

Eurex Derivative Products in Alternative Investments: The Case for Managed Futures



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Abstract

This report provides an update on the potential benefits of incorporating Eurex futures contracts in CTA programs. In a previous report it was shown that incorporating Eurex futures contracts in trend-following programs would have improved the performance of CTAs employing those trading techniques over the period 1992-2002. This report covers the period 1992-2005. Results show that the Eurex futures contracts continue to provide the benefits illustrated in the previous report. Results also show that these strategies would have improved returns and lowered volatility for an investor holding a typical stock/bond portfolio. Although global equity indexes are highly correlated the returns from momentum strategies employed in these markets are surprisingly different. In particular, a 40% allocation to Eurex futures contracts would have resulted in similar volatility levels as an equity portfolio with a 200 basis point increase in annualized returns.

1. Introduction

The managed futures industry is comprised of professional money managers known as commodity trading advisors (CTAs) and commodity pool operators (CPOs) who manage client assets on a discretionary basis using global futures and options markets as an investment medium. Managed futures provide exposure to international financial and commodity sectors while offering – through their ability to easily take both long and short positions – a means to gain exposure to risk and return patterns not easily accessible through investment in traditional stock and bond portfolios or other alternative investment strategies such as hedge funds.

Academic research has shown that investments in managed futures strategies

- 1) reduce portfolio volatility risk,
- 2) enhance portfolio returns in economic environments in which traditional stock and bond investment media offer limited opportunities, and
- 3) participate in financial products and markets not available in traditional investor products.

The dominant trading strategy employed by CTAs is trend-following, a type of momentum strategy that seeks to identify and exploit longer-term trends in asset markets. Prior research has explored the use of momentum strategies in a number of traditional and alternative asset markets. Most of these studies find support for the use of momentum strategies in the absence of transactions costs, and many support their use after accounting for these costs. In a previous report (Schneeweis et.al [2003]) the performance of momentum strategies employing equity index and fixed income futures contracts traded on Eurex was explored. Results indicated that these strategies would have improved returns and lowered volatility for an investor holding a typical stock/bond portfolio. This report provides an update on the performance of momentum strategies employing contracts traded on Eurex. The performance of momentum strategies for futures contracts on the Dow Jones EURO STOXX 50 Index, the DAX Index, Euro Schatz, Euro Bobl, and Euro Bund are compared to the performance of similar strategies employed using other major equity index and fixed income futures contracts.

The paper is organized as follows: In the next section, we present an update of managed futures and the economic function of speculative capital in futures markets. Section 3 describes the data and methodology used in this study, while Section 4 presents findings as they relate to the performance of the futures contracts as an investment tool. Results show that Eurex products continue to provide investment benefits both for managed futures traders as a diversifier to other non-Eurex trading strategies and for long only stock and bond investors as an investment vehicle that provides enhanced risk and return benefits. Section 5 summarizes the results.

Managed Futures – An Overview

Among major alternative investment strategies, private equity, private debt and venture capital may be said to derive their returns from the same general source – economic growth – as stocks and bonds, albeit with a risk premium for illiquidity and informational costs. Similarly, hedge funds hold predominantly long positions in stocks or bonds and may likewise have a claim on economic growth. Long-only commodity investment may likewise link expected returns with economic growth, in that unexpected increases in demand may lead to increases in price until increased supplies or production can be raised. In addition, futures-based long-only commodity investments may capture returns related to convenience yields that result from the hedging activities of corporations.

Managed futures are unique among alternative investment strategies in that the markets they trade – futures and options markets – are zero-sum games; that is, total losses equal gains on any given day. However, this fact does not restrict certain managed futures strategies from offering positive expected rates of return. Traders who employ strategies that are designed to offer liquidity or other benefits to commercial users of these markets may generate income in exchange for providing these services. Spurgin (2000) describes a model in which commercial hedgers on one side of a market (e.g., oil producers) prefer to hedge their production before the hedgers on the other side of the market (e.g., airlines) choose to lock in the cost of their inputs. Under certain conditions, this creates a demand for speculative capital in the market to employ a momentum strategy that will be, on average, profitable. There are other explanations for the significant returns generated by CTAs over the past few decades. For example, the return to managed funds can stem from the ability of managers to exploit imperfections in the markets for futures as well as the markets for the underlying cash instruments. Behavioral research (Silber (1984), Shiller (2003)) also provides explanations for price trends. Research on traditional investment vehicles (e.g., stocks, bonds, and currency) indicates that investors may underreact to information and, consequently, price trends may result. Also, research has shown that the government intervention in interest rate and currency markets may result in trending currency and interest rate markets (Acar and Satchell (1998), Neely (1997)).

Data and Methodology

The methodologies used in the report are similar to those used in the previous report. Trend-following and long-only returns were computed for a number of futures contracts in four major market segments: Currencies, interest rates, physical commodities, and equity indexes. Daily returns are computed from January 1, 1992 to December 31, 2005, a total of fourteen years of trading history. We also construct indexes representing the performance of each segment. The trend-following trading strategy is described in Spurgin (1999). The trading model employed in the index is quite simple: If the total return to the futures contract over the prior x days is positive, then the trading signal will be long. Otherwise, it will be short. Three different versions of this model are simultaneously traded for each futures contract, and the results are averaged to give the daily index return. The parameters for the three models are 15, 27, and 55 days. The same parameters are used for each futures contract. For more information about the trading model, their historical performances, and the index construction methodology, please refer to the appendix.

In each market, the strategy holds positions in the two nearest-to-maturity contracts. The allocations to the two contracts are changed daily to maintain a constant weighted average time-to-maturity in each market. The market segment indexes follow the methodology in Spurgin et al. (2000). The market indexes use historic volatility to determine allocation to each futures market. The strategy allocates equal dollar risk to each market in the index. Index weights are revised daily. Formulas for estimating volatility and for computing the notional investment in each futures contract are given in the Spurgin et al. (2000) article.

The trend-following futures indexes are:

- Currency Index (three contracts): Euro (CME), Japanese Yen (CME), and British Pounds (CME).
- Global Fixed Income (three contracts): Treasury Bonds (CBOT), Eurodollar (CME), and Euro Bunds (Eurex).
- Physical Commodity Index (five contracts): Crude Oil (NYMEX), Natural Gas (NYMEX), Gold (COMEX), Copper (COMEX), and Corn (CBOT).
- Global Equity Index (three contracts): S&P 500 (CME), FTSE 100 (LIFFE), and Nikkei 225 (OSX).

Two Eurex trend-following indexes are also constructed using the same trading model. Data was not available for two of these contracts (Euro Schatz and Dow Jones EURO STOXX 50) for the full time period of 1992-2005. For the full period 1992-2005, the Eurex Fixed Income Index contains Euro Bund and Euro Bobl and the Eurex Equity Index contains only the DAX. For the second time period, 2000-2005, the Fixed Income index contains three contracts and the equity index includes two contracts.

- Eurex Fixed Income (three contracts): Euro Bund, Euro Bobl, and Euro Schatz
- Eurex Equity Index (two contracts): DAX and Dow Jones EURO STOXX 50

The data for equity and fixed income indexes and futures contracts were obtained from Datastream and Bloomberg.

Results and Discussion

Analytical tests on the benefits of using Eurex futures contracts in trend-following trading strategies are conducted using a number of different metrics. First, we show the performance of trend-following and long-only strategies for a number of stock index and fixed income futures contracts. We then show the performance of these contracts during rising, falling, and consolidating markets. Next, the trading performance of commodity, fixed income, equity index, and currency indexes are presented. We also show the performance of a broad-based CTA index and the performance of traditional equity and bond indexes. The asset allocation decision is analyzed from a number of different perspectives: efficient frontiers for combining these contracts with traditional assets and broad based CTA portfolios, performance during market extremes and correlation analysis.

Descriptive Statistics for Trend-following and Long-Only Returns

As shown in Exhibits 1A and 1B, employing a trend-following model in financial futures contracts significantly alters the properties of the return series. For example, while the trend-following returns to most of the fixed income futures contracts are of similar magnitude to long-only returns, the correlation of the trend-following strategies with Treasury (TSY) Bonds is much lower than long-only. Thus, as a portfolio asset, the trend-following strategy offers greater diversification.

The returns for equity index futures are less consistent than the fixed income returns. Spurgin [2000] discusses the sources of returns to managed futures and why certain sectors are more conducive to this strategy than others. Trend-following returns for the DAX and Nikkei 225 are much higher than the long-only returns, while trend-following returns for the FTSE 100 and S&P 500 are lower than long-only. For the 2000-2005 period, the trend-following returns for all five equity indexes were higher than the long-only returns. The annual difference was most pronounced for the DAX (18.6%) and Nikkei 225 (8.4%).

Performance of Trend-Following vs. Buy-and-Hold for Commodity and Financial Futures Contracts

Exhibit 1A: January 1992 - December 2005

	Long Only				Trend-Following				Difference	
	Annualized Return	Standard Deviation	Correlation S&P 500	Correlation TBond	Annualized Return	Standard Deviation	Correlation S&P 500	Correlation TBond	Annualized Return	Standard Deviation
FTSE 100	5.2%	14.5%	73.5%	-9.6%	-1.0%	12.1%	-16.3%	13.6%	-6.2%	-2.4%
Nikkei 225	-1.7%	21.6%	40.1%	-2.2%	7.4%	16.7%	-17.4%	-3.5%	9.1%	-4.9%
S&P 500	7.8%	14.2%	100.0%	-4.2%	-0.2%	12.3%	-5.8%	20.8%	-8.0%	-2.0%
DAX	6.0%	22.6%	70.0%	-18.4%	12.5%	18.1%	-21.3%	12.3%	6.6%	-4.4%
									Difference	
	Annualized Return	Standard Deviation	Correlation S&P 500	Correlation TBond	Annualized Return	Standard Deviation	Correlation S&P 500	Correlation TBond	Annualized Return	Standard Deviation
TBond	8.3%	8.9%	-4.2%	100.0%	4.1%	7.6%	-3.8%	30.2%	-4.2%	-1.3%
Bund	8.0%	5.0%	-4.2%	69.1%	7.0%	4.0%	-2.3%	32.1%	-1.0%	-0.9%
EDollar	5.3%	1.8%	0.5%	38.0%	5.3%	1.7%	-3.6%	7.7%	0.0%	0.0%
Bobl	7.4%	3.3%	-9.5%	65.9%	6.2%	2.9%	-9.6%	29.1%	-1.2%	-0.4%

Exhibit 1B: January 2000 - December 2005

	Long Only				Trend-Following				Difference	
	Annualized Return	Standard Deviation	Correlation S&P 500	Correlation TBond	Annualized Return	Standard Deviation	Correlation S&P 500	Correlation TBond	Annualized Return	Standard Deviation
FTSE 100	-4.4%	14.9%	86.5%	-25.7%	-4.2%	13.3%	-35.9%	10.2%	0.3%	-1.6%
Nikkei 225	-1.7%	19.8%	48.3%	-10.2%	6.7%	16.0%	-16.4%	-9.2%	8.4%	-3.8%
S&P 500	-4.1%	15.6%	100.0%	-28.2%	-3.0%	12.9%	-22.2%	16.1%	1.1%	-2.7%
DAX	-7.9%	25.5%	79.8%	-39.4%	10.7%	20.1%	-41.2%	2.0%	18.6%	-5.3%
DJ EURO STOXX 50	-7.0%	20.4%	80.5%	-34.4%	-6.5%	17.5%	-33.4%	16.9%	0.5%	-2.9%
									Difference	
	Annualized Return	Standard Deviation	Correlation S&P 500	Correlation TBond	Annualized Return	Standard Deviation	Correlation S&P 500	Correlation TBond	Annualized Return	Standard Deviation
TBond	9.6%	9.9%	-28.2%	100.0%	2.0%	8.3%	-12.7%	28.3%	-7.6%	-1.7%
Bund	7.4%	4.6%	-31.1%	81.2%	5.1%	4.0%	-15.4%	35.6%	-2.3%	-0.7%
EDollar	5.1%	1.9%	-18.7%	8.4%	4.9%	2.0%	-15.9%	-9.1%	-0.2%	0.2%
Bobl	6.9%	3.4%	-38.4%	80.3%	4.4%	3.1%	-21.3%	38.1%	-2.6%	-0.3%
Schatz	4.9%	1.6%	-38.3%	71.4%	3.9%	1.5%	-32.4%	36.4%	-1.0%	-0.2%

Returns During Rising, Falling, and Consolidating Markets

Simple trend-following models cannot capture all of the details of trading a particular contract. However, it is generally the case that a trend-following model will succeed best in markets where prices generally keep rising once they are above their recent range, and keep falling when they are below their recent range. To test this hypothesis, we studied the returns of each futures contract in relation to three reference points. Following the approach of Spurgin (2001), if the current futures price was higher than the prices of 15, 27, and 55 days prior, then the contract was considered “above the recent range”. If the current price was below all three reference prices, it was defined as “below the recent range”. If the current price was above at least one reference price and below at least one reference price, that day was defined as “within the recent range”.

As shown in Exhibit 2A, the DAX provides the best returns in both rising markets and falling markets. The number of days in consolidating markets was also lowest for the DAX at 38.1%. In contrast the S&P 500 and FTSE 100 contracts had much lower returns in both rising markets as well as falling markets. This helps to explain why the trend-following results for the S&P 500 and FTSE 100 were so low, while the DAX and Nikkei 225 had positive returns in Exhibit 1A.

Exhibit 2B presents returns for fixed income contracts. Although the Treasury Bond and Eurodollar futures contracts have higher returns in both rising and falling markets, the Euro Bobl and Euro Bund contracts have much higher returns in consolidating markets. This is an important feature since all four contracts were in consolidating markets for similar periods of time. It also helps to explain why annualized returns for all four contracts were much closer to each other than for the equity contracts.

Exhibits 2C and 2D present the same analyses for the period 2000-2005. The returns to the Dow Jones EURO STOXX 50 Index contract were much higher than for the S&P 500 and FTSE 100 in falling markets but were similar in rising markets. This is an important feature since the S&P 500 had negative returns in three (2000, 2001, 2002) years and mediocre returns in another (2005).

Exhibit 2A: Comparison of Equity Index Futures Returns 1992-2005

	Price Below Recent Range			Price Within Recent Range			Price Above Recent Range		
	Average Return	Standard Deviation	Days	Average Return	Standard Deviation	Days	Average Return	Standard Deviation	Days
FTSE 100	35.0%	22.2%	22.9%	-54.9%	10.0%	39.6%	26.6%	11.7%	37.5%
Nikkei 225	51.3%	24.5%	32.1%	-62.4%	12.2%	39.6%	46.8%	16.5%	28.3%
S&P 500	31.9%	23.1%	20.5%	-51.3%	10.5%	40.1%	28.2%	10.7%	39.3%
DAX	66.5%	30.1%	22.0%	-65.0%	12.2%	38.1%	49.9%	15.2%	39.9%

Exhibit 2B: Comparison of Fixed Income Futures Returns 1992-2005

	Price Below Recent Range			Price Within Recent Range			Price Above Recent Range		
	Average Return	Standard Deviation	Days	Average Return	Standard Deviation	Days	Average Return	Standard Deviation	Days
Treasury Bond	18.1%	9.0%	21.4%	-31.8%	5.5%	37.9%	21.5%	7.8%	40.7%
Bund	8.9%	5.6%	18.0%	-14.4%	3.2%	36.4%	14.7%	4.1%	45.6%
Eurodollar	70.7%	25.5%	40.9%	-48.4%	13.4%	35.4%	35.2%	18.0%	23.7%
Bobl	3.1%	5.1%	18.6%	-9.5%	1.9%	34.7%	9.9%	2.8%	46.7%

Exhibit 2C: Comparison of Equity Index Futures Returns 2000-2005

	Price Below Recent Range			Price Within Recent Range			Price Above Recent Range		
	Average Return	Standard Deviation	Days	Average Return	Standard Deviation	Days	Average Return	Standard Deviation	Days
FTSE 100	41.3%	25.0%	26.7%	-50.9%	9.3%	44.0%	19.1%	10.0%	29.3%
Nikkei 225	42.5%	23.8%	32.2%	-63.7%	11.8%	38.2%	54.0%	16.0%	29.6%
S&P 500	36.8%	23.9%	30.1%	-57.0%	12.9%	40.3%	25.0%	10.6%	29.6%
DJ EURO STOXX 50	71.3%	33.8%	26.7%	-83.9%	15.3%	40.2%	22.9%	15.4%	33.1%
DAX	77.1%	33.1%	27.8%	-66.0%	12.9%	39.6%	43.8%	16.9%	32.7%

Exhibit 2D: Comparison of Fixed Income Futures Returns 2000-2005

	Price Below Recent Range			Price Within Recent Range			Price Above Recent Range		
	Average Return	Standard Deviation	Days	Average Return	Standard Deviation	Days	Average Return	Standard Deviation	Days
Treasury Bond	18.6%	9.5%	16.5%	-34.4%	6.1%	39.1%	22.4%	8.4%	44.4%
German Bund	6.8%	4.2%	16.7%	-15.2%	3.2%	36.9%	14.5%	4.0%	46.4%
Eurodollar	90.7%	32.4%	46.6%	-66.7%	18.6%	31.1%	45.4%	20.5%	22.2%
Bobl	-1.2%	6.5%	17.1%	-10.8%	2.2%	36.7%	10.3%	3.0%	46.1%
Schatz	0.2%	3.0%	16.4%	-4.1%	0.9%	38.5%	4.7%	1.6%	45.1%

Risk-Adjusted Performance and Portfolio Returns

Investment theory has shown that assets should be compared on a risk-adjusted basis, and that the potential benefit of adding an asset to an existing portfolio may be measured by an asset's ability to improve a portfolio's Sharpe ratio. Results in Exhibit 3 show that, over the past fourteen years (1992-2005), investment in a diversified portfolio of commodity trading advisors (CISDM CTA USD) provides stand-alone risk and return benefits generally similar to or better than existing U.S. and world stock and bond investments. The Sharpe ratios are as follows: CISDM CTA USD (0.60), S&P 500 (0.47), Lehman Brothers Government/Credit bond index (0.67). For the trend-following indexes, the Global Fixed Income (0.93), Eurex Fixed Income (0.86) and Physical Commodities (0.59) had the best risk-adjusted performance.

Exhibit 4 shows the performance of portfolios with various combinations of assets. When a 20% allocation of the Eurex Equity Index is added to a portfolio of stocks and bonds (Portfolio I) the Sharpe ratio increases to 0.89 from 0.62. When a 20% allocation of the Eurex Fixed Income Index is added to a portfolio of stocks and bonds the Sharpe ratio increases to 0.71 from 0.62. The benefits of adding the Eurex Equity and Fixed Income indexes to a broad based CTA portfolio are demonstrated as well. A 50-50 allocation to the CISDM CTA Asset Weighted Index and Eurex Equity Index (Portfolio V) increases the Sharpe ratio to 0.66 compared to 0.60 of the CISDM CTA Asset Weighted Index. A 50-50 allocation to the CISDM CTA Asset Weighted Index and Eurex Fixed Income Index (Portfolio VI) increases the Sharpe ratio to 0.77 compared to 0.60 of the CISDM CTA Asset Weighted Index. Finally Portfolio VII (40% CISDM CTA Asset Weighted Index, 30% Eurex Equity Index and 30% Eurex Fixed Income Index) has a Sharpe ratio of 0.77. This demonstrates a clear benefit of including Eurex Equity Index and Fixed Income contracts to broad based CTA portfolios.

Exhibits 5 and 6 display the efficient frontiers when the Eurex Equity Index is added to a portfolio of stocks and bonds and a broad based portfolio of CTAs. A 40% allocation to the Eurex Equity Index in a portfolio of stocks and bonds results in a slight decrease in volatility with almost 200 basis points increase in annual returns. A 20% allocation to the Eurex Equity Index in a broad based portfolio of CTAs results in a slight increase in volatility with almost 100 basis points increase in annual returns.

Exhibit 3: Descriptive Statistics of Index Performance 1992 - 2005

	Annualized Return	Standard Deviation	Minimum Monthly Return	Maximum Monthly Return	Return/Standard Deviation	Sharpe Ratio	Correlation with S&P 500
Traditional Assets							
S&P 500 Total Return Index	10.3%	13.9%	-14.5%	9.8%	0.74	0.47	1.00
Lehman U.S. Government/Credit Index	6.8%	4.4%	-4.2%	4.2%	1.52	0.67	0.03
US Treasury Bills	3.8%	5.6%	0.8%	6.4%	0.67	0.00	0.08
Managed Futures							
CISDM CTA Asset Weighted Index	9.1%	8.9%	-5.6%	8.2%	1.02	0.60	-0.07
Global Equity Index	3.1%	9.3%	-6.0%	12.9%	0.33	-0.08	-0.21
Global Fixed Income Index	9.0%	5.5%	-3.9%	6.1%	1.65	0.95	-0.12
Physical Commodity Index	9.7%	8.0%	-6.1%	7.1%	1.21	0.74	-0.09
Currency Index	5.7%	5.3%	-3.1%	5.4%	1.06	0.35	-0.06
Eurex Managed Futures							
Eurex Equity Index	12.6%	18.2%	-11.1%	21.8%	0.69	0.48	-0.21
Eurex Fixed Income Index	6.7%	3.3%	-1.9%	3.1%	2.01	0.86	-0.06

Exhibit 4: Descriptive Statistics of Portfolio Performance 1992 - 2005

	Annualized Return	Standard Deviation	Minimum Monthly Return	Maximum Monthly Return	Return/Standard Deviation	Sharpe Ratio	Correlation with S&P 500
Portfolio I	9.1%	8.6%	-7.9%	6.4%	1.07	0.62	0.98
Portfolio II	10.2%	7.2%	-4.1%	8.1%	1.42	0.89	0.83
Portfolio III	8.7%	6.9%	-5.7%	5.5%	1.26	0.71	0.97
Portfolio IV	10.0%	9.5%	-6.3%	12.0%	1.05	0.65	-0.21
Portfolio V	11.2%	11.3%	-6.8%	11.9%	1.00	0.66	-0.19
Portfolio VI	8.0%	5.4%	-3.5%	5.2%	1.47	0.77	-0.07
Portfolio VII	9.8%	7.8%	-4.8%	8.0%	1.26	0.77	-0.18

Portfolio I: 60% S&P 500, 40% Lehman Govt/Credit

Portfolio II: 80% Portfolio I, 20% Eurex Equity Index

Portfolio III: 80% Portfolio I, 20% Eurex Fixed Income Index

Portfolio IV: 50% Eurex Equity Index, 50% Eurex Fixed Income Index

Portfolio V: 50% CISDM CTA Asset Weighted Index, 50% Eurex Equity Index

Portfolio VI: 50% CISDM CTA Asset Weighted Index, 50% Eurex Fixed Income Index

Portfolio VII: 40% CISDM CTA Asset Weighted Index, 30% Eurex Equity Index, 30% Eurex Fixed Income Index

Exhibit 5: Risk and Return Levels of Stock-Bond Portfolios and Eurex Equity Index 1992-2005

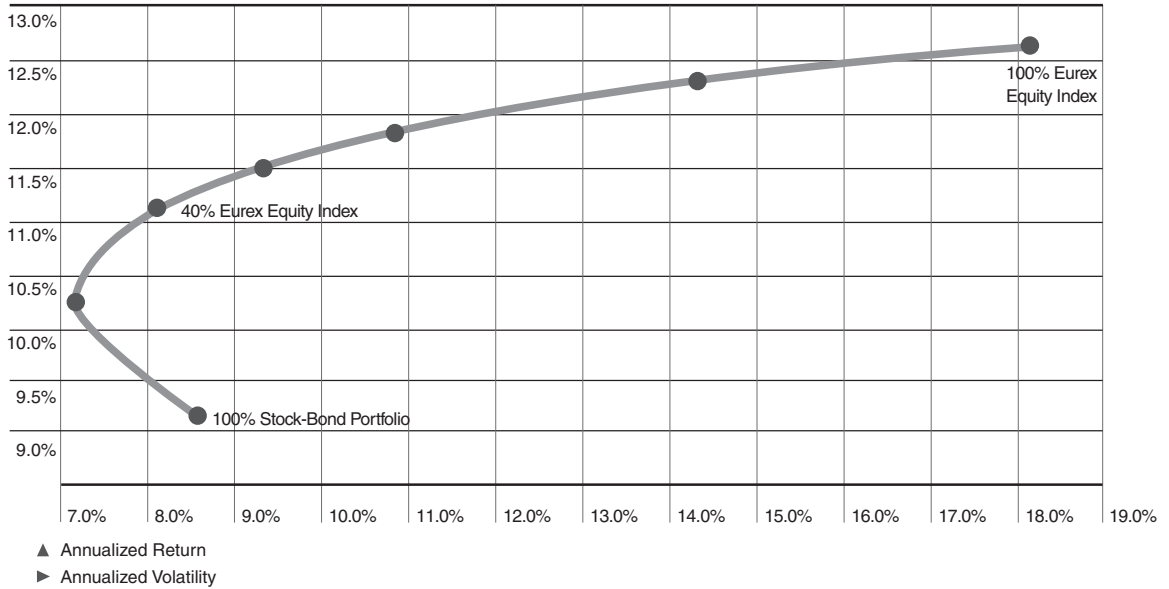
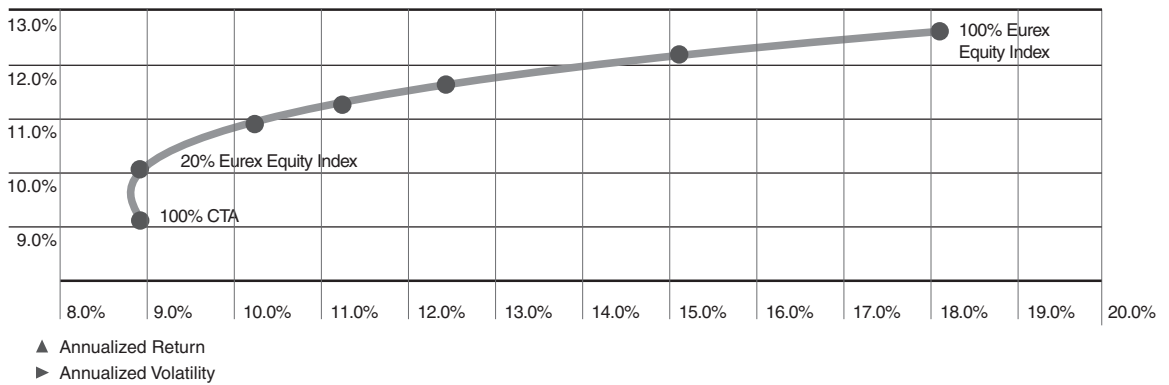


Exhibit 6: Risk and Return Levels of CTA Portfolios and Eurex Equity Index 1992-2005



Euro-Denominated Portfolio Performance

In Exhibits 3-6, the results were presented in terms of a USD-based investor. In Exhibits 7-10, results are presented in terms of a Euro-based investor. Results in Exhibit 7 show that trend-following strategies would have obtained positive Sharpe ratios as stand-alone investments. The one exception to this is the global equity index.

Exhibit 8 shows the performance of various Euro-denominated portfolios. When the Eurex Equity Index is added to a European stock and bond portfolio the annualized return increased to 11.3%. The Sharpe ratio increased from 0.68 to 0.9 when the Eurex Equity Index is added to a stock and bond portfolio. Similarly the Sharpe ratio increased from 0.68 to 0.77 when the Eurex Fixed Income Index is added to a stock and bond portfolio.

Similarly when the Eurex Equity Index is added to a CTA portfolio the annualized return increased to 11.2% from 9.0%. This illustrates that the Eurex Equity Index would be a beneficial addition to CTA portfolios. The Sharpe ratio increased from 0.58 to 0.66 when the Eurex Equity Index is added to the CTA portfolio. When the Eurex Fixed Income Index is added to the CTA portfolio the Sharpe ratio increased to 0.76. This shows that Eurex Equity Index and Fixed Income Futures would be beneficial to investors with stock and bond portfolios and CTAs employing trend following strategies.

Exhibits 9A and B display the efficient frontiers when the Eurex Equity Index is added to stock and bond portfolios and CTA portfolios respectively. From the perspective of a European investor a 40% allocation to the Eurex Equity Index in a stock and bond portfolio would increase the annualized return by more than 100 basis points with only a slight increase in volatility. Similarly a 20% allocation to the Eurex Equity Index in a CTA portfolio would increase annualized returns by almost 100 basis points with only a slight increase in volatility.

Exhibit 7: Descriptive Statistics of Index Performance 1992-2005

	Annualized Return	Standard Deviation	Minimum Monthly Return	Maximum Monthly Return	Return/Standard Deviation	Sharpe Ratio	Correlation with S&P 500
Traditional Assets							
DJ EURO STOXX 50	11.3%	15.7%	-14.1%	11.0%	0.72	0.47	1.00
Lehman Pan-European Aggregate	5.2%	3.6%	-2.4%	3.4%	1.45	0.37	0.10
European Risk Free Rate	3.9%	4.8%	1.3%	6.3%	0.81	0.00	0.09
Managed Futures							
Global Currency Index	5.7%	5.3%	-3.2%	5.6%	1.07	0.35	-0.09
Global Interest Rate Index	9.0%	5.4%	-3.9%	6.1%	1.65	0.94	-0.21
Global Physical Index	9.7%	8.0%	-6.0%	7.0%	1.22	0.73	-0.03
Global Equity Index	3.1%	9.2%	-6.1%	12.8%	0.33	-0.08	-0.20
Eurex							
Eurex Equity Index	12.6%	18.1%	-11.2%	21.6%	0.70	0.48	-0.12
Eurex Fixed Income Index	6.7%	3.3%	-1.9%	3.0%	2.03	0.86	-0.13

Exhibit 8: Descriptive Statistics of Portfolio Performance 1992 - 2005

	Annualized Return	Standard Deviation	Minimum Monthly Return	Maximum Monthly Return	Return/Standard Deviation	Sharpe Ratio	Correlation with S&P 500
Portfolio I	10.4%	9.7%	-7.7%	6.7%	1.08	0.68	0.99
Portfolio II	11.3%	8.2%	-6.0%	8.9%	1.37	0.90	0.88
Portfolio III	9.8%	7.7%	-5.7%	5.3%	1.27	0.77	0.98
Portfolio IV	9.0%	8.9%	-5.9%	8.0%	1.01	0.58	-0.12
Portfolio V	11.2%	11.2%	-6.8%	11.8%	1.00	0.65	-0.14
Portfolio VI	7.9%	5.4%	-3.5%	5.0%	1.48	0.76	-0.14

Portfolio I: 60% Stocks, 40% Bonds

Portfolio II: 80% Portfolio I, 20% Eurex Equity Index

Portfolio III: 80% Portfolio I; 20% Eurex Fixed Income Index

Portfolio IV: CISDM CTA Asset Weighted Index

Portfolio V: 50% Portfolio IV, 50% Eurex Equity Index

Portfolio VI: 50% Portfolio IV, 50% Eurex Fixed Income Index

Exhibit 9A: Risk and Return Levels of Stock-Bond Portfolios and Eurex Equity Index 1992-2005

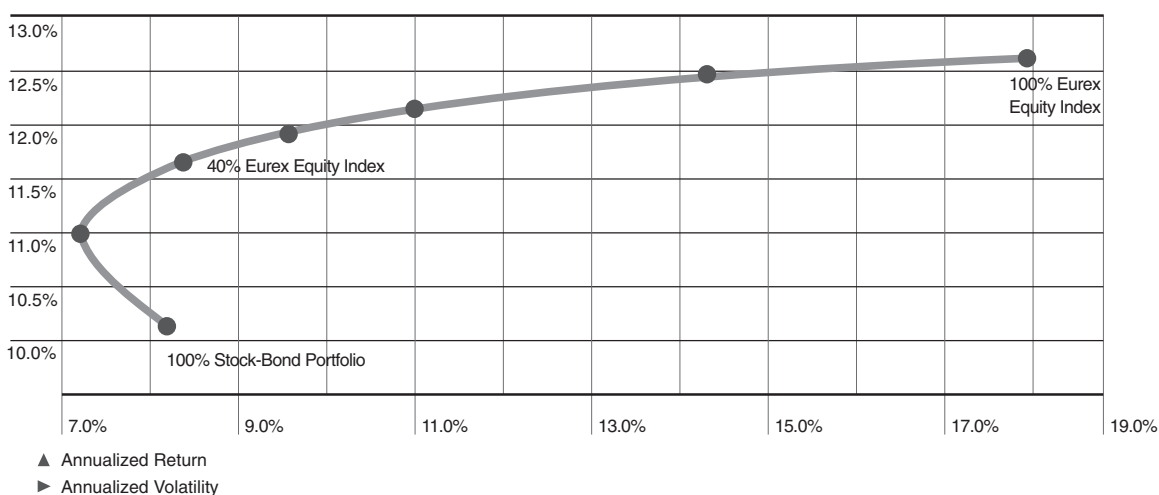


Exhibit 9B: Risk and Return Levels of CTA Portfolios and Eurex Equity Index 1992-2005

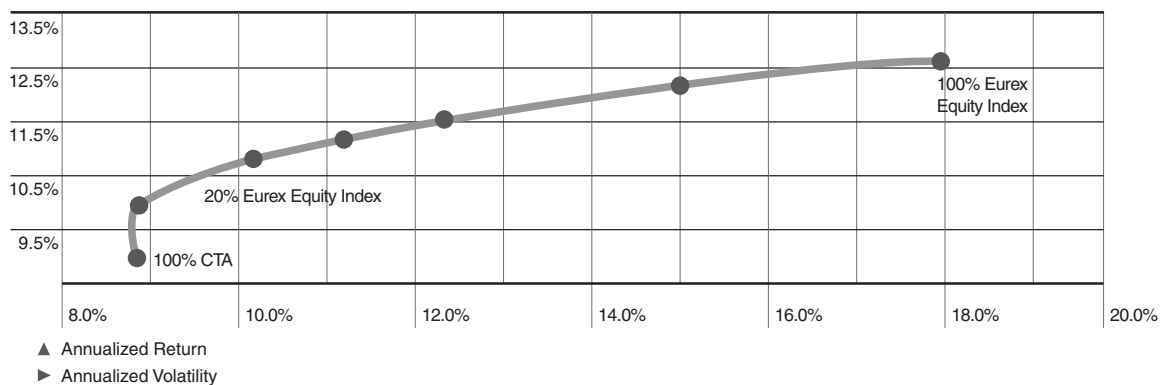


Exhibit 10: Correlations 1992-2005

	DJ EURO STOXX 50	Lehman Pan- European	TBILL	CISDM CTA AW Index	Global Equity Index	Global Fixed Income Index	Physical Commodity Index	Currency Index	Eurex Equity Index	Eurex Fixed Income Index
DJ EURO STOXX 50	1.00									
Lehman Pan- European Aggregate	0.07	1.00								
TBILL	0.09	0.05	1.00							
CISDM CTA Asset Weighted Index	-0.13	0.30	0.00	1.00						
Global Equity Index	-0.22	0.19	0.05	0.23	1.00					
Global Fixed Income Index	-0.22	0.27	0.09	0.45	0.25	1.00				
Physical Com- modity Index	-0.04	0.11	0.14	0.29	0.18	-0.04	1.00			
Currency Index	-0.10	0.11	0.10	0.57	0.01	0.03	0.07	1.00		
Eurex Equity Index	-0.12	0.14	-0.06	0.30	0.54	0.31	0.02	0.09	1.00	
Eurex Fixed Income Index	-0.13	0.37	0.10	0.44	0.18	0.69	0.15	0.05	0.19	1.00

The basis for these results is due primarily to the correlation among the various trend following futures programs and between those programs and traditional long-only investments. As shown in Exhibit 10, the correlation between the Dow Jones EURO STOXX 50 Index and each of the futures-based trading programs was negative. Likewise the correlation between the Lehman Pan-European Aggregate Index and each of the various futures-based programs is low. Similarly, the correlation between the two Eurex trend-following programs and other trend-following programs indicate the potential risk reduction from combining Eurex-based trend-following trades. Exhibit 10 also shows the diversification benefits of adding the two Eurex-based contracts if both are traded with a trend-following system (e.g. correlation of 0.19).

Performance of Trend-following Strategies During Market Extremes

Academic research (CISDM, 2005) has shown that certain managed futures strategies tend to have positive returns when equity markets have large negative returns. In Exhibit 11A, the average monthly return of the S&P 500, Eurex Equity Index, and Eurex Fixed Income are arranged into four groups of 42 months based on the returns of the S&P 500. Group 1 is the average of the worst 42 months of returns while Group 4 is the average of the best 42 months of returns. Groups 2 and 3 are the averages of returns in between. The exhibit illustrates that investing in the Eurex Equity or Fixed Income indexes generally insulates the portfolio from the extreme movements of the S&P 500 while at the same time improving overall performance. The period studied is 1992-2005.

Results confirm previous academic research results (CISDM, 2003) that found high returns to trend-following futures programs during the worst months for the U.S. stock market. During the worst quartile of S&P 500 months, the Eurex Equity Index increased by an average of 2.4% – more than twice the average monthly return for the strategy – and the Eurex Fixed Income rose 0.5%, which was about the average for the strategy over the full time period.

In Exhibit 11B the average monthly return of the Dow Jones EURO STOXX 50 Index, Eurex Equity Index and Eurex Fixed Income Index are arranged into 42 groups based on the returns of the Dow Jones EURO STOXX 50 Index. Group 1 is the average of the worst 42 months of returns while Group 4 is the average of the best 42 months of returns. Groups 2 and 3 are the averages of returns in between. The exhibit illustrates that investing in the Eurex Equity or Fixed Income indexes generally insulate the portfolio from the extreme movements of the Dow Jones EURO STOXX 50 Index while at the same time improving overall performance. The period studied is 1992-2005 as well. During the worst quartile of the Dow Jones EURO STOXX 50 Index months the Eurex Equity Index rose by 2.6% - more than twice the average month return for the strategy while the Eurex Fixed Income Index rose by 0.7% which is a little higher than the average for the strategy over the full time period.

Exhibit 11A: Portfolio Returns Ranked on S&P 500 1992-2005

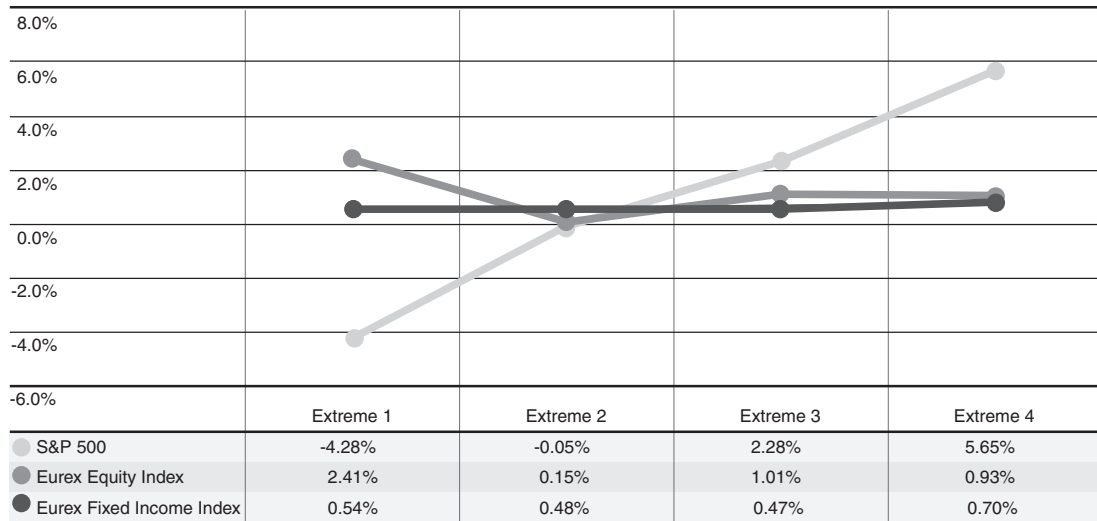
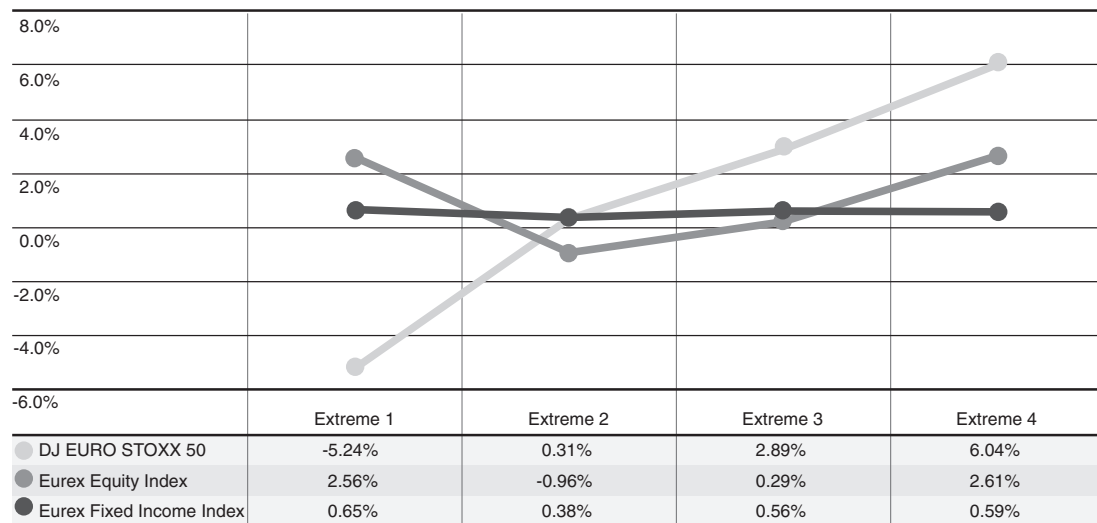


Exhibit 11B: Portfolio Returns Ranked on Dow Jones EURO STOXX 50 1992-2005



Summary and Conclusions

This report provides an update to an earlier report analyzing the potential benefits to CTAs of incorporating Eurex futures contracts as an investment vehicle. Two indexes were constructed applying momentum-type trading models to equity index and fixed income futures contracts. Results indicate that investment in Eurex futures contracts would have improved the performance of a CTA employing a standard momentum-type trading model during the 1992-2005 period. Specifically a CTA using Eurex contracts would have improved portfolio performance by around 100 basis points. Results also indicate that an investment in Eurex futures contracts employing a momentum trading strategy would have improved the performance of a traditional asset portfolio. In particular an investor with a traditional stock and bond portfolio would have improved portfolio performance by about 200 basis points with a 40% allocation to Eurex contracts. Although global stock indexes are highly correlated the returns from momentum strategies employed in these markets are surprisingly different. In particular, the DAX, Nikkei 225, and Dow Jones EURO STOXX 50 Index futures contracts continue to be more conducive to trend-following strategies than the S&P 500 and FTSE 100 futures contracts.

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Appendix: Description of the Trend-following Trading Strategy and Index Construction

Trading Strategy

A momentum trading rule determines long and short positions in each market. An x-day momentum strategy takes a long position in a futures market on date t if the total return to the contract between dates t and $t-x$ is positive. Otherwise the strategy takes a short position. Three separate momentum strategies are traded in each market. The numbers of days used to compute the momentum trading rules are 15, 27, and 55. Spurgin (1999) reports that this combination of momentum rules had the highest correlation with broad based CTA indexes. Each strategy has an equal weight, so the index will either be 100% long, 33% long, 33% short, or 100% short in a given contract, depending on the signals of the three strategies. As is the norm for passive investment indexes, no fees, transaction costs, bid/ask spreads, or other market imperfections are assumed.

Currency Conversion

Futures contracts do not require full collateralization of the underlying assets, so a USD investor can hold collateral in dollars and convert profits or losses in foreign-denominated assets at the end of each day. All assets are assumed collateralized in USD and all gains and losses from trading are converted to the base currency at the end of the day. Currency conversion rates are computed from daily returns to futures contracts traded on the CME.

Leverage and Returns on Collateral

Returns on un-invested collateral are assumed to earn a money-market rate. U.S. Three-Month Treasury yields are added to USD trading returns to allow a comparison between futures based returns and returns for other traditional asset classes such as stocks and bonds. While many futures trading programs employ leverage, the trading indexes employed here are unleveraged – with one exception. The CME Eurodollar (LIBOR) contract is leveraged because the high notional value of this contract (USD 1 million) and small daily price changes results in such low return volatility that the results are often skewed. This contract is leveraged ten times (USD 100,000 in collateral is allocated to each USD 1 million notional contract) in order to produce return volatility that is consistent with other fixed income futures contracts.

Method of Estimating Historic Volatility for Risk Allocation

The method of estimating historic volatility incorporates the average of the trading range (Parkinson, 1980). A period of 200 trading days is used to estimate volatility from observed trading ranges I .

The equation for the volatility of an individual commodity is

$$\hat{\sigma}^2 = \frac{(\sum l_t/N)^2}{8/\pi}$$

Computing Asset Allocations

In order to insure equal risk in each commodity, the percentage allocation (χ_t) to each of the n futures contracts must satisfy two constraints. The solution to this system of equations gives the notional amount of each underlying futures contract.

Constraints

$$\chi_t \sigma_t = C, \sum_{t=1}^n \chi_t = 1$$

Optimal Weights

$$\chi_t = \frac{1}{n} \frac{1}{\sigma}$$

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