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| Vrije Universiteit Brussel  Pleinlaan 2  1050 Brussel  Rector's Office  **R&D DEPARTMENT**  Tel. : +32 (0)2 629 21 08  Fax : +32 (0)2 629 36 40 | 2011 redefined call for applications for a  **Senior Research Fellowship**  **"Economic Sciences — *Subthemes*:**  **1. Operational Research: Logistics;**  **2. Investigation of the performance of financial products and optimalisation of their design"**  starting 1 October 2012  Vacancy number: ES/2012/002  **More information on the topic and research environment**  for publication on the  call's webpage:  **http://rd-ir.vub.ac.be/en\_GB/news/show/id/1209** |

***Subtheme 1:***

**Operational Research: Logistics**

The department “Mathematics, Operations Research, Statistics and Information Systems for management” (MOSI) at the Faculty of Economics, Social and Political Sciences and Solvay Business School has a vacancy for a Senior Research Fellowship in the field of **Operations Research/Quantitative techniques** with a focus on **Logistics and Transport**.

In this position you are responsible for the organization and implementation of new research activities in the field of Logistics and Transport. You can rely on experience concerning writing research proposals, project management and the valorization of scientific output, both in peer-reviewed journals with high impact factor and through the collaboration with government and private sector. You are an enthusiastic scientist and a team player, devoted to the further development of a spearhead research center together with the interdisciplinary research group Mobility and automotive technology (MOBI). As an open-minded researcher you also reach out to other departments and faculties for relevant knowledge sharing. You consolidate the existing research experience in the department and intensify the internal collaboration. The ideal candidate has excellent communication skills, profound analytical skills and good didactic qualities.

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***Subtheme 2:***

**Investigation of the performance of financial products and optimalisation of their design**

Many financial products, such as so-called capital guaranteed products, equity linked bonds or unit linked insurance products, combine standard financial products (stocks, bonds) with at least one derivative. As such, they greatly enlarge the set of investments that are available to investors. Usually, they provide a capital guarantee when markets are declining while offering potentially attractive returns when markets are rallying. Therefore, as they seem to combine the best of two worlds they are a very attractive investment opportunity for many retail investors and it is not a surprise that banks and insurance companies have been marketing these products aggressively. Note also that financial institutions have started using these products in the management of their own assets and liabilities.

These products tend to be very complex in nature and are by no means easy to price in general. Hence it is no surprise that in the literature on structured products (or derivatives in general) the focus has been almost exclusively on the pricing and hedging of these instruments and less on their performance from an investor’s point of view. Indeed, building further on the seminal paper of Black & Scholes (1973) a new discipline in finance, called financial engineering, has emerged with mathematicians and other engineers developing increasingly elaborated pricing techniques for ever more complex structured products.

The same feature of complexity also appears to explain why many of these new generation financial products are overpriced, especially when sold to retail clients (Stoimenov and Wilkens (2005), Henderson and Pearson (2007))). The existence of overpriced complex financial products appears indeed to be consistent with Carlin’s (2009) model. In this model, firms strategically increase the complexity of financial products to preserve market power and bound the financial literacy of consumers. Moreover sellers are able to charge a higher mark-up on the more complex products. In most cases, the retail investor does not have the expertise to understand the complexities of these contracts and obtains advice from an agent who is remunerated by sales commissions. If the producer’s surplus is shared with the sales agent, then there are incentives for the agent to push the more complex products and for the industry to favor a regulatory regime that makes it easier to avoid disclosure and complicate the product. When fees and commissions are taken into account, structured products are very expensive. On the other hand, these instruments provide consumers with features that would be difficult for them to replicate on their own and the argument is sometimes made that they contribute to completing the market (Rossetto and Van Bommel (2008)).

Note that, to the best of our knowledge, there is no clear definition of product complexity in the case of financial products. Nevertheless, there are many cases where most observers would agree that one contract is more complex than another. We suggest that the number of features in the contract, the difficulty of figuring out the benefits and the amount of technical jargon used to describe it would all appear to contribute to product complexity. In a recent paper, Bernard, Boyle and Gornall (2009) study a specific type of contracts with a guaranteed return combined with some complex participation in the performance of the equity market. They show that a risk averse consumer that behaves such as described by the expected utility theory or by the standard mean variance theory should prefer simpler contracts. If consumers overweight the probability of getting the maximum possible return they may however prefer the more complex contract and additional evidence is provided that sellers encourage this type of overweighting. Consumers have therefore a subjective perception of the financial market.

In a paper entitled “how to lose one million dollar on the stock market”, Dybvig (1988) showed that in a so-called complete market-setting the most efficient way to achieve or build a wealth distribution is by purchasing “simple” financial products. Here “completeness” refers to a financial market where all payoffs are hedgeable or replicable (see Harrisson and Kreps, 1979), and “simple” refers to the feature that the payoff can be generated using a (risk-free) bond and plain vanilla derivatives (calls and puts).

Moreover, since these path-independent payoffs can be approximated to any degree of precision by series of (zero-coupon) bonds and calls and puts, the logic conclusion of Dybvig’s work would be that proper investment only consists in simply purchasing the appropriate proportions of bonds and plain vanilla derivatives (calls and puts) written on the underlying risky assets. Path-dependent, thus complex, structured products are then to be avoided. We remark that Cox & Leland (1982, 2000) already showed (using other techniques) that optimal payoffs are necessarily path-independent but this result is more limited because it only holds for investors that are risk averse whereas Dybvig’s result holds for all investors (assuming they all prefer more to less).

In our research unit we have already contributed to this stream of literature. Indeed, in their recent papers, Vanduffel et al. (2009,2011), Maj and Vanduffel (2010), Vanduffel, Ahcan, Henrard and Maj (2011), and Bernard, Boyle and Vanduffel (2011) have discussed that from a buyer’s point of view the only (financially) valuable structured products are path-independent and thus “simple”. While complicated structured products may provide some “emotional” value or happiness to the investor they do not seem to be the right vehicle to generate financial value. For illustrations of the different theoretical results one can also refer to Dybvig (1988) and Vanduffel et al. (2009). Furthermore, Bernard, Boyle and Vanduffel (2011) discuss on investors who seek a specific probability distribution of terminal wealth at a minimal cost. Under fairly general assumptions, they derive a formula for the unique investment portfolio that minimizes the cost of achieving a given distribution of payoff.

On a technical note the theme connects with topics such as dependence modeling, stochastic ordering, risk measures, asset pricing, optimization under constraints, market incompleteness and the conception of (behavioral) decision theories. Economically, there are strong relations with the assessment of systemic risk and contagion. The theme allows for theoretical and empirical (econometric) work in all these directions.

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