Disclosure Policies for the Issuer Estimated Value — Facts and Fiction

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Abstract

In 2014, the German Derivatives Association introduced the policy of disclosing an Issuer Estimated Value (IEV) for structured retail investment products. The IEV is supposed to reflect the fair value of the product. As an act of self-regulation, issuers intended this measure to meet criticism regarding their intransparent profit margins. We analyze the objectivity of the IEV for a large sample of discount certificates on the German major stock market index DAX. We find that margins based on issuer-disclosed IEVs are substantially lower than fair value margins. While deviations might be explained to some degree by a lack of precision in the definition of the IEV, most issuers seem to ignore their own bankruptcy risk in their IEV estimations.

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1 Introduction

Structured investment products represent a convenient way for retail as well as institutional investors to invest in all kinds of risk and return structures related to one or more underlying instruments. Basically, these products can be characterized as a package of base assets such as stocks or equity indices together with derivatives with the legal form of a debt instrument that is issued by a financial institution. Issuers typically act as market makers for their own products, providing liquidity by continuously quoting bid and ask prices in the secondary market.

After an impressive growth in the years before the financial crisis 2007/08, the market for structured retail products suffered significant volume losses. In Germany, one of the world's largest market for these products, aggregate market volume consolidated at a level of 69 billion euros as of the end of 2017.[1] Part of the decline in market volume can be attributed to misbehavior during the financial crisis and large losses of small investors. Issuing banks have been accused of lacking transparency in their cost structures. To regain investors' trust and to some extent also to prevent external regulatory measures, 15 major issuers, affiliated within the German Derivatives Association (Deutscher Derivate Verband, DDV), have committed to a Fairness Code (DDV, 2014a) as an act of self-regulation. The Fairness Code governs structured products that are offered publicly to private individuals in Germany and sets out guidelines for "responsible conduct regarding the capital and trust of investors" (DDV, 2014a). In a novel move, the Fairness Code prescribed the disclosure of an Issuer Estimated Value (IEV) as a theoretical fair value of the derivative package reflecting the "market price of the product among professional market participants" (DDV, 2014a). Comparing the IEV with the quoted retail market

[1] See https://www.derivateverband.de/ENG/Statistics/MarketVolume (German Derivatives Association).

price would allow investors to assess the issuer's gross profit margin and hence the costs associated with the product—under the assumption that the IEV indeed represents an unbiased estimate of its fair value.

The Fairness Code, however, did not prevent the imposition of external regulatory measures. In 2018, the Packaged Retail and Insurance-Based Investment Products (PRIIPs) regulation became effective in the European Union, requiring all issuers of structured retail products to explicitly disclose the costs associated with these products. This requirement can be seen as the regulatory counterpart of the IEV. Apparently, legislators did not trust the effectiveness of issuer self-regulation. Consequently, most issuers refrained from disclosing IEVs.[2] In the 2018 version of the Fairness Code, the IEV was no longer included (DDV, 2018).

This paper analyzes the policy of issuers in disclosing the IEV. Particular, we investigate whether the IEV indeed represents an unbiased estimate of a structured product's fair value. We aim to provide insight into the actual necessity of imposing external regulations requiring the disclosure of costs associated with structured products, as demanded by the PRIIPs. According to the Fairness Code, the IEV is not definitely clear on components such as hedging costs and financing gains, giving issuers leeway to hide differences between the retail price and the theoretical fair value. We analyze the extent to which issuers exploit this leeway and quote an IEV significantly higher than the fair value. Such a policy would indeed call for external regulation to ensure that the costs disclosed by issuers do reflect the actual costs for the investor.

We focus on discount certificates as one of the most important subsegment of structured retail products. Discount certificates can be easily duplicated by a long position in the un-

[2]Nonetheless, some issuers such as UBS and Société Générale still stick to the disclosure of the IEV even for new issues.

derlying and a short position in a European call option. As these duplicating instruments are actively traded in a reference market, model error and differences due to model choices are kept to a minimum. This allows us to make a straightforward comparison between reported IEVs and their theoretical fair values.

This paper adds to the literature on issuer pricing policies in the market for structured retail products. Existing studies primarily focus on the gross margin, defined as the relative difference between the quoted price and the theoretical fair value. For plain-vanilla products such as discount certificates, gross margins have become quite low in recent years. For discount certificates on single DAX stocks in 2004, Baule et al. (2008) find average margins between 0.67% and to 2.27%; for certificates on the index itself, Baule (2011) reports margins that range between 0.34% and 1.06% in 2007. Schertler (2016) finds similar low margins of 0.44% on average for DAX certificates between 2008 and 2010, however, only if issuer default risk is neglected. Although the studies are not directly comparable because of different treatments of default risk, certificate selection issues, and lifetime effects, a trend towards low margins becomes evident. Decreasing margins can be explained by higher competition (Schertler, 2016), along with increased price sensitivity of retail investors, and decreased operating costs due to standardization and efficiency gains in the issuance process (Baule, 2011).

Our study extends the results of Bauer et al. (2016), who compare disclosed and recomputed fair value margins after the introduction of the IEV, examining a set of 501 discount certificates covering a sample period of one month. We use a much more comprehensive data set of more than 6,000 discount certificates over an observation period of 18 months from May 2014 to October 2015. As a major result, we find that the disclosure policy varies remarkably between the issuers. While some issuers disclose average annualized margins of only a few basis points, others report margins exceeding one percentage point. Compared with margins based on fair value calculations, all except one issuer understate

their margins considerably. Thus, the leeway in the Fairness Code left by the opaqueness of the definition of the IEV's components is used by nearly all issuers, although to different degrees. Particularly, we find evidence that most issuers seem to ignore their credit risk in the disclosed IEVs. Further, fair value margins have only limited explanatory power for disclosed IEV margins.

The paper proceeds as follows: Section 2 provides a short overview of the regulation of structured retail products and analyzes the definition of the IEV. In Section 3, we describe our data and empirical design, i.e., our approach to calculating the fair values of products. Section 4 presents the results. Section 5 concludes.

2 Regulation of Structured Retail Products

2.1 Overview

Even for structured products that exhibit simple payoff structures, associated risks and costs cannot be assessed straightforwardly, in particular for private investors with limited knowledge about derivative pricing theory. Therefore, a whole set of regulations have been introduced with the aim of protecting private investors from alleged poor investment advice and unfavorable investment decisions. In the European Union, the determination of regulators to strengthen investor protection is demonstrated by regulatory measures such as Directive 2009/65/EC on the coordination of laws, regulations and administrative provisions relating to Undertakings for Collective Investment in Transferable Securities (UCITS) (European Parlament, 2009). The introduction of new Key Investor Information Documents (KIIDs) was a key element of the UCITS IV revision in 2011. The KIID contains pre-contractual information in a prescribed format, designed to promote harmonization and comparability of investor information.

In addition to this external regulation, the German Derivatives Association introduced a voluntary Fairness Code as an act of self-regulation to implement standards with respect to the structuring, issuing, marketing, and trading of structured retail products in Germany (DDV, 2014a). In addition to several guidelines intended to strengthen public trust in the issuers, the Issuer Estimated Value (IEV) is a key element of the Fairness Code. The IEV is meant to represent the theoretical fair value of a structured product. Investors previously had limited information about the costs of the product. To redress this, issuers are to state the IEV in the KIID of the investment product. However, as the IEV must be solely calculated on the date when the product conditions are determined (DDV, 2014a), the IEV only allows an assessment of the product's price at issuance—it provides no explicit information about issuers' pricing in the secondary market.

Further regulation was carried out with the comprehensive revision and extension of the Markets in Financial Instruments Directive (MiFID II) (European Parlament, 2014a) and the EU Regulation 1286/2014 on key information documents for Packaged Retail and Insurance-Based Investment Products (PRIIPs) (European Parlament, 2014b). The latter was introduced in order to further enhance investor protection standards and increase transparency in the market, particularly with respect to sales and distribution. As a key measure, issuers are required to prepare a short and uniform "Key Information Document" (KID) for each product. The revised Key Information Document (KID) replaces the former KIID and easily lets retail investors compare products by providing information such as the risk and return profile and different performance scenarios. Further, as the KID also includes the costs associated with the product, disclosing IEVs has become redundant.

2.2 Calculation of the IEV

According to the Fairness Code, the IEV should reflect the "market price of the product among professional market participants" (DDV, 2014a). In a note in the Fairness Code (DDV, 2014b), the German Derivatives Association details the composition of the IEV and how its components are calculated (see Table 1). The IEV is essentially determined by the model price of the product components. This model price has to be calculated with "recognized valuation models" assuming an "efficient and perfect" capital market with no transaction costs. A further specification of the models to be utilized is, however, lacking. Further, the model price should assume that financing is based "on an average market interest rate which is independent of the creditworthiness of the respective issuer". Thus, the model price assumes that the issuer cannot default on its payoff obligation. The note does not, however, specify whether this interest rate should represent an actual market rate such as LIBOR or a theoretical risk-free rate (e.g., an overnight index swap rate).

[Insert Table 1 about here.]

To account for the issuer's default risk, the so-called "finance income" has to be deducted from the default-free model price: "As the buyer of a structured product, the investor provides the issuer with money. This may result in finance income for the issuer which is included in the issuer estimated value" (DDV, 2014b). Finance income can thus be seen as the benefit for being endowed with capital under the conditions of a perfect market instead of borrowing at the bank's actual cost of debt. This interpretation would require reducing the model price by the value of the issuer-specific default risk, and it would be in line with the general statement that the IEV should reflect the "market price of the product among professional market participants" (DDV, 2014a). Finally, the IEV is obtained by adding the expected hedging costs the issuer incurs. The note mentions trading costs or bid-ask

spreads as examples for these hedging costs, but omits a clear definition. The difference between the IEV according to Table 1 and the price of the structured product represents the issuer's gross margin. The final acquisition price for the investor can be subject to a further front-end load fee.

In summary, issuers have some leeway in how they determine the size of the components of the IEV. Their options include the choice of model to calculate the value, the choice of the risk-free interest rate, the method of considering the issuer-specific default risk ("finance income") and the estimation of expected hedging costs.

3 Data and Empirical Design

3.1 Structured Products Data

To examine issuers' disclosure policy in terms of the IEV, we focus on discount certificates on Germany's major stock market index, DAX. A discount certificate pays the holder an amount, DC_T, equal to the level of the underlying, S_T, at maturity, T, subject to a cap, C:

$$DC_T = \min\{S_T; C\}. \tag{1}$$

As the certificate's payoff is limited by a cap, its price before maturity is quoted at a "discount" compared to the level of the underlying asset.

Our base data comprises all discount certificates on the DAX outstanding in February 2016 and issued in Germany after the introduction of the IEV in May 2014. We hand-collected the IEVs from the Key Investor Information Documents (KIIDs), which are provided on the issuers' websites. To calculate IEV-based issuer margins, we also retrieved issue prices from the KIIDs. Out of 13 initially considered issuers, five were dropped from the sample due to data issues. KIIDs from Goldman Sachs and WGZ were only available upon request

and could not be retrieved automatically. BNP Paribas provided information about the IEV at the time of the request only, not at issuance. LBBW and Société Générale provided no information about issue prices. The remaining eight issuers that disclosed adequate information for our analyses are Citigroup, Commerzbank, Deutsche Bank, DZ Bank, HSBC, UBS, UniCredit and Vontobel, with a total of 6,678 certificates. Market price data was unavailable for 15 products, so the final data set consists of 6,663 discount certificates.

[Insert Table 2 about here.]

Table 2 reports descriptive statistics of the discount certificates in our sample. Maturity of the certificate is stated in years, discount and maximum return are reported in percent. Discount is defined as the relative difference between the level of the underlying and the (lower) issue price of the certificate. Maximum return is the relative difference between the cap of the certificate and the issue price, and represents the maximum possible return for the investor. Moneyness is defined as the relative distance of the cap to the underlying level.

The issuance of discount certificates usually takes place in tranches, that is, a larger number of certificates is issued simultaneously. Besides the number of single certificates, Table 2 also reports the number of tranches per issuer. The quotient observations/tranches is the average number of certificates issued per tranche. This figure has values between about a dozen (DZ Bank, Vontobel) and more than one hundred (Commerzbank, HSBC).

With 2,309 discount certificates, around one-third of the sample products were issued by Commerzbank, followed by Deutsche Bank with 1,116 certificates, and DZ Bank and HSBC with nearly 700 products. Taken together, these four issuers represent 72% of our sample, which is consistent with their share of the total discount certificate market in Germany.

3.2 Valuation of Discount Certificates

The payoff structure of a discount certificate as given in (1) can be replicated by either (i) buying the underlying and selling a call option with the strike price equal to the cap, C:

$$DC_T = S_T - \max\{S_T - C; 0\}, \tag{2}$$

or (ii) buying a zero bond with a face value equal to the cap, C, and selling a put option with strike price C:

$$DC_T = C - \max\{C - S_T; 0\}. \tag{3}$$

As the certificate does not generate any income before maturity, a zero strike call must be used for underlyings that pay dividends or generate any other income before maturity of the certificate. Since we only consider discount certificates on a performance index in our study, we may use the underlying itself.

According to the first replication strategy as given by (2), the fair (default-free) model value, $DC_{0,i}$, of a certificate i equals the current level of the DAX, S_0, minus the fair value of a plain-vanilla call option on the DAX, $c_{0,i}$ (with the strike price equal to the cap):

$$DC_{0,i} = S_0 - c_{0,i}. \tag{4}$$

While the index value of the DAX is readily observable, market values of DAX index options that should apply among "professional market participants" can be obtained from traded options. We use DAX index options traded at the Eurex exchange, which is the largest European futures and options market, and obtain settlement prices through Thomson Reuters Datastream. Traded options however, do not necessarily match with a discount certificate's embedded option in terms of maturity and strike price. We therefore interpolate between prices of similar options. More precisely, this is done via an interpolation of implied volatilities using the Black and Scholes (1973) model, which is standard

in the literature on valuing plain-vanilla retail derivatives (e.g., Baule, 2011). We basically calculate an implied volatility surface by first interpolating between strike prices and second between maturities. The interpolated implied volatility is then employed in the Black-Scholes option pricing model to estimate the value of the call option. However, implied volatilities may differ depending on the use of call or put options. Instead of using either call or put implied volatilities, we utilize the put-call parity as is done in Hentschel (2003). Based on a call price, $c_{0,i}$, and a put price, $p_{0,i}$, with the identical strike price, C_i, and maturity, T_i, this approach implies an underlying level $S_{0,i} = c_{0,i} - p_{0,i} + C_i\, e^{-T_i}$.

While the resulting value of the certificate does not yet consider default risk, structured products have the legal form of unsecured bonds and thus suffer from bankruptcy risk (Baule et al., 2008). In other words, as stated in the Fairness Code, if default risk was neglected, the issuer would benefit from "finance income" by being endowed with capital under the conditions of a perfect market instead of borrowing at the bank's actual cost of debt. To account for the issuer's default risk, we apply the model of Hull and White (1995). The approach assumes independence of the issuer's default risk and the underlying of the derivative. The default-adjusted fair value, $DC^d_{0,i}$, is obtained by discounting the default-free model value with the credit spread, s_{j,T_i}, of issuer j:

$$DC^d_{0,i} = e^{-s_{j,T_i} T_i}\,(S_{0,i} - c_{0,i}). \tag{5}$$

Credit spreads are taken from credit default swaps for one to five years maturity, obtained from Thomson Reuters Datastream, and are interpolated to match the maturity of the certificate, T_i.[3]

[3]For Vontobel, no credit default swaps are available. Based on their long-term issuer rating A3 (Moody's), we used the spreads of UBS as a similar issuer.

We compare theoretical fair values, $DC^{d}_{0,i}$, with the ask prices of the certificates, $DC^{ask}_{0,i}$, to calculate the issuer's actual gross margins. Market prices were delivered by vwd group. Besides absolute margins (in EUR), we calculate relative annualized fair value margins:

$$\text{Percentage-Margin: } \frac{DC^{ask}_{0,i} - DC^{d}_{0,i}}{DC^{d}_{0,i} \cdot T_i}. \tag{6}$$

Further, the calculation of the IEV requires the consideration of expected hedging costs. While their actual size is opaque by nature, we use a rough estimate as given by the German Derivatives Association (DDV, 2017), which amounts to 15 basis points per year. We adjust the margins calculated by (6) accordingly to obtain the issuer's fair value gross margin after expected hedging costs. Although hedging costs may vary across the issuers, we are confident that the DDV's own assessment is at least an unbiased estimate for the average issuer.

We also calculate gross IEV margins based on the issuer's disclosed IEVs and the actual issue price. As there is no exact time stamp given for either the IEV or the issue price, we are not able to recalculate the contemporaneous fair value margins. For the fair value approach outlined above, we therefore focus on the first stage of the secondary market phase and assume that fair value margins in the first trading days after issuance do not significantly deviate from the gross margin in the primary market. As margins tend to decrease over the life cycle of the product (Wilkens et al., 2003), margins in the secondary market are a lower bound for margins in the primary market. For noise reduction, we calculate average margins for the first ten trading days in the secondary market. Implied volatilities are calculated based on settlement prices at the Eurex, timed daily at 5.30 p.m. To keep time distances small, we use the latest ask price for a certificate before 5.30 p.m. each day. If this latest price is quoted before 5.00 p.m., the respective day is dropped, and we extend the observation period in the secondary market to get at least ten observations, however, up to a maximum of 30 days after entry in the secondary market phase. For a few

certificates, less than ten valid observations were available within the first 30 trading days; for these products, we calculate the average margin based on the available observations.

4 Results

4.1 IEV Margins and Fair Value Margins

Table 3 reports descriptive statistics for the absolute (EUR) and annualized percentage IEV margins based on disclosed IEVs and issue prices. Although all analyzed products belong to the same product category (i.e., discount certificates), we observe considerable differences in disclosed margins between the issuers. Commerzbank, Deutsche Bank and HSBC stand out with average margins of only a few cents or basis points (0.05%–0.06%) suggesting rather attractive terms for investors. At the other extreme, Vontobel discloses average margins of 1.35%. The average IEV margin over all issuers amounts to 0.37 EUR or 0.24%, which is rather low compared to actual margins reported in previous studies with estimates between 0.5% and 1% (e.g., Baule, 2011).

[Insert Table 3 about here.]

Further, the margin range differs considerably between the issuers. While Commerzbank, for example, reports margins in a quite narrow range of 0.03%–0.09% (standard deviation of 0.01%), Citigroup and Vontobel exhibit a rather heterogeneous pricing strategy, with margins ranging from 0.06% to almost 3% (standard deviation of 0.44% for Vontobel).

The margin histograms displayed in Figure 1 provide a more detailed picture of the margin distributions. The figure confirms the impressions from Table 3. While most issuers concentrate their disclosed margins in a narrow range around certain values, Citigroup and Vontobel seem to pursue a rather different pricing strategy, not only with higher

average margins but also with a wider range of margins. If issuers honestly state margins based on a common understanding of the IEV definition, the majority of issuers obviously charges very small margins. However, issuers may also use the opaqueness of the IEV definition to enhance the look of their actual pricing policy.

[Insert Figure 1 about here.]

In Table 4, we compare disclosed IEV margins with recalculated fair value margins. As discussed, the IEV should represent the model price of the product components, adjusted for expected hedging costs and financing income. In order to compare disclosed IEV margins and fair value margins, we add these adjustments step-by-step. We start with the margin based on the default-free model value. Adding expected hedging costs of 15 basis points per year represents the hedging-adjusted model value. Further, financing income is represented by the bank's credit spread, which leads to the default-risk-adjusted value. We report absolute (EUR) as well as annualized percentage margins and, furthermore, descriptive statistics on the differences between fair value and IEV margins. If the IEV actually represents the market price of the product among professional market participants, the IEV margin should be close to the fair margin based on the default-risk-adjusted value.

[Insert Table 4 about here.]

The results are striking. The average default-adjusted fair value margin amounts to 0.54% (0.82 EUR) and is thus similar in magnitude compared to fair value margins reported in other studies of discount certificates (e.g., Baule, 2011). However, all issuers except Vontobel report significantly lower IEV margins. While the average difference between the fair value margin and the disclosed margin is 0.29% or 0.45 EUR (i.e., the average fair value margin is almost twice as large as the disclosed IEV margin), some issuers such as

Commerzbank and Deutsche Bank even report IEV margins of only about one-tenth of the fair value margin. Thus, based on our definition of the product's fair value, almost all issuers understate their margins and hence the costs investors incur. Vontobel stands out with a disclosed IEV margin that is around one percentage point higher than the actual fair value margin.

The picture changes when considering alternative definitions for the fair value margin. While average IEV margins are even larger than the default-free margin, we observe similar average margins when comparing the IEV margin with the hedging-adjusted margin. With the exception of Vontobel, whose IEV margin is 1.28 percentage points larger than the hedging-adjusted fair value margin, average absolute issuer-specific differences range below ten basis points. Thus, almost all issuers seem to disclose IEV values adjusted for hedging costs, but not for default risk.

The considerable deviations between IEV margins and fair value margins can hardly be attributed to our methodology. Regarding the calculation of the default-free model price, simple structured products such as discount certificates with embedded plain-vanilla options do not leave much space for model risk which may lead to such considerable differences. Regarding unobservable hedging costs, we used a rather rough estimate of 15 basis points as given in DDV (2017). According to the DDV, this assessment includes bid-ask spreads of the hedging instruments. Of course, actual hedging costs may vary between the issuers. However, the variation should not be large enough to explain the magnitude of the observed issuer-specific margin differences. Further, the DDV's estimate represents an assessment of the average issuer that should hence be at least valid for the sample average. A further possible source of deviation may be the time lag between the initial calculation of the IEV by the issuer and the entry into the secondary market phase, where our fair margins are calculated. This time lag may take up to several weeks. However, as margins tend to decrease over the life cycle of the product (Wilkens et al., 2003), observed

margins in the secondary market are a lower bound for margins in the primary market. Furthermore, time discrepancies between the settlement of EUREX options as the source for implied volatilities and the quoting of the certificate prices may be a source of pricing error. But this error should be unsystematic and rather small, as we restrict the time lag to a maximum of 30 minutes.

In summary, the effects mentioned so far may only explain a part of the differences between IEV margins and recalculated margins. Particularly, we see no indication on a systematic bias that may have led to higher average fair value margins. An exception might be the adjustment for issuer default risk. While an adjustment should be made to cope with the goal of the IEV (see the discussion above), the Hull and White (1995) approach tends to overestimate the effect when credit risk is correlated with market risk. Baule et al. (2008) show that an alternative structural model leads to adjustments which are 20%–30% lower. Thus the Hull and White (1995) adjustment is an upper bound for the actual adjustment. For this reason, our analysis also covers the unadjusted figures as a loose lower bound.

4.2 IEV Disclosure Policies

Our results so far indicate that issuers on average set the IEV based on the product components' model value plus expected hedging costs, but without any adjustment for default risk. However, it is yet unclear whether this average is a good representative for the individual certificate. In this section, we investigate whether the fair value margin has explanatory power for the disclosed IEV margin and what further factors drive issuers' disclosed IEVs. We start with a simple linear model by regressing the disclosed IEV margin, $IEVM_i$, on the fair value margin, FVM_i:

$$IEVM_i = \alpha + \beta FVM_i + \epsilon_i. \tag{7}$$

We regress the fair value margin adjusted for hedging costs and default risk. If issuers actually based their disclosed IEV on the fair value margin, we would expect the coefficient on FVM_i to take a value of one while the intercept should equal zero.

There might be further factors that affect the issuer's disclosure policy. We check for product-specific factors as the certificate's maximum return ($MAXRETURN_i$) and maturity ($MATURITY_i$). We also include the stock market volatility as measured by the VDAX volatility index ($VDAX_i$). The extended model reads:

$$IEVM_i = \alpha + \beta FVM_i + \gamma_1 MAXRETURN_i + \gamma_2 MATURITY_i + \gamma_3 VDAX_i + \epsilon_i. \quad (8)$$

The models are estimated using both absolute and percentage margins. We apply the pairs cluster bootstrapping technique described by Esarey and Menger (2018) to calculate cluster-robust standard errors, with clusters defined by the tranches.

[Insert Table 5 about here.]

The results are presented in Table 5. For the simple model without control variables, the coefficient on the fair value margin is significant for four out of the eight issuers. However, all coefficients are below one, except for Vontobel. Commerzbank, Deutsche Bank, and UBS show coefficients on the fair value margin near zero and rather low R^2s of 0.016 to 0.192. Apparently, the IEV margin disclosed by these issuers is hardly associated with the certificates' actual fair value margin. After including the control variables, we obtain considerably higher R^2s, implying that the controls are able to explain a significant part of the variations in the IEV margin. Coefficients on the controls are, however, insignificant for the most part and do not show any consistent direction across the issuers. As issuers on average seem to set margins closer to the fair value margin without adjustment for default risk (see Section 4.1), we also run the models with the default-free fair value margin. The

results are, however, similar to those presented in Table 5 and are therefore not reported. In summary, there is no consistent IEV disclosure policy, and some issuers even seem to ignore the fair value margin in disclosing the IEV.

To assess the association between IEV margins and fair value margins beyond the linear assumption of the regression approach, Figure 2 visualizes the actual relation for individual certificates. Different tranches are marked by different colors.

[Insert Figure 2 about here.]

Apparently, the relation between IEV margins and fair value margins is non-linear in most cases. Most issuers seem to apply a few distinct EUR or percentage margins when disclosing the IEV. Commerzbank chooses among four EUR margins between five and eight cents with no visible relation to the fair value margins, leading to four vertical lines in the graph. Similarly, both Deutsche Bank and DZ Bank exhibit several vertical lines at very low IEV margin levels (in absolute terms) without any relation to fair value margins. HSBC declares margins increasing in one-cent steps up to about 30 cents, with certificates almost uniformly distributed within this range. UBS and UniCredit both seem to apply percentage margins. For UBS, the percentage IEV margin is obviously fixed at two points with little variation for most of the certificates. UniCredit applies a uniform IEV margin of 0.3% for all certificates. Annualization of the percentage margins with different maturities leads to the observed vertical structures. Finally, Citibank and Vontobel both apply a rather large range of IEV margins that exhibit a visible relation to the fair value margins (confirming the substantial R^2s of the regression models without controls).

In summary, the association between IEV margins and fair value margins is rather weak. Some issuers even seem to completely ignore the fair value margin and set IEV margins more or less arbitrarily. All in all, the information gain to private investors through the disclosure of IEVs is very limited.

5 Conclusion

With the introduction of the IEV, the German Derivatives Association aimed to improve transparency regarding issuers' pricing of structured retail products. However, our results indicate that the implementation of IEVs by most of the issuers investigated in this study is disappointing. First, the IEV is a downward-biased estimate for the actual fair value margin. Except for one issuer, the self-estimated IEV margins disclosed by issuers we studied are considerably smaller than the fair value margins. In fact, the average fair value margin is about twice as large as the IEV margin. Also notably, average IEV margins are similar to default-free fair value margins. Thus, most issuers seem to ignore their default risk when disclosing IEVs. Second, some issuers even seem to ignore the fair value margin and set IEV margins more or less arbitrarily. In other words, any association between IEV margins and fair value margins is rather weak. Taken altogether, the investor's gain in information through learning the IEV is very limited. Even worse, the issuers disclosure of the IEV may even lead to unfavorable investment decisions due to an underestimation of the actual costs the investor incurs.

The lack of objectivity in issuers' estimations of IEVs can be seen as a justification for an external regulation, such as that carried out by the PRIIPs regulation that became effective in 2018. More importantly, our results stress the necessity of a regulatory examination to ensure that disclosed costs reflect the actual costs for the investor on a fair value basis. Future research should thus analyze the implementation of the PRIIPs regulation and the objectivity of the mandatory cost disclosure. Further, it might be worthwhile to investigate how such disclosures affect private investors' investment decisions.

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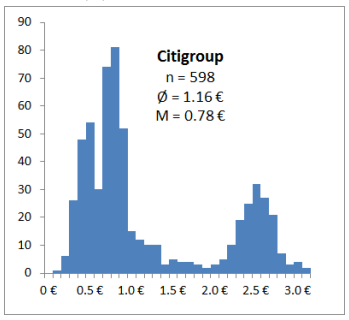
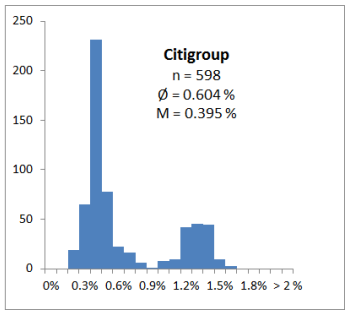
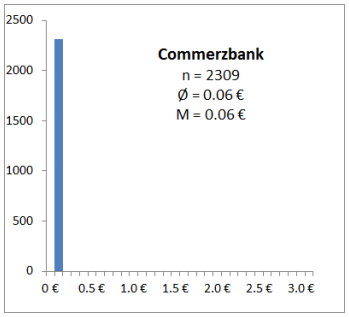
(a) *Citigroup EUR*



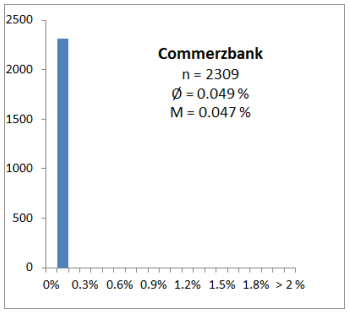
(b) *Citigroup %*



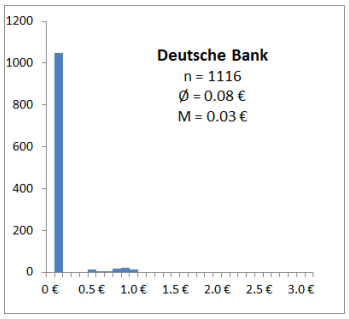
(c) *Commerzbank EUR*



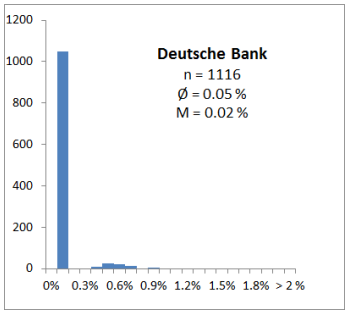
(d) *Commerzbank %*



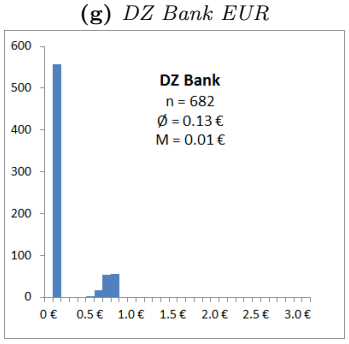
(e) *Deutsche Bank EUR*



(f) *Deutsche Bank %*



(g) *DZ Bank EUR*



(h) *DZ Bank %*

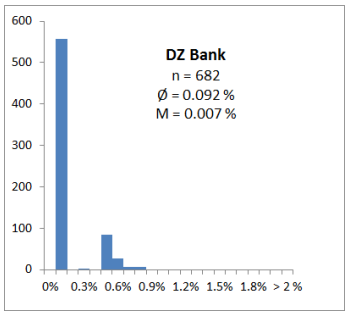


Figure 1. *(to be continued)*

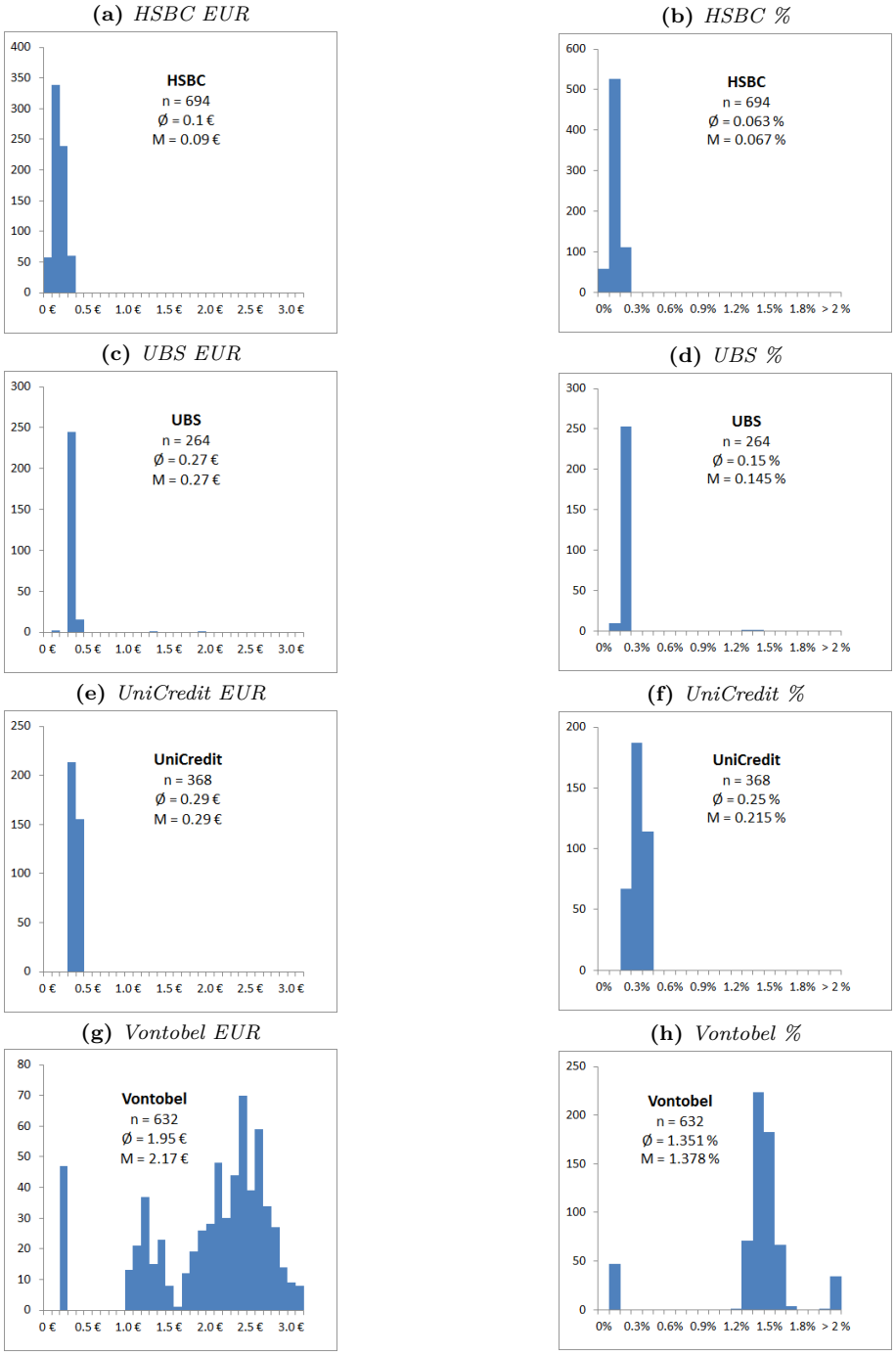
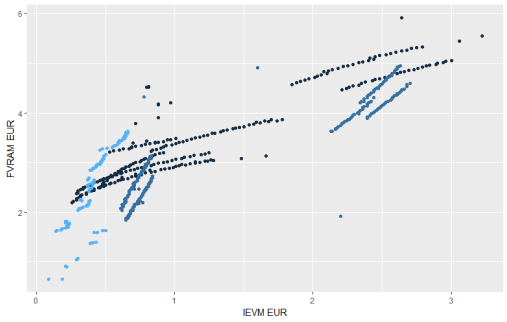
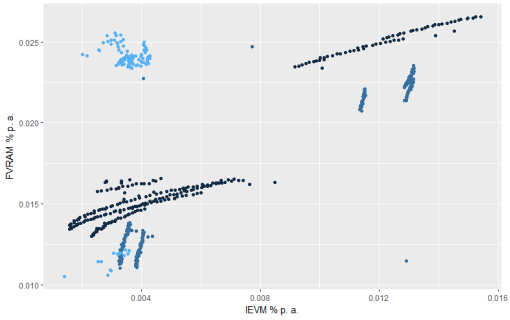


Figure 1. *Distribution of IEV margins of discount certificates, defined as difference between the issue price of the certificate and the disclosed IEV. Absolute (left figures) as well as annualized percentage margins (right figures) are shown. For each distribution, the number of observations, mean and median margins are reported.*

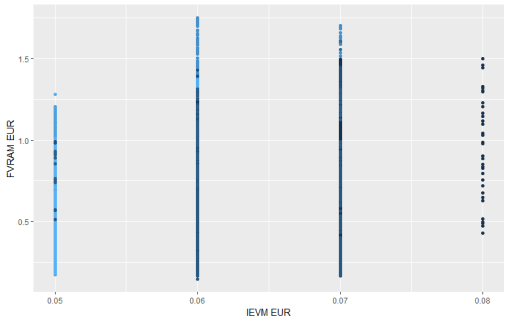
(a) *Citigroup EUR*



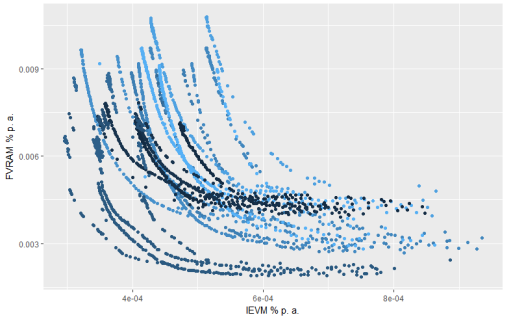
(b) *Citigroup %*



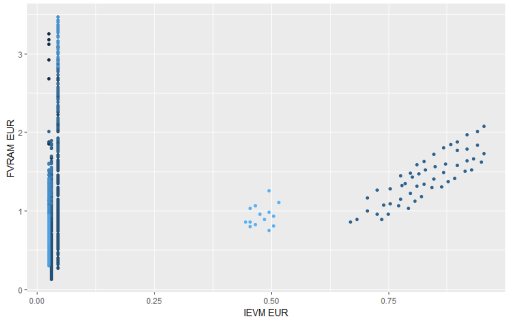
(c) *Commerzbank EUR*



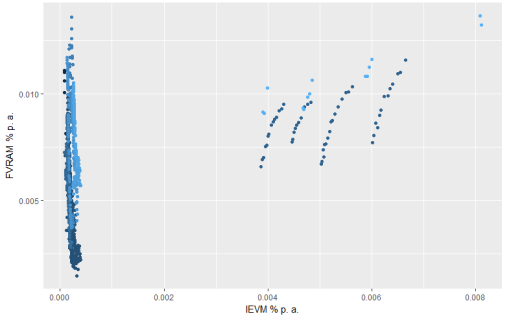
(d) *Commerzbank %*



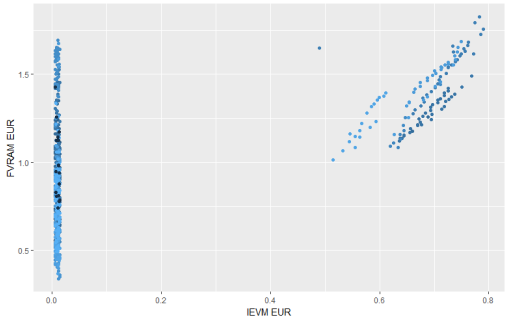
(e) *Deutsche Bank EUR*



(f) *Deutsche Bank %*



(g) *DZ Bank EUR*



(h) *DZ Bank %*

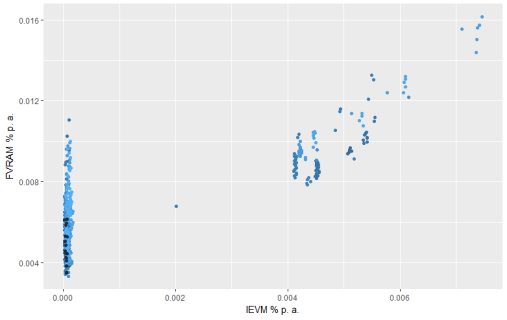


Figure 2. *(to be continued)*

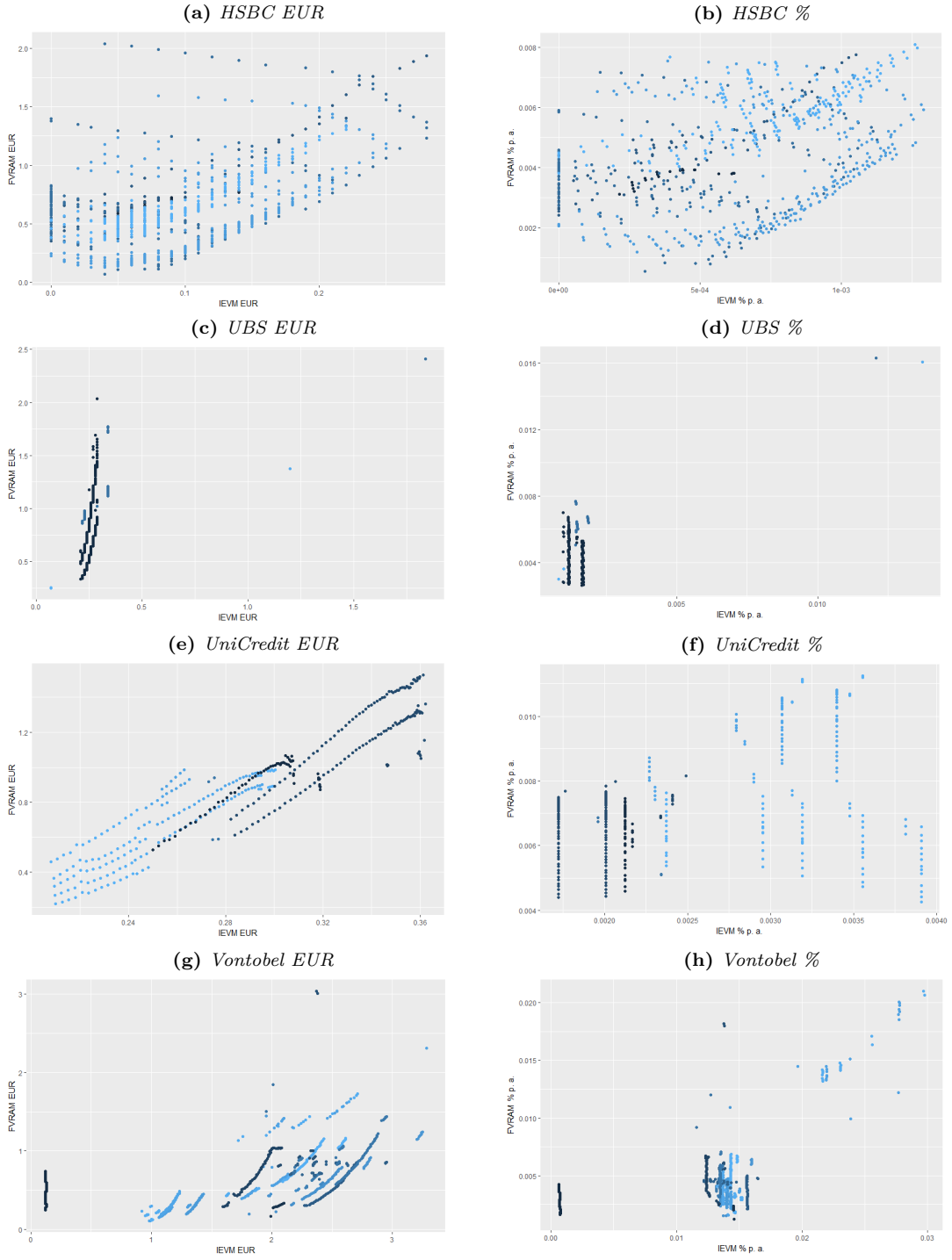


Figure 2. *Fair value margins (vertical axis) and IEV margins (horizontel axis) for individual certificates by issuer. IEV margins are defined as difference between the issue price of the certificate and the disclosed IEV. Fair value margins are calculated as difference between the certificate's ask price at the secondary market within the first 30 trading days and its fair value. Absolute (left figures) as well as annualized percentage margins (right figures) are shown. Darker dots represent earlier products, while brighter dots indicate certificates that were issued later.*

Model price of the product components
− Finance income
+ Expected hedging costs
= Issuer Estimated value (IEV)
+ Expected issuer margin
+ Distribution and selling costs (commission)
= Structured product price
+ Front-end load fee, where applicable
= Acquisition price for the investor

Table 1. *Composition of the IEV and the investor's acquisition price according to the German Derivatives Organization (DDV, 2014b).*

	Obs.	Tranches	Maturity	Discount	Max. Return	Moneyness
Citigroup	598	6	2.09	12.56	10.07	0.06
			(0.43)	(5.52)	(4.02)	(0.1)
Commerzbank	2,309	15	1.46	16.43	12.05	0.15
			(0.32)	(15.17)	(10.58)	(0.34)
Deutsche Bank	1,116	19	1.89	18.03	10.00	0.18
			(0.77)	(14.69)	(6.91)	(0.34)
DZ Bank	682	49	1.80	15.22	9.84	0.10
			(0.49)	(7.00)	(5.28)	(0.13)
HSBC	694	5	1.76	18.93	6.68	0.18
			(0.47)	(8.08)	(5.12)	(0.16)
UBS	264	5	2.13	10.72	14.88	−0.01
			(0.44)	(8.41)	(7.99)	(0.17)
UniCredit	368	10	1.39	11.11	12.24	0.03
			(0.32)	(8.70)	(9.67)	(0.18)
Vontobel	632	51	1.67	14.03	6.44	0.08
			(0.41)	(5.42)	(3.30)	(0.10)
All Issuers	6,663	136	1.69	15.74	10.33	0.12
			(0.53)	(12.07)	(8.21)	(0.27)

Table 2. *Descriptive statistics of the sample composition. The Table reports mean values and standard deviations in parentheses. Maturity of the certificate is stated in years, discount and maximum return are reported in percent. Discount is defined as the relative difference between the level of the underlying and the (lower) issue price of the certificate. Maximum return is the relative difference between the cap of the certificate and the issue price and represents the maximum possible return for the investor. Moneyness is defined as the relative distance of the cap to the underlying level.*

		Mean		Std.		Min.		Max.	
Issuer	Obs.	EUR	%	EUR	%	EUR	%	EUR	%
Citigroup	598	1.16	0.60	0.83	0.40	0.09	0.14	3.22	1.54
Commerzbank	2,309	0.06	0.05	0.01	0.01	0.05	0.03	0.08	0.09
Deutsche Bank	1,116	0.08	0.05	0.18	0.12	0.02	0.01	0.95	0.81
DZ Bank	682	0.13	0.09	0.26	0.19	0.01	0.01	0.79	0.75
HSBC	694	0.10	0.06	0.06	0.03	0.00	0.00	0.28	0.13
UBS	264	0.27	0.15	0.12	0.10	0.07	0.08	1.84	1.37
UniCredit	368	0.29	0.25	0.04	0.07	0.21	0.17	0.36	0.39
Vontobel	632	1.95	1.35	0.74	0.44	0.12	0.06	3.28	2.97
All Issuers	6,663	0.37	0.24	0.69	0.44	0.00	0.00	3.28	2.97

Table 3. *Descriptive statistics of IEV margins of discount certificates, defined as difference between the issue price of the certificate and the disclosed IEV. Absolute (EUR) as well as annualized percentage margins are reported.*

		Margin		Difference to IEV-Margin							
		Mean		Mean		Min.		Max.		Std.	
		EUR	%	EUR	%	EUR	%	EUR	%	EUR	%
Citigroup	IEV	1.16	0.60								
	Default-free	1.37	0.79	0.22	0.19	−1.97	−1.15	1.64	1.29	0.52	0.42
	Hed.-adj.	1.09	0.64	−0.06	0.04	−2.22	−1.30	1.34	1.14	0.56	0.42
	Default-adj.	2.92	1.66	1.76	1.05	−0.53	−0.29	3.31	2.11	0.45	0.41
Commerz-	IEV	0.06	0.05								
bank	Default-free	0.24	0.17	0.18	0.12	−0.21	−0.28	0.81	0.54	0.26	0.21
	Hed.-adj.	0.05	0.02	−0.01	−0.03	−0.45	−0.43	0.52	0.39	0.24	0.21
	Default-adj.	0.55	0.42	0.49	0.37	−0.04	−0.04	1.42	0.88	0.33	0.22
Deutsche	IEV	0.08	0.05								
Bank	Default-free	0.40	0.25	0.33	0.19	−0.34	−0.22	1.83	0.93	0.38	0.20
	Hed.-adj.	0.16	0.10	0.09	0.04	−5.69	−0.37	1.39	0.78	0.36	0.20
	Default-adj.	0.81	0.50	0.74	0.45	−0.03	−0.04	2.98	1.19	0.58	0.24
DZ Bank	IEV	0.13	0.14								
	Default-free	0.42	0.26	0.29	0.12	−0.14	−0.29	1.03	0.61	0.25	0.17
	Hed.-adj.	0.18	0.11	0.05	−0.03	−0.27	−0.44	0.69	0.46	0.21	0.17
	Default-adj.	0.76	0.49	0.62	0.36	0.20	−0.07	1.30	0.94	0.24	0.17
HSBC	IEV	0.10	0.06								
	Default-free	0.20	0.12	0.10	0.06	−0.32	−0.25	1.14	0.40	0.26	0.16
	Hed.-adj.	−0.02	−0.03	−0.12	−0.09	−0.54	−0.40	0.71	0.25	0.23	0.16
	Default-adj.	0.45	0.29	0.35	0.23	−0.18	−0.13	1.57	0.58	0.29	0.16
UBS	IEV	0.27	0.15								
	Default-free	0.54	0.28	0.27	0.13	−0.11	−0.07	1.07	0.37	0.24	0.11
	Hed.-adj.	0.26	0.13	−0.02	−0.02	−0.43	−0.22	0.63	0.22	0.21	0.11
	Default-adj.	0.63	0.33	0.36	0.18	−0.07	−0.05	1.31	0.48	0.29	0.13
UniCredit	IEV	0.29	0.25								
	Default-free	0.53	0.42	0.24	0.17	−0.16	−0.27	0.66	0.45	0.20	0.15
	Hed.-adj.	0.34	0.27	0.05	0.02	−0.33	−0.42	0.36	0.30	0.16	0.15
	Default-adj.	0.70	0.58	0.41	0.33	−0.07	−0.12	0.87	0.65	0.23	0.15
Vontobel	IEV	1.95	1.35								
	Default-free	0.30	0.22	−1.64	−1.13	−2.64	−1.80	0.40	0.28	0.68	0.38
	Hed.-adj.	0.09	0.07	−1.86	−1.28	−2.93	−1.95	0.15	0.13	0.71	0.38
	Default-adj.	0.46	0.33	−1.49	−1.02	−2.36	−1.70	0.42	0.29	0.64	0.37
All issuers	IEV	0.37	0.24								
	Default-free	0.42	0.26	0.04	0.02	−2.64	−1.80	0.40	1.29	0.66	0.44
	Hedge-adj.	0.20	0.11	−0.18	−0.13	−5.69	−1.95	0.15	1.14	0.66	0.44
	Default-adj.	0.82	0.54	0.45	0.29	−2.36	−1.70	0.42	2.11	0.84	0.53

Table 4. *IEV margins and fair value margins as well as descriptive statistics of the differences between fair value margins and IEV margins. IEV margins are defined as difference between the issue price of the certificate and the disclosed IEV. Fair value margins are calculated as difference between the certificate's ask price at the secondary market within the first 30 trading days and its fair value. We calculate a default-free fair value as well as two further values adjusted for expected hedging costs and for default risk. Absolute (EUR) as well as annualized percentage gross margins are reported.*

	Citigroup		Commerzbank		Deutsche Bank		DZ Bank	
Panel A: IEVM EUR								
Intercept	−1.220*	−1.018	0.058***	0.030**	0.034	0.792	−0.286	0.382
FVM_i	0.745*	0.785*	0.003	−0.000	0.039	0.184	0.420	0.607***
$MAXRETURN_i$		−2.819		0.000		−1.220		−2.433***
$MATURITY_i$		−0.021		0.020***		−0.125		−0.208*
$VDAX_i$		−0.000		0.000		−0.023		−0.010
Obs.	598	598	2,309	2,309	1,116	1,116	682	682
R^2	0.773	0.790	0.016	0.667	0.022	0.244	0.300	0.739
Panel B: IEVM %								
Intercept	−0.003	−0.014	0.001**	0.001**	−0.000	0.005	−0.004***	−0.002
FVM_i	0.479	0.648	−0.029	−0.020	0.138	0.362	0.709***	0.718***
$MAXRETURN_i$		−0.009		−0.000		−0.009		−0.012***
$MATURITY_i$		0.005		−0.000		−0.000		0.001
$VDAX_i$		−0.000		0.000*		−0.000		−0.000
Obs.	598	598	2,309	2,309	1,116	1,116	682	682
R^2	0.367	0.571	0.281	0.476	0.077	0.394	0.674	0.767

	HSBC		UBS		UniCredit		Vontobel	
Panel A: IEVM EUR								
Intercept	0.033	0.394	0.145	0.906	0.175***	0.420*	1.203**	−1.940
FVM_i	0.096	0.223*	0.140	0.560	0.130***	0.128*	1.101***	0.784**
$MAXRETURN_i$		−1.142		−1.714		−0.004		2.617
$MATURITY_i$		−0.030		−0.211		−0.068**		0.871*
$VDAX_i$		−0.014		−0.023		−0.006*		0.073
Obs.	694	694	264	264	368	368	632	632
R^2	0.299	0.557	0.192	0.635	0.872	0.960	0.301	0.499
Panel B: IEVM %								
Intercept	0.000	0.002	−0.000	0.004	0.001	0.005*	0.010*	−0.002
FVM_i	0.072	0.193*	0.395	0.887	0.143	−0.000	0.827*	0.659**
$MAXRETURN_i$		−0.005		−0.012		−0.000		0.001
$MATURITY_i$		0.000		−0.001*		−0.002		0.000
$VDAX_i$		−0.000		−0.000		−0.000		0.001
Obs.	694	694	264	264	368	368	632	632
R^2	0.130	0.381	0.366	0.877	0.125	0.996	0.330	0.587

Table 5. *Results of regressing the IEV margin (EUR and percentage margin) on the fair value margin and a set of controls. $MAXRETURN_i$ denotes the the investor's maximum possible return of the certificate, $MATURITY_i$ is the certificate's maturity as measured in years and $VDAX_i$ is the level of the VDAX implied volatility index. Significance is indicated at the 10% level as *, at the 1% level as **, and at the 0.1% level as ***.*