The retail market for structured notes: Issuance patterns and performance, 1995-2008

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Abstract

The structured note market has recently been a large and important part of the personal financial landscape. These notes offer investors exposure to asset classes and investment themes that they may find difficult to access in other ways. Particularly in Europe and Asia, these markets grew rapidly until the financial market disruptions of 2008. While earlier research papers have investigated the performance of small samples of specific types of notes, analysis of performance and issuance patterns across the entire marketplace has not kept pace with market growth. This paper investigates issuance and performance patterns, using a broad sample based on more than 1,000,000 individual note issues. Patterns of issuance suggest that investors chase performance, and issuers prefer to issue notes whose underlying risks are easier for them to hedge. Taken as a whole, estimated performance of the notes suggests that they are sold at a significant premium. Premium estimates over the entire period are close to the estimates in Henderson and Pearson (2007), which were based on a small sample of one type of note. There is significant variation across time period, with the measured premium falling significantly in the period since 2005.

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Structured notes offer investors pre-programmed exposures to underlying assets, allowing them to access a wide set of desired risk exposures. These exposures can include commodities, individual equities, equity indexes and baskets, credit instruments and indexes, currencies, sovereign interest rates, and measures of inflation. Structured notes have become particularly important in Europe and Asia, and were rapidly penetrating the US retail market until the financial crisis of 2007-2008. The sample of notes used in this paper has more than 1,000,000 notes ever issued; the sample of notes still outstanding as of June 2008 contains 314,000 individual notes with a total value of more than 3.4 Trillion EUR.

Structured notes differ in important ways from other investment tools, including mutual funds. A mutual fund investor enjoys a direct claim on an underlying pool of assets; a structured note owner, on the other hand, enjoys a general claim against the institution that has issued the note. The amount to be delivered based on this claim can be conditioned on the performance a reference asset or index. In the event of a default by the notes' issuer, the investor will recover value alongside issuer's other creditors. Thus, the market for structured notes has been dominated by investment-grade issuers.

These notes help complete markets for retail and other investors who would otherwise be unable to inexpensively access desired risk exposures. For example, while a retail investor may be able to create a downside-limited position in an underlying equity by dynamically hedging their exposure to the company's stock, or by trading in options markets, transactions costs can make these strategies difficult to undertake directly. Structured notes can also be used to transfer underlying assets' returns across tax frameworks, and can be useful to deliver risk exposures that would be difficult to otherwise achieve due to portfolio investment restrictions.

There is an alternative to this somewhat sanguine (at least from the investor's perspective) view of the structured note market. In particular, recent research has focused on the strategic creation of complexity by the developers of financial products (see for example Carlin, 2008, and Gabaix and Laibson (2005)). In particular, extreme complexity can make it difficult for investors to understand the true price that they are paying for financial services. These authors have argued that some designers of financial products create complexity in order to hide the true price that investors are paying for their

products. Strategic complexity has also been identified as a component of problems in the design of home mortgage contracts (see for example Jackson and Berry, 2008). Applied to the structured note market, this line of argument suggests that part of the goal behind the development of structured products with complicated patterns of performance is to extract premia from boundedly rational investors. Bernard and Boyle (2008) offer a slightly different view of the structured note market, arguing that the pattern of caps and floors on structured products are designed to exploit investors' misweighting of the likelihood of low-probability events.

It can be difficult to tease apart the relatively sanguine view of structured notes from the view that the notes merely represent another channel for the exploitation of imperfectly informed investors. This paper provides evidence that will be useful for this debate, investigating the issuance patterns and performance of structured notes. I complement recent analyses of individual types of structured notes by Henderson and Pearson (2007), Szymanowska, Ter Horst, and Veld (2008). Henderson and Pearson focus on patterns of issuance in the structured equity note market in the United States. They analyze the performance of one type of structured note, the SPARQ, issued by Morgan Stanley, and use a sample of less than 100 notes in their evaluation of performance. Their key result, the SPARQS are sold at roughly a 6% premium for a 6-month note, is consistent with the results in this paper. Szymanowska, Ter Horst, and Veld analyze the market for another particular type of note, the 'Reverse Convertible'. Their sample consists of 108 reverse convertibles issued on Euronext Amsterdam between January 1, 1999 and December 31, 2002. On this sample of issues, the authors also document overpricing of almost 6 percent.

This paper investigates the performance of a much larger sample of notes, drawn from an underlying sample of over 1,000,000 retail-sold structured notes. The larger sample and longer time period allow me to investigate patterns of performance across issuers and across time. My overall estimates of note performance suggest premia in line with the estimates of Henderson and Pearson and Szymanowska, Ter Horst, and Veld, but I also find extreme variation in the performance of notes across time. There were very large premia between 2000 and 2004, and much smaller premia in the period

since. Looking across notes by issuer, there is also significant variation in the premia. Notes issued by Goldman Sachs and Unicredito stand out as being sold with particularly high premia.

The first section describes structured notes in more detail, with a handful of examples. The second section describes the data sample used in this paper and the overall size of the market. The third section explores the determinants of issuance behavior. The fourth and final section describes the performance of these notes.

1. Structured notes: Description and examples

Structured notes have been issued by highly-rated issuers, generally investment banks, commercial banks, and occasionally export-import banks. High-rated issuers are essential in order to isolate the risk exposure desired by investors: investors in retail structured notes are generally searching for an exposure to the underlying risk targeted by the note issue rather than the issuer's credit risk.

The notes are often issued through private banks and wealth managers. A private bank, wealth manager, or other intermediary who identifies a market appetite for a certain type of exposure will then work with a structured note issuer (potentially affiliated with the same institution) to develop a note targeted towards those investors. Issuers of structured note compete with each other in terms of the level of service, speed, and pricing that they can provide to the arranger of the note issue.

Once the note has been issued, in the absence of any other activity the issuer would end up with a risk exposure the exact opposite of the risk exposure enjoyed by the note's investor. In general, however, the issuer's risk exposure is at least partially hedged out. For example, a structured note's issuer could offer a note delivering a positive relationship between the payoff and the DAX index, then hedge this exposure with an offsetting OTC or exchange-traded derivative market. Thus the structured note business can be thought of, at least in part, as the transfer of risk, through issuers, between the notes' end investors and counterparties to the issuer's hedging transactions. Another means of hedging would be to offer 2 or more structured notes, with risk exposures that offset each other. Finally, an issuer can also design a structured note with an eye to offloading an undesirable risk exposure from their existing trading book.

One piece of evidence in the paper by Henderson and Pearson (2007) speaks to potential difficulties for issuers in hedging the portfolio of notes that they have issued. Henderson and Pearson find evidence that, in the United States, issuance of structured equity products based on single stocks is made up predominantly of products with concave payoffs, while issuance based on indexes is made up predominantly of products with convex payoffs. This pattern of issuance would potentially leave the bank with a short exposure to correlation. These types of higher-order risk exposures have been identified as a source of concern for financial institutions with significant structured note businesses.

The taxation of structured notes has created some policy concern, as well. This concern arises because structured notes and other derivative-related transactions allow the transfer of risk exposures across investors and across formats (for example between instruments labeled 'debt' and 'equity'). For taxation in the United States, tax treatment of the notes for taxable investors depends in part on whether the note enjoys principal protection or not. For a note that pays no coupons and is offered without principal protection, tax treatment is based on the concept of a pre-paid forward contract: effectively, the return of the note is taxed as a capital gain at maturity. This tax framework offers the ability to convert dividend income for the end investor into capital gains; in a market that is efficient at the level of the issuer of the note, the performance of the note would be directly tied to the total return on the underlying asset. This asymmetric treatment in the tax code has recently come under scrutiny by Congress. The Investment Company Institute, the trade association of the mutual fund industry, has argued in particular that this tax treatment has put the mutual fund industry at an unfair disadvantage relative to structured notes. For notes with principal guarantees, the key concept governing taxation is the concept of 'phantom income', similar to the case of bonds offered at an initial discount. For these structured notes, the accruing implied interest should, in principal, be paid by the investor each period.

The relationship between the performance of the underlying asset or assets and the payoff of the notes can range from extremely simple to extremely complex. One example of a flavor of structured note is the 'reverse exchangeable' note, and the related 'reverse convertible'. These notes are very common, issued by many issuers. Among the issuers of these notes was Lehman Brothers, which issued a tiny

quantity ($120,000) of 'reverse exchangeable' notes in September of 2008. **Figure 1** is an excerpt from the registration statement for these notes. These were the last notes issued by Lehman prior to its bankruptcy filing in that month. The particular note issued had a 3-month maturity and promised a 16-percent coupon. The notes have a reverse exchageable feature, and have Visa, Inc., as the underlying, meaning that in the event that the price of Visa stock falls below a certain reference price, Lehman will have the option to deliver a fixed number of shares of Visa (or the cash value thereof) in lieu of the face value of the notes. An investor in the notes has therefore written a put option on Visa stock – if the price of Visa falls to zero the note will expire worthless. Compensation for this put comes in the form of the coupon payments offered by this particular note.

Lehman went bankrupt directly after issuing the notes; as the pricing supplement to the prospectus notes, [1]

> Because the notes are our senior unsecured obligations, any coupon payment or any other payment at maturity is subject to our ability to pay our obligations as they become due.

Recovery for the investors in these notes remains uncertain as of early October, 2008. The impact of Lehman's default on the structured note market as a whole, as well as the impact of the general financial market turmoil of 2007-2008, is likely to be extreme and negative. Even prior to Lehman's default, the pace of issuance had slowed significantly.

Notes frequently carry brand-names constructed as acronyms. Examples include Yield-Enhanced Equity-Linked Debt Securities (YEELDS), which were issued by Lehman, and Stock Participation Accreting Redemption Quarterly-Pay Securities (SPARQS), issued by Morgan Stanley. One note which was evidently not marketed by its acronym was the Lesser-Index Annual Review (LIAR) note, issued by JP Morgan Chase. **Figure 2** is an excerpt from the SEC registration statement for these notes. These notes offered a return linked to the lesser-performing of two indexes. In the case of the notes issued

[1] http://www.sec.gov/Archives/edgar/data/806085/000119312508193837/d424b2.htm

September 19, 2007, the indexes were the S&P 500 and the DJ EuroStoxx.[2] Only a handful of this particular note were issued during 2007, suggesting that risk-management systems (reputational and otherwise) kicked in at some point and issuance of such ill-named notes was discontinued.

2. Data description and size of market

The data used in this paper come from Datastream. These data include descriptions of the notes, identifiers for the issuer and underlying, and identifiers for the issuance date and redemption date. The data available from Datastream also include price quotes for the notes and the notes' trading volumes. These data series are taken from the exchanges on which they trade. For some notes, Datastream also has data on the effective gearing of the note, reflecting the leverage in the underlying asset implicit in purchasing the note.

One weakness of the data from Datastream is that they do not contain information about the notes' coupon payments. To assess the importance of this omission, we took the subsample of notes that also are listed on Bloomberg, over 100,000 notes in all, and obtained from Bloomberg the posted coupon rate of the note. The average coupon rate of these notes is approximately 27 basis points per month. While many of the notes pay large coupons, the vast majority for which we have data do not appear to pay coupons at all. **Figure 6** shows the average coupon rates of the notes in the sample with both Datastream and Bloomberg data issued in each month.

Datastream makes available a field describing the underlying asset for the note. While this field is missing for many of the observations in my sample, I employ text matching on the text description of the note in order to map the note to the appropriate underlying asset. Because this description is almost uniformly available, I am able to match almost 90 percent of the notes available on Datastream to the appropriate underlying assets.

The Datastream data are based on all warrants issued through June 30, 2008, and issued in the following currencies: Austrian Schilling, Euro, French Franc, German Mark, HK Dollar, Italian Lira,

[2] See http://www.sec.gov/Archives/edgar/data/19617/000089109207004043/e28594-424b2.htm

Singapore Dollar, Swiss Franc, Taiwanese Dollar, UK Pound, and US Dollar. The restriction on currencies excludes 3,396 notes from the sample, and leaves 1,031,154. The weighting of currencies and issuers in the sample suggests that my sample is somewhat skewed away from Asian issuers and towards notes that are issued in Europe.

The details on the extent of issuance are described in **Table 1**. Issuance has grown sharply since 1995, which a noticeable dropoff in issuance since the beginning of the 2007-2008 financial crisis. Monthly issuance peaked in late 2006 at more than 20,000 notes per month; the count of notes outstanding stood at more than 315,000 in June of 2006. The total amount of notes outstanding, measured in EUR, peaked at more than $4.4 Trillion in 2006 and has since fallen to under $3.5 Trillion.

Table 2 shows the dominant issuers of the notes in the sample used in this paper. Over 961,000 of the notes in the sample can be matched to one of the issuers in the table. The remaining notes are issued by issuers who issue smaller numbers of notes in my sample. The most important individual issuers are the German banks Deutsche Bank and Commerzbank, followed by Goldman Sachs, Citigroup and its predecessors, Dresdner, Societe Generale, and BNP Paribas. The dominant set of issuers has changed over time; among the notes issued in 1995 through 1999 the dominant issuers are UBS and Citi. Later in the period the German banks dominate, with the HSBC subsidiary Trinkaus and Burkhardt becoming dominant at the end of the sample.

Table 3 shows the most common individual underlying assets for the notes in this sample. Of the 1,000,000 notes in the sample, roughly 11 percent cannot be matched to any underlying. By a wide margin, the most common individual underlying is the DAX index, followed by a number of currencies and indexes. Gold-based structured notes account for 13,464 of the notes in the sample. The most common individual equities which form the basis of notes are Deutsche Bank, Siemens, SAP, and Daimler, all of which have served as underlyings for at least 10,000 notes. The most common non-German individual equity underlying is the Finnish company Nokia, which has been the underlying for more than 8700 notes.

The data from Datastream contain not just the characteristics of the note, but also contain data on the quoted price of the notes after issuance. Not all notes in my sample have this post-issuance information. **Table 4** shows the counts of notes, by type of underlying and by the level of data on price and volume available. Among the 706,770 issues that contain any post-issuance data on price, gearing, or volume, 425,479 notes have price data and observe positive trading post-issuance. For 262,674 of the notes in the sample I observe price data, but do not observe volume data. This may be because the volume is positive but the data are missing, or because the notes are not trading post-issuance. In these cases, the prices would reflect quotes, but the quality and depth of these prices should be considered somewhat suspect.

3. Determinants of issuance

This section investigates the determinants of issuance among the notes in my sample. I focus on notes whose payoff is based on individual equity securities. The unit of observation is the underlying equity security: my empirical analysis investigates the relationship between the underlyings' characteristics and patterns of issuance of notes. The sample of notes comes from Datastream, and the sample of underlying equity securities is constructed from the stocks that appear between 2000 and 2008 in any of the DAX, Nasdaq, FTSE, CAC, SMI, and STOXX 50 indexes. To this group I add other equities that serve as underlying assets for more than 200 identifiable notes in my sample. This leads to a total of 810 underlying equity securities in all.

Table 5A estimates models where the year-over-year change in the count of note issuance is regressed on the characteristics of the underlying securities. The timing convention for this table is as follows: issuance over the next 20 trading days is compared to issuance during the same 20 trading days of the previous year. This controls for seasonal or tax-timing related patterns in the issuance of the notes. The regressions use monthly observations, so there is no overlap in the dependent variable across observations. **Table 5** contains summary statistics for the variables used in the regressions presented in Tables 5A-6C.

The explanatory variables are the excess return on the underlying stock over the period between 250 days prior through 21 days prior. Excluding the most recent days accounts for a roughly one-month lag between the development of a new note and issuance. The results are not particularly sensitive to whether these 20 trading days are included or not.[3] I also include trading volume in the underlying, in EURO, over the same period, as well as the standard deviation of the daily return over the same period. The results in Table 5A, Column 1 include no other fixed effects or explanatory variables. The results suggest that issuers choose to issue more structured notes based on underlying equity securities that have seen recent price increases, higher trading volume, and that have lower daily return standard deviation. The price increase result suggests that inflows into structured notes is positively related to past returns. The effect, while statistically significant and consistent across specifications, is not very large in economic magnitude: an increase by 10 percentage points in the return over the previous period would be associated with an increase of 0.035 in the expected number of notes issued in the next month. The results for trading volume and standard deviation suggest that issuers issue notes based on underlying equity securities that are easier to hedge: higher trading volume and lower return standard deviation is associated with lower hedging cost. Columns 2 through 5 in Tables 5A-6C add additional controls to this basic regression. Column 2 adds a separate dummy variable for each underlying equity security. Column 3 adds dummy variables for the date of issuance; Column 4 adds controls for the date and an identifier indicating the index (if any) into which the underlying is included. Column 5 includes fixed effects for both the date and for the underlying equity security. While the results for past return and past trading volume are robust across specification, the standard deviation result does not hold up to the inclusion of both date and firm-level fixed effects. Controlling for this pattern of fixed effects suggests that, structured note issuance is particularly high when its' standard deviation has been particularly high relative to its average. Looking across stocks, however, I see that structured note issuance is higher, in general, for underlying equity securities that have lower standard deviations. Taken as a whole, this pattern of results

[3] The excess return during trading days [t-21] through [t-1] has very little explanatory power for not issuance in the following month.

suggests a mix of marketing and issuance-cost-related factors driving issuance: issuers prefer underlyings that are easier to hedge, but will also increase issuance based on underlyings whose recent performance is high or volatile relative to that underlying's average over the period.

The results in **Table 5B** are based on a different dependent variable. Datastream identifies the structured notes in the sample as being 'call', or 'put' notes. In practice, this identifier is almost perfectly correlated with whether the correlation between underlying returns and the notes' returns is positive (call) or negative (put). Table 5B is similar to Table 5A, but uses as a dependent variable the change in the issuance of notes labeled by Datastream as 'call' notes – notes whose payoff will be positively related to the performance of the underlying asset. The results for 'call' and 'put' notes (**Table 5C** shows results for the 'put' notes) are remarkably similar, in terms of the patterns that appear to be driving issuance. Both types of notes see higher issuance after positive performance of the underlying, and both types of notes see the same patterns with respect to the volume and return volatility of the underlying equity securities.

Table 6A fits a model similar to Table 5A, except that it uses the year-over-year change in the EUR amount of issuance rather than the change in the issuance count. . The results here suggest that a 10 percentage point increase in performance would be associated with roughly a 1 million EUR increase in issuance of notes referencing the underlying. **Tables 6B** and **6C** explore separately the relationship between underlying characteristics and issuance of call and put notes. The pattern of results here is more mixed. For the call notes, the EUR issuance amount is negatively related to the standard deviation of the underlying, but the result is no longer statistically significant. For the put notes, the relationship is the same as documented for the issuance counts: issuers issue a larger EUR amount of notes based on less-volatile underlyings, but issue a larger EUR amount of notes after periods when underlyings have been particularly volatile relative to average.

4. Performance of issues

This section investigates the performance of the notes in my sample. The technique used here for evaluating note performance is to construct a portfolio of the notes in the sample or a particular subsample, and construct the value-weighted return of the notes in that portfolio. The performance of this structured note portfolio over time is regressed on market indexes, with the intercept term from those regressions reflecting an estimate of the alpha of the notes in the sample.

Figure 3 shows the relationship between the performance of the portfolio of warrants and the DAX monthly return. The overall impression is one of a positive relationship between the warrant portfolio and the DAX; while individual notes offer highly non-linear exposures to individual underlying assets, the entire portfolio is approximated reasonably well by a linear term on the DAX. This linear approximation becomes increasingly good as the sample of notes is pared down. **Figure 4** shows the relationship between the DAX return and the portfolio of notes with German equity underlyings. Here, the R-squared rises to .83, meaning that the portfolio of warrants issued offers a return that is highly correlated, in a linear way, with the DAX return.

Further analysis by specific underlying reveals some surprising results. **Figure 5** shows the relationship between the performance of the DAX market and the performance of the portfolio of notes which have the DAX index as their underlying. This evidence suggests an abrupt change in 2004. Prior to that period, notes referencing the DAX had delivered, in aggregate, a negative exposure. Over this period the loading on the contemporaneous DAX return is -0.55. In the period since 2005 the loading on the DAX among the notes that have the DAX as their underlying changes signs, and rises to 1.08.

All of the analysis in the paper is based on monthly returns; thus the coefficient on the Constant variable in **Tables 7A-7E** reflects an estimate of a monthly alpha. One concern in estimating the performance of structured notes is the fact that trading can be relatively infrequent. In the presence of infrequent trading, measures of both the loading on the market returns and the alpha are biased (see Elroy Dimson). To control for any potential bias here, two approaches are taken. Both of these approaches are reflected in **Table 7A**. The first approach is to add lags of the market index. These lags control for non-trading. The second approach is to limit the sample to being constructed from only warrants that have

positive trading volume in a given month. Columns 3 and 4 limit the sample to warrants with positive trading volume in the most recent month, while Columns 5 and 6 limit the sample to warrants with positive trading volume in the most recent two months.

Both of these approaches suggest that the main result, that the portfolio of structured notes has delivered a large negative alpha, is robust to controls for non-trading. Using the entire portfolio of warrants, and using no lags of the market index in the performance regression (**Table 7A, Column 1**) delivers an alpha estimate of -0.82, which is statistically significant at standard levels. This corresponds to an annual alpha of almost -10%, or perhaps more relevantly, a roughly 5% premium built into the price, at issuance, of a structure note with a maturity of 6 months. Limiting the sample to warrants with positive trading in the current and previous month, and including 3 lags of the market index returns, delivers a monthly alpha estimate of -1.62 percent, consistent with a much higher estimate of the premium built into the pricing of these retail notes.

This premium comes on top of any brokerage fees paid by the investor to the intermediary who sells the notes.

Table 7B limits the sample in two ways. Columns 3 and 4 limit the sample to notes identified as having equity underlyings. Limited to this sample, the estimated monthly alpha of the note portfolio is between -161 and -168 basis points per month. Columns 5 and 6 limit the sample to the sample of notes with German-listed equity as the underlying. Limited in this way, the estimated monthly alpha of the note portfolio is between 87 and 84 basis points per month. One striking thing, highlighted in Figure 2, is how closely the performance of this sample of notes matches the performance of the DAX.

Table 7C reproduces columns 2, 4, and 6 of Table 7B, but divides the sample by time period. This approach is in order to evaluate performance over subperiods, as well as to control for potential misspecification induced by abrupt changes in the loading of notes on underlying indexes (as documented in **Figure 5**). The first part of the sample runs from 2000 through 2004, and the second part starts in 2005 and runs into 2008. As competition among issuers has heated up in this market, this split breaks the sample into a earlier period and a later period. The evidence in Table 7C suggests that the extremely

large negative alphas of the portfolio of structured notes was a phenomenon of the first 5 years of the sample. In particular, looking at columns 5 and 6 of Table 7C suggests that the note portfolio delivered a monthly negative alpha of 116 basis points through 2004, and an alpha that is statistically indistinguishable from zero in the period after 2005.

Table 7D analyzes notes based on underlyings from different individual equity markets. In particular Columns 1-5 of the table look at notes with American, German, British, French, and Swiss underlyings respectively. Across all of these markets, the estimated alpha on the note portfolios is negative. Estimates range from an alpha estimate of -84 basis points per month for notes with German underlyings to the very extreme estimate of -529 basis points per month among notes with British underlyings. The notes break down into two groups; the portfolios of notes with Swiss, German, and American underlyings have very high correlations with their respective market returns and have estimates of negative alphas that are smaller than the estimates coming from the portfolios of notes based on French and British underlyings. The portfolios of these notes also have lower correlations with their respective market indexes.

Table 7E breaks out the notes by issuer. Columns 1-3 estimate models with no lags of market performance, while columns 4-6 estimate models with 3 lags of the market performance. Issuers whose notes appear to perform particularly poorly include Goldman and the Italian issuer Unicredito.

Unfortunately missing from the analysis so far has been two features. One feature is the coupon payments on these notes, which can be substantial for individual cases. Datastream data unfortunately do not reliably provide coupons on the notes, so I take the notes and match them by ISIN with data from Bloomberg, leading to a sample of about 100,000 notes for which coupons are available. The other feature I don't observe is the ex-ante credit risk inherent in the note. While the note may offer an exposure to corn or oil prices, an investor in the note is an unsecured creditor of the note issuer. While this was not a particularly salient risk earlier in the period, it has become increasingly so. In an effort to gauge the impact of this effect, I measured the credit risk on the notes by taking 5-year CDS spreads (subordinated) from the major note issuers and weighting these spreads by issuance in each period. I

measure the cost of buying 1 month of protection based on these 5-year CDS contracts. I measure the coupon by taking the weighted average coupon of the notes issued in each month. **Figure 6** shows the result of this investigation. The impact of ignoring coupons and ignoring credit risk appear to roughly offset each other during the period studied. With respect to credit risk, the note-weighted 5-year CDS spread begins the period at around 30 basis points per annum, then drifts down towards a minimum of under 20 basis points during early 2007, before spiking to over 180 basis points during the market disruptions of 2008.

One way of benchmarking the underperformance of the structured notes in this sample is with the performance of mutual funds that deliver relatively exotic exposures to underlying assets. The ProFunds family offers funds that promise highly levered exposures to underlying market indexes. I used two of these funds to create a mutual fund industry benchmark for the underperformance of my structured note sample. The UltraBull/UltraBear NASDAQ funds promise investors 2-times levered positive and negative exposure to the NASDAQ index. In a market without transactions costs, constructing an equally-weighted portfolio of these funds should deliver a risk-free return. In **Figure 7** I compare the performance of this equally-weighted portfolio to the cumulative LIBOR 1-month performance less the equally-weighted stated expense ratios of these funds. The underperformance of this pair of mutual funds matches very closely the underperformance among the structured notes: greater than negative 100 basis points per month until about 2004, and coming close to 0 in the later periods.

5. Conclusion

The results in this paper suggest that, based on a large sample of structured notes, investors in this market over the period since 2000 were getting a negative alpha, in aggregate, of approximately 100 basis points per month. This underperformance was much more pronounced in the early part of the period. In the period since 2005, the underperformance is not statistically significant. This does not necessarily mean that investors in the period after 2005 were getting a 'good deal'; the analysis in this paper does not factor in the loads and selling charges captured by intermediaries for selling these products to end

investors. But, looking purely at the pre-selling-expense performance of the product, the performance is significantly negative prior to 2005 and indistinguishable from zero since.

The pattern of issuance suggests that investors chase returns, in the sense that more notes are issued based on underlying equity securities that have recently performed well. Issuance patterns suggest also that issuance is more common for underlying equity securities that are easier to hedge – those that have higher trading volume and lower return standard deviation.

Looking across issuers, the evidence suggests some clustering in the performance by issuer. In particular, issues by the American issuer Goldman Sachs and the Italian issuer Unicredito deliver large negative outperformance.

6. References

Baule, Rainer, Oliver Entrop, and Marco Wilkens, 2005, 'What do banks earn with their own credit risk? Theoretical and empirical evidence from the German retail market for structured financial products,' mimeo, University of Goettingen.

Bernard, Carole and Phelim Boyle, 2008, 'Structured investment products with caps and floors', mimeo, University of Waterloo and Wilfred Laurier University.

Bethel, Jennifer and Allen Ferrel, 2006, 'Policy issues raised by structured products,' Harvard Law School Olin Center discussion paper No. 560.

Carlin, Bruce I., 2008, 'Strategic price complexity in retail financial markets', mimeo, UCLA.

Henderson, Brian J. and Neil D. Pearson, 2007, 'Patterns in the payoffs of structured equity derivatives,' mimeo, Seton Hall University and University of Illinois.

Schroth, Enrique, 2006, 'Innovation, differentiation, and the choice of an underwriter: Evidence from equity linked securities,' *Review of Financial Studies*.

Szymanowska, Marta, Jenke Ter Horst, and Chris Veld, 2008, 'Reverse convertible bonds analyzed,' mimeo, Rotterdam School of Management.

Table 1. Count of structured notes issued, 1995-2008.

Year	Month	Count issued, month	Count issued, last 12 months	Sum (EUR) issued, month	Sum issued (EUR), last 12 months	Count outstanding	Sum outstanding
1995	6	433		3.37		3166	35.73
1995	12	532	6471	5.53	70.92	6267	70.62
1996	6	725	7567	11.05	75.58	9099	97.44
1996	12	867	8930	8.74	81.95	11331	116.42
1997	6	1233	12017	19.74	120.7	14355	150.05
1997	12	947	13609	9.55	153.25	15893	180.58
1998	6	1579	15990	38.92	236.34	19641	283.03
1998	12	431	19208	6.77	327.14	24086	386.22
1999	6	1489	18257	55.59	381.99	24686	507.37
1999	12	2587	19593	36.82	401.95	25887	524.39
2000	6	2325	24014	31.31	398.62	29984	536.66
2000	12	3517	30984	23.4	421.56	38538	577.83
2001	6	4089	39612	71.16	449.06	47324	607.52
2001	12	3953	46472	30.41	489.1	54878	643.97
2002	6	4663	48866	50.71	501.19	55658	666.4
2002	12	2725	45331	15.37	473.38	51713	677.73
2003	6	5332	46042	40.76	475.64	48724	664.28
2003	12	5552	58784	44.39	589.78	58331	727.67
2004	6	6351	74109	47.09	668.05	69465	820.83
2004	12	7854	83504	76.69	754.8	82962	1050.36
2005	6	10262	92638	155.74	1144.6	96045	1499.11
2005	12	12473	113147	156.64	1960.86	119522	2475.58
2006	6	14611	150710	317.45	2975.16	157968	3832.75
2006	12	13430	183626	79.41	2985.91	201242	4491.63
2007	6	20848	201181	151.85	1879.32	235721	4239.93
2007	12	18659	239323	103.23	1293.34	290020	3795.1
2008	6	11786	266073	67.29	1359.83	315718	3422.51

Table 2. Issuance by issuer and year, count of notes.

Issuer	Total	1995	1997	1999	2001	2003	2005	2007	2008
ABN Amro	39330	1	75	113	391	1192	3228	14641	7198
Banca IMI	4287	4	1	31	438	618	606	1001	385
Bankers Trust	1416	332	255	58	0	0	0	0	0
BHV	4323	0	62	219	861	45	147	932	1210
BNP Paribas	65049	66	114	836	2885	2325	7283	19035	9508
Caboto	3687	0	8	161	309	285	540	490	297
Centro	2498	11	301	733	415	0	0	0	0
Citi	77728	828	1359	3264	5644	3231	6795	18583	11732
Commerzbank	119647	161	521	1294	3254	9031	14781	38668	11756
Credit Agricole	1834	0	1	2	59	479	0	0	0
Credit Lyonnaise	5806	143	404	799	1134	57	0	0	0
Credit Suisse	5176	156	202	205	337	146	249	1451	879
Deutsche Bank	113807	325	946	1032	1609	8198	11711	35122	15993
Dresdner	68672	4	151	591	3294	3512	7955	20617	12004
DZ Bank	36074	214	306	589	1366	2381	4828	7470	3340
Erste Bank Oesterreich	6960	253	829	487	411	163	295	383	293
Giro	853	147	432	0	0	0	0	0	0
Goldman Sachs	70697	219	386	1202	3022	3972	7432	15110	9491
HSBC	73194	172	352	454	781	4165	9078	17548	17332
JP Morgan	2957	30	27	13	1231	163	172	326	92
Julius Baer	4549	11	18	25	17	67	328	1668	1465
KBC	2479	0	0	15	167	119	198	701	246
Lang und Schwarz	17037	0	0	0	652	511	2369	4778	3348
LBBW	2864	0	0	0	39	408	694	8	3
Lehman	5036	58	152	366	1429	10	35	197	188
Macquarie	3025	0	4	0	35	156	419	959	365
Merrill	8195	221	744	357	1186	362	404	1001	1190
Morgan Stanley	908	61	229	31	48	4	2	29	24
Rabobank	1753	37	297	177	79	2	62	426	178
Raffeisen	4247	16	84	0	419	554	789	671	178
Salomon Oppenheim	32142	4	288	47	921	3232	6012	434	384
Salomon Brothers	751	151	170	52	0	0	0	0	0
Sinopac	968	0	0	0	1	27	57	449	272
Societe Generale	65420	442	953	2234	5399	3704	8642	12389	5734
UBS	47162	1243	2137	2520	2389	3429	5245	4848	3554
Unicredito	17881	0	0	567	1667	2834	3220	1290	752
Vaudoise	2076	0	0	0	24	65	337	614	260
Vontobel	29526	31	98	178	1405	1181	4106	7558	4238
West LB	3550	136	265	256	732	23	0	0	0
ZCB	7443	0	0	93	419	315	657	2439	1349
Total	961007	5477	12171	19001	44469	56966	108676	231836	125238

Table 3. Issuance, by issuer and type.

Underlying	Count issued	Sum (EUR) issued	Sum (EUR) issued - call	Sum (EUR) Call/(Call + Put)	Sum (EUR) issued - put	Sum (EUR) outstanding, 200806
DAX Index	90600	1546.1	1128.8	73%	417.3	365.1
USDEUR Curncy	32977	534.0	288.9	54%	245.1	62.5
SX5E Index	24032	637.2	568.4	89%	68.8	272.6
JPYEUR Curncy	22924	481.7	221.5	46%	260.2	50.9
CAC Index	17021	160.4	90.5	56%	69.9	21.4
SPX Index	14751	99.8	63.9	64%	35.9	17.3
NDX Index	14580	84.5	50.9	60%	33.7	19.7
NKY Index	14087	98.0	70.4	72%	27.6	50.1
GOLDS Comdty	13464	124.4	78.4	63%	46.1	70.5
OIL Comdty	10997	101.7	56.3	55%	45.4	73.2
DBK GR Equity	10912	226.2	211.5	94%	14.7	94.9
SIE GR Equity	10840	165.6	152.8	92%	12.8	59.5
SAP GR Equity	10808	183.5	167.3	91%	16.2	34.8
DAI GR Equity	10616	105.3	94.1	89%	11.2	30.8
ALV GR Equity	10371	234.3	230.8	99%	3.5	84.3
DTE GR Equity	10221	67.5	57.0	84%	10.5	22.6
VOW GR Equity	9488	108.6	91.7	84%	16.9	26.9
NOK1V FH Equity	8769	53.3	46.6	87%	6.8	12.4
BAY GR Equity	8705	76.0	65.8	86%	10.3	20.1
MUV2 GR Equity	8301	178.9	173.8	97%	5.0	33.1
CBK GR Equity	8136	59.7	50.2	84%	9.4	19.9
EOA GR Equity	8096	160.0	149.8	94%	10.2	40.9
BAS GR Equity	8081	98.8	88.2	89%	10.6	30.6
SILV Comdty	7969	26.6	13.8	52%	12.8	13.9
SMI Index	7906	43.9	27.0	62%	16.9	16.4
HSI Index	7677	59.9	37.8	63%	22.1	29.0
DJ Index	7538	69.3	40.2	58%	29.0	30.7
Unknown	110336	1076.1	930.7	86%	145.4	417.0

Table 4. Issuance by type and data availability.

Underlying type	Total observations	With price data and > 0 volume data	With price data, no volume data	With volume data, no price data	No price or volume data
single stock underlying					
Equity - Austria	5,416	2,918	2,408	54	36
Equity - Belgium	1,273	508	738	13	14
Equity - China	2,629	2,450	133	44	2
Equity - Denmark	2,652	1,257	1,303	52	40
Equity - Finland	7,732	4,240	3,233	171	88
Equity - France	68,784	48,978	17,888	1,565	353
Equity - Germany	228,124	123,917	98,723	3,223	2,261
Equity - Hong Kong	4,471	4,071	274	116	10
Equity - Italy	21,935	19,315	1,834	735	51
Equity - Japan	4,280	2,243	1,920	77	40
Equity - UK	4,560	2,446	1,995	67	52
Equity - Netherlands	12,639	5,273	7,054	141	171
Equity - Spain	2,305	978	1,267	32	28
Equity - Sweden	1,453	842	566	31	14
Equity - US	58,002	30,203	26,267	967	565
Equity - Switzerland	31,369	27,266	3,274	775	54
Other underlying					
Basket	1,356	935	364	35	22
Commodity	31,724	18,219	12,915	380	210
Currency	43,184	19,535	22,347	634	668
Equity Index	165,176	106,387	54,176	3,226	1,387
Interest rates	7,706	3,498	3,995	107	106
Sum	706,770	425,479	262,674	12,445	6,172

Table 5. Summary statistics for issuance regressions.

				Percentiles						
	N	Mean	SD	p5	p10	p25	p50	p75	p90	p95
Excess return, [t-250] through [t-21]	67464	10.9	55.0	-40.8	-29.8	-13.6	3.1	23.3	51.9	79.3
EUR Billion trading volume, [t-250] through [t-21]	67464	24.4	295.4	0.0	0.0	0.2	4.3	20.3	56.1	94.6
Daily return standard deviation, [t-250] to [t-21]	67464	2.4	1.3	1.1	1.2	1.6	2.1	2.9	4.0	4.9
Issuance count, [t] through [t+20]	67464	6.5	19.6	0.0	0.0	0.0	0.0	4.0	17.0	32.0
Call note issuance count, [t] through [t+20]	67464	5.0	14.5	0.0	0.0	0.0	0.0	4.0	14.0	25.0
Put note issuance count, [t] through [t+20]	67464	1.5	5.9	0.0	0.0	0.0	0.0	0.0	4.0	7.0
Issuance sum, EUR Million, [t] through [t+20]	67464	58226.4	502237.3	0.0	0.0	0.0	0.0	7070.0	65120.0	175385.0
Call note issuance sum, EUR Million, [t] through [t+20]	67464	52933.1	491788.9	0.0	0.0	0.0	0.0	5700.0	55651.0	150000.0
Put note issuance sum, EUR Million, [t] through [t+20]	67464	5293.3	39889.1	0.0	0.0	0.0	0.0	0.0	5930.0	108200.0
Change in issuance count, [t] through [t+20]	67464	1.7	12.5	-7.0	-3.0	0.0	0.0	1.0	8.0	16.0
Change in call note issuance count, [t] through [t+20]	67464	1.2	9.6	-6.0	-2.0	0.0	0.0	1.0	6.0	12.0
Change in put note issuance count, [t] through [t+20]	67464	0.5	4.1	-2.0	-1.0	0.0	0.0	0.0	2.0	4.0
Change in issuance sum, EUR Million, [t] through [t+20]	67464	5337.6	616361.0	-53850.0	-14000.0	0.0	0.0	0.0	27090.0	86300.0
Change in call note issuance sum, EUR Million, [t] through [t+20]	67464	3921.1	613773.4	-48524.3	-12376.0	0.0	0.0	0.0	23237.1	75825.5
Change in put note issuance sum, EUR Million, [t] through [t+20]	67464	1416.6	44466.9	-5200.0	-3.0	0.0	0.0	0.0	2439.7	10700.0

Table 5A. Regressions of new note issuance on characteristics of underlying security.

Dependent variable: Year-over-year change in count of note issuance (next month vs. same month of previous year)						
Column	1	2	3	4	5	Note: impact of move from 25th to 75th percentile (based on coefficients in column 5)
Underlying security fixed effects	No	Yes	No	No	Yes	
Underlying index fixed effects	No	No	No	Yes	No	
Date fixed effects	No	No	Yes	Yes	Yes	
Independent variables: characteristics of underlying security:						
Excess return, [t-250] through [t-21]	0.0039 ***	0.0040 ***	0.0039 ***	0.0041 ***	0.0046 ***	0.1694
	(0.0009)	(0.0009)	(0.0009)	(0.0007)	(0.0009)	
EUR trading volume, [t-250] through [t-21]	0.0005 ***	0.0004 **	0.0004 **	0.0004 **	0.0003 *	0.0061
	(0.0001)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	
Daily return standard deviation, [t-250] to [t-21]	-0.5800 ***	-0.5973 ***	-0.2229 ***	-0.0953 **	0.2596 ***	0.3448
	(0.0381)	(0.0494)	(0.0428)	(0.0421)	(0.0639)	
Constant	3.0727 ***	3.1157 ***	2.2052 ***	1.4752 ***	-0.4380	
	(0.1040)	(0.1285)	(0.1132)	(0.1120)	(0.6301)	
N	67474	67474	67474	67474	67474	
R2	0.0036	0.0662	0.0575	0.096	0.1276	

Note. Monthly observations, by underlying security. Standard errors in parentheses. Stars denote statistical significance: *** < 1%; ** < 5%; * < 10%.

Table 5B. Regressions of new note issuance on characteristics of underlying security.

Dependent variable: Year-over-year change in count of 'call' note issuance (next month vs. same month of previous year)						
Column	1	2	3	4	5	Note: impact of move from 25th to 75th percentile (based on coefficients in column 5)
Underlying security fixed effects	No	Yes	No	No	Yes	
Underlying index fixed effects	No	No	No	Yes	No	
Date fixed effects	No	No	Yes	Yes	Yes	
Independent variables: characteristics of underlying security:						
Excess return, [t-250] through [t-21]	0.0029 ***	0.003 ***	0.0025 ***	0.0026 ***	0.0029 ***	0.1068
	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	
EUR trading volume, [t-250] through [t-21]	0.0003 **	0.0002 *	0.0003 **	0.0002 *	0.0002 *	0.0040
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	
Daily return standard deviation, [t-250] to [t-21]	-0.3981 ***	-0.4145 ***	-0.1551 ***	-0.0753 **	0.1449 ***	0.1925
	(0.0294)	(0.0384)	(0.0331)	(0.0328)	(0.0499)	
Constant	2.1522 ***	2.1922 ***	1.5669 ***	1.1079 ***	-0.2011	
	(0.0799)	(0.1000)	(0.0875)	(0.0873)	(0.4920)	
N	67474	67474	67474	67474	67474	
R2	0.0029	0.0561	0.0515	0.0747	0.1041	

Note. Monthly observations, by underlying security. Standard errors in parentheses. Stars denote statistical significance: *** < 1%; ** < 5%; * < 10%.

Table 5C. Regressions of new note issuance on characteristics of underlying security.

Dependent variable: Year-over-year change in count of 'put' note issuance (next month vs. same month of previous year)

Column	1	2	3	4	5	Note: impact of move from 25th to 75th percentile (based on coefficients in column 5)
Underlying security fixed effects	No	Yes	No	No	Yes	
Underlying index fixed effects	No	No	No	Yes	No	
Date fixed effects	No	No	Yes	Yes	Yes	
Independent variables: characteristics of underlying:						
Excess return, [t-250] through [t-21]	-0.0010 ***	-0.0010 ***	0.0014 ***	0.0015 ***	0.0017 ***	0.0626
	(0.0003)	(0.0003)	(0.0003)	(0.0003)	(0.0003)	
EUR trading volume, [t-250] through [t-21]	0.0002 ***	0.0001 **	0.0001 ***	0.0001 ***	0.0001 **	0.0022
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	
Daily return standard deviation, [t-250] to [t-21]	-0.1818 ***	-0.1829 ***	-0.0678 ***	-0.0199	0.1148 ***	0.1525
	(0.0126)	(0.0163)	(0.0142)	(0.0137)	(0.0210)	
Constant	0.9204 ***	0.9235 ***	0.6384 ***	0.3673 ***	-0.2369	
	(0.0344)	(0.0424)	(0.0374)	(0.0366)	(0.2073)	
N	67474	67474	67474	67474	67474	
R2	0.0032	0.0822	0.0617	0.1214	0.1409	

Note. Monthly observations, by underlying security. Standard errors in parentheses. Stars denote statistical significance: *** < 1%; ** < 5%; * < 10%.

Table 6A. Regressions of new note issuance on characteristics of underlying security.

Dependent variable: Year-over-year change in sum (EUR) of note issuance (next month vs. same month of previous year)						
Column	1	2	3	4	5	Note: impact of move from 25th to 75th percentile (based on coefficients in column 5)
Underlying security fixed effects	No	Yes	No	No	Yes	
Underlying index fixed effects	No	No	No	Yes	No	
Date fixed effects	No	No	Yes	Yes	Yes	
Independent variables: characteristics of underlying:						
Excess return, [t-250] through [t-21]	136.01 ***	144.73 ***	92.40 **	93.67 **	97.33 **	3583.98
	(43.64)	(45.36)	(43.98)	(43.99)	(45.75)	
EUR trading volume, [t-250] through [t-21]	-9.04	-8.44	-6.23	-6.33	-5.49	-110.84
	(8.03)	(8.32)	(7.96)	(7.96)	(8.24)	
Daily return standard deviation, [t-250] to [t-21]	-3798.72 **	-3428.69	-3017.49	-2727.53	-2400.46	-3188.53
	(1888.39)	(2534.57)	(2152.56)	(2158.69)	(3332.70)	
Constant	13317.89 **	12307.71 *	11824.28 **	10296.45 *	14684.06	
	(5132.03)	(6594.92)	(5689.88)	(5749.90)	(32887.50)	
N	67474	67474	67474	67474	67474	
R2	0.0002	0.0027	0.0252	0.0253	0.0277	

Note. Monthly observations, by underlying security. Standard errors in parentheses. Stars denote statistical significance: *** < 1%; ** < 5%; * < 10%.

Table 6B. Regressions of new note issuance on characteristics of underlying security.

Dependent variable: Year-over-year change in sum (EUR) of 'call' note issuance (next month vs. same month of previous year)						
Column	1	2	3	4	5	Note: impact of move from 25th to 75th percentile (based on coefficients in column 5)
Underlying security fixed effects	No	Yes	No	No	Yes	
Underlying index fixed effects	No	No	No	Yes	No	
Date fixed effects	No	No	Yes	Yes	Yes	
Independent variables: characteristics of underlying:						
Excess return, [t-250] through [t-21]	124.28 ***	133.48 ***	80.44 *	81.63 *	84.93 *	3127.38
	(43.46)	(45.18)	(43.79)	(43.80)	(45.56)	
EUR trading volume, [t-250] through [t-21]	-9.40	-8.85	-6.49	-6.59	-5.77	-116.49
	(8.00)	(8.28)	(7.92)	(7.93)	(8.20)	
Daily return standard deviation, [t-250] to [t-21]	-3002.04	-2509.24	-2852.32	-2684.03	-2965.34	-3938.86
	(1880.50)	(2524.53)	(2143.19)	(2149.31)	(3318.94)	
Constant	10099.55 **	8786.29	10142.65 *	9257.42 *	10546.95	
	(5110.57)	(6568.80)	(5665.12)	(5724.92)	(32751.76)	
N	67474	67474	67474	67474	67474	
R2	0.0002	0.0023	0.0255	0.0256	0.0276	

Note. Monthly observations, by underlying security. Standard errors in parentheses. Stars denote statistical significance: *** < 1%; ** < 5%; * < 10%.

Table 6C. Regressions of new note issuance on characteristics of underlying security.

Dependent variable: Year-over-year change in sum (EUR) of 'put' note issuance (next month vs. same month of previous year)

Column	1	2	3	4	5	Note: impact of move from 25th to 75th percentile (based on coefficients in column 5)
Underlying security fixed effects	No	Yes	No	No	Yes	
Underlying index fixed effects	No	No	No	Yes	No	
Date fixed effects	No	No	Yes	Yes	Yes	
Independent variables: characteristics of underlying:						
Excess return, [t-250] through [t-21]	11.73 ***	11.25 ***	11.96 ***	12.03 ***	12.40 ***	456.605
	(3.15)	(3.25)	(3.18)	(3.17)	(3.28)	
EUR trading volume, [t-250] through [t-21]	0.37	0.40	0.26	-0.26	0.28	5.653
	(0.58)	(0.60)	(0.58)	(0.57)	(0.59)	
Daily return standard deviation, [t-250] to [t-21]	-796.69 ***	-919.45 ***	-165.17	-43.51	564.88 **	750.330
	(136.21)	(181.56)	(155.51)	(155.68)	239.04	
Constant	3218.34 ***	3521.43 ***	1681.63 ***	1039.03 **	4137.11 *	
	(370.17)	(482.43)	(411.05)	(414.65)	(2358.86)	
N	67474	67474	67474	67474	67474	
R2	0.0006	0.0168	0.0226	0.0261	0.039	

Note. Monthly observations, by underlying security. Standard errors in parentheses. Stars denote statistical significance: *** < 1%; ** < 5%; * < 10%.

Table 7A. Performance of structured notes.

Sample	All warrants with price quotes	All warrants with price quotes	All warrants with price quotes and positive trading volume in current month	All warrants with price quotes and positive trading volume in current month	All warrants with price quotes and positive trading volume in current and previous month	All warrants with price quotes and positive trading volume in current and previous month
Time Period	2000m2-2008m6	2000m2-2008m6	2000m2-2008m6	2000m2-2008m6	2000m2-2008m6	2000m2-2008m6
N (months)	101	101	101	101	101	101
Constant	-0.82 **	-0.91 **	-1.49 ***	-1.61 ***	-1.50 ***	-1.62 ***
	(0.37)	(0.36)	(0.51)	(0.49)	(0.52)	(0.51)
DAX return[0]	0.35 ***	0.30 ***	0.61 ***	0.55 ***	0.63 ***	0.58 ***
	(0.09)	(0.08)	(0.12)	(0.12)	(0.12)	(0.12)
DAX return[-1]		0.16 *		0.25 **		0.24 **
		(0.08)		(0.12)		(0.12)
DAX return[-2]		-0.07		-0.07		-0.10
		(0.08)		(0.11)		(0.12)
DAX return[-3]		0.12		0.11		0.16
		(0.08)		(0.11)		(0.12)
NASDAQ return[0]	0.10	0.12 *	0.09	0.12	0.09	0.11
	(0.06)	(0.06)	(0.09)	(0.09)	(0.09)	(0.09)
NASDAQ return[-1]		-0.10		-0.17 **		-0.16 **
		(0.06)		(0.09)		(0.09)
NASDAQ return[-2]		0.15 **		0.17 **		0.16 **
		(0.06)		(0.08)		(0.09)
NASDAQ return[-3]		-0.15 **		-0.12		-0.15
		(0.06)		(0.08)		(0.09)
R2	0.37	0.48	0.45	0.52	0.45	0.51

Note. Performance measure based on performance of portfolio of warrants. Performance calculated monthly, based on value-weighting of the warrants in each month. Standard errors in parentheses. Stars denote statistical significance: *** < 1%; ** < 5%; * < 10%.

Table 7B. Performance of structured notes, broken down by type of underlying.

Sample	All warrants with price quotes	All warrants with price quotes	All warrants with price quotes and equity underlying	All warrants with price quotes and equity underlying	All warrants with price quotes and German equity underlying	All warrants with price quotes and German equity underlying
Time Period	2000m2-2008m6	2000m2-2008m6	2000m2-2008m6	2000m2-2008m6	2000m2-2008m6	2000m2-2008m6
N (months)	101	101	101	101	101	101
Constant	-0.82 **	-0.91 **	-1.61 ***	-1.68 ***	-0.87 **	-0.84 **
	(0.37)	(0.36)	(0.40)	(0.40)	(0.36)	(0.37)
DAX	0.35 ***	0.30 ***	0.95 ***	0.91 ***	1.15 ***	1.13 ***
return[0]	(0.09)	(0.08)	(0.09)	(0.09)	(0.08)	(0.09)
DAX		0.16 *		0.16 *		0.00
return[-1]		(0.08)		(0.09)		(0.09)
DAX		-0.07		-0.06		-0.06
return[-2]		(0.08)		(0.09)		(0.09)
DAX		0.12		0.09		0.02
return[-3]		(0.08)		(0.09)		(0.09)
NASDAQ	0.10	0.12 *	0.20 ***	0.22 ***	0.08	0.08
return[0]	(0.06)	(0.06)	(0.07)	(0.07)	(0.06)	(0.07)
NASDAQ		-0.10		-0.07		0.03
return[-1]		(0.06)		(0.07)		(0.06)
NASDAQ		0.15 **		0.08		0.07
return[-2]		(0.06)		(0.07)		(0.06)
NASDAQ		-0.15 **		-0.07		-0.04
return[-3]		(0.06)		(0.07)		(0.06)
R2	0.37	0.48	0.78	0.80	0.83	0.84

Note. Performance measure based on performance of portfolio of warrants. Performance calculated monthly, based on value-weighting of the warrants in each month. Standard errors in parentheses. Stars denote statistical significance: *** < 1%; ** < 5%; * < 10%.

Table 7C. Performance of structured notes, broken down by type of underlying and time period.

Sample	All warrants with price quotes	All warrants with price quotes	All warrants with price quotes and equity underlying	All warrants with price quotes and equity underlying	All warrants with price quotes and German equity underlying	All warrants with price quotes and German equity underlying
Time Period	2000m2-2004m12	2005m1-2008m6	2000m2-2004m12	2005m1-2008m6	2000m2-2004m12	2005m1-2008m6
N (months)	59	42	59	42	59	42
Constant	-1.72 ***	0.13	-2.59 ***	0.30	-1.16 **	0.20
	(0.55)	(0.34)	(0.64)	(0.36)	(0.59)	(0.30)
DAX return[0]	0.19 **	0.68 ***	0.92 ***	0.70 ***	1.21	0.73 ***
	(0.11)	(0.10)	(0.13)	(0.10)	(0.12)	(0.08)
DAX return[-1]	0.13	-0.01 *	0.14	0.07 *	-0.02	0.09
	(0.11)	(0.09)	(0.13)	(0.10)	(0.12)	(0.08)
DAX return[-2]	-0.09	-0.07	-0.11	-0.14	-0.09	-0.13
	(0.11)	(0.09)	(0.13)	(0.10)	(0.12)	(0.08)
DAX return[-3]	0.12	-0.05	0.06	-0.04	0.00	-0.02
	(0.11)	(0.10)	(0.13)	(0.10)	(0.12)	(0.08)
NASDAQ return[0]	0.13	0.12 *	0.22 **	0.18 **	0.08 ***	0.11
	(0.08)	(0.06)	(0.10)	(0.08)	(0.09)	(0.06)
NASDAQ return[-1]	-0.09	-0.10	-0.07	-0.03	0.04	-0.06
	(0.08)	(0.06)	(0.09)	(0.08)	(0.09)	(0.06)
NASDAQ return[-2]	0.16 **	0.15 **	0.11	0.10	0.10	0.05
	(0.08)	(0.06)	(0.09)	(0.09)	(0.08)	(0.07)
NASDAQ return[-3]	-0.13 *	-0.15 **	-0.04	0.00	-0.04	-0.02
	(0.08)	(0.06)	(0.09)	(0.09)	(0.08)	(0.07)
R2	0.41	0.86	0.80	0.80	0.85	0.90

Note. Performance measure based on performance of portfolio of warrants. Performance calculated monthly, based on value-weighting of the warrants in each month. Standard errors in parentheses. Stars denote statistical significance: *** < 1%; ** < 5%; * < 10%.

Table 7D. Performance of equity-based structured notes, by type of equity underlying.

Sample	All warrants with price quotes and US equity underlying	All warrants with price quotes and German equity underlying	All warrants with price quotes and British equity underlying	All warrants with price quotes and French equity underlying	All warrants with price quotes and Swiss equity underlying
Benchmark Return Index	NASDAQ	DAX	FTSE100	CAC	SMI
Time Period	2000m2-2008m6	2000m2-2008m6	2000m2-2008m6	2000m2-2008m6	2000m2-2008m6
N (months)	101	101	101	101	101
Constant	-1.52 **	-0.84 **	-5.29 ***	-2.85 ***	-1.42 ***
	(0.70)	(0.37)	(0.10)	(0.64)	(0.49)
Index return[0]	1.13 ***	1.13 ***	1.51 ***	0.87 ***	1.67 ***
	(0.08)	(0.09)	(0.27)	(0.12)	(0.12)
Index return[-1]	0.07	0.00	-0.50	-0.05 *	0.23 *
	(0.08)	(0.09)	(0.26)	(0.12)	(0.13)
Index return[-2]	0.06	-0.06	0.07	0.01	0.05
	(0.08)	(0.09)	(0.26)	(0.12)	(0.13)
Index return[-3]	-0.07	0.02	0.45	0.36 ***	0.08
	(0.08)	(0.09)	(0.26)	(0.12)	(0.12)
R2	0.66	0.84	0.28	0.39	0.69

Note. Performance measure based on performance of portfolio of warrants. Performance calculated monthly, based on value-weighting of the warrants in each month. Standard errors in parentheses. Stars denote statistical significance: *** < 1%; ** < 5%; * < 10%.

Table 7E. Performance of structured notes, by issuer.

Sample	All with price quotes	All with price quotes	All with price quotes	All with price quotes	All with price quotes	All with price quotes
Return indexes	NASDAQ, DAX	NASDAQ, DAX	NASDAQ, DAX	NASDAQ, DAX	NASDAQ, DAX	NASDAQ, DAX
Lags	0	0	0	0-3	0-3	0-3
Time Period	2000m2-2008m6	2000m2-2004m12	2005m1-2008m6	2000m2-2008m6	2000m2-2004m12	2005m1-2008m6
N (months)	101	59	42	101	59	42
Issuer			*coefficient on constant variable*			
ABN Amro	-0.50	-1.31 ***	0.27	-0.54	-1.32 ***	0.93
	(0.34)	(0.44)	(0.51)	(0.34)	(0.43)	(0.66)
BNP Paribas	-1.55 **	-3.18 ***	-0.16	-1.69 ***	-3.16 ***	0.36
	(0.60)	(0.91)	(0.38)	(0.59)	(0.92)	(0.49)
Citi	-0.79 *	-1.83 ***	-0.35	-0.86 *	-1.82 ***	-0.28
	(0.46)	(0.65)	(0.35)	(0.44)	(0.61)	(0.47)
Commerzbank	-0.52	-1.05	0.08	-0.62	-1.05	0.24
	(0.49)	(0.81)	(0.26)	(0.47)	(0.79)	(0.36)
Deutsche Bank	-0.50	-1.21 *	-0.23	-0.55	-1.20 **	-0.16
	(0.40)	(0.62)	(0.26)	(0.39)	(0.60)	(0.34)
Dresdner	-0.28	-0.81 *	-0.16	-0.32	-0.79 *	-0.05
	(0.32)	(0.44)	(0.40)	(0.30)	(0.40)	(0.54)
DZ Bank	0.04	-0.69	0.18	-0.03	-0.69	0.24
	(0.65)	(1.07)	(0.20)	(0.63)	(1.05)	(0.26)
Goldman Sachs	-2.78 ***	-4.24 ***	-1.49 **	-2.92 ***	-4.16 ***	-0.51
	(0.66)	(0.96)	(0.73)	(0.66)	(0.97)	(0.92)
HSBC Trinkaus &	0.14	0.04	-0.24	0.10	0.06	-0.43
Burkhardt	(0.40)	(0.63)	(0.38)	(0.41)	(0.64)	(0.53)
Lang & Schwarz	-0.59	-1.95	-2.79 ***	-0.81	-2.11 *	-3.07 ***
	(1.07)	(1.21)	(0.90)	(1.07)	(1.21)	(1.23)
Salomon	-1.56 ***	-2.82 ***	0.14	-1.51 ***	-2.80 ***	0.42
Oppenheimer	(0.55)	(0.87)	(0.37)	(0.56)	(0.89)	(0.51)
Soc Gen	-2.17 ***	-3.70 ***	-0.65	-2.30 ***	-3.63 ***	0.03
	(0.52)	(0.71)	(0.63)	(0.49)	(0.67)	(0.83)
UBS	-0.49 **	-0.96 ***	0.08	-0.52 **	-0.94 ***	0.14
	(0.22)	(0.33)	(0.16)	(0.21)	(0.34)	(0.23)
Unicredito	-5.67 ***	-7.50 ***	-3.28 ***	-6.08 ***	-7.36 ***	-3.37 ***
	(0.98)	(1.55)	(0.90)	(0.90)	(1.42)	(1.25)
Vontobel	-0.73	-2.16 ***	0.53	-0.90 *	-2.05 ***	0.71
	(0.53)	(0.68)	(0.74)	(0.52)	(0.68)	(0.98)

Note. Performance measure based on performance of portfolio of warrants. Performance calculated monthly, based on value-weighting of the warrants in each month. Standard errors in parentheses. Stars denote statistical significance: *** < 1%; ** < 5%; * < 10%.

Figure 1. Excerpt from SEC registration statement for final retail structured note issued by Lehman.

LEHMAN BROTHERS HOLDINGS INC.
$120,000
16.00% Reverse Exchangeable Notes Linked to the Common Stock of Visa Inc. (V)

Summary Description
The notes are designed for investors who seek a higher coupon rate than the current dividend yield on the Reference Stock or than the yield that we believe would be payable on a conventional debt security with the same maturity issued by us or an issuer with a comparable credit rating. Investors should be willing to forgo the potential to participate in appreciation in the Reference Stock, be willing to accept the risks of owning equities in general and the Reference Stock in particular, and be willing to lose some or all of their principal.

The notes do not guarantee any return of principal at maturity. Instead, the payment at maturity will be based on the Fina Share Price of the Reference Stock and whether the closing price of the Reference Stock is below the Trigger Price during the Monitoring Period, as described below.

Issuer:	Lehman Brothers Holdings Inc. (A/A2/A+)†
Issue Size:	$120,000
Pricing Date:	September 9, 2008
Settlement Date:	September 12, 2008
Observation Date:	December 9, 2008††
Maturity Date:	December 12, 2008††
Term:	3 months
Reference Stock:	The common stock of Visa Inc. (NYSE: V). See "The Reference Stock." The Reference Stock issuer may be changed in certain circumstances. See "Description of Notes—Anti-dilution Adjustments—Reorganization Events" in the accompanying product supplement no. 150-I for further information.
Coupon Rate:	16.00% per year paid monthly and calculated on a 30/360 basis.
Coupon Payment Date:	Monthly, on the 12th day of each month, starting on October 12, 2008 to, and including, the Maturity Date. If any Coupon Payment Date falls on a day that is not a business day, then any payment required be made on such Coupon Payment Date will instead be made on the next succeeding business day following such Coupon Payment Date, unless that day falls in the next calendar month, in which case th Coupon Payment Date will be the first preceding day that is a business day; provided, however, that the final coupon payment will be made with the Payment at Maturity.
Payment at Maturity:	The payment at maturity, in addition to accrued and unpaid coupon payments, is based on the performance of the Reference Stock. You will receive $1,000 for each $1,000 principal amount note plu any accrued and unpaid coupon payments at maturity *unless*: (i) the Final Share Price is less than the Initial Share Price; *and* (ii) a Trigger Event has occurred. If the conditions described in (i) and (ii) are both satisfied, at maturity you will receive, instead of the principal amount of your notes, the number of shares of the Reference Stock equal to the Physical Delivery Amount (or, at our election, the Cash Value thereof), plus any accrued and unpaid coupon payments. If we deliver shares of the Reference Stock, fractional shares will be paid in cash. **The market value of the Physical Delivery Amount (or, at our election, the Cash Value thereof) will be less than the principal amount of your notes and may be zero. Accordingly, you may lose some or all of your principal if you invest in the notes.**
Trigger Event:	A Trigger Event occurs if, on any trading day during the Monitoring Period, the closing price of the Reference Stock is below the Trigger Price.
Monitoring Period:	The period from, and including, the Pricing Date to, and including, the Observation Date.
Initial Share Price:	The closing price of the Reference Stock on the Pricing Date, which was $67.49, divided by the Stock Adjustment Factor.
Trigger Price:	A dollar amount that represents 80% of the then applicable Initial Share Price. The Trigger Price is initially $53.992.

Figure 2. Excerpt from SEC registration statement for LIAR notes.

JPMorganChase

Structured Investments

JPMorgan Chase & Co.
$9,225,000
Lesser Index Annual Review Notes Linked to the S&P 500® Index and the Dow Jones EURO STOXX 50® Index due October 1, 2010

General

- The notes are designed for investors who seek early exit prior to maturity at a premium if, on any one of the three annual Review Dates, both the S&P 500® Index and the Dow Jones EURO STOXX 50® Index are at or above their respective Call Levels applicable to that Review Date. If the notes are not called, investors are protected at maturity against up to a 10% decline of either Index or both Indices on the final Review Date but will lose some or all of their principal if either Index or both Indices decline by more than 10%. Investors in the notes should be willing to accept this risk of loss, and be willing to forgo interest and dividend payments, in exchange for the opportunity to receive a call premium payment if the notes are called.
- The first Review Date, and therefore the earliest call date, is September 29, 2008.
- Senior unsecured obligations of JPMorgan Chase & Co. maturing October 1, 2010†.
- Minimum denominations of $50,000 and integral multiples of $1,000 in excess thereof.
- The notes priced on September 19, 2007 and are expected to settle on or about September 24, 2007.

Key Terms

Indices:	The S&P 500® Index and the Dow Jones EURO STOXX 50® Index (each an "Index," and collectively, the "Indices").	
Automatic Call:	On any Review Date, if the Index closing level for each Index is greater than or equal to its respective Call Level, the notes will be automatically called for a cash payment per note that will vary depending on the applicable Review Date and call premium.	
Call Level:	**First Review Date**	**90% of the Initial Index Level for each Index**
	Second Review Date	**90% of the Initial Index Level for each Index**
	Final Review Date	100% of the Initial Index Level for each Index

Figure 3. All structured note portfolio return versus DAX index return, 2000-2008.

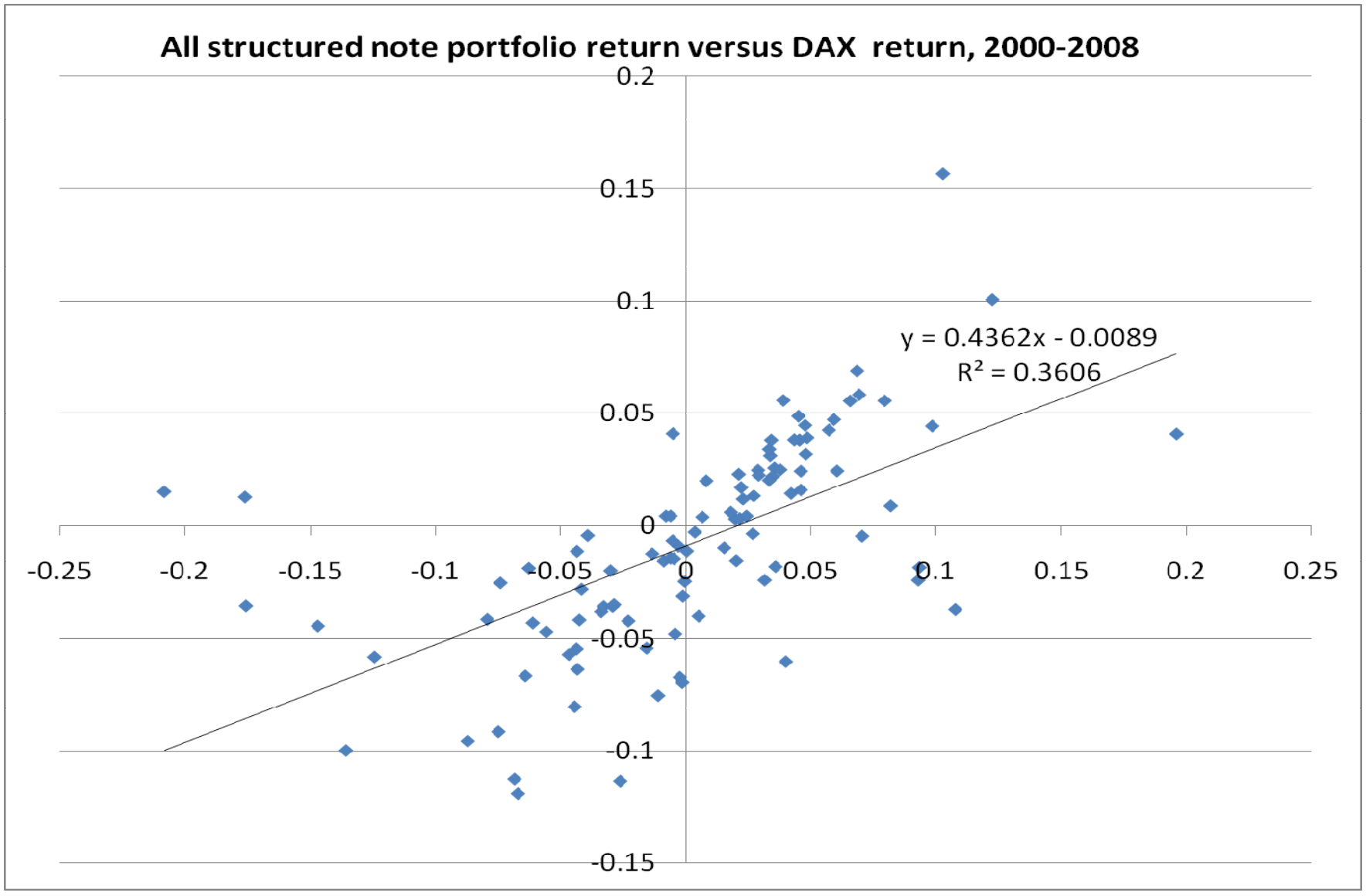

Figure 4. German individual equity-based structured note portfolio return vs. DAX return, 2000-2008.

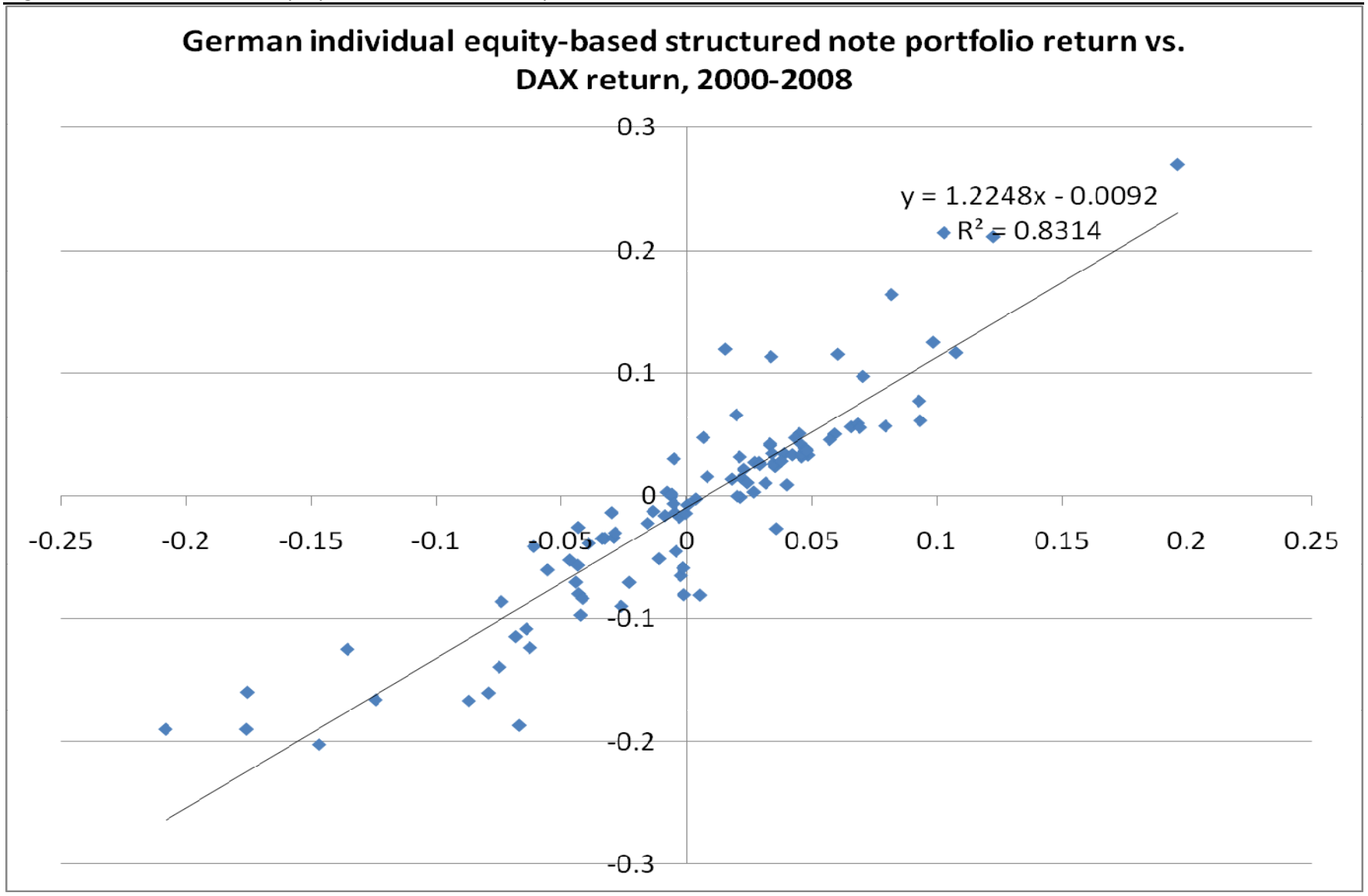

Figure 5. Return on structured notes with DAX index as underlying vs. return on DAX, 2000-2008.

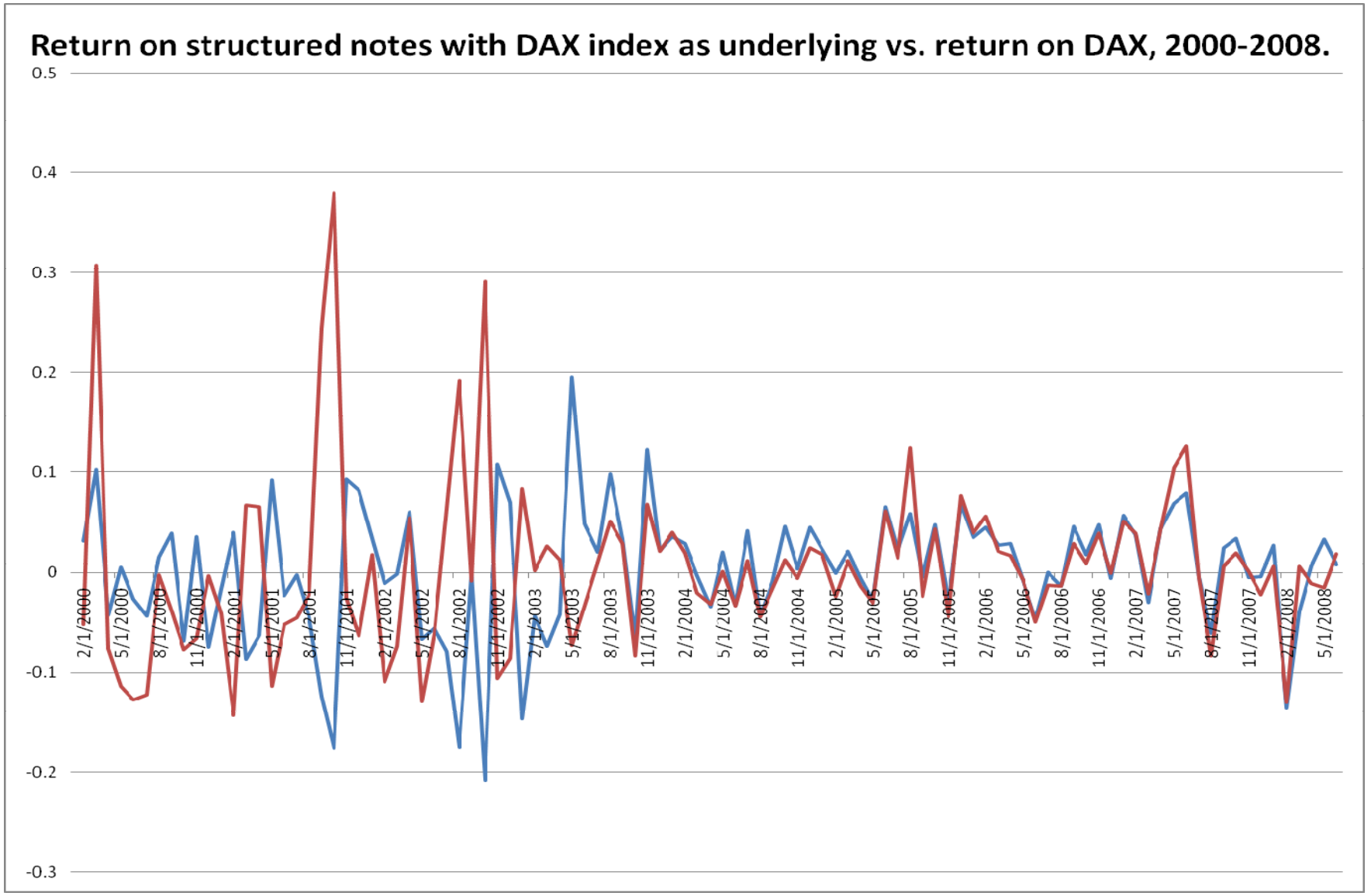

Figure 6. Issuer CDS 5-year spreads and structured note coupons, 2004-2008.

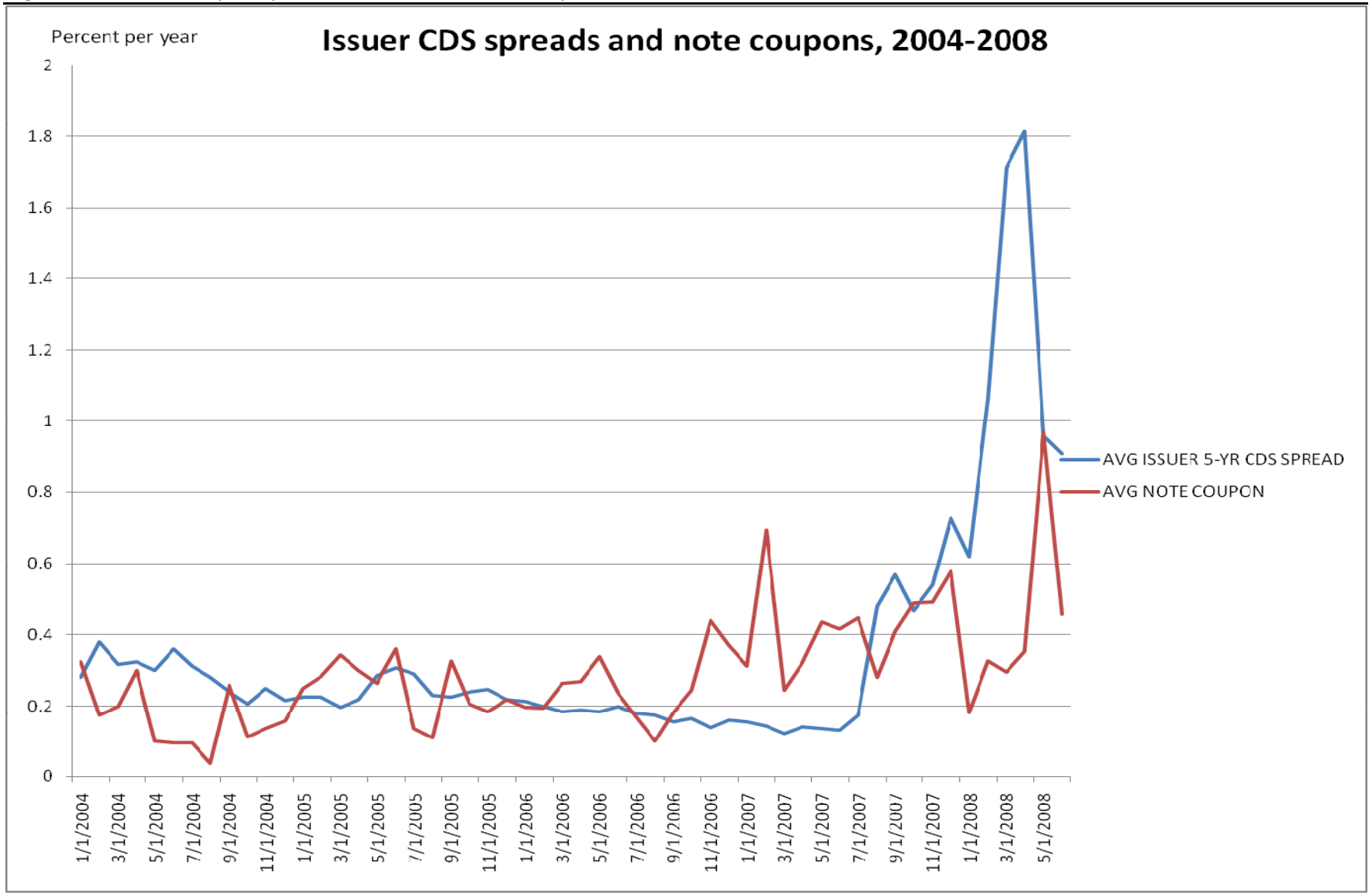

Figure 7. Performance of EW portfolio: 50% UltraBull NASDAQ 50% UltraBear NASDAQ