

The Pricing of Structured Products in the Swiss Market

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Abstract

Securitized covered call writing strategies play an important role in the investment industry of Switzerland. We analyze the initial pricing of 275 products by comparing them to equivalent strategies in the underlying markets and at EUREX. On average, we find price distortions in favor of the issuing institutions which compensate them for the efforts associated with the management of the structured products. We find differences in the pricing behavior of several issuers. The pricing differs in terms of average pricing errors but also in the corresponding dispersions. Furthermore, we are able to show significant pricing differences between products paying a fixed coupon and those without such a coupon. Finally, we are able to document the important role of co-lead managers in the process of new issues.

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1 Introduction

In Switzerland, so-called ‘structured products’ play an important role in the implementation of advanced investment strategies for private investors. These structured products combine the characteristics of other, more basic, financial instruments. The repackaging allows for easy access to investment strategies that build on long and short transactions in the derivative as well as in the underlying market. In the past ten years, the issuance of these products has become an actual boom industry, in which Swiss and foreign banks play roles of comparable importance.¹

Basically, two types of structured products can be distinguished: Instruments with a *convex* payoff profile on one side and those with a *concave* payout on the other side. Convex products (so called “capital protected notes”) guarantee a minimum terminal value at expiration but yield a certain upside potential at the same time. Such a strategy can be replicated through a riskless investment in combination with one or more call options on an underlying asset (typically a stock market index).

Products with a concave payout pattern can be seen as a combination of a position in the underlying asset (typically a single stock) in combination with a short position in a call option on the same asset. In sum, the investor buys the underlying asset ‘at a discount’ but gives up a substantial part of the upside potential. Especially this latter strategy cannot easily be implemented by small investors because it implies a short position in a corresponding derivative instrument. In Switzerland, approximately a dozen banks offer securitized instruments with this payout pattern on a regular basis to private investors in Switzerland. Due to the seeming return enhancement caused by the short call position, these instruments became extremely popular in the low interest rate environment in the Swiss franc of the late nineties.

By structuring these securities, the involved banks make payoff patterns available to the investors that these cannot always easily create themselves. Namely short selling restrictions, indivisibilities and transaction costs may keep especially smaller investors from creating these securities themselves. The issuing institutions on the other hand are able to benefit from substantial economies of scale in the management of the positions. The cost for a new product consist of an upfront component (fixed cost associated with the structuring of the product, the marketing, etc.) and of a component related to the ongoing management of the products (trading cost for the dynamic hedging strategies, compensation for non-hedgeable risks etc.). Especially important are the cost associated with the (dynamic) hedging of these products because it implies substantial vega, gamma, and liquidity risks for the issuers. Obviously, they will strive to get compensated for their efforts and the additional risks, e. g. through the initial pricing of these instruments.

Today, there is always a secondary market for of these structured products. The issuing banks typically act as (OTC-) market makers for their own products, although there is no formal obligation for them to do so. It is to be assumed that no additional cost are caused for the issuers by their running of a secondary market. Quite on the

¹ Due to strict sales restrictions, these products cannot be bought by U.S. citizens. Furthermore, the issuing costs of such products in the U.S. are too high to make them attractive instruments for the US investment industry. For details see BRADDOCK (1997) and BRADDOCK/KRAUSE (2000).

contrary, the market making in the secondary market is presumably a very lucrative source of income, since the issuer of a product is usually the only one to make a market in that particular instrument.²

For the investor, it is of crucial importance to be able to judge the appropriateness of the pricing of these structured products. Therefore, we investigate the initial pricing of all concave products on Swiss blue chips that were outstanding on August 1, 1999. This makes up for a total of 275 different products to be analyzed. Although concave products are of significant importance in the Swiss market, their pricing has not been systematically analyzed so far. A few authors have analyzed the pricing of *convex* products; among them are CHEN/KENSINGER (1990) and CHEN/SEARS (1990) who examine the pricing of convex instruments on the S&P 500 and find substantially positive as well as negative deviations from the theoretical values. WASSERFALLEN/SCHENK (1996) investigate a sample of 13 capital protected products in the Swiss market. They document a significant pricing bias in favor of the issuing institution. The same bias is found by WILKENS/SCHOLZ (2000) for a single instrument they are analyzing in the German market.

Our results will yield important insights for investors and thereby enforce transparency and competitiveness in this market. By comparing the pricing of convex products to equivalent strategies in the underlying markets, we are able to clearly identify differences in the pricing behavior of various issuers but also to show significant differences between distinct types of products. In particular, we will analyze the product pricing by 15 banks in the primary market. Furthermore, we will distinguish between products with and without a fixed coupon, and eventually, we will make a distinction between products that are issued by a single bank and those that are launched together with a co-lead manager.

The remainder of the paper is organized as follows: Section 2 documents the methodology applied in our analysis, section 3 describes the data used and their processing, section 4 contains the empirical results, and section 5 concludes the article by summing up the major insights.

2 Product description and methodology

A typical concave product as we analyze it is of the following structure:

Bank A offers a new instrument on stock Z (current stock price: \$ 100) at a price of \$ 90. The issuer promises at expiration (in 12 months time) to

- (a) physically deliver the underlying stock Z to the investor if the then occurring stock price is below \$ 100 (the cap level) or*
- (b) to pay the amount of \$ 100 in cash to the investor if the then occurring stock price is \$ 100 or higher.*

² See WOHLWEND (2001) for details.

A variation of this basic structure are products that pay a fixed coupon to the investor. In the above example, this would mean that the investor pays \$ 100 (instead of \$ 90) and receives a fixed coupon payment of \$ 10.3 at expiration,³ no matter what the stock price is. Everything else is the same as in the previous example. Some of these coupon paying products may in fact look like a bond to the inexperienced investor since they pay a fixed coupon and have typically a rather long time to expiration (see *Table 1*).

Based on the put-call-parity for European options, concave investment strategies can be implemented either through a position in the underlying asset together with a short call option on the same asset or through a riskless investment in combination with a short put option.

The two equivalent strategies can be characterized as follows:

$$(1) \quad P_{Model} = Xe^{-r(T-t)} - p_t = S_t - c_t - \sum_{i=1}^I D_i e^{-r(t_i-t)}$$

whereby

P_{Model}	Model-price of the structured product
X	Strike price
r	Riskless rate of return (continuous compounding)
T	Maturity of the structured product
t	Current point of time
p_t	Price of a European put option
S_t	Price of the underlying asset
c_t	Price of a European call option
D_i	Dividend payment of the underlying asset ($i = 1,2,3, \dots, I$)
t_i	Date of dividend payment i ($t \leq t_i \leq T$)

In the case of structured products paying a fixed coupon, equation (1) is extended to

$$(2) \quad P_{Model} = Xe^{-r(T-t)} - p_t + \sum_{j=1}^J CP_j e^{-r(t_j-t)} = S_t - c_t - \sum_{i=1}^I D_i e^{-r(t_i-t)} + \sum_{j=1}^J CP_j e^{-r(t_j-t)}$$

whereby

CP_j	Coupon payment j ($j = 1,2,3, \dots, J$)
t_j	Date of coupon payment j ($t \leq t_j \leq T$)

In order to assess the appropriateness of the initial product offerings, the prices at issuance (P_{Market}) are compared to the values from the synthetic strategies (P_{Model}) as documented in (1) and (2). A standard BLACK/SCHOLES-model is used to derive the option prices in (1) and (2) respectively. To implement the option pricing formula an implied volatility measure is used which is extracted from traded options at the EUREX, the German/Swiss options exchange.⁴ Since EUREX-options are of the American type, a COX/ROSS/RUBINSTEIN (1979)-model is implemented in order to

³ The option price of \$10 invested during 12 months at 3 % p. a.

⁴ For the details of the matching process, see section 3.

derive the implied volatilities. The relative price difference in percent is then defined as:

$$(3) \quad PD = \frac{P_{Market} - P_{Model}}{P_{Model}}$$

If this difference is negative, then the investor gets a better deal by buying the structured product than in the underlying markets. If the difference is positive, on the other hand, the investor could achieve the same payoff at lower cost if he implemented the replicating strategy in the underlying markets directly. Transaction costs for these two strategies are approximately the same, therefore they are neglected.

Swiss tax legislation⁵ treats products paying a fixed coupon as a riskless deposit in combination with a short put option, and therefore raises income taxes on the riskfree return.⁶ Products without a coupon, on the other hand, are not taxable for private investors because they are treated as a stock investment in combination with a short call position. Following this ruling, we replicate instruments with (without) a coupon payment with a short put (call) strategy.

3 Data

This study includes all plain vanilla concave products on Swiss blue chips that were outstanding on August 1, 1999, and issued in Switzerland. This made up for a total of 275 instruments. The data was collected from the issuers' published term sheets.

The data used for the replicating strategy in the derivatives market was provided by EUREX. The EUREX options that are used to replicate the structured product have to match the characteristics of the products as closely as possible. Therefore, for every issuance, the one contract at EUREX is selected that reflects the product's investment characteristics best according to its strike price and its time to maturity. These criteria adjust for potential smile effects as well as for term structure effects of the implied volatilities. In order to derive the model prices, some additional information had to be specified:

- Precise conditions of issuance
The terms on which the analysis builds are those of the term sheets as they were published.
- Riskless rate of return
Euro market rates for Swiss francs were linearly interpolated in order to match the exact times to maturity of the products.

⁵ See tax guidelines by EIDGENÖSSISCHE STEUERVERWALTUNG (1999).

⁶ In Switzerland, interest rate payments, coupons, dividends, etc. are taxable for private investors, whereas capital gains (including option premiums) are tax free.

- Dividend payments
Dividends payments, as they were to be expected at the date of the product's issuance, were included in the analysis and discounted at interpolated riskless rates of return.

It has to be mentioned that it is usually not possible to replicate a structured product *precisely* by using EUREX options. There are three types of obstacles for an exact replication:

- The equity-options traded at EUREX are American style, whereas for the product replication European options are needed.
- The strike prices implied in the structured products are usually not exactly available at EUREX, although differences are typically small.
- It is difficult to find price quotes for long running options at EUREX. This makes the replication of products with a time to maturity of over one year especially difficult. However, term structure effects of implied volatilities are typically not that severe for exchange traded options in the Swiss market.⁷

In addition, there will typically not be enough liquidity in EUREX contracts to replicate a bank's entire position reliably, therefore the issuing institutions usually turn to dynamic hedging strategies.

Despite these shortcomings, a meaningful comparison of prices in the two markets is still possible. We will not ask for an *exact* replication of the products under investigation through other instruments, but rather *compare the price (volatility) levels* in the two markets, *given the instruments available to the investor*. This has to be kept in mind when interpreting the results of the empirical analysis.

⁷ KRAUS (1998).

3.1 Overview of processed raw data

Table 1 gives an overview of all the data used as a basis for this study. The table is grouped by types of products (without/with a fixed coupon payment) and by issuer. The columns give for each group the average time to maturity of the products in days ($\text{avg}(t_{\text{SP}})$), the average (relative) differences between strike prices ($\text{avg}(X\text{-diff})$), and the differences between the corresponding times to maturity ($\text{avg}(t\text{-diff})$). The final two columns show the same information in absolute values.

	n	avg (t_{SP})	avg ($X\text{-diff}$)	avg ($t\text{-diff}$)	avg ($ X\text{-diff} $)	avg ($ t\text{-diff} $)
Whole sample	275	394.28	-1.46%	52.1	4.11%	83.29
Products <i>without</i> a coupon	199	314.17	-1.71%	2.47	4.21%	35.70
ABN AMRO	30	306.40	-0.73%	2.57	2.59%	16.70
Bank Julius Baer	1	136.00	0.61%	-6.00		
Bankers Trust	8	349.75	-0.52%	-3.13	2.04%	4.88
Crédit Lyonnais	17	282.71	-0.12%	-32.29	2.43%	71.47
CSFB	13	356.62	-2.05%	5.54	3.91%	42.15
Goldman Sachs	2	365.00	2.46%	-60.00	2.46%	102.00
HSBC	13	312.38	-0.59%	29.77	2.54%	44.38
Merrill Lynch	41	299.63	-8.22%	7.61	10.68%	20.88
Morgan Stanley	4	263.50	0.55%	-14.00	1.83%	14.00
Salomon SB	21	312.00	0.35%	18.52	1.41%	32.43
UBS Warburg	21	355.38	1.19%	22.71	3.29%	57.67
ZKB	28	314.50	0.46%	-15.21	2.64%	44.64
Products <i>with</i> a coupon	76	604.07	-0.74%	181.37	3.77%	207.39
ABN AMRO	2	362.00	-5.09%	-53.00	5.09%	53.00
Banca del Gottardo	11	333.09	-0.78%	11.18	2.46%	64.27
Bank Vontobel	25	683.12	0.27%	233.16	2.94%	234.12
BCV	9	365.89	1.04%	-41.11	2.21%	58.67
Crédit Lyonnais	11	531.55	0.05%	114.55	5.26%	132.55
CSFB	9	845.00	-5.62%	413.00	7.39%	413.00
UBS Warburg	9	855.33	-0.42%	370.11	3.51%	377.00

Table 1: Overview of processed raw data. The following, not internationally known abbreviations are used: BCV (Banque Cantonale Vaudoise), ZKB (Zürcher Kantonalbank).

At the fixed day of our analysis, we find structured products without a fixed coupon payment to be substantially more numerous than those paying a coupon (199 vs. 76), but also to be of a considerably shorter time to maturity than their counterparts (314 vs. 604 days). Furthermore we find the three most active players in this market to be Merrill Lynch (41), ABN AMRO (32), and UBS Warburg (30).

4 Empirical results

The analysis of the initial pricing of the structured products builds primarily on the average price difference ($\text{avg}(PD)$) of a group of products. Within each group, we analyze the standard deviation of the pricing difference (σ_{PD}) and the statistical significance of the average difference. Assuming a normal distribution of the volatility differences, the significance is tested by

$$(4) \quad t = \frac{\text{avg}(PD)}{\sigma_{PD}} \sqrt{n}$$

Since the distribution of the pricing differences is a-priori unknown, we conduct a non-parametric WILCOXON (1945)-signed-rank-test. In this test, ranks are assigned to the absolute values of the price differences, whereby the smallest difference is assigned rank # 1. The test statistic is then calculated as

$$(5) \quad W = \sum_{i=1}^n rg|PD_i| V_i \quad \text{with} \quad V_i = \begin{cases} 1 & \text{if } PD_i > 0 \\ 0 & \text{if } PD_i < 0 \end{cases}$$

whereby

$rg|PD_i|$ rank of $|PD_i|$

Critical values can be found in MCCORNACK (1965).

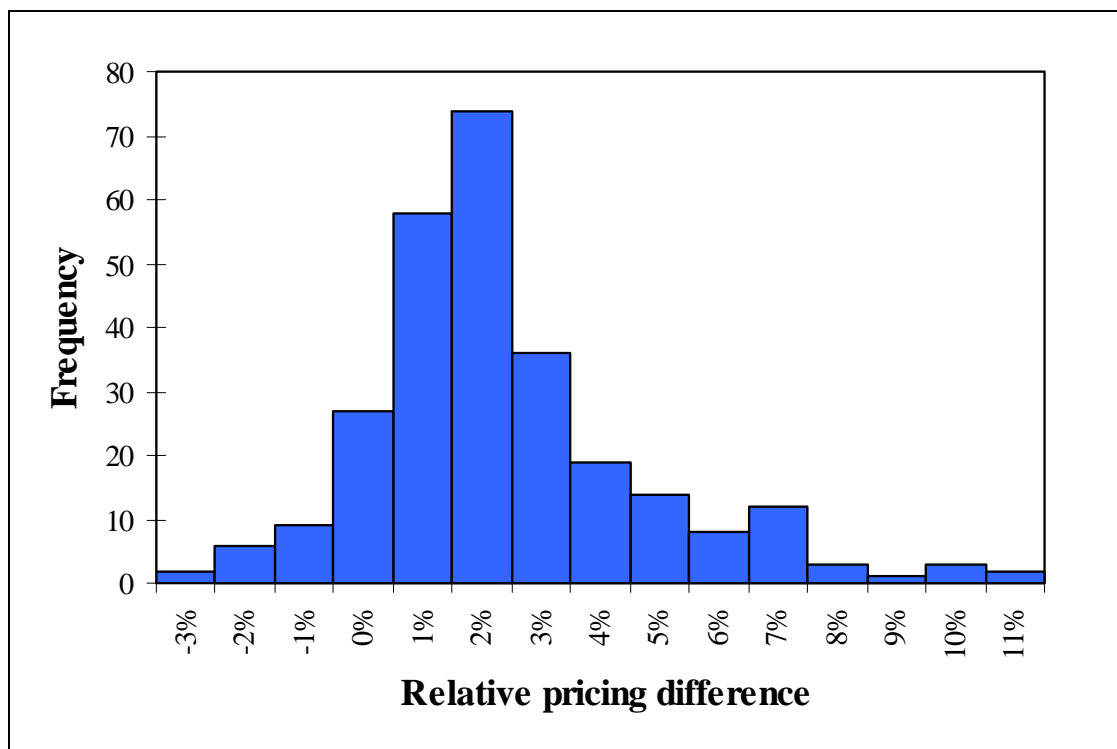
Finally, the root mean squared error (RMSE) within each sample is calculated as follows:

$$(6) \quad RMSE = \sqrt{\frac{1}{n-2} \sum_{i=1}^n (PD)^2}$$

A low RMSE stands for a pricing that is fairly in line with the underlying market, whereas a high RMSE signifies a pricing that is unfair on average or extremely unstable. When calculating the RMSE, positive deviations do not compensate negative ones, and vice versa.

4.1 Analysis of the entire sample

Graph 1 gives the frequency distribution of the pricing differences in the sample. We find a substantial spreading of the pricing differences, whereby 44 initial offerings (16 %) show a negative pricing difference, i. e. the initial pricing is cheaper than the cost of an equivalent strategy in the underlying markets. As a consequence, the remaining issues are priced in favor of the issuing institutions.



Graph 1: Frequency distribution of relative pricing differences in the whole sample.

Table 2 gives some descriptive statistics for the entire sample. As the most important result, it emerges that the average pricing difference is positive and the initial pricing of the analyzed products is with 1.91% clearly in favor of the issuing institutions. The difference is significant at all conventional levels of confidence. This result is consistent with the findings of CHEN/SEARS (1990) and WASSERFALLEN/SCHENK (1996) who found a significant price distortion in favor of the issuer in the case of (small samples of) convex products.

	n	avg(PD)	σ_{PD}	t-value	W-value	RMSE
Whole sample	275	1.91%	2.39%	-13.23***	3'674***	0.0307

Table 2: Descriptive statistics for the whole sample. *t*- and *W*-values significant at the 1 % level are denoted by ***.

The extent of the mispricing as well as its spreading is substantial. At first sight, the purchase of such an instrument seems to be extremely unattractive for the investor. However, as was discussed earlier, there are substantial obstacles keeping especially the smaller investor from transacting equivalent strategies in the markets and, of course, the issuer has to be compensated for the expenses associated with the management of the products. In the following sections, we will be able to identify groups of instruments that are clearly priced more attractively than others, thereby bringing the opportunity costs for the implementation of an equivalent strategy down substantially.

4.2 Grouping according to issuer

We find substantial differences between the pricing behaviors of the issuing institutions, as is documented in *Table 3*. Not only the average pricing differences (avg(PD)) vary substantially but also the spreading of the differences is surprisingly diverse. By grouping the table according to the over-all quality of the pricing (RMSE, which does not allow for negative differences to be compensated by positive ones), we find a group of three Anglo-Saxon institutions to clearly be ahead of the others. All members of this top group do not have a (considerable) distribution system in Switzerland of their own. Therefore, it is appealing to explain their competitive pricing behavior through their need to penetrate the market based on an attractive pricing policy. However, due to the small cross-section, we are not able to find a significant relation between the pricing behavior and the bank's physical market presence in Switzerland.

	n	avg(PD)	σ_{PD}	t- value	W- value	RMSE
ABN AMRO	32	1.19%	1.56%	4.33 ***	57 ***	0.0201
Banca d. Gottardo	11	1.66%	2.72%	2.02 **	11 **	0.0340
Bank Julius Bär	1	1.44%	---	---	---	---
Bank Vontobel	25	3.06%	1.82%	8.40 ***	0 ***	0.0369
Bankers Trust	8	6.29%	2.87%	6.19 ***	0 ***	0.0790
BCV	9	1.73%	0.80%	6.46 ***	0 ***	0.0214
Crédit Lyonnais	28	3.56%	2.44%	7.71 ***	4 ***	0.0446
CSFB	22	3.31%	1.78%	8.71 ***	1 ***	0.0393
Goldman Sachs	2	1.43%	0.63%	3.23	---	---
HSBC	13	0.82%	1.32%	2.24 **	14 **	0.0164
Merrill Lynch	41	0.70%	1.27%	3.55 ***	180 ***	0.0148
Morgan Stanley	4	1.06%	1.31%	1.62	1	0.0219
Salomon SB	21	0.02%	1.31%	0.06	106	0.0134
UBS WARBURG	30	2.35%	3.41%	3.78 ***	73 ***	0.0424
ZKB	28	1.22%	1.81%	3.57 ***	54 ***	0.0223

*Table 3: Grouping according to the issuing institution. t- and W-values significant at the 1, 5, and 10 % level are denoted by ***, **, and *, respectively.*

4.3 Products with and without a coupon payment

Next, we analyze whether there are differences in the pricing of structured products with and without a fixed coupon. As was discussed earlier, structured products promising the investor a fixed coupon are perceived almost like bonds by many less sophisticated investors. It is consistent with this (false) perception that these products typically are of a longer time to maturity, and are usually managed by the fixed income desk of the issuing institutions. Instruments without a coupon are usually managed by the equity desk.

Table 4 and Table 5 give the same information that was contained in the previous section but group them according to the presence or absence of a fixed coupon payment.

	n	avg(PD)	σ_{PD}	t- value	W- value	RMSE
All products <i>without</i> a coupon	199	1.40%	2.03%	9.75 ***	2'574 ***	0.0248
ABN AMRO	30	1.22%	1.58%	4.24 ***	48 ***	0.0205
Bank Julius Bär	1	1.44%	---	---	---	---
Bankers Trust	8	6.29%	2.87%	6.19 ***	0 ***	0.0790
Crédit Lyonnais	17	2.42%	3.98%	6.65 ***	2 ***	0.0301
CSFB	13	2.57%	1.57%	5.91 ***	1 ***	0.0324
Goldman Sachs	2	1.43%	0.63%	3.23	---	---
HSBC	13	0.82%	1.32%	2.24 **	14 **	0.0164
Merrill Lynch	41	0.70%	1.27%	3.55 ***	180 ***	0.0148
Morgan Stanley	4	1.06%	1.31%	1.62	1	0.0219
Salomon SB	21	0.02%	1.31%	0.06	106	0.0134
UBS Warburg	21	1.68%	2.38%	3.23 ***	33 ***	0.0301
ZKB	28	1.22%	1.81%	3.57 ***	54 ***	0.0223

Table 4: Products with no coupon, grouped according to issuer. *t*- and *W*-values significant at the 1, 5, and 10 % level are denoted by ***, **, and *, respectively.

	n	avg(PD)	σ_{PD}	t- value	W- value	RMSE
All products <i>with</i> a coupon	76	3.22%	2.75%	10.23 ***	104 ***	0.0428
ABN AMRO	2	0.74%	1.57%	0.66	---	---
Banca del Gottardo	11	1.66%	2.72%	2.02 **	11 **	0.0340
Bank Vontobel	25	3.06%	1.82%	8.40 ***	0 ***	0.0369
BCV	9	1.73%	0.80%	6.46 ***	0 ***	0.0214
Crédit Lyonnais	11	5.32%	2.62%	6.73 ***	1 ***	0.0650
CSFB	9	4.39%	1.57%	5.91 ***	0 ***	0.0525
UBS Warburg	9	3.92%	4.90%	2.40 **	5 **	0.0686

Table 5: Products paying a fixed coupon, grouped according to issuer. *t*- and *W*-values significant at the 1, 5, and 10 % level are denoted by ***, **, and *, respectively.

We find structured products with a coupon payment to be substantially more mispriced than those without a coupon (3.22% vs. 1.40%).⁸ The standard deviations within the two groups are almost the same (2.75% vs. 2.03%).

⁸ A part of this substantial difference may be caused by the lack of EUREX options with a equivalently long times to maturity like coupon paying products (see Table 1).

Again, a non-parametric test is conducted to test for the difference of the two sample means. Because the test is non-parametric, the results will not rely on any distributional assumptions. In a MANN/WHITNEY (1947) test, ranks are assigned to the values in the joint samples (here, these are not absolute values). Using these ranks, the following two statistics are calculated:

$$U_1 = n_1 n_2 + \frac{n_1(n_1 + 1)}{2} - R_1$$

(7)

$$U_2 = n_1 n_2 + \frac{n_2(n_2 + 1)}{2} - R_2$$

with

n_1	Number of observations in sample 1
n_2	Number of observations in sample 2
R_1	Rank sum sample 1
R_2	Rank sum sample 2

The smaller of the two values is the test statistic in the MANN/WHITNEY test. Critical values can be found in MILTON (1964).

Testing the difference of the means of the two groups, we find a U-value of 4'325, which is significant at all conventional levels. This means that structured products with a coupon are significantly more unfairly priced than those without a coupon. There are three possible explanations for this observation at hand: The market for these products is not (yet) very competitive, because structured products with a coupon emerged in the Swiss market only two years before the time of the analysis (i. e. in 1997), which is two years later than the others. The lower volumes and the management at another desk within the same bank may not yet have put too high a pressure on the initial pricing. Another explanation for the observed difference is that investors may be irritated by the bond-like appearance of products paying a fixed coupon and are therefore ready to pay an additional premium for them. Finally, the differences between the products and the replicating strategies may be caused by the lack of equivalently long option contracts at EUREX. As can be seen from *Table 1*, products with a coupon have a substantially longer time to maturity than those without a coupon (604 days vs. 314). Hence the problems of replication are more pronounced in the case of the former instruments.

Four issuers have products with and without a coupon outstanding at the same time. Even *within* these institutions, we find the mispricing for three of the four to be more pronounced for the products paying a fixed coupon than for the products paying no fixed coupon, as is documented in *Table 6*.

	n_1	avg(PD) with cp.	n_2	avg(PD) without cp.	U- value
ABN AMRO	2	0.74%	30	1.22%	25
Crédit Lyonnais	11	5.32%	17	2.42%	29 ***
CSFB	9	4.39%	13	2.57%	17 ***
UBS Warburg	9	3.92%	21	1.68%	66

Table 6: Average pricing differences for products with and without a coupon issued by the same institution. U-values significant at the 1, 5, and 10 % level are denoted by ***, **, and *, respectively.

4.4 Issues with and without a co-lead-manager

A major share of all structured products is not issued by a single bank but rather together with a so-called co-lead-manager. These are typically smaller banks that see a market potential for a certain product but are not willing or not able to issue and manage the corresponding products themselves. Rather, they shop around for the best deal they can get from a major player in order to launch the product jointly. In fact, of the 199 structured products in our sample without a coupon, 112 were issued together with a co-lead-manager. Looking at the co-lead management function, the Swiss market for structured products is clearly dominated by the small private bank Wegelin & Co. 92 out of the 199 analyzed products are co-led by Wegelin & Co.

The question arises whether these co-lead-managers actually fulfill a valuable pre-screening function on behalf of the investor or whether they only increase the total amount of fees to be paid. In Table 7, the structured products without a coupon payment are grouped according to the presence/absence of a co-lead-manager.

	n	avg(PD)	σ_{PD}	t- Value	W- value	RMSE
Without a co-lead manager	88	1.86%	2.52%	6.92 ***	473 ***	0.0315
With a co-lead manager	111	1.05%	1.46%	7.56 ***	830 ***	0.0180
Migros Bank	14	1.58%	2.17%	2.73 ***	15 ***	0.0282
Valiant	6	1.18%	0.69%	4.18 ***	1 **	0.0164
Wegelin & Co.	91	0.95%	1.36%	6.72 ***	563 ***	0.0167

Table 7: Comparison of issues with and without co-lead managers. t- and W-values significant at the 1, and 5 % level are denoted by *** and **, respectively.

We find a clear difference between the average pricing differences of the group without and the group with a co-lead-manager. The difference amounts to 0.81 percentage points (1.86% - 1.05%) in favor of the co-lead-manger group. Again, the difference is significant at all conventional levels (U-value: 3'887***). However, co-lead managers do not only seem to enforce a pricing that is on average fairer but also to issue instruments with a smaller dispersion of the pricing errors. The standard de-

viation within the group with a co-lead-manager is dramatically lower than for the one without a co-lead-manager (1.46% vs. 2.52 %). As a consequence, the root mean squared error (RMSE) for the group with a co-lead-manager is only about half of that of the control group (0.0180 vs. 0.0315). A substantial difference!

We conclude that co-lead-managers play a very important role in the primary market for structured products in Switzerland. Their bundling of market power allows them to effectively put pressure on the pricing behavior of larger institutions. As a result, co-lead-managers are well worth the additional fees because the products issued through that channel are still a lot more attractive for the investor than those issued by a single bank.⁹

5 Conclusions

In the nineteen nineties, banks in Switzerland started to securitize portfolio insurance strategies and covered call writing strategies on a large scale. In the low interest rate environment of the late nineties, these latter products have become extremely popular, especially with small investors. Through the implicit writing of a call option, the investor receives a premium, which can be perceived as a return enhancement on his stock investment. Of course, this happens at the cost of a limited upside potential. In sum, the investor is left with what we call a concave payoff pattern.

It is of great practical as well as academic interest to analyze the pricing of these products. We do this by comparing the terms in the primary market to equivalent strategies in the underlying markets and in the corresponding traded options. As we would expect, we find a statistically significant bias in favor of the issuing institutions. First of all, this difference compensates the issuer for his efforts associated with the management of the product. Based on our data, we are not able to judge what portion of this difference is caused by (marginal) cost and what portion goes to the issuing bank as a net-profit. The potential for additional profits in this business seem to be considerable, due to a limited transparency in this market and due to a limited sophistication on the side of many smaller investors.

We have distinguished between products with and without a fixed coupon payment. We found the more established market for instruments without a coupon to generate significantly lower prices. The products with a fixed coupon are typically managed at the institution's fixed income desk and sold in a bond-like manner. The perception as a bond-related investment may make investors pay a premium for these instruments.

Finally, we investigated the role of the co-lead-managers in the issuing process of a new instrument. These co-lead-managers are smaller banks that initiate the launch of a new product. They collect quotes from various bigger players and eventually cooperate with the one who gave in the best offer. As a result, structured instruments whose issue is co-led by a third-party are significantly better priced and show a smaller dispersion of pricing errors.

⁹ Of course, there is not really an *additional* fee to be paid by the investor. Instead, the co-lead-manager shares profits with the lead manager. See WOHLWEND (2001).

In sum, we find substantial price distortions across the various segments of the market under investigation. The differences between the offerings proved to be statistically significant. This does not necessarily mean that they are also *economically* significant. To be of economic importance, a detected mispricing would imply an arbitrage opportunity or at least the potential for a more cost-effective replication by investors.¹⁰ However, this is not necessarily the case. For private investors, replicating strategies are usually limited by a lack of available instruments, by short selling restrictions, transaction cost, etc. Therefore, a specific product offering may not be priced perfectly in line with the market, but it may still be the best deal a smaller investor can get.

After all, it is to be expected, that increasing transparency, sophistication, and price-awareness on the side of investors will eventually lead to a substantially better and more consistent pricing in the market for structured products.

¹⁰ Because the structured products under investigation cannot be sold short, the two criteria are not necessarily the same.

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