smoothing are of relevance examining data from the insurance industry in Germany and the EMU as a whole. Thus, it can be argued that dividend reductions quite clearly seem to be a less attractive option for Italian insurers trying to strengthen their capital base than for insurance companies in other EMU countries—especially in Germany.

## 6 Conclusion

Examining the dividend policy of the Italian insurance industry we have documented empirical evidence indicating that dividend smoothing is a relevant phenomenon us-

ing the approach suggested by Reddemann et al. (2010). Given that dividend smoothing is dividend signalling with precaution the empirical findings reported above do show that Italian insurers seem to fear that dividend cuts or omissions could be interpreted as negative signals by investors and financial analysts. This result does have practical implications. Most importantly, Italian insurers should be very careful when trying to improve their capital base by dividend reductions. As dividend smoothing is a consequence of asymmetrically distributed information between investors and the management of the firms, insurance companies deciding to use this option should at least communicate clearly why dividends are cut or even omitted. Reddemann et al. (2010) have reported no empirical evidence for the relevance of dividend signalling or dividend smoothing examining data from the insurance industry in Germany and the EMU as a whole. Therefore, dividend cuts or omissions seem to be less attractive for Italian insurers than for their competitors in other EMU countries.

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## **MODULE 6**

### **Market Transparency and Dividend Policy of Insurance Companies: A global Comparison**

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International Association for the  
Study of Insurance Economics

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# Market Transparency and Dividend Policy of Insurance Companies

## A Global Comparison\*

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### ABSTRACT

Transparency plays a major role in signaling theory, as a fully transparent company has no incentives to send dissipative signals. Thus the need for signaling may be dependent on the market transparency in general. This paper introduces transparency as additional variable into the principal agent framework. Consequences of this model augmentation are derived subsequently.

In the second part this study also tries to empirically verify or reject the deduced consequences using aggregated data from insurers in different countries. After dealing with the measure of Roll for transparency and proposing a different way of measurement, a proxy for transparency is calculated for all those countries or economic stratum. The estimation results of a VECM model and the respective impulse-response functions are calculated and a possible connection between transparency and the relevance of dividend signaling/smoothing is examined. Throughout the analysis inflation is considered as additional variable as it may also distort the ability to convey additional information.

This might provide wide implications regarding the dividend policy of insurers. Especially in the times of financial crisis and with respect to upcoming regulations (as Solvency II), dividend cuts may be considered as instrument to strengthen the insurers capital basis. This is especially true as the financial sector is highly regulated and therefore naturally more transparent than other sectors because of disclosure requirements.

### Keywords

Signaling Theory, Dividend Policy, Transparency, Insurance Industry

### 1. MOTIVATION

The latest financial crisis and looming tighter regulation may lead to various insurance companies being troubled to meet minimal solvency capital requirements in the future. In spite of the recent rise of stock prices, raising new capital is currently rather costly and therefore other possibilities should be considered carefully. One option is keeping free cash flows in the company to strengthen the capital base instead of paying them out to investors. Several studies deal with payout policy in general and theories surrounding these payments. While Miller and Modigliani concluded that in a specific setting (most importantly assuming perfect markets) dividend payments and capital gains are interchangeable from the investors perspective [1], newer studies consider them as dissipative signals due to higher taxation (compared to capital gains) or other occurring signaling costs (e.g. [2]). In this case it seems to be unfavorable to actually payout cash, but in the framework of agent theory and the theory of signals these payments may lead to a future plus in earnings, compensating for the dissipated value.

The approach to empirically analyze signaling pursued by Basse and Reddemann includes inflation in the analysis to account for possible distortions and subsequent misinterpretations of empirical results and yields some interesting results [3]. For example it is shown that dividend signaling or smoothing are relevant phenomena in the Italian Insurance sector, while being negligible in Germany [3][4]. It is also found by other studies of the authors ([5][6]) that dividend signaling and smoothing are of differing importance for different sectors. European Banks for example may be less cautious when thinking about dividend cuts, while in the automotive industry there is clear evidence of signaling being effective. Thus fundamental differences between these economic stratum and sectors may be conjectured. This may be verified empirically when comparing the impulse-response functions of the different regions and sectors (see section 3 and 4).

So what may be the reason for these findings? We think the transparency of a specific sector might be one important answer to this question. The financial sector is subject to a high degree of supervision and regulation, thus creating

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a naturally higher level of transparency than for example in the automotive industry. Also regional differences might be explained by the difference in national law even if there are minimal requirements as e.g. in Europe. The evidence presented from several studies would be in line with this assumption.

The paper at hand is organized as follows. In section 2 we present empirical evidence from insurance sectors of different regions to further motivate the addition of transparency into the framework, which is done in section 3 combined with the subsequent analysis. We then want to recommend and apply a method for measuring the transparency to different sectors and regions in section 4. Those results are then compared with the studies presented earlier to see if the results concur in the sense that high transparency correlates to low signal effectiveness. Section 5 concludes and highlights needed subsequent research.

## 2. EMPIRICAL EVIDENCE

We employ the technique of vector-autoregression models when analyzing the relevance of signals in different insurance markets (regional, not product specific). Therefore cointegration tests are performed to identify possible deep structural relations among the variables examined. If those tests report existence of those relations, this additional information can be used in the econometric analysis by including an error-correction term into the VAR in differences [7][8]. Thus the short-term dynamic is appropriately reflected in the estimation which would otherwise lead to strong residual autocorrelations. The examined estimation equation is as follows (for all details also concerning the Cholesky partition mentioned in what follows, see e.g. [9]):

$$\begin{aligned}
 x_t &= \sum_{i=0}^{\infty} (A_i P) (P^{-1} \varepsilon_{t-i}) + \sum_{i=0}^{\infty} G_i w_{t-i} \\
 &= \sum_{i=0}^{\infty} (A_i P) \xi_{t-i} + \sum_{i=0}^{\infty} G_i w_{t-i}
 \end{aligned}$$

$x$  is the endogenous variable which should be modeled by the vector-error-correction model and the formula shows the division of the process into its autoregressive and moving average parts. Finally the  $\xi$  variables are orthogonal (after a Cholesky decomposition of the respective matrices) and may be interpreted as (orthogonalized) impulse responses. This means the feedbacks between variables caused by a shock in one of the variables are accounted for. When this model is estimated these functions may be used to make statements about the impact of sudden changes in one variable to the other. There are three major theories or hypotheses concerning dividend policy in recent literature. Dividend Signaling, Dividend Smoothing and the Dividend Irrelevance Hypothesis. The latter is due to Miller and Modigliani's seminal paper mentioned earlier describing the fact that in perfect markets without taxation, capital gains are not preferable to dividend payments and vice versa [1]. The other two hypotheses have been tested and restated in numerous studies, none of which yielded conclusive results. Most importantly, Goddard, McMillan and Wilson have argued that depending on which of the two hypotheses holds there should be a temporal structure contained in the time series of earnings and dividends [10]. During this analysis one has to consider possible reorderings and the consequences [11].

In terms of Granger causality, changes in dividends causing changes of corporate earnings would indicate that dividend signaling is a phenomenon of economic relevance while the inverse relation would support dividend smoothing. It has been argued that inflation is a major driver of corporate earnings and dividends and may distort the empirical analysis [12]. Reddemann, Basse and von der Schulenburg have suggested an appropriate approach to control for inflation [3]. More details on the test procedure have been discussed by Basse and Reddemann [11]. This is why we include in-

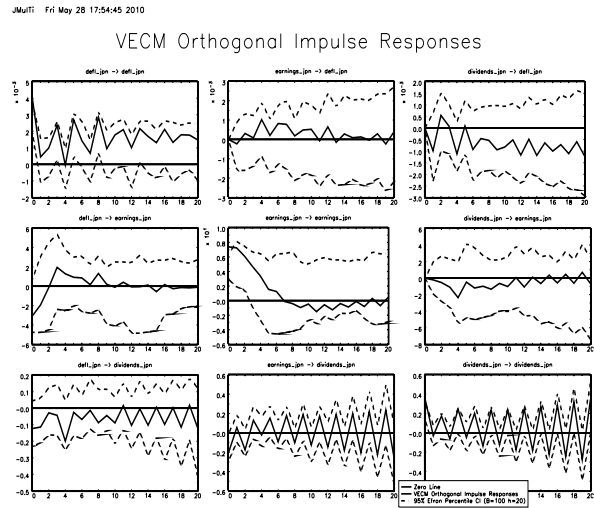


Figure 1: Impulse-Response Functions for Japanese Insurers

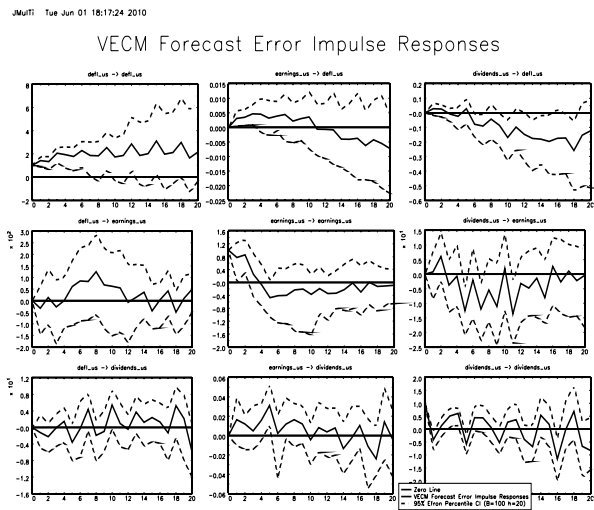


Figure 2: Impulse-Response Functions for American Insurers

flation in our analyses and thus prevent tests from producing insignificant results. To express it in terms of causality, this means if dividend signaling holds, dividends should lead earnings and the other way around for smoothing respectively. This prediction is tested with the mentioned impulse response functions by shocking earnings and dividends by two standard deviations and observing the impact on the

respective other variable<sup>1</sup>. Only if the 0-line is outside the bootstrapped confidence intervals, a significant relation is revealed. We will now present the impulse-response func-

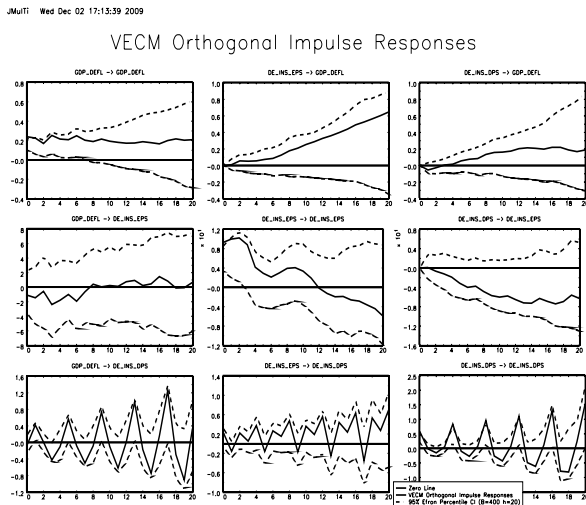


Figure 3: Impulse-Response Functions for German Insurers

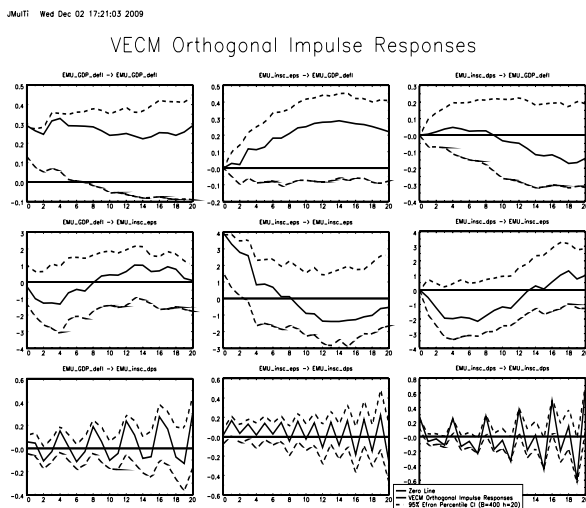


Figure 4: Impulse-Response Functions for European Insurers

tions of different regions. In Figure 1 it is clearly seen that the confidence interval never crosses the zero and therefore yielding no signs of signaling or smoothing being relevant economic phenomena in Japan. The next Figure shows the

<sup>1</sup>We have examined the earnings per index share and dividends per index share of the insurance sector indices of the TOPIX, German Prime Standard Index, Nasdaq and Dow Jones Euro Stoxx stock market indices. Our measure of inflation is the GDP price deflator for the respective country/region. We use quarterly data. Our sample is 1999 Q1 to 2009 Q4 to avoid possible structural breaks due to the introduction of the Euro. Our modeling strategy is guided by parsimony. Thus, we have included just as many time lags as necessary to produce uncorrelated residuals.

impulse-response analysis for American insurers. Here are several points in time where the confidence interval does not include 0, thus giving hints of signals being effective (as smoothing may be considered as signaling with precaution). Similar to the case of Japan the analysis of German and more generally European insurers (Figure 3 and 4) does not yield any signs for signaling being relevant for a company's success.

These findings lead to another question. Why is signaling effectiveness depending on the region where the signal is sent? There have to be fundamental differences between the two markets which did not draw much attention to them as of yet. We conjecture transparency being a major factor when determining the effectiveness of a dissipative signal. This is quite intuitive as a market with full information should not reward signals at all as they are not able to convey further information. We therefore try to augment an existing model of dividend determination with the variable transparency and revisit the comparative statics of the model while now additionally examining the influence of transparency  $\gamma$ .

### 3. MODEL SPECIFICATION

As mentioned in section 1 and 2, there is a variety of models regarding dividend or payout policy and signaling phenomena. Spence developed a basic framework for signaling environments using a labor market example [13]. This framework was advanced by Bhattacharya in two ways: a dissipative and a non-dissipative model [2][14]. The (former) dissipative model is most appropriate for our model augmentation, as it deals with the questions of signaling and optimal dividend policy in a setting quite similar to the one we want to take as basis. He examines the case where there is asymmetric information between current shareholders and potential future ones while including dividend taxation. Thus he deals with dissipative signals and tries to explain why even in this case paying dividends might be optimal. This is used as starting point for our analysis as we gradually want to reveal the hidden information by adding the parameter transparency. It is obvious that future cash flows will not fully anticipated a priori even in the case of full information, but there is no need to signal any earnings expectations as the potential investor has the exact same information and thus assesses the situation identically, resulting in matching earning expectations. We will now give a brief description of the model and the results in this framework, before adding transparency as variable and deducing results beyond the ones originating from the initial model.

#### Original Model

We follow the approach of Bhattacharya and present the respective results in a nutshell. For the full details of these calculations see [2]. He regards the incremental dividends  $D$  paid as cause of an incremental liquidation value  $V(D)$  in the future. Let  $X$  denote the future uncertain cash flow and  $f(X)$  its density function. The dividend payments are taxed at a personal income tax rate of  $(1 - \alpha)$  while capital gains are not taxed at all. If the final cash flow exceeds the paid dividend level,  $(X - D)$  is available for further financing, otherwise  $(D - X)$  is additionally needed compared to the situation  $(X = D)$ . This additional capital is raised with costs (think of risk premiums) which is reflected by  $(1 + \beta)$

in the model. Thus the final model has the form:

$$E(D) = \frac{1}{1+r} \left[ V(D) + \alpha D + \int_D^{\bar{x}} (X - D) f(X) dX + \int_{\underline{x}}^D (1 + \beta)(X - D) f(X) dX \right] \quad (1)$$

To simplify the analysis of this general model he now assumes the cash flows to be uniformly distributed over  $[0, t]$ . The resulting maximization problem is of the form

$$\max_D E(D) = \frac{1}{1+r} \left[ \frac{t}{2} + V(D) - (1 - \alpha)D - \beta \frac{D^2}{2t} \right] \quad (2)$$

Using the first-order and consistency conditions for the equilibrium dividend schedule  $\tilde{D}$

$$V'(\tilde{D}) - (1 - \alpha) - \beta \frac{\tilde{D}}{t} = 0$$

$$V(\tilde{D}(t)) = K \left[ \frac{t}{2} - (1 - \alpha)\tilde{D}(t) - \beta \frac{\tilde{D}^2(t)}{2t} \right]$$

with  $K = \frac{1}{r}$  we have to solve the differential equation

$$(K + 1) \left[ (1 - \alpha) + \beta \frac{D}{t} \right] \frac{dD}{dt} = K \left[ \frac{1}{2} + \beta \frac{D^2}{2t^2} \right]$$

for  $D(t)$  using the boundary condition  $\tilde{D}(0) = 0$ . This is done by a solution of the form  $\tilde{D}(t) = At$ , where  $A$  is given by

$$A = -\frac{(1 - \alpha)(K + 1)}{\beta(K + 2)} \left[ 1 + \sqrt{1 + \frac{\beta K(K + 2)}{(1 - \alpha)^2(K + 1)^2}} \right]. \quad (3)$$

The resulting equilibrium liquidation gain is

$$V(D) = ((1 - \alpha) + \beta A) D. \quad (4)$$

### Adding Transparency

We now want to introduce a new variable into this framework: transparency  $\gamma$ . This variable has to be seen as a transition parameter  $\gamma \in [0, 1]$  where  $\gamma = 0$  yields the model in the original form (asymmetric information) and  $\gamma = 1$  represents the case of full information. Taking a detailed look into the model dynamics as developed in the preceding subsection, there is a natural first choice for including transparency into the calculation:  $\beta$ . The cost of refinancing actually is not zero due to a risk premium banks demand for expanding credit lines or supplying additional capital. Thus  $\beta(\gamma)$  should be a decreasing function in transparency. We will not make any further assumptions concerning the functional form of  $\beta$  as of now besides the two structural boundary conditions:  $\beta(0) = \hat{\beta}$  and  $\beta(1) < \beta(0) = \hat{\beta}$ . The equilibrium dividend schedule and valuation gain function have the form as above, just replacing  $\beta$  with  $\beta(\gamma)$ . To take a look at the change of the results subject to changes in transparency we use an analytical approach. We replace  $\beta(\gamma)$  with its Taylor series and discard the terms of order 2 and higher:

$$\beta(\gamma) = \beta(0) + \sum_{n=1}^{\infty} \frac{\beta^{(n)}(0)}{n!} \Delta\gamma = \hat{\beta} + \frac{\partial\beta}{\partial\gamma}(0)\Delta\gamma + \mathcal{O}^2(\Delta\gamma)$$

This is only true in its convergence radius  $R > 0$ , but a similar representation can be found for the whole interval  $\gamma \in [0, 1]$ . For simplicity we will use the centralized series though.

Combining equation (3) and (4) and including  $\gamma$  yields the modified valuation gain function:

$$\frac{V(D, \gamma)}{(1 - \alpha)} = \left[ 1 - \frac{(K + 1)}{(K + 2)} \left( 1 + \sqrt{1 + \frac{\beta(\gamma)K(K + 2)}{(1 - \alpha)^2(K + 1)^2}} \right) \right] D$$

Note that  $\gamma$  only occurs in the square root. If we use the Taylor approximation the square-root becomes

$$\sqrt{1 + \frac{K(K + 2)}{(1 - \alpha)^2(K + 1)^2}} \left( \hat{\beta} + \frac{\partial\beta}{\partial\gamma}(0)\Delta\gamma \right)$$

being smaller or equal to the root prior to introducing  $\gamma$  because the derivative of  $\beta(\gamma)$  with respect to  $\gamma$  is  $\leq 0$ . This means ceteris paribus,  $V(\gamma)$  is a decreasing function in transparency. This is the first result supporting the conjecture of transparency influencing optimal dividend policy. Note that this result again is quite intuitive, as with increasing transparency the effect of signals will be diminished considerably.

One special case might be additionally noted: If  $\beta(1) = 0$ , there is no refinancing cost in case of full information (which does not mean, that every refinancing demand is met, but rather, if it is met it bears no additional costs), simplifying the objective function and yielding the special case of the original model (see [2]).

In another step we modify the model even further by adding incremental costs for increasing transparency  $C(\gamma)$  and thus optionally reducing the need for costly signaling, meaning a shareholder may choose between two alternatives for the same gain of value. The effects of signals and measures of increasing transparency may then be compared to find the optimal levels of additional disclosure and payoff policy. The objective function from equation (1) then becomes

$$E(D, \gamma) = \frac{1}{1+r} \left[ V(D) + \alpha D + \int_D^{\bar{x}} (X - D - C(\gamma)) f(X) dX + \int_{\underline{x}}^D (1 + \beta(\gamma))(X - D - C(\gamma)) f(X) dX \right] \quad (5)$$

Progressing analogously to the case before the resulting ODE is

$$\left\{ (K + 1) \left[ (1 - \alpha) + \frac{\beta(\gamma)D}{t} \right] - (K - 1)\beta(\gamma)C(\gamma) \right\} \frac{dD}{dt} = K \left\{ \frac{1}{2} + \frac{\beta(\gamma)D^2}{2t^2} \right\}$$

With the same ansatz as earlier there exist two solutions for  $A$ :  $A = 0$  and a way more complex form than before. Thus we will only cover it structurally. The factor  $C(\gamma)$  only occurs as product with  $\beta(\gamma)$ , which is, as we found earlier, a decreasing function in  $\gamma$ . The (not necessarily monetary) incremental costs for transparency  $C(\gamma)$  are assumed to increase with  $\gamma$  as creating the same additional gain in transparency costs more effort if transparency is on a high level. Thus the term  $\beta(\gamma)C(\gamma)$  is highly dependent on the functional form of  $\beta(\gamma)$  and  $C(\gamma)$ . But note that if one assumes

polynomial functions one may compare different combinations. Consider the functional forms:

$$\beta(\gamma) = \hat{\beta} + \sum_{i=1}^n a_i \gamma^{-i} \quad C(\gamma) = \sum_{j=0}^m b_j \gamma^j$$

- $m > n$  The costs for increasing transparency grow faster than the reduction due to cheaper financing.
- $n > m$  The reduction in refinancing costs overcompensates the additional cost of increasing transparency.
- $m = n$  In this case, the product is highly depending on the coefficients of the potencies of  $\gamma$ . In the case where  $m = n = \infty$  (using the full Taylor series) one may use the Cauchy multiplication rule to derive further results.

As we do not have any further information theoretically nor empirically we will suggest this for future studies.

#### 4. MEASURING TRANSPARENCY

The basic idea discussed in the preceding section is that information asymmetries between managers (insiders) and potential investors (outsiders) increase the financing costs of firms. Dividend payments are just one possibility to reduce information asymmetries. An improved level of corporate transparency may help to decrease the cost of capital as well, by giving relevant information to investors in a clear and comprehensible way. Bushman, Piotroski and Smith for example, have defined corporate transparency as the availability of firm-specific information to outsiders [15]. Given that this paper also has an empirical focus, an important and difficult question has to be answered at this point: How to measure corporate transparency?

Recently, the  $R^2$  approach suggested by Roll ([16]) has become a very popular measure of corporate transparency in financial economics (e.g., [17][18]). In order to measure transparency, Roll's approach examines the explanatory power (which, of course, means the  $R^2$ ) of a regression using the total returns of a broad stock market index and an appropriate industry portfolio as regressors explaining the total return of an individual stock. The theoretical foundation of this approach is the CAPM (respectively the APT).

This may be a problem when trying to use the methodology to construct a measure of transparency that can be used in an empirical analysis of dividend policy issues because the CAPM requires a world characterized by perfect markets. In fact, Miller and Modigliani have shown that in this perfect information world without transaction costs dividends are of no economic relevance [1]. Morck, Yeung and Yu, for example, have shown that the  $R^2$  for those regressions tends to be high in emerging markets where corporate transparency usually is seen to be low [19]. Moreover, Jin and Myers have argued that a lack of transparency increases the  $R^2$  by shifting firm-specific risk to managers [17]. They and other studies have offered an excellent explanation for this hypothesis assuming that poor protection of investors' property rights in combination with a lack of transparency may allow insiders to capture more of a firm's operating cash flows than they would be able to extract when the property rights of outsiders could be protected perfectly [18]. Given that outsiders

have some information about a firm's cash flows insiders can skim more funds when cash flows are higher than expected by outside investors. Consequently, insiders are forced to extract less cash flow when there is bad news and cash flows are lower than expected by outside investors. Investors, of course, absorb all market risk because information about macroeconomic phenomena should be common knowledge. In other words, the management can capture more when the hidden firm-specific information is positive and less when it is negative. In order to possibly extract more funds in good market environments, insiders have to absorb some firm-specific variance. The firm-specific variance absorbed by investors is correspondingly lower. Therefore, the ratio of market to total risk ought to be increased in an environment that is characterized by a lower level of corporate transparency. This should lead to higher  $R^2$ s. Moreover, the willingness of insiders to absorb negative shocks to cash flows most probably is limited. When there is too much bad firm-specific news insiders leave the firm and all negative information becomes available to outsiders at once. Therefore, it is predicted that a lack of transparency leads to an increase of the likelihood of crashes meaning large negative market-adjusted returns on individual stocks [17].

They also focus on international empirical evidence analyzing country averages using cross sectional regression techniques. Given the question examined here we had to calculate  $R^2$ s for regional insurance sector indices using time series regression analysis examining data on individual stocks. This is a problem. In fact, it was already noted that not using country averages creates a number of difficulties - mainly because there may be country differences in  $R^2$ s that could be traced to reasons other than differences in opaqueness [17]. These problems will now be discussed. In our view, there is a major practical problem with the  $R^2$  approach which applied econometricians examining transparency and the dividend policy of the global insurance have to face. Usually, an econometrician trying to measure transparency with the  $R^2$  of a time series regression analysis would explain the total return holding the stock of on an individual insurance company by the total returns of an adequate broad regional stock market index and a regional sector index. A market model regression equation of this type has been suggested by Campbell, Lettau, Malkiel and Xu [20]. The global insurance industry is characterized by a number of very large companies. In Europe, for instance, there is a number of insurers with an almost predominant role in specific countries (e.g. Allianz in Germany, Axa in France and Generali in Italy).

These companies are large and - due to their market capitalization - have a high weight in both the broad stock market index and the sector index. Allianz, for example, has a weight of about 7,5% in the DAX and a weight of almost 64,0% in the German Prime Standard Insurance Index. Moreover, these insurers are seen to have a signaling function for the equity market as a whole. Therefore, good or bad news regarding these important insurers will also affect stock prices of other companies - especially in the financial sector. Consequently, a Roll approach regression will show a relatively high  $R^2$  for these companies and all other insurers with a similar business model. In Germany a pure small health insurer, on the other hand very likely had a low  $R^2$  just because the business model of this firm is very different from the business model of Allianz. This result

would not justify any assertions considering transparency but measures size (or the similarity to the large insurer). There is a number of additional problems. First of all, the estimated regression coefficients seem to be unstable over time possibly resulting in difficulties with structural breaks [20]. This would lead to low  $R^2$  examining the complete data set while yielding higher  $R^2$ s using sub-samples for the estimation. Furthermore, Jin and Myers have noted that opaqueness is only one possible explanation for the high  $R^2$  observed in emerging markets and have argued that this finding could simply be a consequence of higher local market volatility [17]. While they have argued that controlling for the local market in the regression does not change the role of their measures of transparency and other control variables there at least seem to be some effects as one coefficient even changed its sign. This implies the lacking robustness of this approach. Therefore, we have to be careful interpreting the results of this study. Additionally, they argued that opaque stocks with high  $R^2$  are more likely to crash. At this point there may be a problem with inverse causality. In fact, high  $R^2$ s simply might be a consequence of crashes in the past. In sum, it seems to be necessary to search for a more adequate measure of corporate transparency. Some recently suggested measures of corporate transparency are based on the extent to which companies avoid to report earnings behind expectations or delay the recognition of losses [21]. Other econometricians have examined the extent to which financial statements reflect subsidiaries on a consolidated basis or how many analyst cover a stock [18][22]. We return to these ideas later on.

Transparency is also an important concept in the fields of monetary and international economics. From the perspective of monetary economics a central bank may use transparent communication strategies to anchor inflation expectations of the public at the desired level [23]. In international economics transparency is seen to help a country to attract foreign capital [21]. Therefore, applied econometricians working in the fields of monetary and international economics also have a need for an adequate measure of transparency. These research efforts may also be interesting for financial economist searching for a gauge of corporate transparency. Focussing on monetary economics Fry, Julius, Mahadeva, Roger and Sterne have made suggestions for an index of central bank transparency based on the explanations of policy decisions, the frequency and form of forecasts and forecast errors as well as the frequency in which research papers are published and speeches are held [24]. Eijffinger and Geraats have also calculated an index of transparency covering five important aspects of transparency (namely political, economic, procedural, policy and operational transparency) examining nine different central banks [25]. This index is thought to reflect the public availability of information regarding the formal objectives, quantitative targets and institutional arrangements, of economic data, policy models, and central bank forecasts and of minutes and voting records as well as the promptness of announcements of interest rate changes. In the field of international economics some measures of transparency focus on the frequency and timeliness of the publication of key economic indicators while others are based on the dispersion of macroeconomic forecasts by different forecasters [21]. This approach is based on the assumption that different economists produce more diverging forecasts for countries that are less transparent about their

macroeconomic policy measures. We believe that this is an interesting concept.

As already noted, the number of analysts actively covering a firm is commonly seen as a measure of corporate transparency. Jin and Myers, for example, have argued forcefully that active coverage by financial analysts should make firms more transparent [17]. Using this concept, we have tried to measure the transparency of the insurance industries of the U. S., Europe and Japan (see table 1)<sup>2</sup>. We have focused on

	U.S.	Europe	Japan
High	19	50	16
Low	24	22	2
Mean	21,4	39,4	12

**Table 1: Number of analysts covering a firm**

the largest seven insurers of any country/region (by market capitalization) because there only are seven big insurers in Japan. The insurers are also required to be a member of either the Dow Jones Sector Titans Insurance Index or the leading regional insurance index. Quite clearly, the European insurance industry is covered by the highest number of financial analysts. This, of course, is only one facet of corporate transparency. Bhattacharya, Daouk and Welker have suggested examining the number of auditors [26]. We think that it could also be informative to count the number of rating agencies assigning credit ratings to the seven insurers of the three countries or regions respectively<sup>3</sup>. Using this criterion Japanese insurers would seem to be the most transparent firms (see table 2). However, we have to be careful

	U.S.	Europe	Japan
High	6	5	7
Low	4	3	5
Mean	4,4	4	6,3

**Table 2: Number of rating agencies assigning credit ratings**

interpreting this result because it is mainly a consequence of the existence of two rather important Japanese rating agencies. This shows that national institutional arrangements do matter when analysing corporate transparency issues.

Media coverage may also help to increase transparency [17]. We have tried to measure how often the insurers are named in the international quality press<sup>4</sup>. Table 3 shows the total number and the number of appearances in headlines. The results seem to indicate difficulties with this approach as well. While the results from the international press section of GENIOS do include almost all major U.S. and Asian

<sup>2</sup>We have used the Bloomberg ANR function to identify the number of analysts actively covering a firm.

<sup>3</sup>In order to do so we have used the Bloomberg CRPR function. We have reported the number of rating agencies for the respective holding company or of the subsidiary firm (in the respective region) with most ratings by different rating agencies.

<sup>4</sup>We have used the GENIOS tool to search for the 21 firms in the international press. This excludes smaller European newspapers (e.g., Aar-Bote or Main-Taunus-Kurier) from the search. Our results are from one year (which means we have started in May 2009).

newspapers (e.g., Washington Post and Bangkok Post) GENIOS may still have a stronger focus on Europe. This would bias the results and could be one reason for the results reported in table 3. On the other hand a number of insurers

	U.S. Total (Headlines)	Europe Total (Headlines)	Japan Total (Headlines)
High	1596 (183)	10987 (1039)	323 (67)
Low	43(0)	544 (33)	10 (0)
Mean	560,9 (61,8)	4213,7 (395,7)	129,1 (19,16)

**Table 3: Media Coverage**

play a special role in European stock markets and correspondingly have high weights in the regional blue chip stock market indices. As a consequence, it is quite common that Allianz or Axa are mentioned in general stock market commentaries. This is not the case with Aflac<sup>5</sup>. But does it really increase corporate transparency when a press report tells us that the DAX increased considerably and that Allianz has contributed to this rise? Probably econometricians planning to measure corporate transparency should focus on headlines. There are also less practical problems. The Enron scandal, for example, presumably has considerably increased the presence of Enron in the media. But are press reports about past scandals really a sign of more transparency? This is also of importance in the insurance industry. In fact, the presence of AIG in the quality press has largely decreased after the crisis. Comparing the period May 2009 to May 2010 with May 2008 to May 2009 the number of press releases dealing with AIG has almost halved. In fact, the high media coverage of Prudential PLC (10987) has to be put in this perspective because there have been many articles discussing the Asia deal with AIG.

The discussions above show that there are many different aspects of corporate transparency. Therefore, it may seem to be a good idea to construct an index of transparency that combines as much relevant information as possible. This approach could also help to measure time-series variation of corporate transparency. However, there are also some problems with this approach. Most importantly, it is not clear how to set appropriate weights for the different components of the transparency index. Phrased somewhat differently, how many headlines make up one additional analyst covering a firm? One interesting solution is a measure suggested by Jin and Myers: They argue that the diversity of analysts' earnings forecasts may be an appropriate measure of transparency [17]. We believe that this is an excellent concept that gives relevant information about corporate transparency and also varies over time.

<sup>5</sup>AIG is the only U.S. insurer that had a media coverage matching the large European insurers. However, AIG is not one of our 7 U.S. insurers because it is neither a member of the Dow Jones Sector Titans Insurance Index nor the U.S. regional insurance index.

## 5. CONCLUSION AND OUTLOOK

The analysis of several different regions and their insurance sectors suggest transparency to be a major factor when talking about dividend policy. This is intuitive, as a higher level of transparency naturally results in less private information which could be the cause for conducted signaling. If there is no hidden and signaling-worthy information, dividend payments are of no use at all and even real corporate earnings because of taxes and the resulting dissipative nature. So the sector-transparency should definitely be included in the reasoning of managers concerning dividend policy. If neglecting these findings it is well possible, that free cash flows are partially consumed because of signaling costs. Thus especially in strongly regulated industries as the financial sector, dividend payments might not be as important as currently valued by a large proportion of investors. The negative impact of cutting or even omitting dividends should therefore be of minor influence during critical decisions for the future of the company.

As already noted in section 3 there are several options for future research. Following Bhattacharya, a combination of his two models should be of interest ([2] and [14]). In that case the dissipative nature of dividends and the possibility of increasing disclosure are combined, targeting in the same direction as this study does. But due to the structural disparities this seems to be not as easy as it might appear on first sight. Further investigating the model augmentation proposed in this paper might therefore be a rewarding alternative. For example it might provide further insights when analyzing different industries with regards to their transparency and dividends paid, to make structural assertions about the functional form of transparency costs and refinancing costs with respect to  $\gamma$ .

Transparency and especially measuring transparency are hard to handle due to the various facets of transparency as was shown during the differing approaches in section 4. An appropriate measure of transparency would be a major advancement for several sectors of economics. Further research thus should investigate if for example the criteria described above may be accumulated in a coherent index of transparency. Also the dispersion arguments should provide interesting insights into this complex matter. It might also prove to be quite useful if heuristic to use the effectiveness of signals (inferred from an analysis similar to the ones conducted in section 2) as a proxy for a markets transparency.

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## **MODULE 7**

**Variable-ordering induced problems of impulse-response analysis and other difficulties: the dividend policy of Austrian firms**

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## **Variable-ordering induced problems of impulse-response analysis and other difficulties: the dividend policy of Austrian firms**

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**Abstract:** Orthogonalised impulses are the standard way to isolate shocks to variables in a vector error correction model. While using the Cholesky decomposition to adjust interdependencies of the shocks, the ordering of the variables on the stage of estimation has a great impact on the resulting impulse response functions. It is shown how the variable ordering affects the empirical evaluation of the dividend policy of Austrian firms examining corporate earnings, dividends and inflation. Additional problems are discussed (e.g., bootstrapped confidence intervals and seasonal adjustment procedures, missing variables). The paper has two messages: it is a fatal flaw of any economic model to omit important variables. Moreover, it is also of major importance to use appropriate econometric modelling techniques.

**Keywords:** corporate earnings; dividend policy; smoothing; variable ordering; cointegration; impulse-response function; Austria; dividends; signaling.

**Reference** to this paper should be made as follows: Basse, T. and Reddemann, S. (2010) 'Variable-ordering induced problems of impulse-response analysis and other difficulties: the dividend policy of Austrian firms', *Int. J. Computational Economics and Econometrics*, Vol. 1, Nos. 3/4, pp.278–293.

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## 1 Introduction

Trying to explain why firms pay dividends is an important problem faced by the modern theory of finance. In a seminal paper, Miller and Modigliani (1961) have argued that under certain assumptions the value of a firm is not affected by its dividend policy. According to their theory, dividend changes have no economic implications and therefore no optimal dividend policy appears to exist. This *dividend irrelevancy hypothesis* is based on the argument that dividends are paid from earnings and investors do not prefer dividend payments to capital gains or vice versa. Furthermore, there are obvious arguments against dividend payments as dividend income is subject to heavier taxation than capital gains in many countries. Thus, economic theory seems to have difficulties to explain why firms do pay dividends.

The *dividend signalling hypothesis* is a very popular approach to justify dividend payments. This hypothesis is based on the idea that the management of a firm can use changes in the dividend level to overcome information asymmetries signalling revised earnings expectations to investors. Another important theory of dividend determination is based on the observation that companies seem to be reluctant to cut dividends and therefore try to alter the volume of dividend payments only gradually. In other words, this so-called *dividend smoothing hypothesis* predicts that firms plan to avoid sending out negative signals to their investors. According to this theory a strong link between dividend payments and corporate earnings still remains to exist. However, Goddard et al. (2006) have argued that the two hypotheses make opposing predictions about the temporal relationship and subsequently the Granger causality between dividend payments and corporate earnings. Whereas the smoothing hypothesis suggests that earnings lead dividends, the signalling hypothesis predicts that dividends lead earnings.

Allen and Michaely (1995) have provided an excellent survey of the literature on empirical tests of theories of dividend determination. Therefore, this article does not attempt to extensively review the literature, but will only discuss two important but often neglected factors complicating tests of theories to explain the existence of dividend payments. Namely, clientele effects and inflation can create serious problems for econometricians as both factors may be of importance analysing dividend policy issues. Numerous firms seem to tailor their dividend payouts to suite particular groups of investors: In many countries, family-controlled firms may, for example, have a tax-based incentive to avoid dividend payments altogether (e.g., Gugler, 2003). Moreover, it has also been argued that inflation could distort the ability of firms to use dividend changes to signal revised earnings expectations to their investors (Basse, 2009). Therefore a tendency of firms to gradually increase dividend payouts due to inflation could falsely be interpreted as empirical evidence in favour of dividend smoothing. Tests of dividend policy theories should definitely control for these factors. Gugler (2003) recently has examined the existence of clientele effects in Austria and has argued that family-controlled enterprises have lower payout target ratios and are more likely to cut dividends while state-owned firms are most reluctant to do so. This empirical study should be complemented by studying the dividend policy of Austrian firms taking a more macroeconomic perspective examining the influence and possible effects of inflation.

The aim of this paper is twofold. First of all empirical evidence of dividend payments in Austria is analysed taking a macroeconomic perspective considering inflation as additional variable. While dealing with those questions, the importance of appropriate

modelling and choice of methods is inestimable. Thus, this paper aims at the identification of adequate methods and the problems arising if chosen wrongly. In order to achieve this, an econometric approach is implemented dealing with the disclosed traps at the point of their appearance resp. relevance. So far the empirical evidence regarding the validity of the hypotheses have been more or less inconclusive. This could be due to overlooking model inherent or statistical problems.

## 2 Inflation and the present value model

To motivate the further empirical analysis the present value model with inflation is investigated from the viewpoint of economic theory. Following the reasoning of classical corporate finance textbooks stock prices are given by:

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

where  $E(\cdot)$  is the expectations operator,  $D_t$  the dividend process and  $R_t$  the risk adjusted required rate of return. Thus, the dividend discount model predicts that stock prices are fundamentally determined by the present value of expected future dividend payments. Expected dividends are discounted with  $1+R_t$ . At this point the dividend discount model requires that assumptions about future dividend payments and the required rate of return on equities are made. Different assumptions lead to a variety of more or less complex versions of this simple model. Gordon (1959), for example, suggested assuming dividends growing at a constant rate  $g$ . Corporate earnings are denoted by  $EA$ . Moreover, assuming that the required rate of return on equity is also constant and introducing  $b$  as ratio of reinvestment, leads to the equation (by using the limit for the geometrical series):

$$SP_t = \frac{D_t(1+g)}{(R-g)} = \frac{EA_t(1-b)(1+g)}{(R-g)}$$

Gordon and Hochman (1978) made suggestions to improve this model by also examining the effects of inflation on stock prices under the assumption that the inflation rate per period  $\pi$  is constant over time. In this version of the dividend discount model, dividends are expected to grow at a constant real rate  $g$ . Therefore, the nominal rate of dividend growth is assumed to be  $(1+g)(1+\pi)-1$  and stock prices are given by:

$$SP_t = SP_{t-1}(1+g)(1+\pi)$$

These theoretical considerations are closely linked to the question whether stocks are a useful hedge against inflation. Gordon and Hochman (1979) have made some suggestions which conditions lead to positive correlations between equity returns and inflation and which lead to negative correlations. Following Campbell and Shiller (1988), Schotman and Schweitzer (2000) as well as Basse (2009) have shown that two countervailing trends are present. They have argued that there is a positive effect because inflation raises corporate earnings and thereby increases future expected dividends. However, there is also a second, negative effect of higher inflation rates because inflation increases the discount rate via the Fisher effect thus lowering stock prices. Fons and Osterberg (1986) have noted that firms typically are not able to match declines of profits with declines of

expenses in a deflationary or disinflationary environment. This seems to be especially true following periods of prolonged high inflation rates. More recently, Sharpe (2002) has argued that inflation is negative for stock prices because it lowers expected real earnings growth and increases the real required return.

While there is no consensus on the effect of inflation on stock prices it seems to be generally accepted that increases to the price level do raise corporate earnings. Given that dividends are paid from earnings inflation quite clearly may be of relevance analysing dividend policy issues. Moreover, some empirical studies published more recently seem to indicate that stock prices and inflation are cointegrated (e.g., Kolari and Anari, 2001; Luintel and Paudyal, 2006). Therefore, dividend payments and the general price level could also follow common stochastic trends. The empirical evidence presented by Basse (2009) does indeed indicate that this is the case.

### **3 Data and methodology**

As mentioned this paper employs a macroeconomic perspective analysing the relationship between dividends, earnings and inflation in Austria. Consequently, it does not focus on the dividend payments and earnings of individual firms but examines the aggregated variables of the ATX members using the dividend per index share and earnings per index share concepts. Therefore, there is no need to control for clientele effects. The ATX Index is a common measure for the performance of the Austrian stock market. It is a capitalisation-weighted index consisting of the most frequently traded stocks on the Vienna Stock Exchange. Bloomberg provides data on earnings and the volume of dividends paid by the ATX index constitutes. The measure of inflation used is the GDP price deflator which is a broad gauge for the development of the Austrian price level. Avoiding possible problems due to the introduction of the Euro in 1999 quarterly data from Q1 1999 to Q4 2008 is examined.

To accurately model the interdependencies between the three variables assumed to be endogenous, the estimation of a vector autoregressive (VAR) model is inevitable. A VAR model is a system of equations that regresses the variables on themselves and the other included endogenous variables and thereby considers the interdependencies between all variables. It is of course still possible to include exogenous variables as regressors, but no new equation is connected with the addition of this variable. Variables contained in a VAR have to be stationary. Stationarity is tested using the ADF-tests reported in Table 1. The results of the test imply that all three variables are non-stationary and integrated of order 1.

Assuming that a long run relationship of inflation and the two variables earnings and dividends exists, the Johansen (1991) cointegration test is performed. This test yields an interesting result. Inflation is a relevant factor in this model and may indeed partly be responsible for the inconclusive findings in the literature (next to the further discussed problems). According to the test results, two cointegration relationships seem to exist.

Given the results reported in Table 2 a vector error correction model (VECM) shall be used which augments the standard VAR model in differences by an additional term: A linear combination between earnings and inflation respectively dividends and inflation. This is the so-called error correction term which has the effect that deviations from the joint equilibrium are cancelled out during the following periods and both processes

reverse to their long-term relationship. Thus, cointegration provides additional information to further improve the model. In order to avoid problems with structural breaks – which are known cause major problems with cointegration tests (e.g., Gregory and Hansen, 1996) – and to keep a parsimonious model we have shortened the time period analysed avoiding possible difficulties due to the introduction of the Euro. This does create a new problem. In fact, Monte Carlo experiments performed by Hargreaves (1994) do indicate some difficulties using the Johansen test with less than 100 data points. However, he has also argued that it is a common practice in applied econometricians to work with sample sizes of about 50 observations.

**Table 1** Testing for stationarity

<i>Null hypothesis: time series has a unit root</i>		
<i>Time series:</i>	<i>ADF-test statistic</i>	<i>5% critical value</i>
GDP price deflator:	1.04	-2.86
$\Delta$ (GDP price deflator):	-2.66	-2.86
Dividends	-1.90	-2.86
$\Delta$ (Dividends):	-23.47	-2.86
Earnings:	-0.54	-2.86
$\Delta$ (Earnings):	-3.21	-2.86

Note: ADF ten max number of lags, seasonal dummies, no trend, critical values from Davidson and MacKinnon (1993).

**Table 2** Testing for cointegration

<i>r0</i>	<i>LR</i>	<i>pval</i>	<i>90%</i>	<i>95%</i>	<i>99%</i>
0	62.76	0.0000	32.25	35.07	40.78
1	23.95	0.0132	17.98	20.16	24.69
2	4.93	0.3018	7.60	9.14	12.53

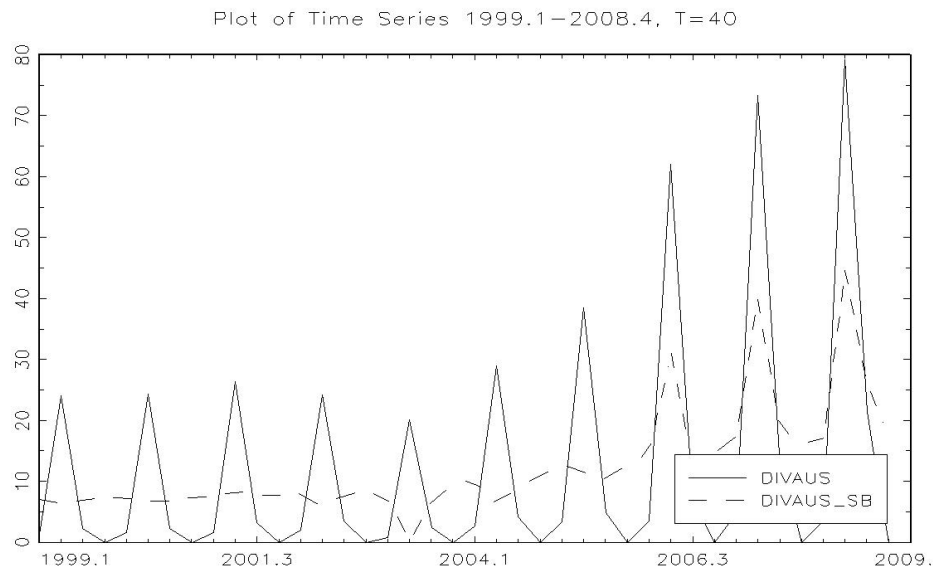
Note: Critical values taken from Doornik (1998)

To account for the strong seasonal pattern of the dividend time series seasonal dummies were included while estimating the model (two cointegration relations, four time lags). The choice of four lags is motivated by considerations of parsimony; relevant system dynamics are already covered by four lags as supported by the Portmanteau tests conducted (indicating randomness of the residuals with a p-value of 0.39). It may also be appropriate to work with seasonally adjusted data, but even after the standard adjustment process CENSUS X12 strong seasonal patterns are obvious in the resulting time series (and impulse-response graphs, whenever dividends are included). The following graph shows both the seasonally adjusted and the non-adjusted dividend time series.

The adjustment procedure has severe problems with the massive increases once a year, when most companies payout the annual dividends. As already indicated the unadjusted data is used and adjusted in the process of model estimation by including dummy variables to soften the effect of the strong seasonal fluctuations. This process obviously is subject to the restrictions mentioned above, but seasonally unadjusted data is

used to not omit valuable information before the actual estimation begins, as even a preceding seasonal adjustment does not lead to time series without seasonal patterns.

**Figure 1** Seasonal adjustment



Once the model is specified one can proceed to analyse the resulting estimation of the parameters. In this context impulse-response analysis is utilised to gain a deeper insight into the causal relations driving the model. Subsequently the standard method of orthogonalised impulses is briefly discussed following the ideas of Sims (1980) and Pesaran and Shin (1998). In a later section the notation of Pesaran and Shin is used again to discuss the concept of generalised impulses.

Impulse-response analysis has developed to a very successful tool in the field of econometrics. It provides a variety of results, both graphically and formula-based and can be used to examine causal relations between endogenous variables in a VAR model. As known from basic econometrics under the standard assumptions a VAR(p) process of the form:

$$x_t = \sum_{i=1}^p \phi_i x_{t-i} + \Psi w_t + \varepsilon_t$$

where  $x_t$  is the  $m \times 1$  of endogenous,  $w_t$  the  $q \times 1$  vector of exogenous or deterministic variables and  $\phi_i$  ( $i = 1, \dots, p$ ),  $\Psi$  are  $m \times m$  resp.  $m \times q$  coefficient matrices, has a moving average representation:

$$x_t = \sum_{i=0}^{\infty} A_i \varepsilon_{t-i} + \sum_{i=0}^{\infty} G_i w_{t-i}$$

The  $A_i$  can be obtained via the recursive relation  $A_i = \phi_1 A_{i-1} + \dots + \phi_p A_{i-p} A_0 = I_m$  and the  $G_i := A_i \Psi$ . Now the following general impulse response function as introduced in Koop et al. (1996) is analysed:

$$GI_x(n, \delta, \Omega_{t-1}) = E(x_{t+n} | \varepsilon_t = \delta, \Omega_{t-1}) - E(x_{t+n} | \Omega_{t-1})$$

where  $\Omega_{t-1}$  denotes the information available at time  $t - 1$ . It is clear that the resulting response function will greatly depend on the vector of shocks  $\delta$ .

Since the correlation matrix  $\Sigma$  in most cases is not diagonal, there will be feedback mechanisms and intertemporal correlations providing a skewed impression of the actual interdependencies, leading to the problem of choosing an appropriate  $\delta$ . Thus econometricians thought about ways to circumvent these problems. Sims (1980) suggested orthogonalisation of the incoming shocks. Therefore a standard matrix decomposition technique is used, which is also often utilised in a numerical approach solving complex linear systems of equations, the Cholesky decomposition. With this procedure the original matrix is decomposed into a lower triangular matrix and its conjugate transpose.

$$\Sigma = PP^\dagger = \begin{bmatrix} p_{11} & \dots & 0 \\ \vdots & \ddots & \vdots \\ p_{m1} & \dots & p_{mm} \end{bmatrix} \begin{bmatrix} p_{11}^* & \dots & p_{1m}^* \\ \vdots & \ddots & \vdots \\ 0 & \dots & p_{mm}^* \end{bmatrix}$$

It is achieved that each variable only affects the succeeding variables by using this decomposition in the original moving average representation:

$$x_t = \sum_{i=0}^{\infty} (A_i P) (P^{-1} \varepsilon_{t-i}) + \sum_{i=0}^{\infty} G_i w_{t-i} = \sum_{i=0}^{\infty} (A_i P) \xi_{t-i} + \sum_{i=0}^{\infty} G_i w_{t-i}$$

Here  $\xi_i$  are orthogonal, i.e., the orthogonalised impulse response functions to a unit shock in variable  $j$  are given by:

$$\psi_j^o(n) = A_n P e_j, \quad n = 0, 1, 2, \dots$$

As the scale of variables differs in most cases, usually an innovation of one standard deviation is considered in the literature.

Employing the Cholesky-decomposition to purge the unwanted interdependencies, a new problem occurs: the ordering. The econometrician has to decide a priori which variable affects which other variables. By imposing different orderings varying results may be obtained. In this study the relationship between dividends and corporate earnings with the inclusion of inflation as described in Section 2 is examined. Then the results of different orderings of the three variables are presented.

Theory – and in particular the present value model – was developed throughout the past decades, resulting in theory-given possible orderings. There still is no unique order for the variables, as empirical studies do not verify a specific economic theory. This section does not try to validate or falsify one or another either, as the focus is laid upon problems arising from different orderings in the VAR/VECM. But nevertheless some theses can be found in the results section regarding the question of validity of the presented hypotheses (smoothing, signalling and irrelevance). More precisely, we use a variant of the approach suggested by Goddard et al. (2006) who have argued that



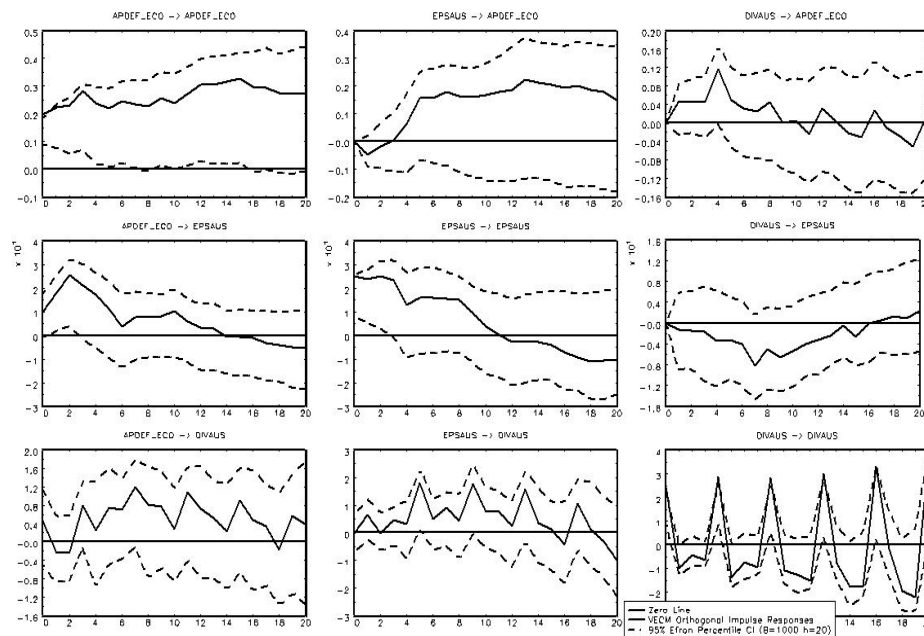
empirical evidence indicating that dividends lead corporate earnings would help to confirm the dividend signalling hypothesis while the finding that earnings lead dividends would give support to the dividend smoothing hypothesis.

#### 4 Results and interpretation

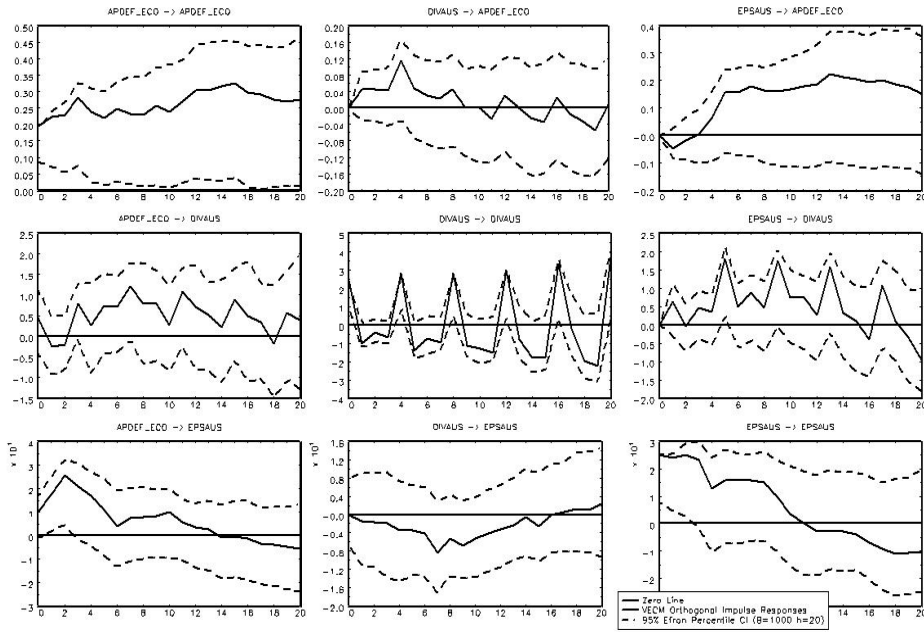
As already noted, different orderings of the endogenous variables in a VAR/VECM may affect the results of the empirical investigations, especially when using the Cholesky decomposition during an orthogonal impulse analysis. Given these problems the ordering of the variables should be set according to economic theory. In fact, the general price level ought to be seen as the most exogenous variable affecting corporate earnings and thereby – because dividends are paid from earnings – the volume of dividend payments. Consequently, the appropriate ordering of the variables seems to be Austrian GDP price deflator (APDEF\_ECO), ATX earnings per share (EAR\_AUS), and ATX dividends per share (DIV\_AUS). However, it may of course be possible to develop economic theories suggesting a different ordering of the three variables. Corporate earnings, for example, could be a major driver of inflation when firms are trying to increase profit margins.

First of all the results using the ordering inflation, earnings and dividends (Figure 2) are analysed. At this point an important question emerges: How stable are these results to different orderings of the variables? This question is answered by examining the results of different orderings (see Figures 3–7). Note that no serial correlation is present in the estimated VECM residuals. As noted before the Portmanteau test including 16 lags cannot reject the hypothesis of no serial correlation with a p-value of 0.39.

**Figure 2** Ordering price deflator – earnings – dividends



**Figure 3** Ordering price deflator – dividends – earnings



**Figure 4** Ordering dividends – price deflator – earnings

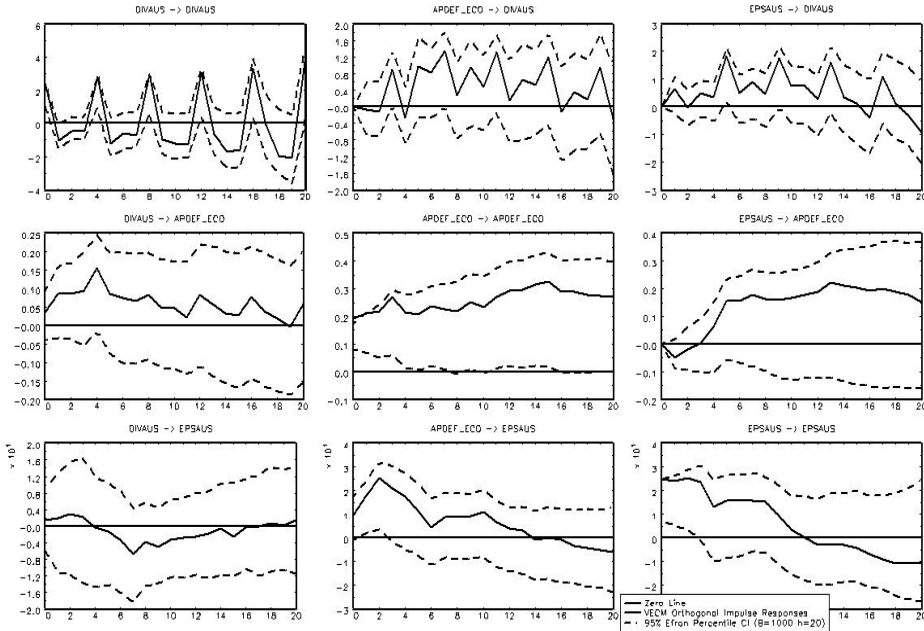


Figure 5 Ordering dividends – earnings – price deflator

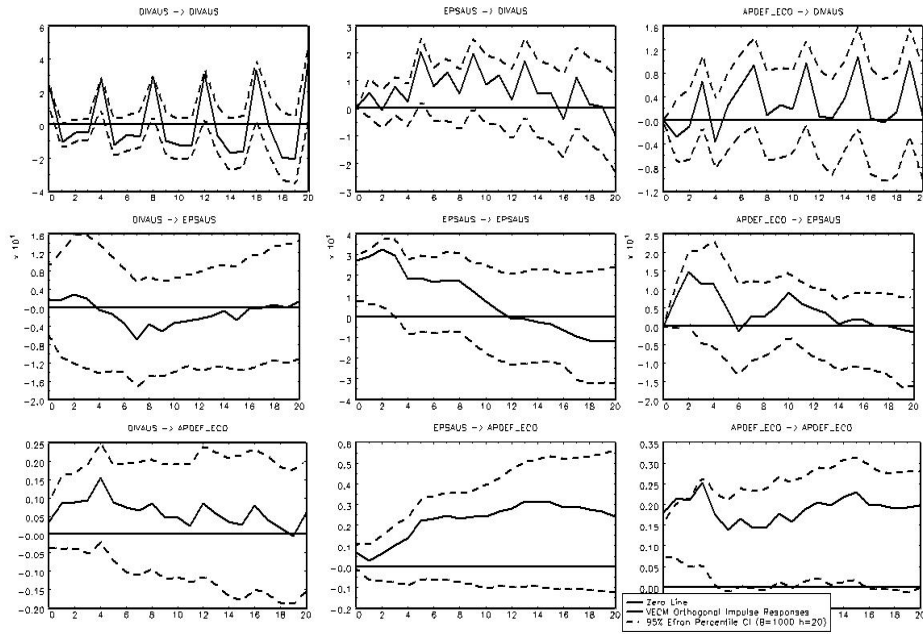


Figure 6 Ordering earnings – price deflator – dividends

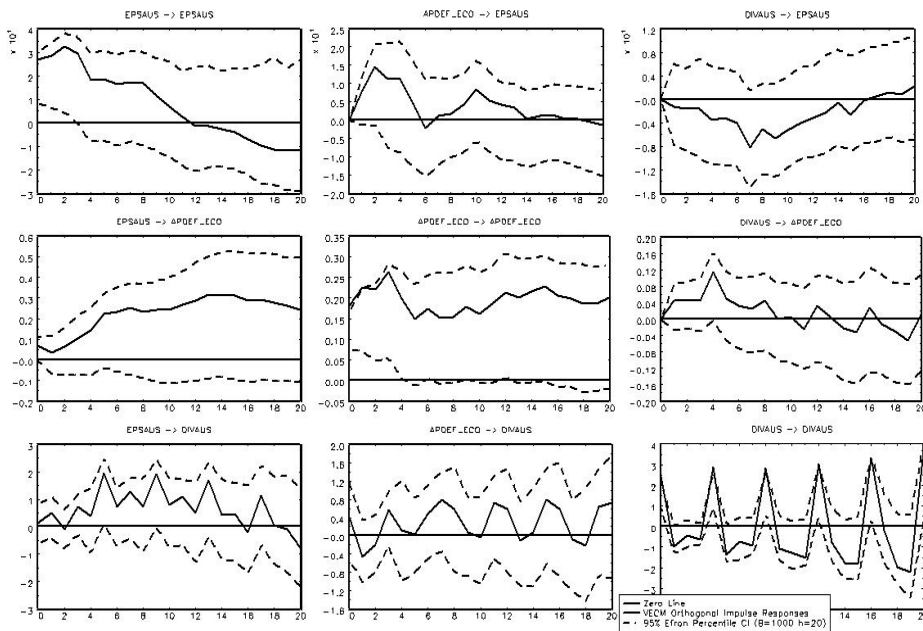
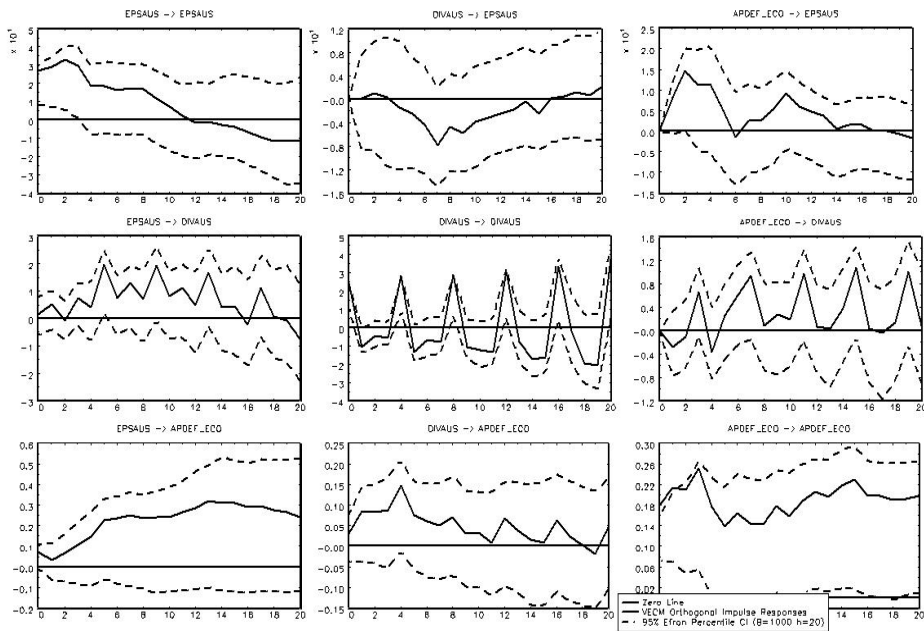


Figure 7 Ordering earnings – dividends – price deflator

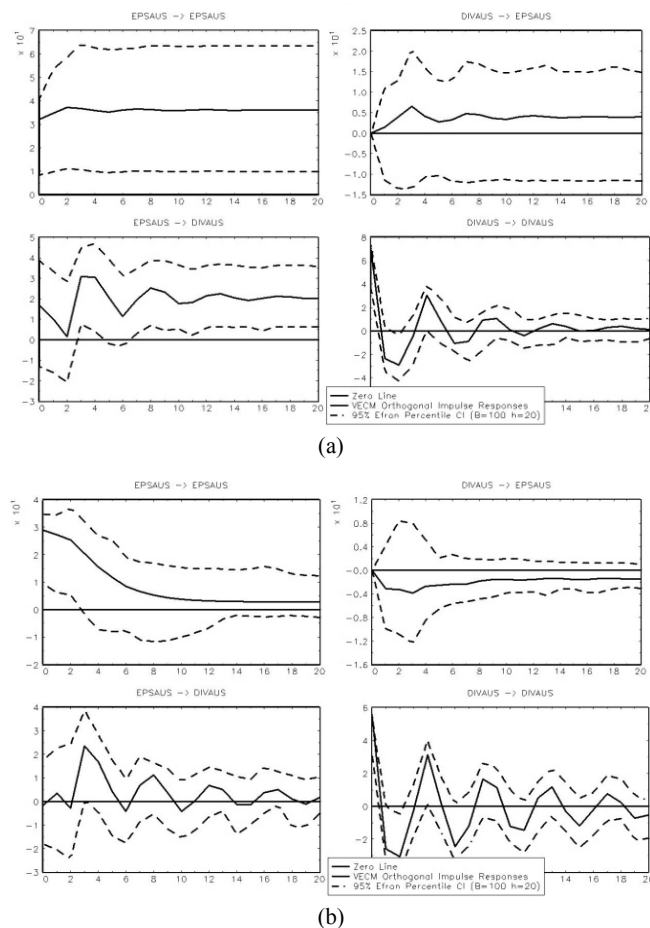


Most importantly, there is no empirical evidence indicating that dividend signalling is of any relevance in Austria following the reasoning of Goddard et al. (2006) because dividends do not lead earnings. This finding is independent of the ordering of variables. Thus, given that it was controlled for inflation the Austrian data set does not indicate that inflation had significant negative effects on the ability of firms to use dividend changes to signal revised earnings expectations to their investors. This is probably no surprise at all because the period examined here was characterised by a relatively high degree of price level stability. The average annual inflation rate as measured by the GDP price deflator was just over 2%. Consequently, the informational costs of inflation should have been rather low in recent years. Moreover, the finding of inflation affecting corporate earnings is quite robust and in general does not rely on the specific ordering of the variables examined. Only one obvious exception exists: with the variable ordering earnings, GDP deflator and dividends there is no empirical evidence indicating that inflation does significantly affect corporate earnings. Additionally, using the ordering earnings, dividends, and GDP price deflator, the effect inflation has on corporate earnings is only marginally significant on the 95% level. These results are important examining the potential of stocks to hedge against inflation. Nominal earnings quite clearly seem to rise with inflation. However this positive reaction of corporate earnings to inflationary shocks is in general not very pronounced. Therefore, the results reported above seem to imply that inflation has a tendency to lower real earnings growth.

Furthermore, the empirical evidence also does show some signs of dividend smoothing with dividends in a number of cases reacting to shocks from corporate earnings. At this point a second VECM is estimated. This model includes only two variables: earnings and dividends. The results of the impulse response functions computed for this model are fairly stable to different orderings of the variables. For

further comprehension of the differences the two VECMs (one – just earnings and dividends; two – earnings, dividends and inflation) are compared directly (Figure 8). Obviously, using inflation as third endogenous variable in the estimation of the VECM does affect the results. The seemingly strong link between earnings and dividends (down-left graph in both  $2 \times 2$  figures) nearly disappears as the confidence interval is just scraping zero. For reasons of comparability only the inflation variable was included leaving all other parameters unchanged (e.g., lag length, dummies) and using the ordering suggested by economic theory (inflation, earnings, dividends respectively earnings, dividends). The results presented in Figure 8 therefore rather clearly (and in most cases independently from the ordering of the variables) indicate that dividend smoothing is an economic phenomenon of less significance when inflation is also included in the VECM. Thus, the effects of inflation on dividend policy must be considered to avoid finding hints that are falsely interpreted as empirical evidence in favour of dividend smoothing. This may be due to inflation gradually increasing corporate earnings over time.

**Figure 8** (a) Earnings and dividends (b) the same model with inflation



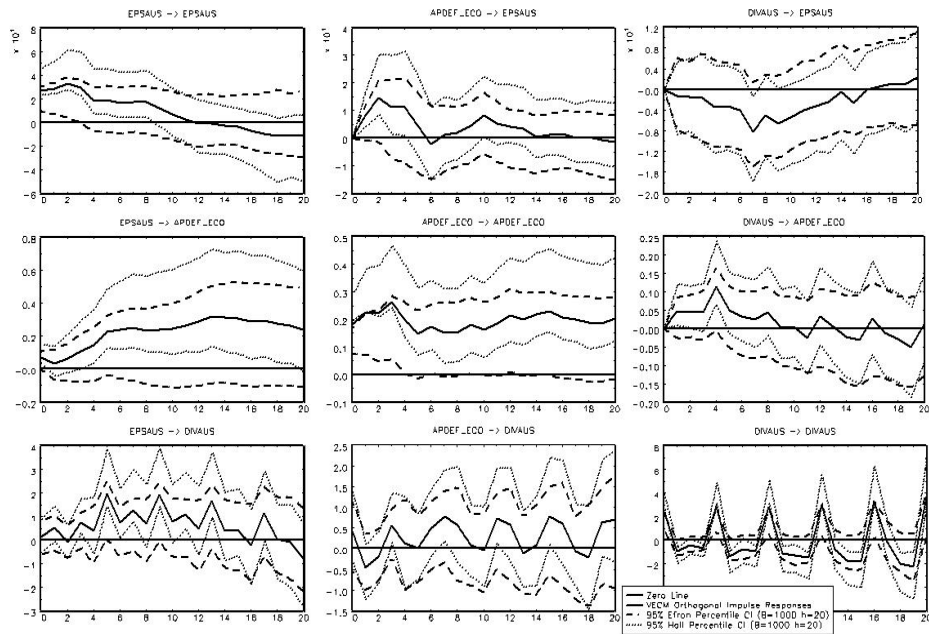
As shown, the ordering of variables is capable of drastically affecting the results of the impulse-response analysis. Next to examining all possible orderings to evaluate the stability of the results, this weakness of the orthogonalisation can also be surpassed by using generalised impulses. This means calculating the response functions in a variable ordering independent way thus leading to consistent results. The notation of Pesaran and Shin (1998) is followed returning to the level of the general impulse response function:

$$GI_x(n, \delta, \Omega_{t-1}) = E(x_{t+n} | \varepsilon_t = \delta, \Omega_{t-1}) - E(x_{t+n} | \Omega_{t-1})$$

Now another approach would be not to decompose  $\Sigma$  for the choice of an appropriate  $\delta$  but shock one element of  $\varepsilon$  directly and try to eliminate the influence on other variables:

$$GI_x(n, \delta_j, \Omega_{t-1}) = E(x_{t+n} | \varepsilon_{jt} = \delta_j, \Omega_{t-1}) - E(x_{t+n} | \Omega_{t-1})$$

Figure 9 Comparison Hall/Efron bootstrapped CIs



Under the assumption  $\varepsilon_t$  follows a multivariate normal distribution it is seen that:

$$E(\varepsilon_t | \varepsilon_{jt} = \delta_j) = (\sigma_{1j}, \sigma_{2j}, \dots, \sigma_{mj})^T \sigma_{jj}^{-1} \delta_j = \Sigma e_j \sigma_{jj}^{-1} \delta_j$$

resulting in the generalised impulse response functions:

$$\psi_j^g = \sigma_{jj}^{-\frac{1}{2}} A_n \Sigma e_j, \quad n = 0, 1, 2, \dots$$

These are invariant under variable reordering, as they directly account for the correlations included. The response function is furthermore ‘normalised’ by setting  $\delta_j = \sqrt{\sigma_{jj}}$ .

While the impulse response analysis was undertaken, a second major problem emerged. The use of bootstrapped confidence intervals (as done in most recent papers) leads to enormous differences regarding the results. Here the methods of Efron and Hall were used and yielded the results presented in Figure 9.

As it is clearly seen, all relations, without exception, are significant assuming confidence intervals computed by Hall's (1992) method. In this paper bootstrapped confidence intervals as proposed by Efron and Tibshirani (1993) were computed as suggested for smaller samples by Scholz (1994). Given the results documented in Figure 9 further research regarding appropriate techniques for bootstrapping confidence intervals would be of high value for applied econometricians.

## **5 Conclusions**

Summarising and evaluating the results of this paper there are two different facets – one related to the theory of corporate finance and the other related to problems of applied econometric analysis – to be discussed. Firstly, the examined relationship between corporate earnings and dividends has to be reconsidered given the fact that inflation exerts a massive influence on the variables. This result is quite robust to different model specifications and empirical research strategies and therefore seems to be of special importance. Moreover, the empirical findings presented in the sections above do not support the dividend signalling hypothesis. However, the empirical evidence in general seems to be compatible with the more 'intuitive' dividend smoothing hypothesis, even though adding the variable inflation reduces the significance of the empirical evidence in favour of this hypothesis. Further research considering dividend policy of firms in inflationary environments should be carried out; especially studies focusing on countries with more volatile inflation rates could provide additional insight into relevant relations.

Second, while performing the empirical analysis several statistical problems occurred. Namely problems with variable ordering, bootstrapped confidence intervals and seasonal adjustment procedures complicated the analysis. In the case studied here, a definite ordering was supplied by theory and its results were compared with other possible orderings. Significant differences were found thus making it indispensable to deal with the corresponding theory before actually estimating the first model or to use generalised impulses. Using different bootstrapping methods affected the results tremendously. Further research in this area is mandatory since most statistical/empirical papers use bootstrapping to indicate significance levels. As a matter of fact, the results reported in this paper appear to have an eminent importance for applied econometrics due to the fact that the widely used statistical packages either cannot compute impulse response standard errors for VECMs (EViews) or do not grant the possibility to employ generalised impulses (JMulTi, R or Gretl).

This paper provides the fundamental message that it remains a fatal flaw of any economic model of dividend policy to not consider important variables. Examining the dividend policy of Austrian firms it was shown that neglecting inflation may greatly distort the empirical findings and therefore tempt the researcher to draw incorrect conclusions. Next to this finding, based on economic theory, it was also shown that it is of major importance to use appropriate econometric techniques fitting the particular question dealt with.

## Acknowledgements

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## **MODULE 8**

### **Impact of the Introduction of the Social Long-Term Care Insurance in Germany on Financial Security Assessment in Case of Long-Term Care Need**

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## Impact of the Introduction of the Social Long-Term Care Insurance in Germany on Financial Security Assessment in Case of Long-Term Care Need\*

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The discussion concerning long-term care insurance in Germany barely exceeds the financial state of the social system. The view of the insured involved is largely ignored. This paper analyses the effect of the introduction of compulsory long-term care insurance in 1995 in Germany on the perception of financial security when needing long-term care. Using different regression techniques on a subset of the German Socio-Economic Panel (SOEP) data, we show that the introduction led to a general positive shift of the assessment. Furthermore, experience with long-term care had no significant effect before the introduction but a positive effect afterwards. Also, the perception of financial security is found to be increasing with income at both times with similar magnitudes.

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**Keywords:** long-term care insurance; social insurance; risk perception; introduction; Germany

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### Introduction

The potential need for long-term care is one of the greatest financial risks faced by the elderly and their adult children. As traditional structures of the family evolve towards one-generation households and female employment rates increase, family members are increasingly unable to provide long-term care. As a result, institutional care must be organised and paid for, or family members may have to interrupt their employment. Both alternatives result in financial risks that emerge from long-term care risk. In Germany, as well as in France and Austria, adult children are legally obligated to support their parents if the parents have exhausted their financial resources.

Following a large debate in Germany since the 1970s, compulsory long-term care insurance was introduced in 1995 as the fifth pillar of social insurance and was structured as a pay-as-you-go system. After several efforts to reform this system,

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\* We wish to thank two anonymous referees for their helpful comments.

which suffered from severe financial problems, long-term care insurance reform in Germany is currently widely discussed. Several measures were proposed by a number of institutions, leaving the future of the programme in an uncertain state. Most discussions have centred on the state of social funds while mostly neglecting the mindset of the affected segment of the population. The recent debate on reforming the social long-term care insurance scheme received renewed attention in September 2009 from the new German government, but several concrete steps still remain.

The development and implementation of social long-term care insurance in Germany appears to be primarily dominated by fiscal, rather than socio-political arguments, as the disburdening of the communities from long-term care insurance payments has been one of the main arguments in the discussions.

Existant literature primarily focuses on analysing appropriate designs for a long-term care system. These designs incorporate financial structures and apply theories of demand.<sup>1</sup> Kunreuther<sup>2</sup> states that high loss/low probability events that have not occurred recently are likely to be ignored, which plays an important role in risk assessment. Hershey *et al.*<sup>3</sup> applied this theory to health insurance. Pauly<sup>4</sup> suggests an underestimation of needs by uninformed elderly individuals. Moreover, he finds non-rational demand for long-term care insurance, which is motivated by second-stage moral hazard behaviour between parents and children and by consumption reasons in the case of death of a partner. Zweifel and Struwe<sup>5</sup> built a two-generation model for long-term care insurance based on this theory. Holtgrave and Weber<sup>6</sup> state that most of the risks considered by research on risk perception fall into the two categories: health and financial risk. Moreover, most of the health risks include a financial component. There are rarely studies that assess the financial aspects and also recommend a new insurance scheme to implement.

In our paper, we focus on the perception of financial aspects concerning long-term care risks. We aim to investigate whether the introduction of compulsory long-term care insurance in Germany affects the individual assessment of the financial implications of long-term care risks. This is performed by conducting regression analysis on a fitting subsample of observations from the German socio-economic panel before and after the introduction of long-term care insurance. Therefore, we evaluate the perception of financial risk when needing long-term care, but we do not estimate the individual probability of long-term care risk. Our three hypotheses are embedded in the general question of the impact of social long-term care insurance in a given setting.

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<sup>1</sup> German studies are found in Breyer (1991,1992), Buchholz and Wiegard (1992) and Eisen (1992); international studies are found in Courbage and Roudaut (2008), Guillén and Pinquet (2008), Costa-Font *et al.* (2008), Parker and Clarke (1997), Brown and Finkelstein (2007) and Doeringhaus and Gustavson (2002).

<sup>2</sup> Kunreuther (1978).

<sup>3</sup> Hershey *et al.* (1984).

<sup>4</sup> Pauly (1990).

<sup>5</sup> Zweifel and Struwe (1998).

<sup>6</sup> Holtgrave and Weber (1993).

As there are no empirical studies focussing on introductory effects of insurance systems on individual perception, we are able to discover new insights as to how the introduction itself, and other variables, influence the individual financial assessment regarding facing personal high-probability risks. Our study helps to understand whether the public adopts this new pillar of social security and whether the new financial burdens that result from paying additional premiums are viewed as acceptable given the reduction of other long-term financial risks. The answer to the question of acceptance provides useful input for the discussion of changing the current system to a funded scheme.

The paper is structured as follows. After this introduction, an overview of German long-term care insurance is given. In the next section, the methodology and data are described, and the hypotheses are constructed. The regression results are presented in the subsequent section and discussed against the background of the derived research questions. The final section summarises the results, deduces possible implications and hints towards further research questions.

### **Overview of German social long-term care insurance**

Compulsory long-term care insurance in Germany was implemented in 1995 after 20 years of political discussion. The aim was to treat the risk of long-term care as an existential risk (such as retirement, sickness, unemployment and disability) and roll the programme into social security. Before the installation of social long-term care insurance, whereas acute care was covered by health insurance, long-term care was covered only for the needy through a community-based, means-tested programme. This programme (*Hilfe zur Pflege*) only provides benefits if the recipient has exhausted all private assets and income resources. Private care insurance has been available in Germany since the mid-1980s but played a minor role in covering long-term care risk due to low demand (only 250,000 private contracts were purchased).<sup>7</sup>

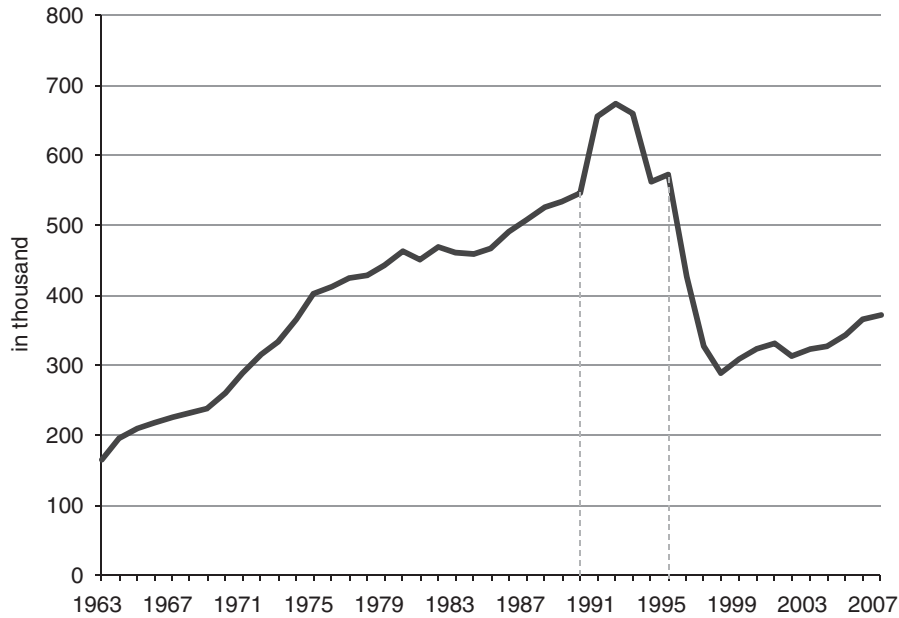
Prior to the introduction of social long-term care insurance, most of the chronically ill or elderly individuals in need of long-term care were dependent on payments from social assistance. Approximately 80 per cent of nursing home residents financed their care by means-tested social assistance. In addition, the number of eligible persons rose from 165,000 in 1963 to nearly 660,000 in 1993.<sup>8</sup> Long-term care was a large and growing financial burden for communities, and German Reunification exacerbated the problems of financing long-term care. Figure 1 displays the increase in the number of beneficiaries when long-term care social assistance was implemented. The introduction of the social long-term care insurance programme in 1995 led to a downward shift in the curve as a result of a massive shift from community-financed social assistance to the new insurance scheme.

The mandatory social insurance programme for long-term care was established in 1995 as the fifth pillar of the social security scheme in Germany to protect the population against the financial hardship associated with disability and chronic illness. The government initially implemented social long-term care insurance to cover nursing

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<sup>7</sup> Goetting *et al.* (1994, p. 289) and Zweifel and Struewe (1998, p. 13ff.).

<sup>8</sup> Statistisches Bundesamt (2009).



**Figure 1.** Recipients of social assistance for long-term care (Hilfe zur Pflege) 1963–2007 (Statistisches Bundesamt, 2009, Table D7).

care dependency, to disburden the local authorities from increasing payments to provide social assistance and to enhance ambulatory care for long-term care patients. These goals were mostly achieved.<sup>9</sup>

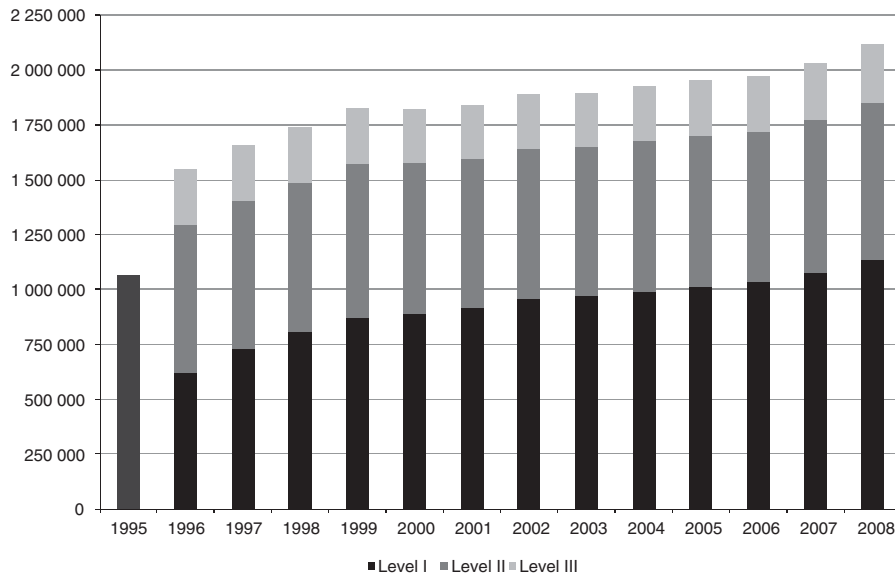
Social long-term care insurance was designed as a pay-as-you-go system and was financed by income-related contributions, which are split equally between employees and employers. The initial contribution rate in 1995 was 1 per cent. The new social insurance programme provides home care and nursing home care for people with a medically approved need without regard to age or financial status and without requiring a means test. The benefits are fixed at a monthly maximum per eligible person and are determined by illness/disability level and the setting.<sup>10</sup> After the implementation in January 1995, benefits for home care were paid in cash or in kind beginning in July 1995, and benefits for nursing home care were added in July 1996.<sup>11</sup> The administration of social long-term care insurance was connected to the existing public health insurance fund and covers the same people (approximately 90 per cent of the population<sup>12</sup>). In 1996, the contribution rate was raised to 1.7 per cent due to the extension of benefits on institutional care. The rate was raised again to 1.95 per cent

<sup>9</sup> BMGS (2003, p. 186) and Geraedts *et al.* (2000, p. 395).

<sup>10</sup> BMG (2008a, pp. 11–12 and 23).

<sup>11</sup> BMGS (2003, p. 185).

<sup>12</sup> OECD (2008, p. 19). Individuals with high income and covered by private health insurance schemes were obliged to purchase long-term care insurance at the same private insurance company with the same range of coverage as the public scheme.



**Figure 2.** Recipients of long-term care (1995 only recipient in total available) (BMG, 2008b).

in 1998. The benefit and contribution structure has been relatively stable since then, excluding minor modifications.

Figure 1 illustrates that up to 400,000 individuals are dependent on both social assistance and social long-term care insurance. This is based on the fact that social long-term care insurance provides defined benefits (the limit of which depends on the disability level)<sup>13</sup> and form of care (home or institutional). Therefore, the provided benefits or services often only cover part of an individual's needs.<sup>14</sup> If the personal wealth of the aggrieved individuals or their potentially liable relatives cannot completely cover the costs for needed care, they can also apply for social assistance.<sup>15</sup>

While the purpose of health insurance is to improve existing health conditions, long-term care aims at making current conditions more bearable. As displayed in Figure 2, more than two million people currently received monthly benefits from social long-term care insurance. Most of these people receive ambulatory benefits (1.53 million). Stationary care in nursing homes is used by 720,000 people. As the probability of becoming dependent on long-term care after the age of 80 years is approximately 29 per cent, it is expected that in the year 2030, 3.09 million people will be in need of long-term care.<sup>16</sup>

As the long-term care insurance programme began to run a deficit in 1999 and was forecasted to have exhausted any prior surplus by 2008, the German government

<sup>13</sup> The eligibility for benefits is distinguished by three levels of need and based on limitations for a minimum of six months in activities of daily living (ADL) and instrumental activities of daily living (IADL).

<sup>14</sup> BMGS (2003, pp. 185–186.)

<sup>15</sup> BMG (2008a).

<sup>16</sup> BMG (2009b, p. 15).

initiated several small reforms.<sup>17</sup> Connected with the newly elected government in 2009, the discussion about the financial deficit and the long-term care insurance system resumed.

### **Data, methodology and hypotheses**

The data used in this publication was made available by the German Socio-Economic Panel Study (SOEP) at the German Institute for Economic Research (DIW), Berlin. The German Socio-Economic Panel is a representative panel survey of households and individuals. The first questioning was performed in 1984, covering approximately 6,000 households and 12,000 individual respondents. In 2008, the 26<sup>th</sup> questioning was performed, which included nearly 11,000 households and 20,000 individuals. The survey covers a wide range of diverse topics, such as income, employment status, education and health situation.<sup>18</sup>

The aim of our paper is to analyse the individual assessment of financial risk associated with long-term care dependency. The SOEP contains questions about individual perceptions of the risks inherent to unemployment, old-age, long-term care, etc. and information about income and other socioeconomic factors. We, therefore, use the following question and the outcomes included in the SOEP survey as a proxy for individual perception of the financial risks associated with long-term care:

The social security system in the FRG is split into several branches: health care, unemployment insurance and pension insurance. The social security system and its corresponding private businesses exist to provide assistance during emergencies and old age. How financially secure are you in the following situations?

Only the answers concerning long-term care dependency are used in the regression analysis as we aim to investigate the impact of the implementation of the social long-term care insurance. Potential answers are divided into five categories, from “very good” to “bad”, in addition to “don’t know/does not apply”. We transformed the answers into a numerical scale from 1 to 5, where 1 corresponds to “bad” and 5 corresponds to “very good” (we dropped observations with the answer “don’t know/does not apply” as they had no relevance). The SOEP includes this specific question every five years, beginning in 1987. To analyse the effect of implementing compulsory long-term care insurance, we use a balanced data set from 1992, 1997 and 2002. The answers from 2002 and 1997 were used to ensure not only the detection of direct (short-term) effects (e.g., broad media coverage or introductory problems) but also the long-term effects from the introduction. Our sample consists of members of the German health insurance system, either compulsory or private. All participants are aged 16 years or older. The final data set includes approximately 18,000 observations.

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<sup>17</sup> BMGS (2003) and BMG (2009a).

<sup>18</sup> A detailed description of the SOEP can be found in Wagner *et al.* (2007).



To examine our research questions, we estimate the following regression equation:

$$\overrightarrow{FS}_t = \overrightarrow{\beta} \cdot X_t + \overrightarrow{\varepsilon}_t \quad (1)$$

where  $\overrightarrow{FS}_t$  is the vector of individual perception of financial security with respect to long-term care need at time  $t$ . The matrix  $X_t$  includes all variables inevitable to test our hypotheses and a set of control variables. The vector  $\overrightarrow{\varepsilon}_t$  represents the error terms.

According to the ordinal scale of our dependent variable, we use an ordered probit regression based on the latent variable approach<sup>19</sup> to estimate Eq. (1). In our analysis, we focus on relative comparisons and on coefficient signs rather than absolute values. We also do not calculate marginal effects to interpret the results, as marginal effects represent the probability that the individual  $i$  changes the former category of the dependent variable, given a marginal change in an explanatory variable. Such information does not deliver further information to analyse our hypotheses.

To analyse structural breaks of individual risk perception caused by the introduction of compulsory long-term care insurance and the significance of these influences, we ran separate regressions at all observed points in time. First, we look at shifts in perception due to the introduction of compulsory long-term care insurance by adding year dummy variables  $\mu_t$  and their interaction terms with all other explanatory variables (excluding control variables) to the variable-matrix  $X_t$  and estimate Eq. (1) employing a pooled ordered probit regression. The year dummy variables  $\mu_t$  have a value of one at time  $t$  and zero otherwise. In the second step, we estimate Eq. (1) separately for 1992, 1997 and 2002 to focus on the significance level of the influences at each point in time.

Using our regressions, we will analyse the estimation results with regard to our three hypotheses covering different aspects of the influence of introducing compulsory long-term care insurance in Germany.

#### *Motivation and formulation of hypotheses*

As mentioned in the section ‘Overview of German social long-term care insurance’, the implementation of long-term care insurance in 1995 exerted influence on the financial situation of those in need of long-term care. The new system covers the financial risk associated with becoming dependent on long-term care by offering monetary assistance. Beforehand, people had to completely deplete their earnings to finance their care needs and the majority of people obtaining care in institutions were dependent on social assistance sooner or later. Owing to these financial aspects and individual risk aversion, we expect the following results:

**H1:** The introduction of long-term care insurance in 1995 led to a general positive shift in individuals’ assessment of their financial situation in the case of long-term care need. In terms of our regression, the year dummy variables  $\mu_t$  will be positive and significantly different from zero.

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<sup>19</sup> For a detailed description of this approach, see Winkelmann and Boes (2006, ch. 6).

**H2:** An individual's assessment of their financial situation increases with income both before and after introducing long-term care insurance. Therefore, all income coefficients are positive and significantly different from zero. Furthermore, the financial support of compulsory long-term care insurance weakens the influence of income, leading to significantly negative coefficients for the respective interaction terms.

Hypothesis 3 (H3) arises from the insight that the perception of long-term care risk is based on prospects that are influenced by a number of different factors. One important factor is the level of information about financial consequences in the case of long-term care need. The SOEP survey provides information on whether someone in the respondent's household needs care on a constant basis. This direct experience with the psychological, physical and financial aspects of long-term care leads to a higher level of information for the relevant respondent. Weinstein describes a bias in personal risk perception, arguing that less informed individuals believe that they are less likely to be affected by risks or situations than the average individual.<sup>20</sup> This bias might partly be reduced if the individual has experience with long-term care, resulting in a worse perception in 1992 compared to individuals with no experience. In addition, McCall *et al.*<sup>21</sup> found the demand for long-term care insurance significantly increases with long-term care experience. This additional demand may be covered by the newly introduced insurance, leading to a better assessment in 1997 and 2002.

**H3:** Experience with long-term care in a respondent's household has a negative effect on the assessment of their financial situation. After the introduction of compulsory long-term care insurance, this negative effect was diminished. In our pooled regression, this would imply that the coefficient of experiencing long-term care has a negative sign and is significantly different from zero. Conversely, the respective interaction terms are positive and significantly different from zero.

### *Variables*

To analyse our hypotheses, we include the following variables:

"Income" is a natural variable for inclusion; we decided to use per capita household income, which includes all income sources and accounts for both heterogeneous income situations and the number of household members when comparing different households. We did not use a continuous variable but rather clustered income into ranges.

Another important variable is "experience with long-term care", as experienced interviewees have an informational advantage, and we base one of our hypotheses on this fact. This variable is a dummy variable and equal to one if, in the household of individual *i*, a need for long-term care exists. Two additional factors that yield an informational advantage that we included are "political interest" and "general level of

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<sup>20</sup> Weinstein (1980, pp. 813, 818–819), Weinstein (1989, p. 1232).

<sup>21</sup> McCall *et al.* (1998, p. 194).

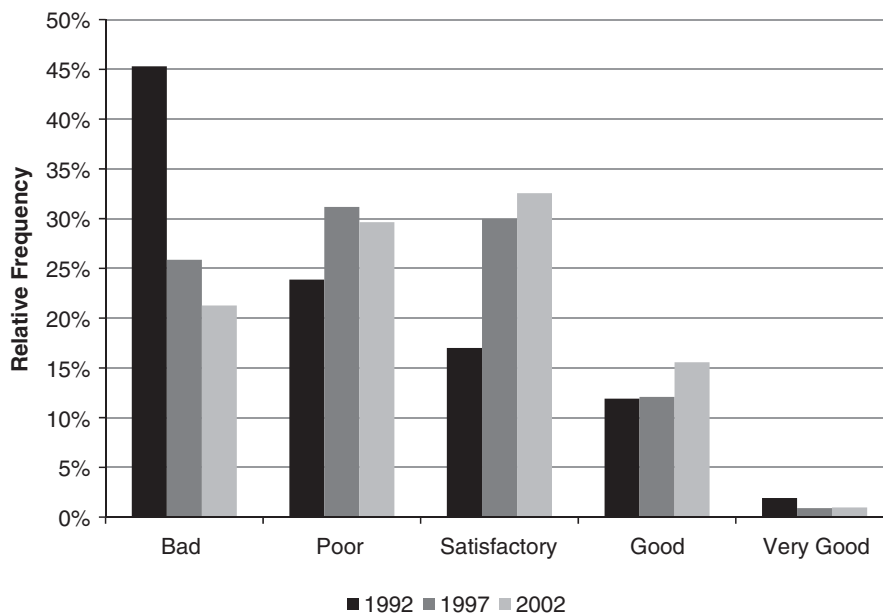
education” (low, middle or high). “Political interest” is coded as an ordinal variable from one (none) to four (very strong).

We also include a set of conventional control variables in the regression, which may be correlated with the dependent variable.

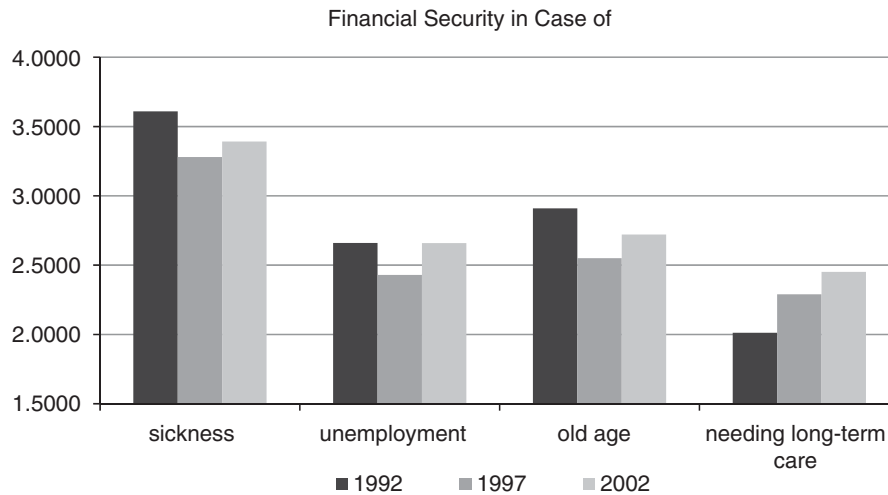
## Results

We begin this section by evaluating the descriptive statistics of the data prior to going deeper into detail and using more sophisticated analytics. Generally, we will focus on and highlight the effects of the introduction of compulsory long-term care insurance by looking at changes in the different clusters between 1992 and 2002. As we mentioned in the third section, we will also refer to separate regressions if they provide additional insights. We will try to verify or reject our hypotheses based on the results presented in this section.

A first examination of the data is displayed in Figure 3, showing the relative frequency of the different perception clusters in 1992, 1997 and 2002. The mass of the distribution shifts from the lower values to higher values over time. This is an expected result as long-term care insurance unburdens a large segment of the population. Only the “very good” cluster exhibits decreasing numbers, but due to its small size, it does not significantly influence the positive shift. To examine this apparent shift and the influence of several other variables in more detail, we will focus on the regression analysis presented in the section ‘Data, methodology and hypothesis’ after the initial descriptive evaluation. To ensure that this positive shift is not the result of a general



**Figure 3.** Perception of financial security concerning long-term care (relative frequencies).



**Figure 4.** Mean value of perception of financial security.

positive trend in the perception of financial security, we compare the perception of financial security in the case of long-term care needs with the perception of financial security in the case of old age, sickness and unemployment, which are also covered by the SOEP. Figure 4 displays the mean values of the perception of financial security in 1992, 1997 and 2002 for all four cases.<sup>22</sup> The mean value in the case of long-term care needs increases from 1992 to 1997, and the mean value decreases for all other cases. Therefore, there appears to be a general negative shift in the assessment of financial security; however, our results verify a positive impact on financial security in the case of long-term care needs due to the introduction of compulsory long-term care insurance. Comparing 1997 and 2002, the mean values represent a positive shift in the assessment of financial security for all cases, which therefore support a general positive trend from 1997 to 2002. Because the trend is positive for all cases, the positive shift in the case of long-term care needs from 1992 to 1997 appears to be stable, at least in the observed sample.

As noted in the section ‘Overview of German social long-term care insurance’, compulsory long-term care insurance had a particularly positive effect on the mid-income subgroup, which had to bear all the costs of long-term care prior to the introduction of social long-term care insurance. Prior to 1995, financial support of long-term care needs was only supplied by voluntary private insurance. Therefore, we expect these clusters to have an increased level of perception relative to the average. This expected effect must be further examined, so we split the population into household-income per capita clusters and observed how their perception of financial security changed over time for specific subgroups in the regression analysis. The clustering split the sample into five groups: [0, 500), [500, 1,000), [1,000, 2,000), [2,000, 3,000) and [3,000, ∞).

<sup>22</sup> Although the mean value is not a probable measure for ordinal data, it is sufficient to identify a trend.

**Table 1** Relative frequency of perception for the (0, €500) cluster of household income per capita

<i>Perception</i>	<i>1992 (in %)</i>	<i>1997 (in %)</i>	<i>2002 (in %)</i>
Bad	51.89	30.19	26.60
Poor	25.00	35.85	31.58
Satisfactory	10.38	20.13	29.66
Good	11.32	13.21	11.68
Very good	1.42	0.63	0.48

Table 1 displays the perception change from 1992 to 2002 for the cluster that has less than €500 of household income per capita. This is a special group with regard to the changes that took place in 1995. As described in the section ‘Overview of German social long-term care insurance’, it is more likely for this group to receive social security benefits in the case of long-term care needs, relying on the aforementioned “Hilfe zur Pflege”. This subgroup did not experience any major changes in coverage with the introduction of the new insurance. Comparing the change in perception for this subgroup with the change in perception for the overall sample, a similar trend can be observed in the data, which leads to the assumption that the perception of financial security is also positively affected by the introduction of social long-term care insurance for this special subgroup.

Table 2 presents the regression results of the pooled ordered probit regression.

#### *Introduction of compulsory long-term care insurance*

The first result to note is that the coefficients for the year dummy variables for 1997 and 2002 are significant on the 1 per cent level and positive, suggesting that the general view of financial risk associated with long-term care needs improved after the introduction of compulsory long-term care insurance. This is also indicated in Figures 3 and 4 where the shift of the distribution to a higher mean suggests the same conclusion. As mentioned before, due to the general negative trend between 1992 and 1997 in the perception of financial security, the coefficients of the year dummy variables are likely underestimated. These results verify our hypothesis that due to individual risk aversion, long-term care insurance improves financial security.

#### *Income*

Now we explore the regression results with regards to our second hypothesis of income positively influencing an individual’s assessment of financial security.

Note that the absolute values of the coefficient monotonously increase with the level of household income per capita in 1992. The coefficient for the [500, 1,000) cluster is insignificant, implying that it yields the same effect if household income per capita is drawn from [0, 500) in 1992. The assessment of financial security increasing with income is also observed in 2002. The interaction dummy variables for 1997 are all insignificant, verifying the conjecture that income is now regarded as minor factor when assessing financial security. Looking at the interaction dummy variables for 2002

**Table 2** Regression results, confidence levels denoted by \*: 10%, \*\*: 5%, \*\*\*: 1% level

<i>Variable</i>	<i>Ordered probit</i>	
	<i>Coefficient</i>	<i>Standard error</i>
Year 1997	0.402***	0.152
Year 2002	0.595***	0.118
Experience with long-term care	-0.049	0.087
Experience with long-term care* (Year1997)	-0.048	0.113
Experience with long-term care* (Year2002)	0.207**	0.106
Having children under 16	0.254***	0.039
Having children under 16* (Year1997)	-0.209***	0.050
Having children under 16* (Year2002)	-0.224***	0.048
Widowed (Reference category: married)	-0.127	0.091
Widowed* (Year1997)	0.334***	0.111
Widowed* (Year2002)	0.238**	0.105
Political interest	-0.062***	0.021
Political interest* (Year1997)	0.041	0.028
Political interest* (Year2002)	0.029	0.027
<i>Household income per capita (Reference category: Income &lt; 500)</i>		
[500, 1,000)	0.079	0.092
[500, 1,000)* (Year1997)	-0.043	0.136
[500, 1,000)* (Year2002)	0.021	0.098
[1,000, 2,000)	0.203**	0.092
[1,000, 2,000)* (Year1997)	-0.044	0.136
[1,000, 2,000)* (Year2002)	0.049	0.101
[2,000, 3,000)	0.264***	0.102
[2,000, 3,000)* (Year1997)	-0.099	0.148
[2,000, 3,000)* (Year2002)	0.355**	0.145
≥ 3,000	0.643***	0.127
≥ 3,000* (Year1997)	-0.001	0.180
≥ 3,000* (Year2002)	-0.088	0.241
<i>Education (Reference group: average education level)</i>		
Low education level	0.110***	0.034
Low education level* (Year1997)	0.055	0.046
Low education level* (Year2002)	-0.015	0.044
High education level	-0.064	0.071
High education level* (Year1997)	-0.070	0.092
High education level* (Year2002)	0.044	0.085
Log-Likelihood: -24,019.717	Pseudo-R <sup>2</sup> : 0.0368	Number of obs: 17,963

Additional control variables: age, sex, marital status, employment status, kind of health insurance, perception of health status, financial assets, house owner.

yields an interesting result. The coefficients rise to levels similar to before the introduction of social long-term care insurance and are significant. The rationale for this may be similar to the argument regarding the variable experience with long-term care. While that group had an informational advantage by directly observing the situation immediately after the introduction, inexperienced individuals appear to trust the newly implemented governmental intervention and, as a result, rely less on their

respective income, as we expected. In the following years, mass media headlines suggested that insurance was experiencing financial difficulties, stoking fears of insufficient funds and a return to the need for individual safety nets.

As the income cluster of [0, 500) cannot be directly observed because it is the reference group for the regression, the regression is inconclusive when interpreting the introduction effect for this income group. Therefore, only the descriptive analysis in Table 1 may be used to derive any conclusion. As mentioned above, due to the general trend, which is also present for the <€500 per capita income cluster, we may deduce that even the lower income group assesses its financial security in the case of long-term care needs significantly better than before the introduction and similar to all other income groups. This is not intuitive as the coverage, or security, for a large part of this group is not actually improving.

#### *Experience with long-term care*

According to our third hypothesis, our assumption can be upheld relatively but not absolutely. Experience with long-term care was not a significant factor prior to the introduction of social insurance. This implies that, contrarily to our first hypothesis, experience had no negative impact on the assessment of financial security for the aggrieved party.

Looking at the sign and coefficient of the change in influence of the experience with long-term care variable, the influence did not change in 1997 but increased significantly in 2002. These effects yield the result stated earlier and in our hypothesis in relative form. This fact may be interpreted as a hint towards the effectiveness of the introduction of social long-term insurance. However, regarding the value and significance level of the variable in 1997, one might suspect that the group of individuals experienced with long-term care are affected by a slow and problematic start.<sup>23</sup> In addition, they could directly observe the effect of the introduction and therefore assess their own situation during the implementation. The fact that the introduction was perceived positively over the long-term is a result that was expected and confirmed by the data. The significant difference does not directly imply that experience was a significant influence for long-term care in 2002.

We also look at the experience coefficient in the separated 1997 and 2002 regression, the results of which are presented in Table 3. The influence is negative and significant at the 10 per cent level in 1997 as well as significant and positive on the 1 per cent level in 2002. This confirms the results of the pooled regression. We also expect the assessment of financial risk prior to the introduction to be distorted in this subgroup as the individual burden was expected to impair the perception of financial risk. This is clearly not the case as the respective coefficient is insignificant. Thus, the experience with long-term care in individual households did not have any influence in 1992.

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<sup>23</sup> Dietz (1992, p. 13).

**Table 3** Regression results, confidence levels denoted by \*: 10%, \*\*: 5%, \*\*\*: 1% level

Variable	Ordered probit 1992	Ordered probit 1997	Ordered probit 2002
	Coefficient (standard error)		
Experience with long-term care	-0.040 (0.087)	-0.122* (0.073)	0.185*** (0.063)
Having children under 16	0.210*** (0.046)	0.071* (0.040)	0.015 (0.038)
Widowed (Reference category: married)	-0.115 (0.098)	0.210*** (0.073)	0.137** (0.062)
Political interest	-0.043** (0.0215)	-0.031 (0.019)	-0.036** (0.017)
<i>Household income per capita (Reference category: Income &lt; 500)</i>			
[500, 1,000)	0.081 (0.093)	0.013 (0.101)	0.110*** (0.035)
[1,000, 2,000)	0.196** (0.094)	0.138 (0.102)	0.269*** (0.045)
[2,000, 3,000)	0.241** (0.104)	0.147 (0.109)	0.660*** (0.107)
≥ 3,000	0.555*** (0.131)	0.664*** (0.132)	0.594*** (0.209)
<i>Education (Reference group: average education level)</i>			
Low education level	0.110*** (0.036)	0.154*** (0.031)	0.010*** (0.030)
High education level	-0.101 (0.073)	-0.110* (0.060)	-0.021 (0.049)
Log-Likelihood	-6405.9055	-7976.8957	-9371.3532
Pseudo-R <sup>2</sup>	0.0177	0.0276	0.0314
Number of observations	4,971	6,017	6,975

Additional control variables: age, sex, marital status, employment status, kind of health insurance, perception of health status, financial assets, house owner.

### *Children and widows*

Although the following variables are not covered by the initially proposed hypotheses, we want to highlight a set of control variables that yield interesting results. The first of which is the influence of children. As mentioned in the introduction, families with children should be less concerned about old age and nursing needs, as families were traditionally responsible for this burden and generally bore the financial risk as payback for the transfers they received while growing up. In 1992, the coefficient was significant and positive, which is probably explained by the traditionalist view discussed above. The assessment of their financial risk depended largely on whether children existed in the respective household. This picture changes after the introduction of social long-term care insurance. Both change coefficients are significant and negative. Therefore, it appears that children did not matter in the assessment of financial risk in the case of long-term care needs. The rationale for this finding is not obvious. First, the introduction of long-term care insurance may be a major factor in



this development. In fact, a large fraction of the financial obligations for long-term care is borne by compulsory insurance after 1995. As a result, the need for financial support from one's children is of decreasing importance. There are other trends that may be partially responsible for these observations. For example, the number of children has significantly decreased, nullifying the effect of "several shoulders" bearing the costs of long-term care. Keep in mind that our question only covers the financial aspects of long-term care, not the fact that children provide important mental support when individuals are in need. Therefore, this effect is not reflected in our results.

The next variable of interest is also not covered by our hypotheses, but we wanted to present the results in this context. Being a widow significantly influences the individual assessment of financial risk after the introduction of social long-term care insurance. Compared to married individuals, the coefficient is insignificant in 1992; however, the change in assessment for 1997 and 2002 is positive and highly significant. The results suggest that before the introduction of long-term care insurance, there was no significant difference in the assessment of financial risk between married or widowed individuals. However, a widowed individual has a more optimistic view of their financial security in the case of long-term care needs compared to a married individual. This is an unexpected result in absolute terms. One explanation for this positive change in the assessment of financial security may be a result of experience with public benefits, such as widow pensions. This positive experience could have generally strengthened the confidence in federal benefits, leading to an improving assessment of financial security.

#### *Education and political interest*

Two other variables also produced interesting results: level of education and level of political interest. It is interesting to note that with a higher level of education and political interest, the assessment of financial security declines. This is most likely because individuals with more education demand more information. Although this is not surprising, the opposite argument could have also been made. As information sources are limited in the lower educated social stratum, one could expect those individuals to be more susceptible to manipulation by the media. However, this is not verified in our data set. Similar to the case of widowed individuals, this result may be due to greater exposure to social benefits and the positive assessment of those benefits. Additional research in this direction could be enlightening.

#### *Robustness of the results*

To check our results for robustness, we performed the same regressions on subsamples of the original sample. Thirty per cent of the observations were randomly dropped, and the analysis was conducted several times. After 20 repetitions, the results were compared. We could not identify any significantly different outcomes in any test regressions. Only in the case where too many people of the small group of experienced participants were dropped by the algorithm, the corresponding variable became insignificant, but more importantly never changed signs. Furthermore, the separate regressions reproduced the results of the pooled regression, where comparable.

## Conclusion

We gained meaningful insight into the validity of a large proportion of our hypotheses. As expected, the feeling of financial security is an increasing function in income. In addition, this effect was diminished with the introduction of long-term care insurance in the short term, while returning to formerly high levels in the long run. Experience with long-term care and an informational edge have a positive influence on the perception of financial security with the introduction of compulsory insurance; however, this occurs on a higher level in the long run than we originally conjectured.

The results of our regression analysis illustrate that the perception of financial security in the case of long-term care needs increased in all segments of the population after introducing compulsory long-term care insurance. This is currently not reflected in public discussions because it focuses on the shortcomings of the current benefit schedule of this social insurance. As previously mentioned, the discussion primarily focuses on directly measurable dimensions, narrowing the argument to the state of insurance itself. Future reform should therefore be accompanied by a more robust information policy. A specific subgroup in our sample highlights the benefits of a better information policy. By directly observing federal support and other benefits, they gain access to more information. As a result, individuals who have experienced long-term care at home assess the situation better. This information deficit can be closed by providing more transparency and involving the insured, which will likely lead to no necessity of compulsory private endorsements.

It is clear that the introduction of a new public benefit system appears to improve an individual's assessment of his or her financial security. This should be kept in mind when thinking about merging health insurance and long-term care insurance, as it has been recently proposed by several parties. Knowledge of the existence of a support system appears to play a significant role in assessment, which can be seen in the low-income cluster of our analysis. The primary change for a large segment of the population is just a name change. This subjective reasoning may also be used in another way: by building a joint institution, the demand for additional private insurance could be artificially increased. Supplementing the current system with private insurance contracts has often been publically discussed (e.g., in the Ruerup commission).

Further research could perform a detailed analysis of how different factors influence individual assessments of financial security. Especially regarding our result of improving perception within the low-income group, further closer analysis is capable of producing additional insights. Another study could analyse the influence of wealth by using clusters of monetary commitments in different asset classes.

Lastly, we want to point out some limitations to our study. As it was not possible to observe if individuals had private long-term care insurance prior to the introduction of social long-term care insurance, we encountered an identification problem. This could limit the validity of our results. However, as mentioned in the section 'Overview of German social long-term care insurance', prior to the introduction, approximately 250,000 private contracts existed, making the effect negligible.

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## **MODULE 9**

**The perception of financial risks - A panel data analysis on perceived financial security in the event of long-term care need in Germany**

*resubmitted to:*

*“Risk Management and Insurance Review”, projected 2014*

# The perception of financial risks – A panel data analysis on perceived financial security in the event of long-term care need for Germany

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## Abstract:

Even though there is a vast literature on risk perception, most studies focus on event probabilities and lack a discussion of loss severity, which is paramount for high financial risks as long-term care need. Analyzing the perception of financial consequences and perceived financial security, conditional on an adverse event occurring, is needed to fully understand an important driver of insurance demand: expected costs. Therefore, we examine the influence of variables like experience with the respective risk, education or financial status on the perception of financial security in the event of needing long-term care. Among other things we show that experience with long-term care has a significant and positive impact on the perception of effective financial security. The results indicate that political decision makers face misperceptions of long-term care which in turn could result in inefficient insurance coverage.

Keywords: risk perception, long-term care, severity of risk, risk assessment, risk experience

JEL-classification: C23, D81, D83, H55

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## Introduction

Originating from research on perception of natural and technological hazards in the 1970s, a research group surrounding Paul Slovic coined the phrase “bounded rationality”, which describes the behavior of individuals facing natural hazards such as droughts or earthquakes or technological risks such as those of nuclear power, pesticides or smoking (Slovic, Kunreuther and White 1974 and Fischhoff et al. 1978). Fueled by independent findings showing that individuals tend to have large biases in their risk perceptions and self-assessments (e.g., the so-called overconfidence bias: Weinstein 1989 or Kruger and Dunning 1999), subsequent empirical studies attempted to isolate the cause of these phenomena. Slovic et al. (1980) suggested early that an individual’s perception of a specific risk is highly dependent on experiences of the individual (i.e., familiarity), the “quality” of the risk (i.e., dread) and the subjective relevance of the risk (i.e., exposure). These results were obtained by conducting a factor analysis on data generated by extensive questionnaires regarding as many as 90 different risks. Savage (1993) further refined these results using demographic factors as explanatory variables for the three major drivers of risk perception stated above.

Several studies suggest that small probabilities are consistently overestimated and that the reverse is the case for more likely events (e.g., Fischhoff et al. 1981, Morgan et al. 1983 or more recently Andersson and Lundborg 2007). While these findings were verified in a more general context, other authors went further to differentiate between the behaviors of different subjects. In particular, these studies found that effects vary between different groups (for age – Matthews and Moran 1986; gender – Dosman, Adamowicz and Hrudey 2001; education – Kruger and Dunning 1999), stressing the importance of subjectivity in an individual’s risk assessment.

Most of the literature uses risk perception and perception of the probability of risk realization synonymously. This approach might be feasible for risks like mortality (see, e.g., Viscusi et al. 1997), but in general, there are two components to risk assessment. Especially when considering the insurance coverage decision of an individual, the metric of importance is expected loss rather than an isolated consideration of event probabilities. The expected loss is the product of the probability of an adverse event and the severity of that event, conditional on the event occurring. This implies that the assessment of the severity of an adverse event, conditional on the event of needing long-term care (LTC), has a positive

relationship with the demand for LTC insurance. In fact, studies support this argument (Sjöberg 1998, 1999). Sjöberg even concludes, “that demand for risk reduction is driven by the severity of consequences, not probability of risk” (Sjöberg 1999, p. 129). This consideration is especially relevant for high financial risks such as the risk of needing long-term care (see Norton 2000 and Zhou-Richter et al. 2010).

Despite the fact that LTC is considered as a high financial risk, it is surprising that (to our knowledge) no empirical study exists investigating the individual perception of financial consequences.<sup>1</sup> Analyzing the individual factors that influence the perception of financial consequences is therefore of major interest.

The aim of this study is to focus on the latter part, the severity of an event conditional on its occurrence. More specifically, we wish to analyze the assessment of financial security conditional on being in need of LTC for Germany. The argument of LTC being a high financial risk also applies for Germany as the current German statutory LTC system – which was introduced in 1995 - only provides partial coverage (see next section for details).

Analyzing perceived financial security conditional on being in need of LTC provides an important contribution to the prior literature as it complements studies on probability estimations with the perception of the second factor of expected loss. Because of the positive relationship between perceived financial security and LTC insurance demand, the assessment of financial security unites several interesting features of the demand for (supplementary) LTC insurance. The connection of our results to possible factors that influence LTC insurance demand sheds some further light on this issue.

The results provide meaningful implications for policy makers and the insurance industry and can help to further understand decisions concerning (LTC) insurance demand inconsistent with canonical insurance economics. More precisely, studies exploring the potential misperception of financial consequences (i.e. expected loss in case of needing LTC) or the relationship between the available information and the perception of financial consequences could help to dampen negative effects with regard to the perception of financial consequences and LTC insurance demand respectively. Furthermore, information on potential substitutes for LTC insurance demand (e.g. having children or real estate) could also provide meaningful implications for potential policy reforms. For example, if having

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<sup>1</sup> One reason could be the difficulty to acquire an appropriate dataset.



children has a negative impact on LTC insurance demand, policy makers could consider reform options that counteract such relationships. Here, information regarding the relationship between such variables and the perception of financial consequences yields important insights, assuming the already stated positive relationship of perceived financial consequences and LTC insurance demand via expected costs.

In particular, to analyze the perception of financial security conditional on being in need of LTC, we use the following question: “How do individuals perceive financial security in the event of long-term care need?”.<sup>2</sup> This question was taken from the German Socio-Economic Panel (SOEP), a broad panel dataset. This question implies the conditionality structure described above and also provides a broader scope for research, as the question does not directly ask about the purchased coverage. With a focus on financial security, it also implicitly includes a consideration of possible substitutes for LTC insurance like family, assets and public LTC insurance schemes (see next section for details). Because of the dataset used for our study, we are able to analyze different kinds of substitutes for the second dimension to provide a more complete view of potential factors that influence the perception and insurance coverage decisions. Thus, the SOEP question is a valid proxy for the individual’s expectation of the second factor, as it implicitly includes all these influences.

The remainder of this article is structured as follows. In the next section we provide a review of the literature on the assessment of (LTC) risk and potential causes of low LTC insurance demand. That section also provides a more precise motivation for our research question and considered hypotheses. These hypotheses are presented in section three. Section four describes the data and the applied methodology. In section five, we present and interpret the descriptive and statistical results. Limitations and robustness of our results are discussed in section six. Finally, we conclude the study in section seven.

### **Long-term Care Insurance and Risk Assessment**

Before presenting a literature review of research into risk assessment, we briefly want to present some key facts of statutory LTC insurance in Germany, as this is the legal framework for respondents.

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<sup>2</sup> The original question was translated and paraphrased for readability.

The current German statutory LTC system, which covers almost 99 % of all German residents (see Federal Ministry of Health 2011), only provides partial coverage. Out-of-pocket payments could accumulate to as much as 50 % of the overall monthly costs of up to 3,000 Euros (see, e.g., Rothgang 2010 and Zuchandke et al. 2012). The amount of monthly costs and out of pocket payments depends on the LTC level and on the kind of care respectively. Eligibility for LTC benefits from statutory LTC insurance is determined by a medical examination and assessment of daily living capabilities. It is differentiated into three levels of severity (see Rothgang 2010). Furthermore, the amount of benefits is also dependent on the kind of care, i.e. home care or nursing home care. In 2012, the benefits ranged from 235 (700) Euros for home care level 1 (level 3) up to 1,023 (1,550) Euros for nursing home care level 1 (level 3). A more detailed tabulation of the benefits is presented in Zuchandke et al. (2012). When the own financial resources are exhausted due to out-of pocket payments, adult children are legally obliged to support their parents' costs of care. As a last option, means tested social assistance exists in Germany to ensure a minimum income level. Rothgang (2010) and Heinicke and Thomsen (2012) provide a detailed overview about the social LTC system in Germany.

Although a potential need for supplementary LTC insurance in Germany does exist (see also Zhou-Richter et al. 2010), the market is quite small. Approximately 2 % of all insured persons covered by the statutory LTC insurance own complementary insurance products (see GDV 2011 and Federal Ministry of Health 2011). This so-called LTC insurance puzzle exists in many developed countries (see Pestieau and Pontière 2012). In the attempt to solve this puzzle more and more studies emphasize that individual perceptions and assessments of LTC risk drive actual LTC insurance demand (see e.g. Courbage and Roudaut 2008, Finkelstein and McGarry 2006 and AHIP 2012).<sup>3</sup>

Based on a broad literature review, Brown and Finkelstein (2009) clustered different arguments for the observed small utilization of LTC insurance markets in three different classes: (1) limited consumer knowledge and rationality, (2) state-dependent utility functions and (3) the existence of potential substitutes. Classes (1) and (3) are of particular importance

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<sup>3</sup> The studies by Finkelstein and McGarry (2006) and AHIP (2012) directly show a positive relationship between perceived risk of needing LTC and insurance coverage. Related to this, Courbage and Roudaut (2008) show that experiences with disability drives LTC insurance demand and emphasize the role of risk perception on insurance demand.

to our analysis, as these factors would influence individual perception of financial security in the event of LTC need, which would in turn affect insurance demand behavior.

The first class of arguments contends that individuals manifest a low level of financial literacy and are unable to fully understand the financial consequences in case of requiring LTC. Additionally, individuals tend to misperceive the risk of LTC. This rationale is consistent with findings of Kunreuther et al. (1978), who argues that people have difficulties understanding low-probability and high-severity risks. On a related note, Pauly (1990) argues that many individuals have little knowledge about LTC programs. This might result in a misperception that, for example Medicare or statutory LTC insurance fully covers LTC expenditures (in the U.S. or Germany respectively). Potential misperceptions of LTC risks have been observed by another study (see AARP 2006). The AARP (2006) determined that more than half of all respondents to a survey believe that Medicare covers the costs of nursing home care. Furthermore, their questionnaire revealed that approximately 60 % of respondents underestimated the monthly costs of LTC by more than 20 % relative to the average cost level.

These findings suggest that information about and experiences with LTC risk influences its perception and therefore probably also insurance demand. This reasoning is supported by several independent studies. Zhou-Richter et al. (2010) asked respondents about their insurance demand before and after providing information on financial consequences (e.g., monthly costs and benefits from statutory LTC insurance) of LTC need. They observed a significant change in the willingness of respondents to buy LTC insurance after they received relevant information. McCall et al. (1998) found evidence that individuals with care-needing family members are more aware of the risk. Demand for LTC insurance among these individuals is higher. Similar to these findings, Zuchandke et al. (2010) have shown that a care-needing family member influences the perception of financial security in the event of LTC need. On a more general level, Viscusi (1990) states that new information also influence the assessment of risk. In another study, Hakes and Viscusi (2004) have shown that “better educated people have more accurate risk beliefs and also are much more adept at incorporating age-related experiences in their risk assessments” (Hakes and Viscusi 2004, p. 663). This finding is important, as it shows that new information regarding a risk – e.g., new information provided by mass media – is evaluated differently across different groups.

When considering knowledge, the aspect of communication and the presentation of LTC risk by the media also become relevant for individual's risk perception. In fact, multiple studies reveal a strong link between risk communication and risk perception. Bomlitz and Brezis (2008) find a significant misrepresentation of health risks by mass media to the extent that there are cases of an inverse relation between the probability of a risk and its coverage by the media.<sup>4</sup> Ackerson and Viswanath (2010) verified these media attention effects for a different set of risks. Additionally, different studies state that risks receiving media attention are more likely to be overestimated by individuals (e.g., Fischhoff et al. 1981 and Viscusi 1990).

With regard to the third class of arguments, Brown and Finkelstein (2009) discuss potential substitutes for LTC insurance coverage, namely family, illiquid housing (or real estate) and public LTC insurance schemes. They argue, for example, that children are considered as a possible substitute for formal LTC and therefore for LTC insurance coverage. Zweifel and Strüwe (1998) provide a similar rationale. On the contrary, Courbage und Roudaut (2008) found a positive relationship between having children and the probability of owning private LTC insurance. They argue that altruistic behavior and the bequest motive can explain this finding. However, Sloan and Norton (1997) could not confirm that the bequest motive itself impacts LTC insurance demand.

Real estate is considered as an additional financial resource (see Finkelstein and McGarry 2006). Besides non-liquid assets like real estate, it might be reasonable to also include financial assets as possible substitutes for LTC insurance. For example, Bernet (2009) argues that the attractiveness to self-insure increases with net worth. In this case, when taking assets into account, it is plausible to include their net value in the analysis (i.e., gross value minus credit). However, a positive relationship between net worth and the level of LTC insurance coverage could be reasonable because insurance coverage can provide protection for the individual's assets (see Brown and Finkelstein 2009).

The argument for public LTC insurance being a substitute for private LTC insurance seems to be straightforward. Brown and Finkelstein (2008), Doeringhaus and Gustavson (2002) and Pauly (1990) have shown that it is rational to not purchase LTC insurance in the presence of Medicaid. For the case of Germany, Zuchandke et al. (2010) have shown that the

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<sup>4</sup> To our knowledge, no study analyzed a direct relationship between mass media and LTC risks.

introduction of social LTC insurance in Germany had a statistically significant positive effect on the individual perception of financial security in the event of LTC need. They compared 1992 with 1997/2002 and have shown significantly improved individual perception of financial security in the event of LTC need after the introduction of statutory LTC insurance. Furthermore, they also compared these results with the perception of financial security over time for other cases (e.g. financial security in case of sickness, old age and unemployment) and have observed a different trend of perception of financial security in case of LTC need compared to all other cases. However, although they had panel data available for their analysis the authors restricted themselves to cross-section techniques.

All of the findings above are strong indicators that perception of LTC risks in general and perception of its financial consequences in particular are of importance to LTC insurance demand. Even the aspects of the third class of arguments (i.e., potential substitutes) are likely to influence the perception of financial security in the event of LTC need and, as a consequence, insurance demand.

### **Hypotheses**

As stated earlier, we analyze individual factors that are influencing the perception of financial consequences in the event of needing LTC. Whereas the analyses of several factors might be of interest, we test hypotheses that are related to the stated classes (1) and (3) by Brown and Finkelstein (2009) (see prior section). More precisely, the first two hypotheses are related to knowledge and level of knowledge regarding the financial consequences of needing LTC. Here, we take experience into account as an immediate source of knowledge, as well as level of education and political interest to proxy for level of knowledge regarding LTC risk. For the latter two factors, we argue that education will impact risk assessment abilities and that political interest will impact demand for information. Hypotheses 3 and 4 relate to possible substitutes for supplementary LTC insurance and their impact on the assessment on financial security in event of needing LTC. In the case of assets, we interpret the amount of debt as negative assets.

To avoid misunderstandings with regard to our research question, we want to clarify the use of “better” or “worse” in the context of perception as well as “negative” or “positive” for impact on the perception of financial security respectively. Throughout this article, we consider if an individual actually subjectively feels better or worse in terms of financial

security. The influence of certain variables on the individual ability to objectively assess financial security is explicitly not a part of our research question. Additionally, when presenting our results regarding an individual with a certain risk assessment, the term “better” is used relatively, i.e. that individual perceives to be better secured. We explicitly do not relate this term to the objective safety or objective risk in our analysis, but might use this notion in our interpretation/explanation of the results.

*Hypothesis 1: Experience with LTC is negatively related to the assessment of financial security in the event of needing LTC.*

As mentioned above, different studies (e.g., Pauly 1990, AARP 2006) have shown that individuals with a low level of knowledge are more likely to underestimate the financial consequences of needing LTC. These effects are also likely to be observed in Germany. Partial coverage in combination with different benefit levels might be a source of misperception. Many individuals may not be fully aware of the amount of coverage to expect. Furthermore, the existing means-tested social assistance to ensure a minimum income level in Germany could be another source of the false impression that they are covered sufficiently. Experience with the current system is providing direct information, increasing the individual's level of knowledge. As a consequence, individuals with this information can better assess the actual financial situation that arises when LTC is needed. Thus, we expect that experience with the LTC system negatively affects the assessment of financial security when LTC is needed.

*Hypothesis 2: The level of education is negatively related to the assessment of financial security in the event of needing LTC. Furthermore, the magnitude of this effect is decreasing over time.*

Based on the same argument presented for hypothesis 1 (i.e., underestimation due to low level of knowledge) and consistent findings in the literature (esp. Hakes and Viscusi 2004), we argue that more educated individuals can more precisely perceive the risk and better understand how to gather crucial information. Furthermore, we expect the same relationship for perception of financial security when needing LTC. Consequently, we assume a negative relationship between education and the assessment of financial security. On the other side, less educated individuals are probably more influenced by (negative)

misrepresentations (e.g., Bomlitz and Brezis 2008) provided by mass media, which would lead to a countervailing effect. Although we assume that this latter effect is dominated by the first effect, we expect this dominance to disappear over time due to an increasing number of negative news stories about the prospective financial problems of statutory LTC insurance between 1995 and 2007.

*Hypothesis 3: The extent of political interest is negatively related to the assessment of financial security in the event of needing LTC.*

As stated above, we use political interest as a proxy for knowledge about the LTC system. Furthermore, we assume that individuals who are more interested in political issues make better use of publicly available information about the LTC system. This is similar to hypothesis 2 where education was used as an indicator of information demand. Therefore, these individuals are able to estimate the financial situation that arises when LTC is needed more accurately. Combined with the fact that less informed individuals are more likely to underestimate the financial consequences of needing LTC (AARP 2006, Zhou-Richter et al. 2010), we assume a negative relationship between this proxy and perception of financial security. More precisely, individuals with higher interest in political issues assess the financial situation in the event of needing LTC, *ceteris paribus*, more negatively.

*Hypothesis 4: Having children is positively related to the perception of financial security in the event of needing LTC.*

When an individual becomes LTC dependent, family members have the option of providing informal care. Compared to nursing home care, the direct costs of informal care are lower (Rothgang 2010). Furthermore, children are legally obliged to financially support parents in need of LTC when financial resources of the dependent are exhausted. Thus, both situations indicate that (*ceteris paribus*) children are a potential source of parents feeling better secured (i.e. in our context, to perceive financial security more optimistically) and, as a consequence, establish the role of children as substitute for insurance demand. This assumption is consistent with the findings of Brown and Finkelstein (2009) and Zhou-Richter et al. (2010).

*Hypothesis 5: Assets (debt) are positively (negatively) related to the perception of financial security in the event of needing LTC. Furthermore, the expected (permanent) income has a positive influence on the assessment of financial security in the event of needing LTC.*

Connected to the reasoning of Brown and Finkelstein (2009), assets may be liquidated in the event of LTC need. Therefore, individuals with assets are financially more flexible covering potential costs in the event of needing LTC. The same would be true for the expected permanent income: a higher permanent income leads to a more flexible care situation, e.g. with regard to capital accumulation. Therefore, we assume a positive impact of assets and the expected income situation on perception of financial security. Consistently, we assume the opposite for debt. As financial pressure is greater on individuals with credit payments and will even grow when LTC dependence occurs, we expect debt to negatively impact the perception of financial security.

### **Data and Methods**

To empirically test our hypotheses, we use data from the SOEP provided by the German Institute for Economic Research, Berlin (DIW Berlin). The SOEP is a representative panel survey of households and individuals (Haisken-DeNew and Frick 2005) and contains a wide range of questions on topics such as income, employment, education and health status. The first survey was conducted in 1984 with participation of approximately 6,000 households and 12,000 individuals responding. In 2010, the 27th wave was completed, including roughly 11,000 households and 20,000 individuals. All initially selected samples of SOEP are multi-stage random samples. In each selected household, members who are 17 and older are interviewed. Furthermore, individuals who leave the household are still interviewed in the following years (see Spiess et al. 2008). The survey method is a mixed-mode design – Paper-and-Pencil interviewing method (PAPI) and computer-assisted personal interviewing method (CAPI). The preferred way to perform the survey is PAPI-based face-to-face interviews (see Schräpler et al. 2006). The respondents might complete the questionnaire in presence and even with assistance of the interviewer to avoid invalid responses due to misunderstandings. The SOEP is frequently used for scientific studies. Currently, more than 7,000 publications related to the SOEP are listed in the literature database SOEPLIT.<sup>5</sup> Among others, Wagner, Frick and Schupp (2007) and Trommsdorff (2009) describe the dataset and its methods in

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<sup>5</sup> <http://panel.gsoep.de/cgi-bin/baseportal.pl?htx=/soeplit/soeplit>



more detail. Moreover, the documentation by the SOEP Group (2013) provides a detailed description of the dataset between 1984 and 2011.<sup>6</sup>

### *Variables*

As we cannot observe perception of severity directly, we use information on perceived financial security in the event of LTC need as a proxy (see *Introduction*). More specifically, we make use of the following question in the SOEP: “How do individuals perceive financial security in the event of long-term care need?”

The possible answers are divided into five categories, from “1 = bad” to “5 = very good”. We excluded individuals who chose the answer “don’t know/does not apply” from our sample. The question is included in the SOEP every five years beginning in 1992. Therefore, we use the waves of 1992, 1997, 2002 and 2007. Furthermore, we use an unbalanced dataset. After cleaning our dataset of missing and implausible values, our final dataset consists of 27,663 individuals and 49,397 observations.

With regard to our five hypotheses, we consider the following independent variables: For experience with LTC, we use two different questions. Individuals are asked if there is a household member in need of LTC. Starting in 2002, participants are additionally asked if the family member in need of care receives benefits from statutory LTC insurance. Using this information, we are not only able to differentiate between levels of experience (yes/no) but also whether the needing individual receives benefits from statutory LTC insurance or not.

The SOEP provides the variable *schoolyears*, which we use as a cardinal measure for education to address our second hypothesis. To represent political interest, we utilize the following question: “How interested are you in politics?”. The possible answers are divided into four categories, from “1=not at all” to “4=very much”. As this variable has an ordinal structure, it could be appropriate to create dummy variables for the particular categories. However, as the results are quite similar under either specification, we decided to use the original ordinal variable.

For different aspects of financial status, we use the value of financial assets, the value of debt, the ownership of real estate and its respective financial value. In the case of debt, we distinguish between debt on mortgages and other debt. Unfortunately, data regarding the

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<sup>6</sup> To further get an idea of the relevant questions, the individual questionnaire for 2007 can be found here: [http://www.diw.de/documents/dokumentenarchiv/17/diw\\_01.c.56579.de/personen\\_en\\_2007.pdf](http://www.diw.de/documents/dokumentenarchiv/17/diw_01.c.56579.de/personen_en_2007.pdf)

nominal values of assets and debt is only available for the waves conducted in 2002 and 2007. Up to 1997, we can only use binary information of having/not having real estate and/or financial assets. Therefore, we take the binary variables *real estate* and *assets* into account whenever considering all four waves. As this dummy structure does not provide precise estimates, we also confirm the results with a sub analysis using the waves 2002 and 2007 only. The ownership of real estate often leads to the following set-up: owning real estate financed by a mortgage arrangement. Therefore, we separate information about the financial value of real estate and the residual value of debt on mortgage ( $\ln(\textit{mortgage})$  and  $\ln(\textit{real estate})$ ).

For all continuous variables on financial aspects, we use the natural logarithm. Except for the control variables for household income, we observe a significant number of individuals with no assets or no debt (variable equals 0). To avoid missing values by taking the natural logarithm, we replace values of 0 with a value very close to zero ( $10e - 26$ ).<sup>7</sup>

In addition to wealth aspects, we also want to cover the individual's economic situation. The appropriate measure for this aspect would be permanent income, e.g. simply measured by the average household income over all years the individual is in the survey (see, e.g., van Praag et al. 2003). However, as we use a fixed effects approach (see section *Method*), the permanent income as a time-invariant variable is already covered by the individual-specific interaction term (see Kazarosian 1997). Therefore, we make use of the proxy variable *econ. situation*, which codifies the intensity of anxiety of one's individual future economic situation. We utilize the question: "Are you concerned about your future economic situation?". The possible answers are divided into three categories, from "1=not concerned at all" to "3=very concerned". As in the case of political interest, the results of dummy variables are quite similar under either specification, so we decided to use the original ordinal variable.

To evaluate the impact of having children on assessments of financial security, we make use of the variable *children*. Finally, we include a set of control variables in our regressions. The full list of variables is presented in Table 1.

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<sup>7</sup> This approach is common for financial values or saving rates (see also Schunk 2009).

**Table 1:** Code and description of independent variables

<b>Variable</b>	<b>Code</b>	<b>Description</b>
<b><i>Experience with the long-term care system</i></b>		
experience	binary variable	equals 1 if a household member is dependent on LTC on a permanent basis
nobenefits	binary variable	equals 1 if experience=1 and the household does not receive benefits from statutory LTC insurance
benefits	binary variable	equals 1 if experience=1 and the household receives benefits from statutory LTC insurance
<b><i>Education and Knowledge</i></b>		
schoolyears	count variable	number of years in school, ranges from 7 to 18 years
political interest	ordinal variable	divided into four categories, from "1=not at all" to "4=very much"
<b><i>Potential Substitutes</i></b>		
econ. situation	ordinal variable	worried about own future economic situation, divided into three categories, "1= not concerned at all", "2=somewhat concerned", "3=very concerned"
children	count variable	number of children in household, ranges from 0 to 10
assets	binary variable	equals 1 if the respondent has financial assets
ln(assets)	continuous variable	natural logarithm of the total value of all financial assets with an overall value of EUR 2,500 or greater
ln(debt)	continuous variable	natural logarithm of the total value of debt, excluding debt on mortgages
ln(mortgage)	continuous variable	natural logarithm of the total value of residual debt on mortgages
real estate	binary variable	equals 1 if the respondents owns real estate
ln(real estate)	continuous variable	natural logarithm of the total value of the respective real estate
<b><i>Control variables</i></b>		
ln(income)	continuous variable	natural logarithm of the household income
econ. development	ordinal variable	worried about future development of the economy, divided into three categories, "1= not concerned at all", "2=somewhat concerned", "3=very concerned"
marital status	binary variables	dummies for single, widowed, married/having partner and divorced
employment status	binary variables	dummies for employed, self-employed, unemployed, out of labor force
health	ordinal variable	self-reported health; divided into five categories, from "1=poor" to "5=very good"
persons	count variable	number of persons in household, ranges from 1 to 13
priv. LTC insurance	binary variables	equals 1 if respondent is privately insured (obligatory LTC insurance)
sex	binary variable	equals 1 if respondent is male
age, age <sup>2</sup>	continuous variable	age (ranges from 17 to 92) and the squared value of age

### *Method*

To make use of the panel structure, we employ panel-estimation techniques to test our hypotheses. Panel data allows us to control for possible unobserved individual heterogeneity, which is likely because of the subjective character of our dependent variable. Among others, one issue of subjectivity is an individual interpretation of the ordinal scale.

More precisely, it is possible that two individuals with the same perception mark different categories (e.g., 3 and 4), which would lead to biased estimates. There are two common ways to control for unobserved heterogeneity: the fixed effects model and the random effects model (see Baltagi 2008). To test whether random or fixed effects estimators are appropriate, we conducted a Hausman specification test. The results indicate that the fixed effects model is appropriate in our case<sup>8</sup> – a detailed description of this test can be found in Baltagi (2008). Using fixed effects, the problem of individual interpretation of the ordinal scale is eliminated if this effect can be assumed to be time invariant. A detailed description of the fixed effects approach can be found in Allison (2009).

Besides considering endogeneity caused by unobserved individual heterogeneity, we also tested for possible endogeneity with respect to the idiosyncratic error term. To exclude possible sources of endogeneity we instrumented the variables for income, economic situation as well as for wealth and debt.<sup>9</sup> To test for a systematic difference between the ordinary fixed effects approach and the non-efficient instrumental variable fixed effects approach we conducted a Hausman specification test. The test cannot reject the null hypothesis that the difference in coefficients is not systematic.<sup>10</sup> Thus, it did not indicate endogeneity with respect to the idiosyncratic error term. Furthermore, a direct comparison of both approaches does not reveal substantial differences. Therefore, we apply the ordinary fixed effects approach for our estimations.

Another econometric issue could rise through multicollinearity. To check if this poses a problem in our specific dataset, we calculated the variance inflation factors (VIF) for all considered variables. With regard to our analyzed variables, *children* reached the highest value of 2.68. Using the accepted practice of a critical value of five (see Menard 1995), the calculated VIFs do not indicate problems with multicollinearity. We also performed a sensitivity analysis with regard to our included variables and could not find relevant changes with respect to significance levels.

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<sup>8</sup> The value is  $\chi^2(43) = 466.94$  ( $p < 0.001$ ) when using all four waves and  $\chi^2(22) = 231.64$  ( $p < 0.001$ ) when using waves 2002 and 2007 only.

<sup>9</sup> The instrument set includes the lagged variables of the probable endogenous variables, lagged variables of received interests and dividends respectively, lagged variables of monthly amount of loans and mortgages paid off and the lagged variable of estimated rent for the own real estate.

<sup>10</sup> The value of the test statistic is  $\chi^2(23) = 7.5$  ( $p = 0.999$ ) in case all four waves (without interaction terms) and  $\chi^2(22) = 17.64$  ( $p = 0.7270$ ) in case of waves 2002 and 2007 only.

The fixed effects approach uses within-individual variation only, which implies lower precision of estimates (see Allison 2009) and can lead to difficulties when interpreting the results, especially if the within-individual variation is very small as in the case of education.<sup>11</sup> Whereas individuals have different options concerning education (even extra occupational) the within-individual variation should normally be very small over time. As we use this variable to analyze hypothesis 2, we also consider the random effects approach to better understand the estimation results and the impact on financial security. Nevertheless, when interpreting the results of the random effects approach we have to be aware of endogeneity caused by individual heterogeneity.

The ordinal structure of our dependent variable would require the use of an ordered probit or ordered logit regression. A description of both methods can be found in Wooldridge (2002). Using an ordered response with panel estimation techniques, however, leads to technical and conceptual problems (see Clark et al. 2009 and Allison 2009). In our case, the most important restriction is the non-availability of random and fixed effects when using ordered response models. To manage these problems, we use the probit-adapted ordinary least squares (POLS) approach by van Praag and Ferrer-i-Carbonell (2008). The core of this method is an implicit cardinalization of the dependent ordinal variable. The advantage of this transformation is that it allows the application of ordinary estimation methods (ordinary least squares) and the use of panel estimation techniques, i.e. using fixed or random effects approaches in our analysis.

The initial point of the cardinalization is the latent variable approach and the assumption that the latent variable  $Y^*$  follows a standard normal distribution. For a detailed description of the latent variable approach, see Wooldridge (2002). The new cardinalized variable  $Y_k^C$  is constructed by transforming the conditional expectation of  $Y^*$  for all response categories  $k$  (five categories in our case), given that the value is located in a specific interval  $[\hat{y}_{k-1}, \hat{y}_k]$ . Due to the assumed standard normal distribution, the conditional expectation is calculated by

$$Y_k^C = E(Y^* | \hat{y}_{k-1} < Y^* \leq \hat{y}_k) = \frac{n(\hat{y}_{k-1}) - n(\hat{y}_k)}{N(\hat{y}_k) - N(\hat{y}_{k-1})}, \text{ for } k = \{1, 5\} \quad (1)$$

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<sup>11</sup> As also stated by Allison (2009, p. 3), the within-individual variation of education is very small compared to the variation between individuals.

where  $n(\cdot)$  is the density function, and  $N(\cdot)$  is the distribution function of  $Y^*$ .

The specific values of the cut-off points  $\lambda_k$  are assigned using information on the overall sample distribution of the observed ordinal variable. According to a given sample distribution  $p(k)$ , we can write

$$N(\lambda_k) = F(k), \quad (2)$$

where  $F(k) = \sum_{j=1}^k p(j)$  represents the cumulated probability of response category  $k$ . We can calculate the cut-off points by rewriting equation (2) as

$$\lambda_i = N^{-1}[F(k)]. \quad (3)$$

Using the calculated cut-off points  $\lambda_k$  in equation (1), the transformation leads to the cardinalized variable  $Y_k^C$  for  $k = \{1,5\}$ . This variable is used as dependent variable in our regressions. Van Praag and Ferrer-i-Carbonell (2008) have shown that estimated effects of an ordered probit and POLS are almost identical up to a multiplicative factor. To further emphasize the appropriateness of this approach, we also compared the estimation results of POLS and ordered probit with our dataset and identified the same relationship between ordered probit and POLS, like van Praag and Ferrer-i-Carbonell (2008). Therefore, the use of POLS with fixed and random effects is an appropriate alternative approach compared to the not applicable ordered response model with fixed and random effects.

Based on several restrictions regarding available information (e.g., value of financial assets, receiving benefits from statutory LTC insurance), we consider various regressions with two different time periods. Firstly, we use the whole dataset (1992-2007); in a second step, we perform regressions including the waves of 2002 and 2007 only. Furthermore, because of possible changes of the impact on perception of financial security due to the introduction of the statutory LTC insurance, we also consider interaction effects between our considered variables and the wave dummies. The measured difference in the impact over time is also known as difference-in-difference estimation. An overview about this issue is provided in Bertrand et al. (2004) and Lechner (2011). Doing this, we are able to observe changes in the relationship between independent and dependent variables. This is especially relevant as the introduction of statutory LTC insurance may change the impact of a variable (as also stated in the hypotheses) on our dependent variable. Whereas interaction effects show differences over the course of time along with the significance of such differences, they do

not provide the significance levels of the overall effects (i.e. the impact of an independent variable for the respective year). Hence, we would not acquire information on the absolute significance of the analyzed variables, as a significant change does not necessarily have to correspond with an overall significant effect and vice versa. Therefore, we additionally calculate and present coefficients and significance levels of all overall effects (see *Results*).

## Results and Discussion

Before looking at the results regarding the endogenous variable, table 2 and 3 present summary statistics of all considered (dependent and independent) variables. Table 2 displays mean values (and fractions in case of dummy variables respectively) and the overall as well as within standard deviation. Table 3 additionally presents the fraction of the chosen categories for our ordinal variables.

**Table 2:** Summary statistics of dependent and independent variables

variable	mean value <sup>†</sup>	standard deviation		variable	mean value <sup>†</sup>	standard deviation	
		overall	within			overall	within
dependent variable	0.0017	0.9346	0.5060	econ. development	2.2281	0.6196	0.3493
experience <sup>†</sup>	0.0439	0.2049	0.1018	single <sup>†</sup>	0.1126	0.3161	0.1258
nobenefits <sup>†</sup>	0.0150	0.1217	0.0538	married <sup>††</sup>	0.6623	0.4751	0.1701
benefits <sup>†</sup>	0.0275	0.1635	0.0598	widowed <sup>†</sup>	0.0476	0.2129	0.0797
schoolyears	11.9089	2.6524	0.5070	partner <sup>†</sup>	0.1614	0.3679	0.1874
political interest	2.3051	0.8088	0.3258	divorced <sup>†</sup>	0.0161	0.1260	0.0676
econ. situation	1.9311	0.6923	0.3376	employed <sup>††</sup>	0.5473	0.4978	0.2235
children	0.8982	1.1208	0.4953	self-employed <sup>†</sup>	0.0614	0.2401	0.1002
assets <sup>†</sup>	0.8965	0.3047	0.1582	unemployed <sup>†</sup>	0.0606	0.2385	0.1411
assets (value)	19,322.54	102,930.00	46,667.93	out of labour force <sup>†</sup>	0.3308	0.4705	0.2027
debt (value)	3,013.58	35,904.17	22,548.11	health	3.3801	0.9442	0.4354
mortgage (value)	19,844.39	53,763.06	19,866.49	persons	2.8101	1.2831	0.4940
real estate <sup>†</sup>	0.5072	0.5000	0.1792	sex <sup>†</sup>	0.4841	0.4998	0
real estate (value)	96,150.25	161,535.30	49,086.49	age	47.8427	16.3664	3.5067
income	2,744.84	1,883.94	905.62	priv. LTC insurance <sup>†</sup>	0.1133	0.3170	0.1010

<sup>†</sup>binary variable: mean value equals the fraction of individuals with the respective characteristic

<sup>††</sup>base category in regression analysis

Table 2 shows that the average age of our sample is nearly 48 and divided almost equally between male and female participants. A major fraction of the participants is married and currently employed. With regard to experience with LTC, only 4.4 % of the respondents have a household member in need of LTC (home or nursing-home care). In our subsample 2002-2007, the majority of households with a family member in need of care also receive benefits

from statutory LTC insurance. As stated in the subsection *Method*, the within-individual variation is generally smaller than the overall variation. Most importantly, the overall variation of *schoolyears* is more than five times higher compared to the within-individual variation. Therefore, the use of random effects is appropriate to analyze hypothesis 2 (as motivated above).

**Table 3:** Fraction of chosen category for our considered ordinal variables

category	dependent variable					political interest	econ. situation	econ. development	health
	overall	1992	1997	2002	2007				
1	0.28	0.46	0.26	0.19	0.31	0.14	0.28	0.10	0.04
2	0.29	0.23	0.31	0.28	0.31	0.49	0.52	0.56	0.13
3	0.28	0.17	0.30	0.32	0.26	0.29	0.21	0.33	0.34
4	0.14	0.12	0.12	0.19	0.11	0.08	-	-	0.41
5	0.01	0.02	0.01	0.02	0.01	-	-	-	0.09

With regard to our dependent variable, table 3 shows a general positive trend in perception of financial security between 1992 and 2002 and a decline (compared with 2002) in 2007. Furthermore, it can be seen that almost half of all respondents classify their perceived financial security as bad (category one) in 1992 (i.e. before the implementation of the statutory LTC scheme).

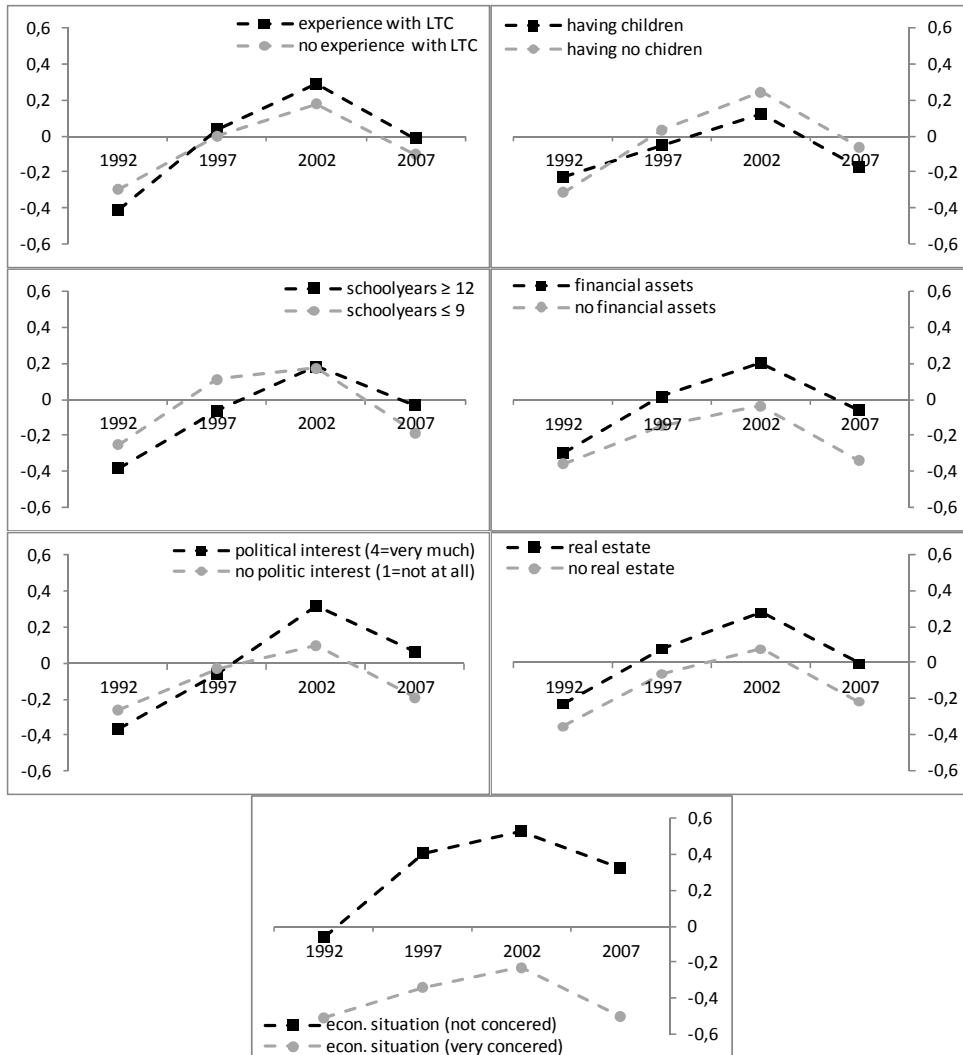
The positive trend can also be seen in Figure 1, which displays mean values<sup>12</sup> of the implicit cardinal dependent variable (perception of financial security) sorted by year and grouped by different variables. Furthermore, in 1997, a change in the difference can be observed for the group variables *experience with LTC*, *having children*, *political interest*, *having assets* and *econ. situation*. Such a change can also be observed for education in 2002. The difference for *real estate* seems to be quite stable over time. Owning assets and real estate has (on average) a general positive effect on the perception of financial security.

The descriptive analysis provides some first support for our hypotheses. They are consistent with the variables *econ. situation*, *assets* and *real estate* (hypothesis 4), but only partly for all other variables due to a switch in differences over time. More specifically, hypotheses 1, 3 and 4 are only supported in 1992 and hypothesis 2 are supported in 1992 and 1997.

<sup>12</sup> Due to the implicit cardinalization, we can make use of mean values for the descriptive analysis.



**Figure 1:** Mean value of the implicit cardinal variable  $Y_C$ , grouped by experience with LTC, having children, education, political interest, assets, real estate and economic situation



In fact, the descriptive analysis of mean values can provide an indication of the direction of the considered relationships, but it does not control for other factors. Therefore, we explore the regression results to shed further light on our research question. Table 4 presents fixed and random effects estimations in case of considering all waves. Columns (1) and (3) represent the initial regressions with all included interaction effects. Columns (2) and (4) show overall effects<sup>13</sup> for the respective years and their respective significance levels.

<sup>13</sup> The overall effects for the years 1997 to 2007 are the same as the sum of the coefficient in 1992 and the respective interaction effect. For example, the overall effect of *experience* in 1997 equals the sum of  $-0.160 + 0.091 = -0.069$ . However, the overall effects are presented separately to provide information regarding the standard errors and significance levels.

**Table 4:** Results of fixed (column 1 and 2) and random effects (column 3 and 4) approaches (1992 – 2007)

Variables	Coefficients		Overall effects		Coefficients		Overall effects	
	(1)		(2)		(3)		(4)	
experience	-0.160**	(0.069)	-0.160**	(0.069)	-0.130***	(0.046)	-0.130***	(0.046)
× 1997	0.091	(0.079)	-0.069	(0.058)	0.088	(0.062)	-0.041	(0.044)
× 2002	0.224***	(0.079)	0.063	(0.047)	0.158***	(0.055)	0.029	(0.032)
× 2007	0.272***	(0.079)	0.112**	(0.044)	0.199***	(0.055)	0.069**	(0.032)
political interest	0.006	(0.017)	0.006	(0.017)	-0.001	(0.013)	-0.001	(0.013)
× 1997	0.015	(0.020)	0.021	(0.016)	0.005	(0.017)	0.004	(0.012)
× 2002	0.025	(0.019)	0.031**	(0.013)	0.011	(0.015)	0.010	(0.008)
× 2007	0.017	(0.020)	0.024*	(0.014)	-0.005	(0.015)	-0.006	(0.009)
schoolyears	-0.008	(0.008)	-0.008	(0.008)	-0.029***	(0.004)	-0.029***	(0.004)
× 1997	-0.004	(0.006)	-0.011	(0.008)	-0.002	(0.005)	-0.031***	(0.004)
× 2002	0.002	(0.006)	-0.006	(0.007)	0.011**	(0.005)	-0.018***	(0.002)
× 2007	0.017***	(0.006)	0.009	(0.007)	0.023***	(0.005)	-0.005*	(0.002)
econ. situation	-0.043**	(0.019)	-0.043**	(0.019)	-0.132***	(0.014)	-0.132***	(0.014)
× 1997	-0.139***	(0.023)	-0.182***	(0.018)	-0.135***	(0.019)	-0.267***	(0.014)
× 2002	-0.107***	(0.022)	-0.150***	(0.014)	-0.112***	(0.016)	-0.244***	(0.010)
× 2007	-0.098***	(0.022)	-0.141***	(0.015)	-0.095***	(0.017)	-0.227***	(0.010)
assets	-0.073	(0.054)	-0.073	(0.054)	0.046	(0.038)	0.046	(0.038)
× 1997	0.148**	(0.063)	0.075*	(0.040)	-0.010	(0.048)	0.036	(0.030)
× 2002	0.125**	(0.061)	0.052	(0.032)	0.006	(0.043)	0.052**	(0.022)
× 2007	0.098	(0.060)	0.025	(0.029)	0.001	(0.043)	0.047**	(0.020)
real estate	-0.044	(0.029)	-0.044	(0.029)	0.053***	(0.020)	0.053***	(0.020)
× 1997	0.023	(0.030)	-0.021	(0.027)	-0.011	(0.025)	0.042**	(0.019)
× 2002	0.035	(0.029)	-0.009	(0.023)	-0.005	(0.023)	0.047***	(0.013)
× 2007	0.011	(0.031)	-0.033	(0.024)	-0.020	(0.024)	0.033**	(0.014)
children	0.059***	(0.014)	0.059***	(0.014)	0.052***	(0.011)	0.052***	(0.011)
× 1997	-0.072***	(0.015)	-0.013	(0.014)	-0.055***	(0.013)	-0.003	(0.011)
× 2002	-0.091***	(0.016)	-0.032**	(0.013)	-0.075***	(0.012)	-0.023***	(0.009)
× 2007	-0.079***	(0.018)	-0.020	(0.015)	-0.057***	(0.013)	-0.005	(0.010)
Observations	36,201			49,397				
No of individuals:	14,467			27,663				
R-squared:	0.081			0.148				
Individual FE:	Yes			No				
Year FE	Yes			Yes				
Controls: income, employment status, family status, perception of health status, priv. LTC insurance, number of persons in household, worried about economic development, sex and age (only in case of random effects estimation)								

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1; standard errors in parenthesis

Table 5 provides a sub-analysis of the fixed and random effects approaches (waves 2002 and 2007) to further analyze hypotheses 1 and 4. Although the results of both techniques are presented afterwards, we would like to stress that we focus on the results of fixed effects

regressions, especially when both approaches do not show consistent effects. Only for *schoolyears* we explicitly consider the random effects approach due to a small-sized within-individual variation.

**Table 5:** Results of fixed (column 5, 6 and 7) and random effects (column 8, 9 and 10) approach (2002 – 2007)

variables	Coefficients			Coefficients		
	(5)	(6)	(7)	(8)	(9)	(10)
experience	0.104* (0.054)	-	-	0.062** (0.025)	-	-
nobenefits	-	-0.040 (0.076)	-0.041 (0.076)	-	-0.143*** (0.040)	-0.135*** (0.040)
benefits	-	0.209*** (0.068)	0.209*** (0.068)	-	0.178*** (0.031)	0.185*** (0.031)
political interest	0.024 (0.015)	0.025 (0.015)	0.024 (0.016)	-0.006 (0.007)	-0.006 (0.007)	-0.008 (0.007)
schoolyears	0.036** (0.018)	0.037** (0.018)	0.037** (0.018)	-0.013*** (0.002)	-0.013*** (0.002)	-0.014*** (0.002)
econ. situation	-0.140*** (0.016)	-0.140*** (0.016)	-0.139*** (0.016)	-0.249*** (0.008)	-0.249*** (0.008)	-0.240*** (0.008)
assets	0.019 (0.031)	0.024 (0.031)	-	0.047*** (0.016)	0.048*** (0.016)	-
ln(assets)	-	-	0.0005* (0.0003)	-	-	0.0009*** (0.00015)
ln(debt)	-	-	-0.00002 (0.0003)	-	-	-0.0004** (0.0002)
real estate	-0.031 (0.033)	-0.030 (0.033)	-	0.044*** (0.012)	0.043*** (0.011)	-
ln(real estate)	-	-	0.00002 (0.0005)	-	-	0.0014*** (0.0002)
ln(mortgage)	-	-	-0.0004 (0.0005)	-	-	-0.0014*** (0.0002)
children	-0.001 (0.019)	-0.001 (0.019)	0.0002 (0.019)	-0.00004 (0.009)	-0.0002 (0.009)	-0.0006 (0.009)
Observations	17,328	17,328	17,328	29,814	29,810	29,810
No of individuals:	8,664	8,664	8,664	21,150	21,150	21,150
R-squared:	0.093	0.094	0.094	0.161	0.162	0.164
Individual FE:	Yes	Yes	Yes	No	No	No
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1; standard errors in parenthesis

### Hypothesis 1

The coefficient of *experience* shows a statistically significant negative effect for 1992 in both regressions (see table 4, column 1 and 3). Furthermore, all interaction terms are positive and statistically significant for 2002 and 2007. Due to positive interaction effects, the overall effects are negative in 1997 and positive in 2002 and 2007. Although most of these overall

effects are statistically insignificant, the coefficient for 2007 in both fixed and random effects estimations are positive and statistically significant ( $p < 0.05$ ). This finding implies that, on average, whenever an individual switches from having no experience to having experience, this individual will assess his financial security in the event of LTC need more positively.

So, based on the regressions in table 4, hypothesis 1 can only be confirmed for 1992. After 1992, a change in the impact on perceived financial security occurred, resulting in positive and statistically significant overall effects in 2007. Looking at table 5, columns (5) and (8) also show a positive and statistically significant ( $p < 0.1$  in column 5 and  $p < 0.05$  in column 8) effect for *experience*.

These findings support the hypothesis of a possible underestimation of the financial consequences by uninformed individuals in the absence of statutory LTC insurance. Both effects (fixed and random effects) are similar with respect to magnitude and significance level, which additionally supports this reasoning. The picture significantly changes with the introduction of statutory LTC insurance. The statistically significant changes in perceptions in 2002 and 2007 provide some indication that perceptions are different when a statutory insurance scheme exists (see also Lange et al. 2012). Furthermore, the statistically significant and positive overall effects in 2007 (see table 4, column 2 and 4) are remarkable. One explanation for these effects could be the already mentioned media effect (Bomlitz and Brezis 2008, Fischhoff et al. 1981 and Viscusi 1990), combined with media attention for statutory LTC insurance as mentioned above. Individuals with a low level of information are probably more affected by mass media. This result would also be in line with observed increasing positive interaction effects caused by increasingly negative news about the prospective financial problems of the LTC insurance scheme. However, as we are not able to estimate a direct effect of mass media, our results and the interpretation cannot provide sufficient evidence for establishing a relationship between mass media and perception of financial security in case of needing LTC.

A more detailed analysis is provided in columns (6), (7), (9) and (10) of table 5, where *experience* is replaced by the variables *benefits* and *nobenefits*. While having experience but not receiving benefits from statutory LTC insurance results in a negative effect (which is statistically significant when using random effects), the impact on perceived financial security is positive and highly statistically significant under both approaches when receiving benefits. This means that information on benefits in particular is responsible for the impact

on perception of financial security (and not just the fact that a family member in the household is dependent). This result further supports our assumption that direct information regarding financial consequences in the event of needing LTC has a strong impact on perceived financial security. Our results concerning experience are consistent with results of Lange et al. (2012), who found a positive effect of experience (in terms of doctor visits and hospital stay) on the assessment of financial security in the event of illness. This finding emphasizes the effect of negative media representation on the perception of financial security, as is also the case for health insurance (see Gross 2010).

### *Hypothesis 2*

Analyzing the effect of *schoolyears*, the coefficients are negative in 1992 under both approaches (table 4) and furthermore statistically significant in the random effects estimation (column 3). While interaction effects are slightly negative and statistically insignificant in 1997, they are positive and mostly statistically significant in 2002 and 2007. Only the interaction coefficient of the within-individual estimation in 2007 is statistically significant ( $p < 0.01$ ).

Analyzing the overall effects, all coefficients are negative except for the within-individual estimation effect in 2007. As expected, all overall effects of within-individual estimations are statistically insignificant, probably due to the already mentioned low within-individual standard deviation (see table 2). The picture is different under the random effects approach. The coefficients are negative and statistically significant in all years, although the magnitude reduces over time, probably due to a general increase in the level of information publicly available. These findings are to some extent supported by the results in table 5. Whereas the coefficients are positive and statistically significant ( $p < 0.05$ ) under the fixed effects approach, the coefficients are negative and highly statistically significant ( $p < 0.01$ ) when applying a random effects approach. Regarding education, hypothesis 2 can be confirmed by random effects estimations.<sup>14</sup>

The results indicate a negative impact of education on perception of financial security in the event of needing LTC. The findings are consistent with the statement of Kruger and Dunning (1999) that unskilled individuals overestimate their abilities and underestimate respective

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<sup>14</sup> We would like to mention again that we only consider the random effects results in case of education. However, the results of the random effects approach have to be considered with caution because of likely inconsistent random effects estimates, but they provide some indicative results regardless.

risks. Additionally, it seems to be the case that individuals with higher education can better assess information about risks (see Hakes and Viscusi 2004). On the other hand, we can also confirm the assumption that the magnitude of the impact on perception of financial security is decreasing over time. A reason for this development could be the media effect described in hypotheses 2 and 3. As less educated individuals are more likely to be influenced by mass media, we observe an opposing effect on the impact of education on perception of financial security. This relationship would also imply that, for 2007, the overestimation effect would have the same impact on perceived financial security as the mass media effect. The interpretation with regard to mass media is limited as already described above.

### *Hypothesis 3*

The impact of *political interest* on perceived financial security is somewhat different than that of education. In the fixed effects approach, all overall and interaction effects are positive (see table 4). Furthermore, the overall effect in 2002 (2007) is statistically significant at the 5 % level (10 % level). Column (3) shows a negative overall effect in 1992 and positive (negative) interaction effects and overall effects in 1997 and 2002 (2007) for the random effects estimation. However, and more importantly, all overall effects of the random effects approach are statistically insignificant. The results of *political interest* do not support hypothesis 3.

The interpretation of our variable *political interest* is vague. The positive coefficients in the within-individual estimation could be an indication for a mass media effect. More precisely, individuals with a higher interest in political issues may be less likely to be affected by mass media. However, we cannot find any evidence for the expected negative effect. If our stated assumption of a negative effect is true, political interest seems not to be an appropriate proxy for knowledge.

### *Hypothesis 4*

The variable *children* shows a statistically significant positive effect on perception of financial security in 1992 for both the fixed and random effects approach (table 4). This finding supports our hypothesis. Furthermore, all interaction terms are negative and statistically significant at the 1 % level. This change over time results in statistically insignificant overall effects in most cases, whereas the signs of the coefficients are all negative. Only the overall

coefficients in 2002 are negative and statistically significant ( $p < 0.05$  for fixed effects approach and  $p < 0.01$  for random effects approach). Additionally, all coefficients are small and statistically insignificant in the sub analysis (see table 5).

This result supports our hypothesis that individuals who have children assess financial security in case of need for LTC more positive. Furthermore, the positive impact on perception of financial security also indicates that children are substitutes for (supplementary) LTC insurance demand if no statutory LTC insurance exists. After the introduction of statutory LTC insurance, the positive impact of children on perception of financial security cancels out. One reason could be that children no longer have a strong effect on financial security as individuals are financially secured by statutory LTC insurance. In the context of insurance demand, Courbage and Roudaut (2008) found evidence that having children positively influences the likelihood of having private LTC insurance. They also argue that altruistic behavior or bequest motives could be a reason for observing comparably higher insurance demand. However, there need not exist a conflict between both results, as altruism may not have an impact on the individual perception of financial security in the event of LTC insurance. More precisely, the results indicate that having children leads to a more positive perception of financial security and therefore to a negative impact on LTC insurance demand. Even under this assumption, the altruistic effect would counteract the first effect and could also lead to a positive overall effect on LTC insurance demand.

#### *Hypothesis 5*

The variable *econ. situation* shows statistically significant ( $p < 0.01$ ) negative coefficients in all regressions. Furthermore, the interaction terms are negative and statistically significant. This hints at a stronger impact of *econ. situation* on perception of financial security between 1997 and 2007. This effect seems to be plausible as expected future financial pressure would lead to either a lower probability of capital accumulation or even elevated financial pressure in the event of LTC need.

When looking at the effects of assets, the dummy variable *assets* is negative (positive) in the fixed effects (random effects) regression but statistically insignificant in both for 1992 (see table 4). All interaction coefficients are positive and even statistically significant in 1997 and 2002 in case of the within-individual estimation; however, the magnitude is decreasing with

time. These results lead to a positive and statistically significant overall effect ( $p < 0.1$ ) in 1997 and positive but statistically insignificant effects in 2002 and 2007 (column 2). Considering the random effects approach, the interaction coefficients are negative (positive) in 1997 (2002 and 2007) and statistically insignificant (column 3), yielding positive overall effects. Furthermore, the overall effects in 2002 and 2007 are statistically significant ( $p < 0.05$ ). While the results partly support hypothesis 5, we have to be aware of the dummy structure, which reduces the precision of the results.

To shed further light on the impact of assets on the perceived financial security, the variable  $\ln(\text{assets})$  in table 5 provides a more precise measure. As observed in columns (7) and (10), both coefficients are positive and statistically significant (at the 10 % level in column 7 and at the 1 % level in column 10). Compared with the statistically significant effect in the within-individual estimation, the dummy variable *assets* leads to a positive but statistically insignificant effect (see columns 5 and 6). In summary, hypothesis 5 can be confirmed only indicatively when analyzing the effect of financial assets, as the coefficient of the within-individual estimator is only significant at the 10 % level.

Another source of assets is represented by the variable *real estate*. Looking at the results in table 4, the coefficient for 1992 is negative and statistically insignificant in column (1) and positive and statistically significant ( $p < 0.01$ ) in column (3). The interaction effects are also quite different. While the interaction effects in the fixed effects estimation are positive and statistically insignificant, they are slightly positive and also statistically insignificant in the random effects estimation. As a result, the overall effects from 1997 to 2007 are negative and statistically insignificant in column (2) and positive and statistically significant in column (4). These results are consistent with the coefficients in table 5, being negative and statistically insignificant in columns (5) and (6) and positive and statistically significant ( $p < 0.01$ ) in columns (8) and (9).

We observe similar results for the variable  $\ln(\text{real estate})$  (see table 5); a relatively small positive and statistically insignificant coefficient in case of the within-individual estimation as well as a positive and statistically significant coefficient ( $p < 0.01$ ) in case of the random effects estimation. Focusing on the within-individual estimation, we do not find strong evidence that the financial value of real estate has a positive impact on the perceived financial security. Furthermore, the results show a smaller impact on the perceived financial security of real estate relative to financial assets. One reason for the smaller impact could be



the low liquidity of real estate. While some financial assets also can have a long maturity, they are (on average) more liquid. This consideration further emphasizes the impact of financial assets on the individual perception of financial security.

The variable  $\ln(\text{mortgage})$  in table 5 leads to the following results: The variable has the expected negative sign in both approaches. Nevertheless, the effect is statistically insignificant in case of the within-individual estimation and statistically significant ( $p < 0.01$ ) in case of the random effects estimation. Focusing on the signs of the effects, hypothesis 5 can be confirmed when separating ownership into mortgage arrangements and the respective financial value. However, the insignificant value in the within-individual estimation does not provide a strong indication to confirm hypothesis 5.

Finally, we also included the variable  $\ln(\text{debt})$  in our sub analysis (see table 5). The results are similar to the coefficients of  $\ln(\text{mortgage})$ . However, the impact on the perception of financial security is smaller for  $\ln(\text{debt})$ . More precisely, both coefficients are negative (column 7 and 10) but only statistically significant in the random effects estimation ( $p < 0.05$ ). Thus, hypothesis 5 can only be confirmed to some extent by ordinary credit arrangements with regard to the direction of the coefficients. However, as the coefficient is relatively small and not significant in the within-individual estimation we could not observe a strong confirmation of hypothesis 5 with regard to  $\ln(\text{debt})$ .

The relatively small and non-significant coefficients (in the within-individual estimation) of  $\ln(\text{mortgage})$  and  $\ln(\text{debt})$  might be caused by the attitude that (with respect to financial security) it does not matter if the individual is indebted or just does not accumulate capital because of other reasons. However, comparing the coefficients, mortgages have a three times stronger effect relative to plain debt. This could be an indication that indebtedness is more likely to play a role on the perceived financial security for debt with long maturity (like mortgages). If so, one argument for the negative relationship could concern the increased financial burden of paying interest on debt and being LTC dependent.

To sum up the results regarding hypothesis 5, financial aspects only partly matter when it comes to the perception of financial security in the event of LTC need. Furthermore, the

positive and significant random effects regression indicates, that there is a stronger impact between individuals compared to the impact within individuals.<sup>15</sup>

With respect to possible effects on LTC insurance demand these results might entail that a better financial security only due to higher assets could reduce the demand for LTC insurance (e.g. in case of financial assets). However, there also exists a direct relationship between assets and LTC insurance demand. More precise, the value of assets could also have a positive effect on LTC insurance demand because insurance coverage can provide a protection for the individual's wealth (see Brown and Finkelstein 2009). Taking both effects into account, the influence on LTC insurance demand is ambiguous (both the direction and the linearity) as it depends on two countervailing effects. This could be an explanation for a bell shaped relationship between assets and LTC insurance demand (see Bernet 2004) which means a dominant protection effect until a certain level of assets and a dominant effect from financial security after reaching the threshold level.

#### **Limitations and robustness of the results**

In the following, we highlight limitations regarding our variables, the methodology and the generalization of the results. However, the data and methodology are the best available to our knowledge.

Concerning the independent variables, we want to highlight that the value of assets and debt are not available for the whole dataset. In addition, data with respect to benefits from statutory LTC insurance are not available before 2002. Thus, we are only able to use the whole range of information for a sub analysis of the years 2002 and 2007.

As already mentioned, we were not able to estimate a direct relationship between mass media and perception of financial security in the event of needing LTC. Therefore the interpretation of our results regarding *schoolyears* and *political interest* should be treated with caution. Knowledge about the relationship between mass media and risk perception might reveal a possible source of an information bias. Therefore, further research into these matters could shed some more light on this issue.

We cannot observe the possible existence of supplementary private LTC insurance. As a consequence, we cannot control for the effect of additional insurance on the perception of

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<sup>15</sup> We want to mention again that the random effects estimation is probably not consistent.

financial security. Nevertheless, as the fraction of individuals holding a supplementary LTC insurance is very small – only 2.15 % of all insured persons in the statutory LTC insurance (see GDV 2011 and the Federal Ministry of Health 2011) – the resulting bias should be very small.

Concerning our dependent variable, we wish to stress its subjective character, which can lead to a heterogeneous interpretation between individuals. The use of the fixed effects approach, however, reduces this problem with heterogeneity. In contrast, the taken approach increases the standard errors (see Allison 2009) because it only takes within-individual variation into account. Especially in case of education, the precision of the estimates is very low due to a low within-individual variation. Some of the inconclusive results might be explained by this fact. As a consequence, we also consider the random effects approach, but the subjective character of the dependent variable should always be considered when interpreting these regression results.

Because the survey with the specific question concerning perceived financial security in the event of needing LTC is only included every five years, this could result in a lack of statistical significance. It might even result in the situation that only effects close to the considered waves are measured appropriately. More precisely, shocks (e.g., unemployment or divorce) may not be accurately captured, although we have included such variables as control variables.

Finally, we stress a general limitation with respect to panel data – especially balanced panel data – that the average age of the study population is increasing over time. Therefore, we used an unbalanced panel for our analysis. In addition, attrition can lead to a serious problem in panel data. However, in the case of the fixed effects regressions, this is only a problem when selection is linked to idiosyncratic errors (see Wooldridge 2002). To check for a possible attrition problem in our dataset, we conducted a simple test suggested by Nijman and Verbeek (1992) and Wooldridge (2002). The resulting selection indicator is statistically insignificant (p-value of 0.110), demonstrating that there is no strong evidence for attrition in our analysis (see Wooldridge 2002). The selection indicator further reduces (p-value of 0.553) when only considering the years 2002 to 2007 for the conducted sub-analysis. Furthermore, similar results for different estimations (table 4 and 5) support the robustness of our results to some extent. Finally, note that the SOEP is a well-researched and

professionally maintained panel, likely avoiding major errors of panel composition found in smaller panels.

## **Conclusion**

This study analyzes the perception of financial security in the event of needing LTC. We do not focus on perception of the probability but rather perception of financial consequences, conditional on the risk occurring. In the literature, this factor making up expected costs seems to be insufficiently researched or even ignored. We start closing this gap by investigating a broad spectrum of hypotheses. Most of the hypotheses deduced from our initial research question found some support in the dataset analyzed. Experience with financial consequences for affected people, in particular, shows a strong impact on perception of financial security. This finding might be due to individuals with experience having intimate knowledge about financial consequences of such an event. This conjecture is also supported by other findings in our analysis. Education has a negative impact on perception of financial security but that seems to decrease with time.

These findings are of importance for several parties in the insurance markets, where risk assessment takes a crucial role in optimal allocation of resources. Misperception of risks, due to a decoupling of probability and severity of risks, might result in sub-optimal prioritization. This could eventually lead to inflated costs for society through higher subsidies, which would be needed to bolster social safety nets. This implication is especially interesting for policy makers, who may adapt information and communication strategies to affect adverse insurance demand behavior. Resulting negative effects could lead to societal inefficiencies. One implication for policymakers might be that they should consider providing more information about average costs of long-term care rather than only targeting to reduce the misperception regarding the likelihood of becoming dependent. These issues are even more pressing in Germany because of the increasing costs of LTC triggered by demographic change and medical innovations.

In total, some experience and a solid economic situation, paired with more general information on the topic due to increased presence in the media, were found to result in a more positive perception of the financial consequences of needing LTC. This finding is consistent with findings by Sjöberg (2003). Pure supply of information is not sufficient to provide a basis for an accurate assessment of risks. These results have important

implications for policy makers as described above. Two things need to be considered: On the one hand, it can be observed that additional objective information can lead to a more accurate perception of risk. Nevertheless, on the other hand, the presentation of information is important. If the presentation of information is performed poorly or in a biased fashion – e.g., presenting worst-case scenarios during an election campaign – the opposite effect could prevail, on average resulting in even less accurate perceptions. Furthermore, poorly performed information strategies could also increase the uncertainty concerning the LTC risk which could in turn result in a status quo bias (see Samuelson and Zeckhauser 1988), i.e. not to buy supplementary insurance coverage.

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