RISK MANAGEMENT LESSONS IN LEVERAGED FUTURES TRADING

Quantitative Work Alliance for Applied Finance, Education & Wisdom

QWAFAFEW

Chicago

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- **The portfolio risk management process includes an effort to monitor and manage risk, but should not be confused with and does not imply low risk.**

PRESENTATION OUTLINE

I. Risk is the Flipside of Return

II. Risk Management May Be the Most Important Element of an Investment Process

III. Risk Management Policies are a Product Design Issue

IV. Risk Management Policies Determine Whether a Program will be Viable

PRESENTATION OUTLINE
(Continued)

V. Standard Risk Management Methodology from Conventional Asset Managers is a Useful Starting Point

VI. Risk Management Rules Flow from an Understanding of Price Behavior

VII. Useful Risk Management Reports in Futures Trading

I. Risk is the Flipside of Return

- **In a number of trading strategies, an investor is paid to bear risks.**
- **Trading strategies can be well known and publicized.**
- **This does not prevent them from continuing to exist.**

I. Risk is the Flipside of Return
(Continued)

December Products/November Soybeans

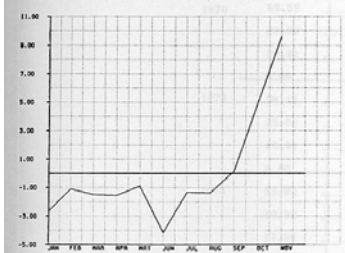
ConticCommodity

J F M A M J J A S O N D

1983. Strong Seasonality

This spread carries slightly more risk than other reverse crush spreads because it usually has to be put on at higher spread differentials than deferred positions, and it often must be held into the delivery period for November soybeans to achieve the best results. This adds the risk of strength in November soybeans after first notice day in some years.

10-Year Seasonality ¢/bu



Seasonal Factors and the DRV

Month	¢/bu Seasonal Factors	¢/bu Monthly Change in Factors	DRV
Jan	−2.6622	+ .0000	2,760.00
Feb	−1.1107	+1.5515	2,480.00
Mar	−1.4947	− .3840	1,920.00
Apr	−1.5667	− .0720	1,625.00
May	− .9148	+ .6519	1,635.00
Jun	−4.1640	−3.2492	1,815.00
Jul	−1.3650	+2.7990	1,325.00
Aug	−1.4050	− .0400	2,095.00
Sep	.1231	+1.5281	3,350.00
Oct	4.9171	+4.7940	3,895.00
Nov	9.6426	+4.7255	5,105.00

Highs and Lows

Year	High Date	¢/bu Level	Low Date	¢/bu Level	¢/bu Move
1970/71	15Nov71	26.96	27May71	6.75	+20.21
1971/72	13Nov72	29.89	9Feb72	11.90	+17.99
1972/73	20Nov73	82.40	5Sep73	−11.60	+94.00
1973/74	29Jul74	86.95	9Jan74	− 9.47	+96.42
1974/75	7Nov75	43.25	27Dec74	1.85	+41.40
1975/76	6Jul76	59.63	22Jul76	7.49	−52.14
1976/77	18Nov77	43.25	12Oct77	11.23	+32.02
1977/78	2Nov78	56.25	28Oct77	20.52	+35.73
1978/79	16Nov79	92.29	29Nov78	27.73	+64.56
1979/80	6Nov80	73.30	22Oct79	28.22	+45.08

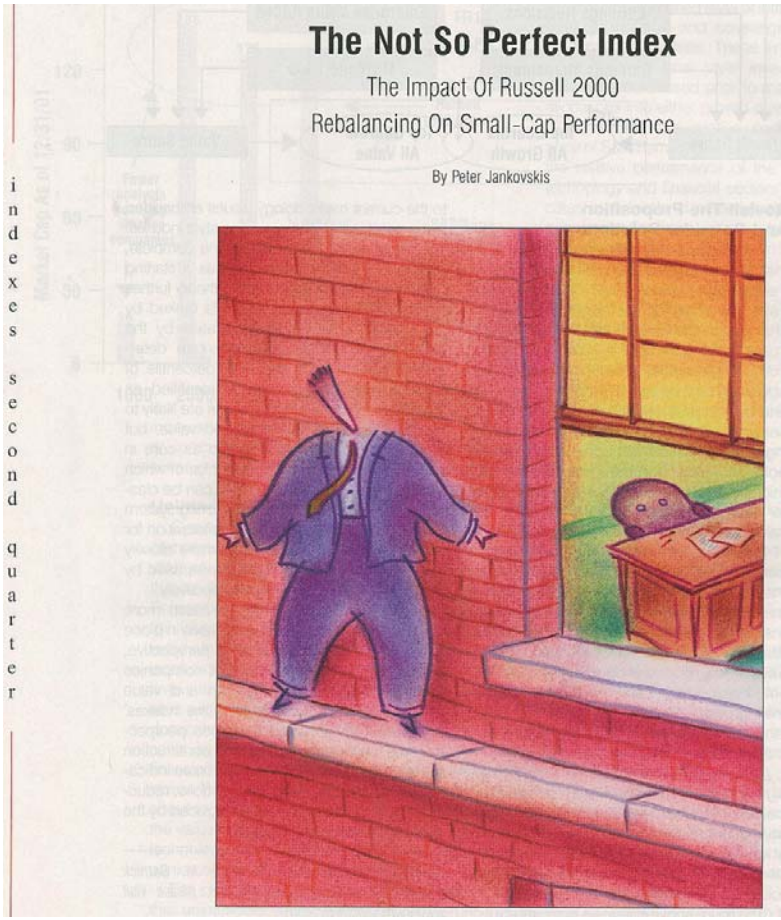
Trading Record

Year	¢/bu Initiate Reverse Crush in Jun at	¢/bu Liquidate Reverse Crush in Nov at	$ Profit/ Loss	$ Worst Scenario	$ Best Scenario
1971	9.8224	22.3103	6,243.95	3,800.00	9,855.00
1972	15.3356	25.5649	5,114.65	47.50	8,087.50
1973	26.0568	34.6182	4,280.70	−17,745.00	40,080.00
1974	11.5799	32.7449	10,582.50	− 3,009.95	17,450.10
1975	23.1022	37.1444	7,021.10	− 124.95	12,290.00
1976	20.2703	25.8482	2,788.95	− 7,210.00	7,940.00
1977	29.3871	21.5314	−3,927.85	−10,175.05	10,210.00
1978	31.7339	46.8181	7,542.10	835.01	14,060.00
1979	35.0241	82.7431	23,859.50	18,835.00	30,704.90
1980	34.7698	68.3686	16,799.40	10,569.75	20,005.10
		Cumulative profit/loss	$80,305.00	−$4,177.69	$170,682.60

Soybean Crush Spread Example

A trade that was recommended in a 1983 commodity futures brokerage report is still relevant nearly 20 years later.

I. Risk is the Flipside of Return
(Continued)



Impact of Russell 2000 Rebalance Example

Average Monthly Excess Return (S&P 600 - Russell 2000) 1994/01 - 2001/12					
Month	Average	Minimum	Maximum	Stdev	T-signif.
January	**-0.79**	-2.59	0.33	0.91	**96.1%**
February	-0.16	-3.12	1.71	1.40	60.9%
March	0.09	-1.91	2.89	1.34	56.2%
April	0.51	-2.35	4.30	1.85	73.6%
May	0.33	-0.85	2.87	1.19	73.7%
June	-0.13	-2.81	1.17	1.16	60.6%
July	**1.47**	-0.40	3.74	1.24	**98.7%**
August	**0.44**	-0.70	1.24	0.67	**91.9%**
September	-0.10	-1.70	0.77	0.79	61.3%
October	0.54	-0.66	5.09	1.92	74.3%
November	-0.12	-1.79	1.07	0.82	63.9%
December	-0.12	-3.10	3.73	1.96	55.9%

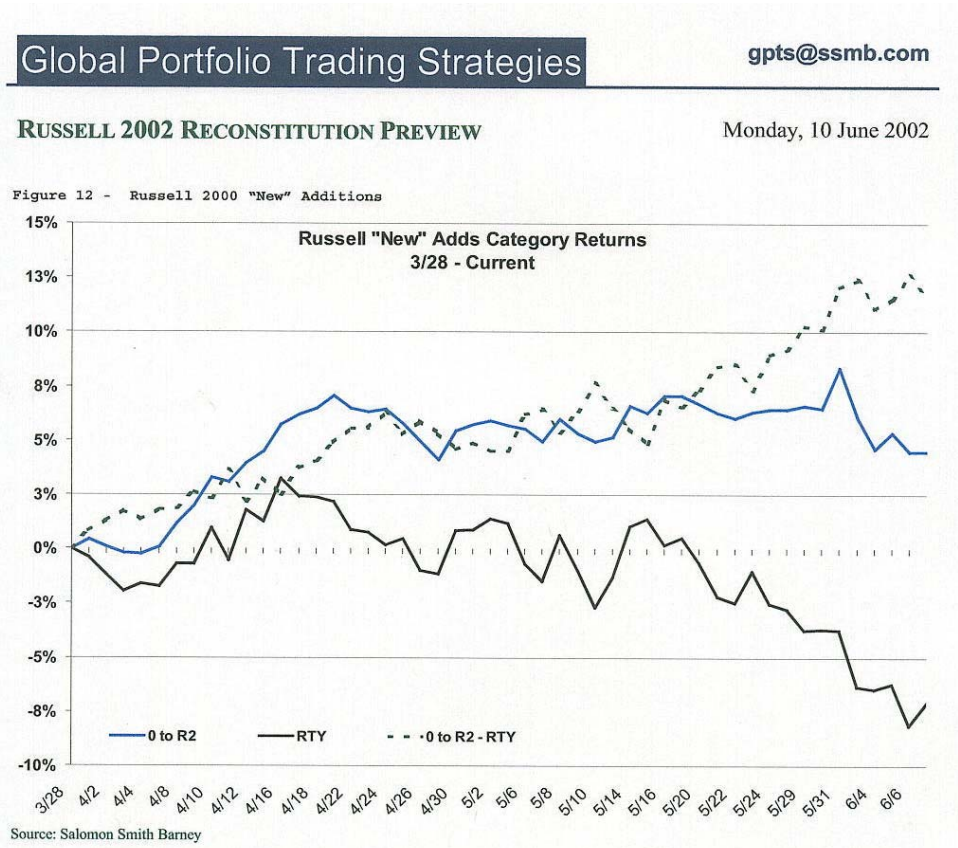
I. Risk is the Flipside of Return
(Continued)

Impact of Russell 2000 Rebalance Example (continued)

- **This phenomenon has been published in the *Journal of Indexes* by Dr. Peter Jankovskis of OakBrook Investments.**

- **It has also been well covered by Wall Street quantitative researchers.**

I. Risk is the Flipside of Return
(Continued)



Impact of Russell 2000 Rebalance Example (continued)

I. Risk is the Flipside of Return
(Continued)

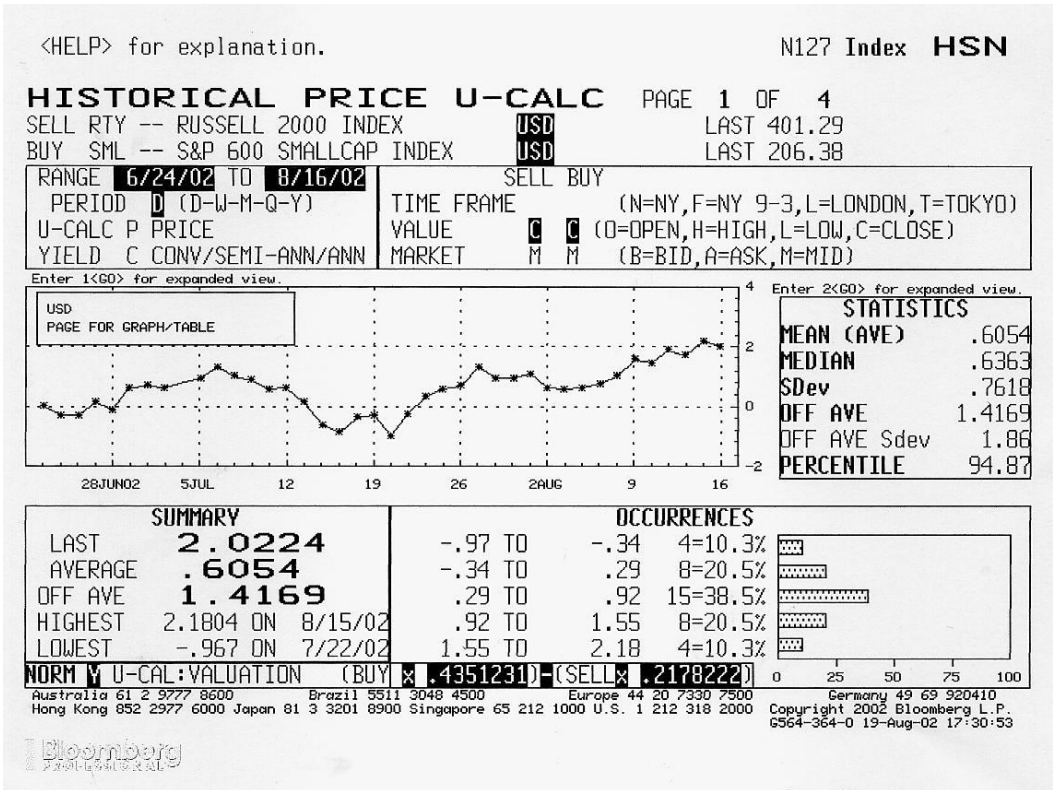
Impact of Russell 2000 Rebalance Example (continued)

- **One can set up a trade where one is long the S&P 600 Small Cap Index (using options traded at the CBOE) and short the Russell 2000 (using futures traded at the CME).**

- **Putting on this spread from late-June until mid-August has not lost money since the launch of the S&P 600 Small Cap Index.**

- **And yet, there is considerable risk to this trade.**

I. Risk is the Flipside of Return
(Continued)



Impact of Russell 2000 Rebalance Example (continued)

This year, for example, the since-inception worst loss of the trade nearly matched the worst case since 1989.

II. Risk Management and the Investment Process

- **The key to a successful investment program is not in finding strategies that have a statistical edge.**

- **A prominent hedge fund manager with currently over $4 billion under management told me in 1993:**

  "Other people have the same information as I do; other people put on the same trades on as I do. I make money; they don't."

III. Risk Management Policies are a Product Design Issue

- **A number of top Commodity Trading Advisors (CTA's) have had losses in excess of -40%.**

- **These losses have been acceptable to clients since these programs sometimes return in excess of 100% annually.**

Top 20 CTA Performers Past Five Years

For the period 1/1/96 to 12/31/00. Includes only CTAs managing at least $10 million as of 12/31/00

TRADING ADVISORS	5-YR COMP. ANNUAL RETURN	SHARPE RATIO	LARGEST DRAW-DOWN	% WINNING MONTHS	BEST 12-MO. PERIOD	WORST 12-MO. PERIOD	FUNDS UNDER MGMT
1. SoundView Capital Mgmt. (MAP)	57.88%	1.68	17.94%	63.33%	+252%	-13%	$10M
2. Tucson Asset Mgmt. (Domestic 2X)	48.58%	1.42	41.18%	68.33%	+176%	-38%	$31M
3. Hathersage (Accelerated Appreciation)	40.07%	1.15	26.43%	65.00%	+132%	-16%	$71M
4. Gollyhott Trading (Discret.)	35.62%	1.32	7.85%	63.33%	+241%	+1%	$102M
5. Eckhardt Trading Co. (Higher Leverage)	34.48%	0.92	28.42%	56.67%	+185%	-13%	$20M
6. Johnson Management	32.96%	2.38	2.70%	70.00%	+68%	+12%	$15M
7. Beacon Management Corp. (Meka)	32.35%	0.79	46.48%	60.00%	+119%	-36%	$131M
8. Cipher Investment Management Co.	32.25%	1.32	12.90%	61.67%	+133%	-4%	$365M
9. Quicksilver Trading, Inc.	29.57%	1.17	17.14%	63.33%	+106%	-0%	$24M
10. Ansbacher Invest. Mgmt. (Opt. Writing)	27.34%	0.83	26.89%	65.00%	+113%	-17%	$30M
11. Dunn Capital Mgmt. (WMA)	27.23%	0.58	44.16%	58.33%	+106%	-44%	$1,066M
12. DigiLog LLC	26.83%	0.82	19.63%	56.67%	+104%	-8%	$103M
13. Clarke Capital Mgmt. (Worldwide)	26.08%	0.98	8.48%	61.67%	+73%	+1%	$87M
14. Eckhardt Trading Co. (Standard)	25.25%	0.88	17.05%	56.67%	+117%	-13%	$269M
15. Bell Fundamental Futures (Standard)	24.97%	0.87	21.37%	60.00%	+100%	+2%	$37M
16. Capital Fund Mgmt.	24.86%	1.40	8.01%	63.33%	+54%	-5%	$47M
17. Analytic Investment Mgmt. (3R Strat)	24.73%	1.73	6.69%	75.00%	+44%	+7%	$299M
18. Hathersage (Long Term Growth)	24.48%	1.37	7.94%	68.33%	+50%	-6%	$14M
19. Jacobson Fund Managers (Curr.)	23.99%	0.94	19.07%	65.00%	+84%	-9%	$188M
20. Macquarie Treasury (Diversified)	23.27%	1.36	8.96%	66.67%	+79%	-7%	$28M

IV. Risk Management Policies Determine Whether a Program will be Viable

- **Our belief is that a number of statistically significant investment opportunities exist because of the possibility of catastrophic loss.**

V. Standard Risk Management Methodology is a Useful Starting Point

- **Risk management is typically applied at conventional asset managers as follows:**
  - **Translate the client's guidelines into return and risk targets with respect to an index or benchmark;**
  - **Determine the active bets away from a program's benchmark;**

V. Standard Risk Management Methodology is a Useful Starting Point
(Continued)

- **Make assumptions about the expected returns, volatility, and correlation of the active bets;**

- **Construct the client's portfolio so that the client's return and risk targets will be achieved if one's statistical assumptions are correct;**

- **Continually monitor the portfolio's actual return and risk performance for adherence to the established targets.**

V. Standard Risk Management Methodology is a Useful Starting Point
(Continued)

- **The conventional asset manager approach is a useful first step in designing a risk management program for leveraged futures trading.**

- **One still needs to add several layers to this approach because of:**
  - **the unique statistical properties of commodity futures contracts, and**
  - **the different way futures products are marketed.**

VI. Risk Management Rules Flow from an Understanding of Price Behavior

- **Diversified portfolios of equities have returns that appear to be symmetrically distributed.**

- **It is a different matter for commodity prices.**

VI. Risk Management Rules Flow from an Understanding of Price Behavior
(Continued)

- **The empirical behavior of commodity prices can be described as follows:**
  - **Commodity prices are *extremely* volatile;**
  - **There exist rare but violent explosions in prices;**
  - **In normal times, there is a high degree of autocorrelation;**

VI. Risk Management Rules Flow from an Understanding of Price Behavior
(Continued)

- **In spite of volatility, prices tend to revert to their mean or to a trend level;**

- **There is substantial positive skewness in the price distributions; and**

- **There is substantial kurtosis with tails much thicker than those of a normal distribution.**

VI. Risk Management Rules Flow from an Understanding of Price Behavior
(Continued)

- **These observations are illustrated with a long-term chart of sugar prices:**

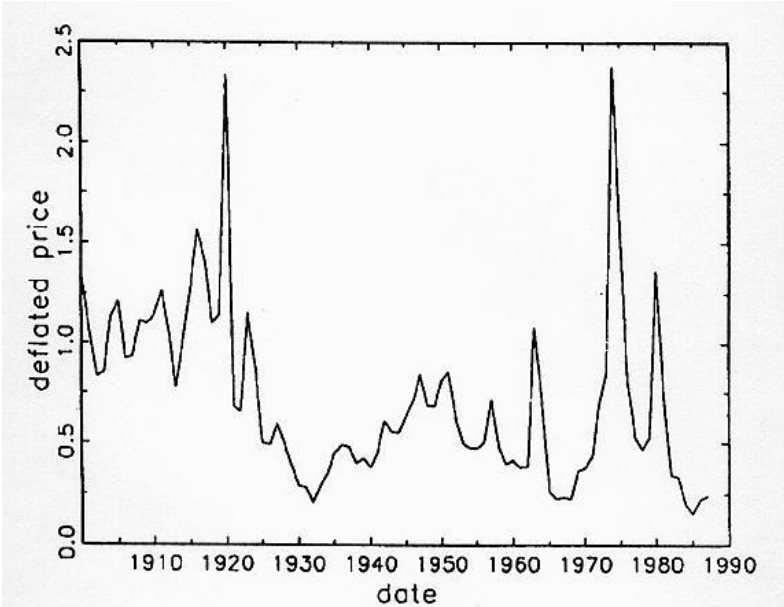
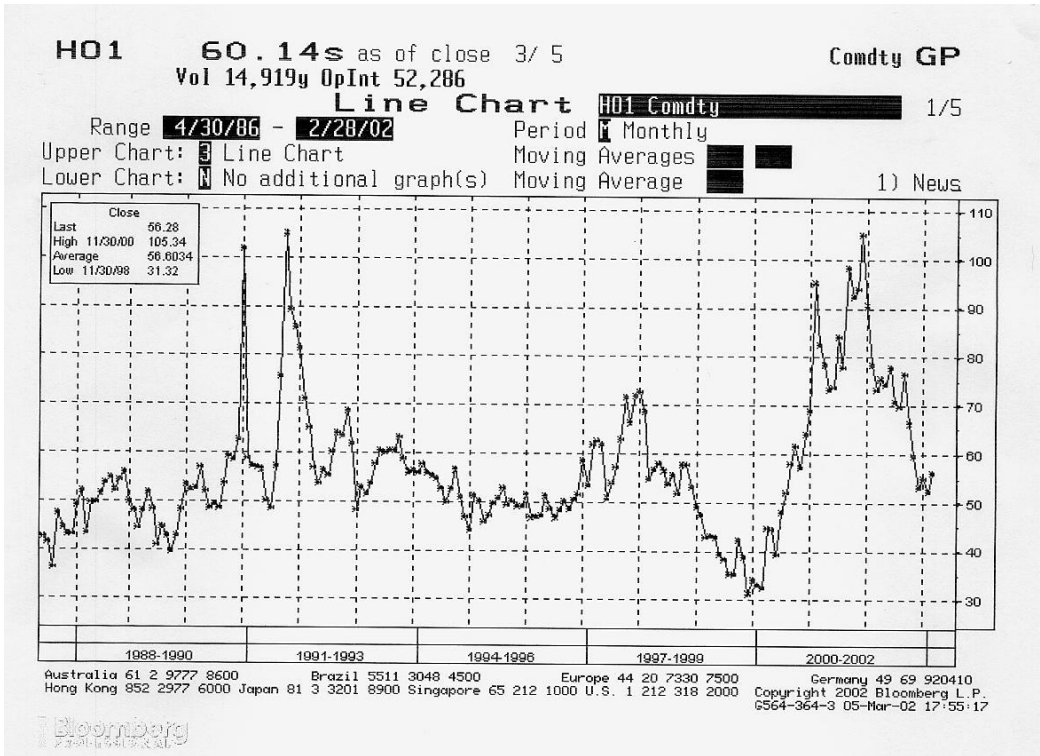


FIGURE 1
Annual sugar prices, 1900-1987

VI. Risk Management Rules Flow from an Understanding of Price Behavior
(Continued)

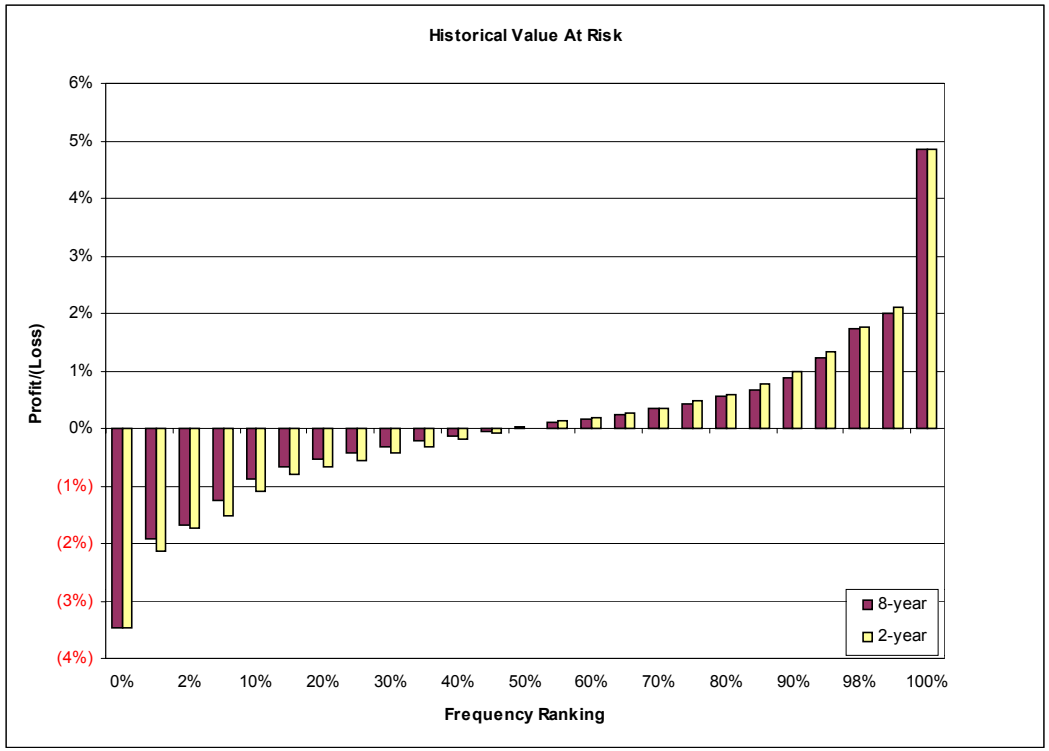
- **Another example can be found in heating oil:**



VI. Risk Management Rules Flow from an Understanding of Price Behavior
(Continued)

Value-at-Risk

- **The portfolio's volatility is calculated using the recent volatilities and correlations of the portfolio's instruments.**



VI. Risk Management Rules Flow from an Understanding of Price Behavior
(Continued)

Value-at-Risk (Continued)

- **The standard Value-at-Risk approach alone is inadequate for a commodity portfolio.**

- **A commodity portfolio consists of instruments that have a tendency toward extreme positive skewness in returns.**

- **This measure, though, is still useful when it is twinned with other measures.**

VI. Risk Management Rules Flow from an Understanding of Price Behavior
(Continued)

Scenario Testing

- If an investment process is based on analysis of historical data, one can perform the following kind of test.

- Using long-term data, an investor can directly examine the worst performance of a commodity trade under similar circumstances.

- This measure will sometimes be larger than the Value-at-Risk measure based on recent volatility.

VI. Risk Management Rules Flow from an Understanding of Price Behavior
(Continued)

Deep Out-of-the-Money Options

- **An investor can use deep out-of-the-money (OTM) options to hedge against catastrophic risk.**

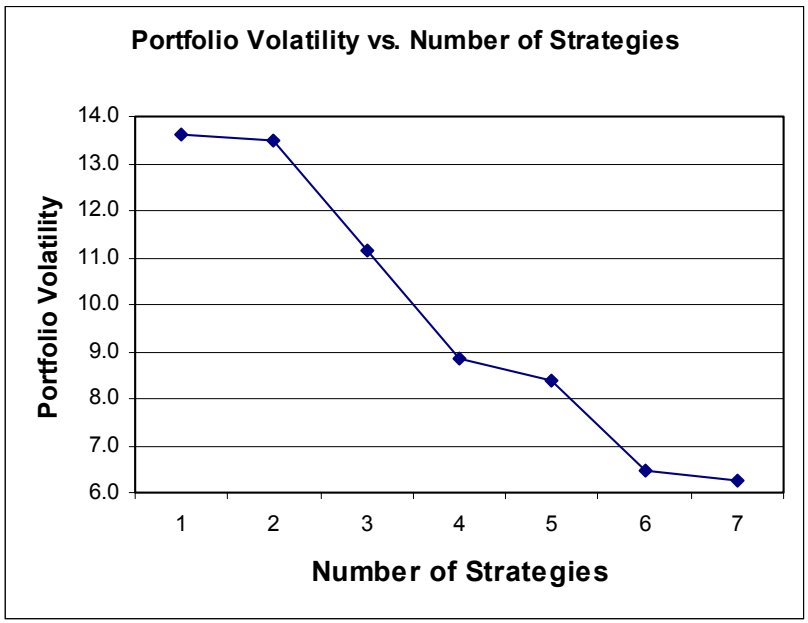
- **This choice is advisable for commodity futures positions that require physical delivery at maturity.**

- **This means that contracts can be periodically squeezed to quite unpredictably high levels.**

VI. Risk Management Rules Flow from an Understanding of Price Behavior
(Continued)

Diversification and Concentration Risk

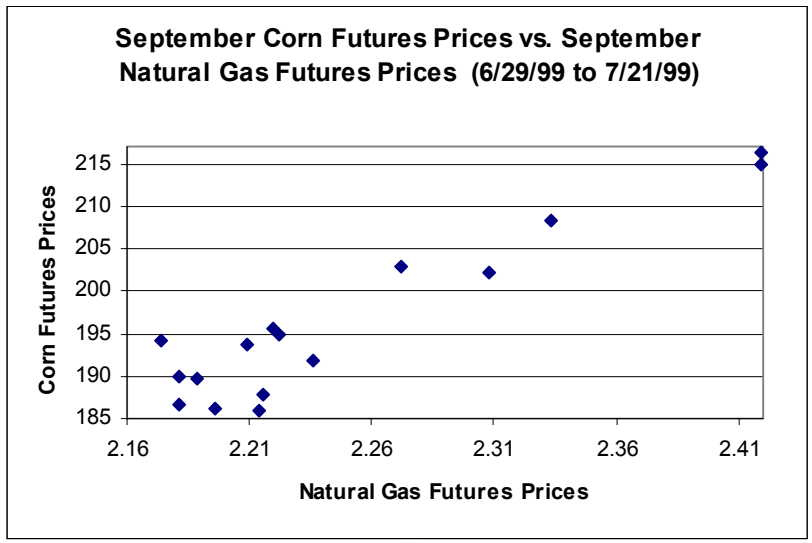
Example of Portfolio Effect When Combining Independent Strategies



VI. Risk Management Rules Flow from an Understanding of Price Behavior
(Continued)

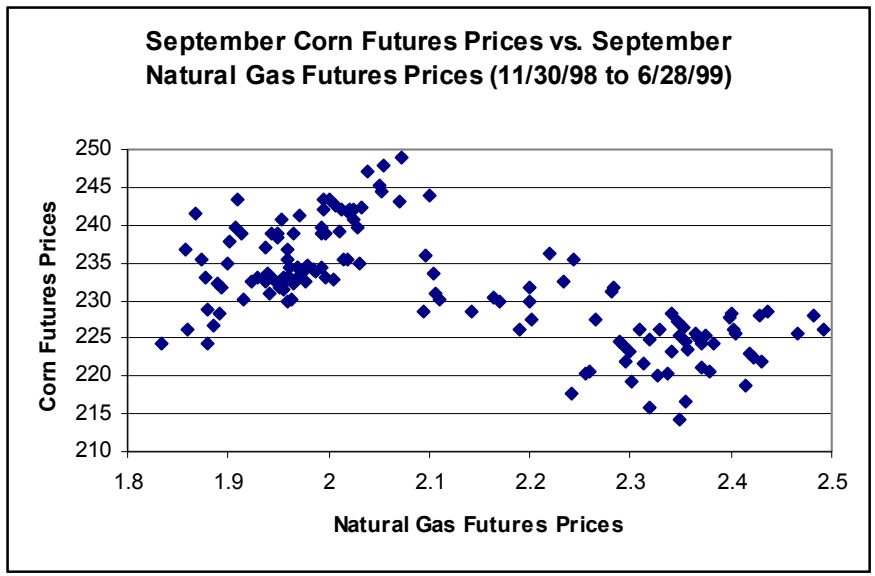
Understanding the Fundamental Drivers of a Strategy

- **The following graphs illustrate how two normally unrelated markets can become temporarily very related:**



VI. Risk Management Rules Flow from an Understanding of Price Behavior
(Continued)

Understanding the Fundamental Drivers of a Strategy (Continued)



VI. Risk Management Rules Flow from an Understanding of Price Behavior
(Continued)

Understanding the Fundamental Drivers of a Strategy (Continued)

- **Natural gas and corn prices are normally unrelated.**

- **But during the summer of 1999, their price changes were +85% correlated.**

- **Sixth months previously, the commodities were only +12% correlated.**

VI. Risk Management Rules Flow from an Understanding of Price Behavior
(Continued)

Understanding the Fundamental Drivers of a Strategy (Continued)

- **In July, both corn and natural gas prices are heavily dependent on the outcome of weather in the U.S. Midwest.**

- **And in July 1999, the Midwest experienced blistering temperatures.**

VI. Risk Management Rules Flow from an Understanding of Price Behavior
(Continued)

Extraordinary Stress Testing

- **Futures products are marketed as equity diversifiers.**

- **Therefore, one job of risk management is to attempt to ensure that a futures investment will not be correlated to stocks during dramatic equity declines.**

- **This is obviously not an issue for an equity mutual fund.**

VI. Risk Management Rules Flow from an Understanding of Price Behavior
(Continued)

Extraordinary Stress Testing (Continued)

- **For a futures portfolio, it is prudent to examine how the portfolio would have performed during various well-defined stock market declines.**

VII. Useful Risk Management Reports in Futures Trading

- **On a per-strategy basis, it is useful to examine each strategy's:**
  - **Value-at-Risk based on recent volatilities and correlations;**
  - **Worst-case loss during normal times;**
  - **Worst-case loss during well-defined eventful periods;**

VII. Useful Risk Management Reports in Futures Trading (Continued)

- **Incremental contribution to Portfolio Value-at-Risk; and**

- **Incremental contribution to Worst-Case Portfolio Event Risk.**

- **The latter two measures give indications on whether the strategy is a risk reducer or risk enhancer.**

VII. Useful Risk Management Reports in Futures Trading (Continued)

- **On a portfolio-wide basis, it is useful to examine:**
  - **Value-at-Risk based on recent volatilities and correlations;**
  - **Worst-case loss during normal times; and**
  - **Worst-case loss during eventful periods.**

VII. Useful Risk Management Reports in Futures Trading (Continued)

- **The spreadsheets on the next two slides give examples of a futures portfolio with the recommended measures displayed.**

- **Note the properties of the soybean crush spread.**

- **It is a portfolio event-risk reducer, but it also adds to the volatility of the portfolio.**

VII. Useful Risk Management Reports in Futures Trading (Continued)

Commodity Risk Reports

Strategy	Value-At-Risk	Worst-Case Loss During Normal Times	Worst-Case Loss During Eventful Period
Deferred Reverse Soybean Crush Spread	2.78%	-1.09%	-1.42%
Long Deferred Natural Gas Outright	0.66%	-0.18%	-0.39%
Short Deferred Wheat Spread	0.56%	-0.80%	-0.19%
Long Deferred Gasoline Outright	2.16%	-0.94%	-0.95%
Long Deferred Gasoline vs. Heating Oil Spread	2.15%	-1.04%	-2.22%
Long Deferred Hog Spread	0.90%	-1.21%	-0.65%
Portfolio	3.01%	-2.05%	-2.90%

VII. Useful Risk Management Reports in Futures Trading (Continued)

Commodity Risk Reports (Continued)

Strategy	Incremental Contribution to Portfolio Value-At-Risk*	Incremental Contribution to Worst-Case Portfolio Event Risk*
Deferred Reverse Soybean Crush Spread	0.08%	-0.24%
Long Deferred Natural Gas Outright	0.17%	0.19%
Short Deferred Wheat Spread	0.04%	0.02%
Long Deferred Gasoline Outright	0.33%	0.81%
Long Deferred Gasoline vs. Heating Oil Spread	0.93%	2.04%
Long Deferred Hog Spread	0.07%	-0.19%

* A positive contribution means that the strategy adds to risk while a negative contributions means the strategy reduces risk.

VII. Useful Risk Management Reports in Futures Trading (Continued)

- **So an incremental contribution to risk measure based solely on recent volatilities and correlations does not give complete information about whether a trade is a diversifier or not.**

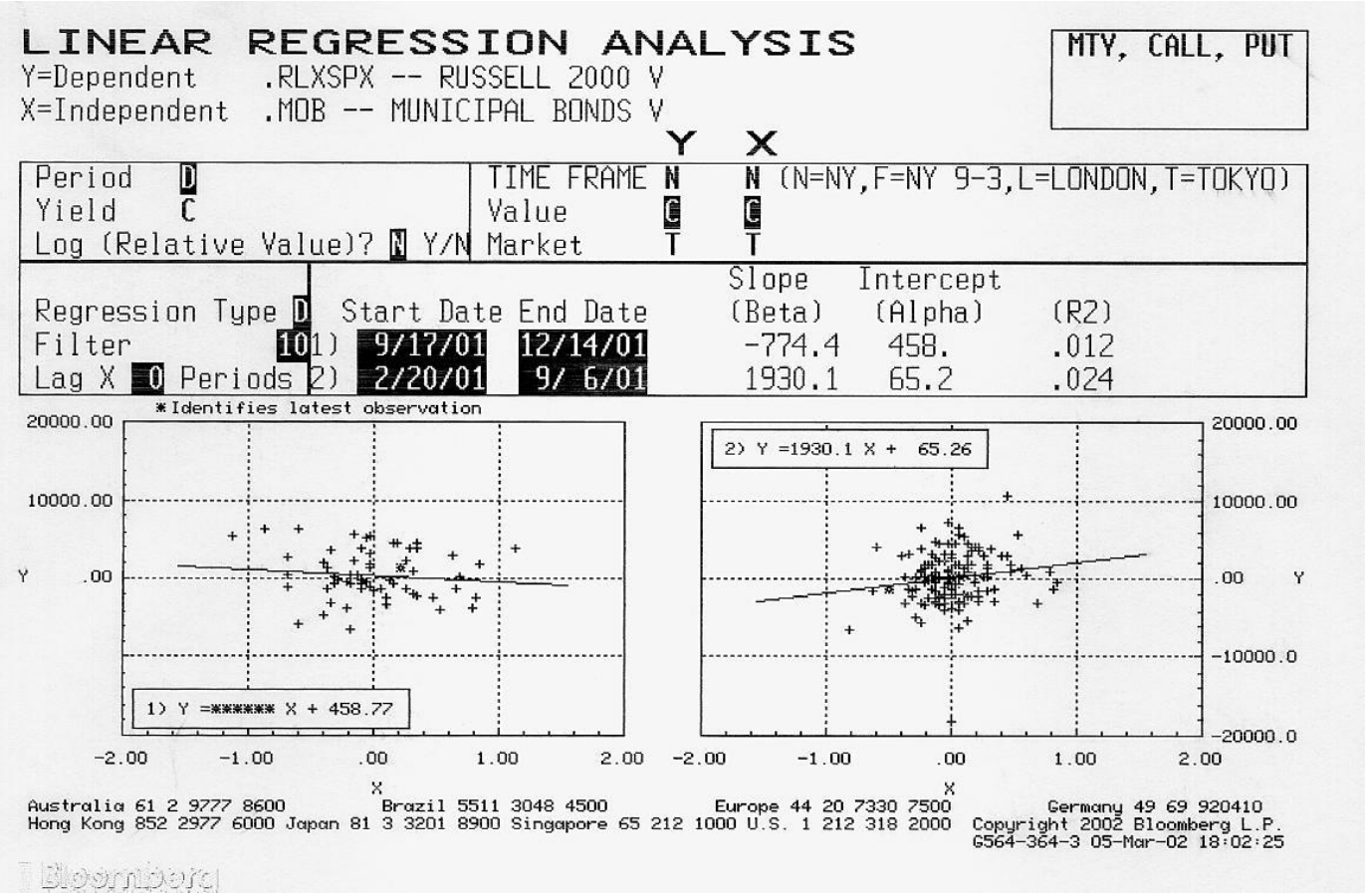
VII. Useful Risk Management Reports in Futures Trading (Continued)

- **Another example concerns financial futures trades.**

- **This example portfolio consists of a long Russell 2000 vs. a short S&P 500 futures trade and a long Municipal Bond vs. a short U.S. Bond futures trade.**

- **These trades are normally unrelated as illustrated in the graphs on the next slide.**

VII. Useful Risk Management Reports in Futures Trading (Continued)



VII. Useful Risk Management Reports in Futures Trading (Continued)

- **But during a scenario test of the portfolio's sensitivity to event risk, we find that the combination of the two trades results in an exposure to a liquidity shock.**

VII. Useful Risk Management Reports in Futures Trading (Continued)

Event	Maximum Loss
October 1987 stock market crash	-4.11%
Gulf War in 1990	-4.12%
Fall 1998 bond market debacle	*-6.42%*
Aftermath of 9/11 attacks	-3.95%

VII. Useful Risk Management Reports in Futures Trading (Continued)

- **Worst-Case Event** — **Maximum Loss**

  Fall 1998 bond market debacle — **-6.42%**

- **Value-at-Risk based on recent volatilities and correlations**

  3.67%

VII. Useful Risk Management Reports in Futures Trading (Continued)

- **The short legs of each spread are the more liquid of the pair.**
- **So both of these trades are at risk to a flight-to-quality event as happened during the Fall of 1998.**
- **Our response to a concentrated risk to a liquidity shock has been to purchase OTM fixed-income calls.**
- **These hedges would cushion the portfolio in the event of another liquidity crisis.**

VII. Useful Risk Management Reports in Futures Trading (Continued)

- **Purchasing OTM fixed-income call options is not always the best economic choice.**

- **Earlier this month, a Premia futures portfolio consisted of the following positions: outright long wheat, a long gasoline calendar spread, short outright silver.**

- **When carrying out an event-risk analysis on the portfolio, the worst case was a 9/11 scenario.**

VII. Useful Risk Management Reports in Futures Trading (Continued)

- **With implied volatilities of short-term interest-rate options at 50%, these options would have been quite expensive macro portfolio insurance.**

- **Given that the scenario that would most negatively impact the portfolio was a sharp shock to business confidence, the least expensive macro portfolio insurance was short-term gasoline puts, which cost the portfolio 4 basis points.**

Conclusion

- **Our view is that there are a number of derivatives strategies that earn their returns due to taking on risky positions in a risk-averse world.**

- **The returns are not due to inefficiencies in the marketplace.**

- **There is a very important active component to an investment program that earns a return due to bearing risk.**

Conclusion (Continued)

- **It is the investment program's risk management methodology.**

- **An investment manager must decide:**

  - **How much to leverage the strategy, and**
  - **Whether to give up any of its returns to hedge out the strategy's extreme risks.**

Conclusion (Continued)

- **That investment manager must also continually monitor the risk exposures in the portfolio.**
- **The manager must make sure that those exposures adhere to predefined limits.**
- **How one designs and carries out a risk management policy is crucial to a leveraged futures program's viability.**

Source of Graphics

- **Slide 8, "December Products/November Soybeans," Seasonality in Agricultural Futures Markets, ContiCommodity, 1983, p. 346.**

- **Slide 9a, "The Not So Perfect Index: The Impact of Russell 2000 Rebalancing on Small-Cap Performance," article by Peter Jankovskis and illustration by Craig Smallish, Journal of Indexes, Second Quarter 2002, p. 38.**

- **Slide 9b, chart of monthly Russell rebalancing impact from slide 5 of "Chicago QWAFAFEW Discussion of Small Cap Investing," by Peter Jankovskis, July 18, 2002.**

- **Slide 11, graph of performance of expected Russell 2000 new additions from Salomon Smith Barney, Global Portfolio Trading Strategies, June 10, 2002, p. 8.**

Source of Graphics (Continued)

- **Slide 13, graph of normalized performance of S&P 600 Small Cap Index vs. the Russell 2000 Index from 6/24/02 to 8/16/02, The Bloomberg.**

- **Slide 15, "Top 20 CTA Performers Past Five Years," *Barclay Managed Funds Report*, 1st Quarter 2001, p. 6.**

- **Slide 16, cover of Against the Gods: The Remarkable Story of Risk by Peter Bernstein, John Wiley & Sons, Inc., 1996.**

- **Slide 23, graph of deflated sugar prices from 1900 to 1987 from Deaton, Angus and Guy LaRoque, "On the Behavior of Commodity Prices." *Review of Economic Studies* (1992) 59, p 2.**

- **Slide 24, graph of monthly heating oil prices from 4/30/86 through 2/28/02, The Bloomberg.**

Source of Graphics (Continued)

- **Slide 25, graph of historical Value-at-Risk for a commodity portfolio from "The Energy Market" presentation by Global Advisors Limited, Slide 22.**

- **Slide 29, graph of portfolio volatility vs. number of strategies from Till, Hilary, "Passive Strategies in the Commodity Futures Markets." *Derivatives Quarterly*, Fall 2000, p 54.**

- **Slides 30 and 31, graphs of Natural Gas vs. Corn prices from Till, Hilary, "Taking Full Advantage of the Statistical Properties of Commodity Investments." *The Journal of Alternative Investments*, Summer 2001, p. 65.**

- **Slides 40 and 41, commodity portfolio risk measures, Premia Capital Management, March 2002.**

- **Slide 44, graphs of RLX-SPX vs. MOB futures spreads, The Bloomberg.**

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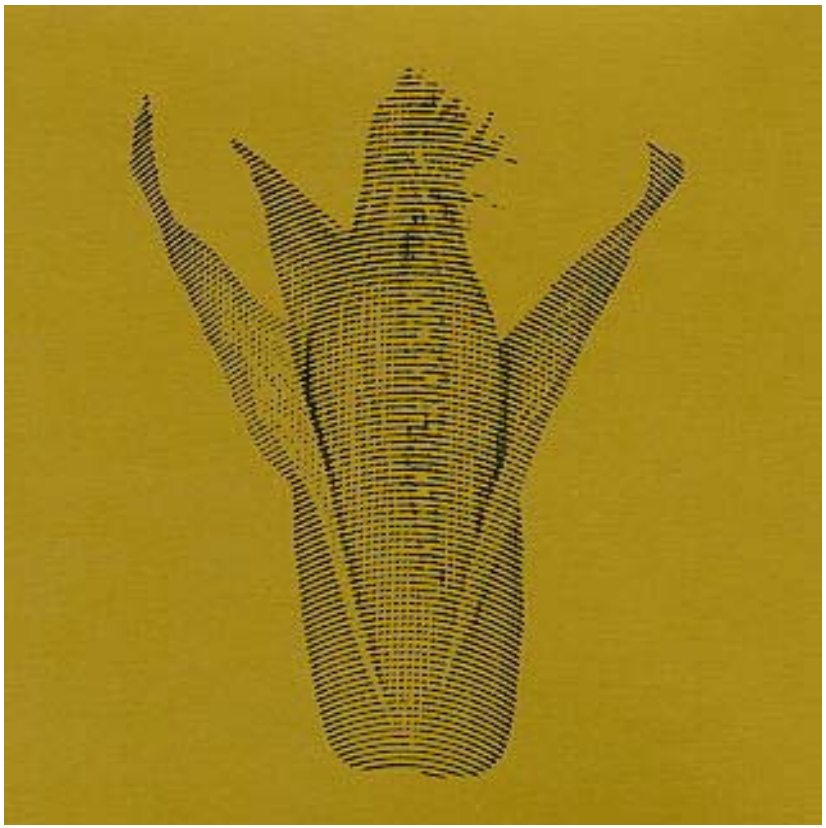

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