

The Impact of Indexing in the Equity *and* Commodity Markets

February 2014



Hilary Till

Research Associate, EDHEC-Risk Institute

Joseph Eagleeye

Principal, Premia Capital Management, LLC

This is a working-paper version of an article, which later appeared in *Indexes: Journal of Index Issues*, Third Quarter, 2001.

EDHEC is one of the top five business schools in France. Its reputation is built on the high quality of its faculty and the privileged relationship with professionals that the school has cultivated since its establishment in 1906. EDHEC Business School has decided to draw on its extensive knowledge of the professional environment and has therefore focused its research on themes that satisfy the needs of professionals.

EDHEC pursues an active research policy in the field of finance. EDHEC-Risk Institute carries out numerous research programmes in the areas of asset allocation and risk management in both the traditional and alternative investment universes.

The price-pressure effects of index investments in the global stock markets are well documented. And even when these effects are so well known, they show no sign of diminishing. Are other asset classes similarly effected by indexing? The short answer is yes: commodity investing is similarly effected by the prevalence of indexed-based investments.

In this article, we will begin by summarising the index effect in the equity markets, which has been widely published in both the popular financial press and in academic papers. Next we will carry out a study which will show that similar effects can be found in the commodity markets. And finally, we will discuss a preliminary model for explaining the magnitude of the index effect on commodity futures markets. Along the way, we will explain some of the arcane aspects of commodity futures markets in order for this article to be generally understood.

The Impact of Indexing in the Equity Markets

The "index effect" usually refers "to the impact on stocks that are added to or removed from the S&P 500," notes Bary [1998]. "[It] is so strong these days because of the growing popularity of indexed investing and the rising number of 'closet indexers,' institutions whose holdings closely match the benchmark portfolio."

As of 1998, 8% of the market value of all stocks in the S&P is held by indexed portfolios, according to Bary [1998]. "When a new company comes into the S&P, indexers need to buy 8% of its shares. Unlike most investors, indexers are price-insensitive. Many simply want to buy at the close of trading on the day a company is added to the S&P." In Bary [1999], the financial columnist adds that "the index effect can be severe because many index funds simply want to buy a stock at the NYSE closing price on the day the company is added to the S&P and often don't care what they pay as long as the price they receive is the NYSE close."

The index effect was actually first documented in an academic study in 1986. Harris and Gurel [1986] reviewed the price and volume effects resulting from changes in the S&P 500. They found that "immediately after an addition [to the S&P] is announced, prices [in the added stock] increase by more than 3 percent. This increase is [then] nearly fully reversed after 2 weeks."

Fifteen years after this academic study, the index effect has not only continued to exist but is even more dramatic than when it was first documented. This is probably because of the increase in popularity of index-based investment since that time. A *Business Week* article in early 1999 queried, "Who Needs a Money Manager?" After all, "index funds are cheap, easy – and they're changing the way Americans invest." The article reported, "Last year, index funds attracted \$42 billion, or 19% of the money committed to mutual funds, according to Financial Research Corp. That number has nearly doubled since 1996" The article later asserted, "When Standard & Poor's Corp. ... puts new stocks in the index, the additions see their prices jump an average of 7%."

Bary [1999] also pointed out the intensifying index effect. "Merrill Lynch quantitative analysts have shown that companies added to the S&P 500 in 1998 enjoyed greater appreciation in the days leading up to their inclusion in the index than new entrants did in previous years. The flip side is that the '98 newcomers tended to fall more sharply after joining the S&P."

The index effect is not just an American stock market phenomenon. In 1999, the *Financial Times* carried a number of articles on the index effect occurring in stocks in both the French and UK markets due to additions and deletions to their respective market indexes.

Changes to the Morgan Stanley Capital Investment [MSCI] Group's family of international equity indexes have reportedly had dramatic impacts on *national* stock markets. The Wall Street Journal

[1999] noted, "the announcement that ... [the MSCI indexes] would reinstate Malaysia and boost Taiwan's weighting ... sent stocks in those countries soaring. ... the Kuala Lumpur composite index soared 6%, while Taiwanese stocks jumped 4%."

It may even be the case that the equity-index effect can have a temporary effect on the value of currencies. Bear Stearns [1999] noted in a morning commentary, "yen strength was the main story. As Europe opened, EUR/JPY made a fresh lifetime low ... The main reason appears to have been Morgan Stanley's decision to increase their weighting of Japanese stocks ... [with respect to] Euro stocks on their MSCI."

The Impact of Indexing on the Commodity Markets

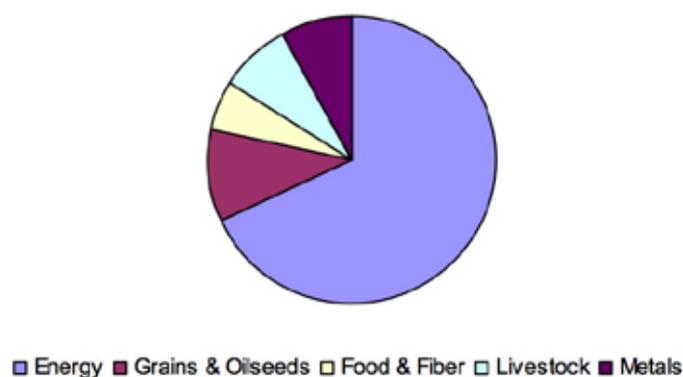
Given how dramatic the impact of indexing on stock market investments is, it stands to reason that other asset classes with a large amount of price-indifferent investors may also have a measurable impact on that asset class. One asset class in which there has not been any published academic work on the impact of this type of investing is commodities.

Arguably, the Goldman Sachs Commodity Index (GSCI) performs the same function for commodity futures contracts as the S&P 500 does for U.S. equities. Although the CRB (Commodity Research Bureau) index may be better known, it has not attracted the same kind of investment that the GSCI has. One may also be able to say the same about the Dow Jones Industrial (DJI) Index vs. the S&P. The DJI is more popularly known as a stock market benchmark, but it is the S&P that has attracted large-scale passive investment.

The GSCI is a world-production-weighted commodity index, consisting of 26 commodity futures contracts which span five commodity sectors. The GSCI was explicitly designed to be a benchmark for commodity investors comparable to the S&P 500 equity index. The GSCI consists of commodity futures contracts in the following commodity sectors: energy, grains & oilseeds, food & fibre, livestock, and metals. Figure 1 shows this year's weighting scheme for the GSCI.

Figure 1

Year 2001 GSCI Weights



Data Source: Chicago Mercantile Exchange

There are several ways a U.S.-based investor can invest in the GSCI. The first is to take long positions in the 26 futures contracts making up the GSCI. This is comparable to investing in the S&P by buying the 500 stocks making up this equity index. Another way to invest in the GSCI is to take long positions in the GSCI futures contract which trades on the Chicago Mercantile Exchange (CME). Again, this is analogous to investing in the S&P by taking long positions in the S&P futures contract which also trades on the CME. A final way is for U.S. investors to buy Over-the-Counter derivatives on the GSCI; this method is only available to institutional investors. This latter method is sometimes preferred by institutions since one in effect hires an intermediary to

handle the operational aspects of running futures positions, which requires specialised expertise (overseas investors have additional ways to invest in the GSCI.)

As of the beginning of 2001, the GSCI futures contract had an open interest of \$1.9 billion. The rise of open interest in this contract is illustrated in Figure 2, which shows the amount of GSCI futures contracts outstanding each quarter since the contract's inception.

Figure 2



Data Source: Bloomberg

As of last year, it has been estimated by trade sources that investments benchmarked to the GSCI, including both the use of over-the-counter instruments and futures contracts, totaled \$4 billion.

Before discussing the possible impact of GSCI-based investment on its component commodity futures contracts, we will explain the technical aspects of commodity futures contract investing.

A long position in a commodity futures contract entitles its owner to take delivery of its underlying commodity at a certain date. If one holds the contract through the contract's maturity, one is obligated to take physical delivery of the commodity. If one only desires the price exposure of the commodity and not the actual commodity itself, then one is obligated to "roll" the futures contract before its maturity date. "Rolling" a futures contract means that the investor sells the contract before its maturity date, while simultaneously buying a contract with a more distant maturity date. The difference in value between the near-maturity contract and the more-distant-maturity contract is the value of the futures contract's "calendar spread."

The GSCI's index definition specifies three basic rules. The first is obviously what specific contracts make up the GSCI. The second is the weighting each contract is given in the GSCI. The third rule is unique to a futures-based index. This rule specifies on what dates these contracts should be rolled before their contract maturity. These rules are known as "roll rules." For the GSCI, the index's roll rule is for each of its constituent maturing contracts to be rolled during the fifth through ninth business day of the month prior to the contract's calendar month.

We noted before that S&P investors are price-indifferent during reweighting episodes. The goal for these investors is to match the closing price of the stock being added to the S&P; the price which is paid does not matter. This effect has been documented empirically by showing that the added stock's price rises before the inclusion of the stock into the index and then declines after the date the stock is added to the index.

In 1999, four commodities were added to the GSCI: International Petroleum Exchange [IPE] Brent Crude Oil, IPE Gas Oil, Kansas City Board of Trade Hard Red Winter Wheat, and New York Cotton Exchange Frozen Concentrated Orange Juice [OJ].

One way a price-pressure effect could manifest itself is in the change of value of a commodity's calendar spread during the GSCI roll period. If there were an effect, one would expect that a contract's front-month price would get depressed relative to the next-month contract during the time that GSCI investors are selling their maturing contracts and simultaneously buying deferred contracts. And that when the roll period was over, one would also expect that the front-month contract's value would recover with respect to its more deferred contract.

Bary [1998] noted that equity "indexers' indifference to price has spawned a host of trading strategies." We have found that the same can be said for the commodity markets.

As noted before, the GSCI roll period is during the fifth through ninth business day. If a GSCI roll-pressure effect exists, one possible trading strategy is a simultaneous "pre-roll" and "post-roll" strategy. A trader would sell the calendar spread just before the GSCI roll period. This means a trader would sell the front-month contract while simultaneously buying the next-month contract. The trader would then wait for the value of the calendar spread to decline during the roll period and would unwind the spread just before the roll period ends. As the roll period ends, the trader would buy the calendar spread. This means the trader would buy the front-month contract while simultaneously selling the next-month contract. The trader would then wait for the calendar spread value to recover and would unwind the spread after it does so.

If this simple strategy made significant profits in 1999 for each of the four added commodities, but was not clearly profitable in the year before the commodities were added to the GSCI, we believe this would be evidence of a price-pressure effect in the commodity markets due to indexing.

Not all commodity futures contracts have contracts listed each month. While the energy futures contracts have twelve monthly contracts, others have only five or six listings per year. For example, OJ futures contracts have six listings a year. This means that in a one-year trading horizon, OJ futures contracts need to be rolled six times a year in order for an investor to have continuous price exposure to OJ.

For each of the four added contracts, we examined the value of their calendar spreads during February through December of 1999 and during February through December of 1998. We excluded January since it may have its own individual effect due to any yearly reweighting occurring during that month.

We can show an analogous effect in the commodity futures contracts being added to the GSCI. In June of each year, the GSCI Policy Committee has the option of reweighting the index. They will do so "to enhance the current and future liquidity of the GSCI," according to Goldman Sachs [1998]. Any reweighting decisions take place during the following January roll period.

The year 1999 provides a good test case for the existence of price-pressure effects resulting from index-based commodity investing. Goldman Sachs made changes to the index "in the spirit of maintaining the twin objectives of global weighting, based on world production, and investability, based on trading liquidity." (in 2000 and 2001, the GSCI included the same underlying commodities as the previous year, which is why we are focusing on events in 1999)

We specifically examined what the profits would be for selling each commodity's calendar spread during the first through eighth business day of the contract's roll period and then buying the calendar spread during the eighth through fifteenth business day. We calculated the hypothetical profits from this strategy using the settlement prices for each of the four commodity futures contracts.

The return over each trade horizon is calculated as the change in the spread values divided by the initial value of the front-month contract on the first business day. We did so in order to express the returns in a way which would be comparable across commodities.

The results of our study are shown in Figure 3.

Figure 3: Roll-Pressure Effects Due to Passive Commodity Investing
In 1998 and 1999

<u>Brent Crude Oil</u>		<u>Pre-roll and Post-roll Strategy Profits</u>	<u>Z-statistic</u>	<u>Data points</u>
		<u>In Percent per Roll Cycle</u>		
1998	0.35%		1.47	11
1999	1.24%		3.12	11
<u>Orange Juice</u>				
1998	-5.59%		-1.04	6
1999	1.83%		1.70	6
<u>Kansas City Wheat</u>				
1998	0.14%		1.06	5
1999	0.21%		2.67	5
<u>Gas Oil</u>				
1998	0.00%		0.24	11
1999	0.86%		2.16	11

Data Source: Bloomberg

Note: These calculations exclude the commissions and execution slippage that a trader would face in carrying out these strategies. The calculations also do not take into consideration that in practice, an investor carrying out this type of strategy would use leverage and therefore magnify the stated returns.

The statistical significance of each of the returns in 1999 greatly improves over the previous year. This is very suggestive evidence that the inclusion of each of these commodities into the GSCI caused a change to the price behavior of their calendar spreads in the days preceding and following the GSCI roll period. Quite simply, this is empirical evidence of a type of temporary price-pressure effect on the added commodities.

We thought we would go one step further in our study and see if one could explain the size of the profits from employing roll-pressure strategies in the various commodities making up the GSCI during 1999. We took a sample of nine of the commodities in the GSCI and found an interesting result. The profits from the roll-pressure strategy could be linked to two variables:

- a measure of the impact of GSCI investment on each contract's trading volume, and
- a measure of the riskiness of each contract's calendar spread.

Both variables are positively related to the profits of carrying out the strategy for each commodity.

We will first discuss how we carried out this study and then we will discuss its implications.

Our sample of nine commodity futures contracts consists of Brent Crude Oil (CO); Orange Juice (OJ); Gas Oil (QS); Kansas City Wheat (KCW); New York Mercantile Exchange (NYMEX) Gasoline

(HU); NYMEX Heating Oil (HO); Coffee, Sugar and Cocoa Exchange Sugar (SB); Chicago Board of Trade Wheat (W), and Chicago Mercantile Exchange Live Cattle (LC).

To create a measure of the impact of GSCI investment on each contract's trading volume, we first need an estimate of the total investment in the GSCI. We will use the open interest of the GSCI's CME-listed contract as of the beginning of 1999 for our estimate. We can then figure out how much of a particular commodity GSCI futures investors control by examining the percentage share the commodity makes up of the GSCI. Next we take the amount of commodity futures contracts implicitly held by indexed investors and compare this amount to the contract's daily trading volume at the start of each month's GSCI roll period. We will assume that GSCI investors roll 20% of their contracts per day during the five-day roll period. With this information, we can calculate the *average percentage of daily trading volume due to 1999 GSCI futures contract investment per commodity contract during the GSCI roll period*.

To create a measure of riskiness of each contract's calendar spread, we will examine the maximum change the spread experienced during the three months prior to the beginning of February, 1999. In order to express this measure in common terms across commodities, we will express this change as a percentage of each commodity's front-month price as of the beginning of February, 1999. Note that we are not using volatility as our measure of risk. This is a deliberate choice. In practice, we note that leveraged investors examine maximum-to-peak drawdowns as their measure of risk rather than using some multiple of recent volatility, which relies on distributional assumptions. The market participants who trade futures spreads are typically leveraged. With this information, we can calculate the *perceived riskiness of each contract's calendar spread*.

Figure 4 shows the data for the two explanatory variables along with the profits of the roll-pressure strategy for each of the nine commodities.

Figure 4: 1999 Profits from Roll-Pressure Strategy Shown With Two Explanatory Factors

	Impact of GSCI Investment On Each Contract's Trading Volume*	Riskiness of each Contract's Calendar Spread	% Profits Per Roll Cycle
CO	5.84%	1.73%	1.24%
OJ	13.48%	2.34%	1.83%
QS	3.77%	2.26%	0.86%
KCW	7.19%	0.99%	0.21%
HU	2.16%	2.20%	0.45%
HO	4.22%	2.30%	0.29%
SB	4.76%	5.30%	2.15%
W	7.64%	1.30%	0.44%
LC	8.09%	4.65%	1.51%

* If one added in the amount of GSCI investment due to over-the-counter (OTC) investment vehicles, these figures would all be proportionately greater. We excluded the OTC figures since exact figures are not published. This does not affect the statistical fit of the trading-volume variable, though.

The regression of the profits of the roll-pressure strategy per commodity vs. the two explanatory variables yields an R-squared of 75%. In other words, 75% of the variation in profits across the nine commodities can be explained by the two factors. The linear equation produced by the regression is as follows:

$$\text{Profits} = -.58\% + [9.57\% * \text{trading-volume variable}] + [.38\% * \text{risk variable}]$$

(-1.39)
(+2.17)
(+3.76)

The t-statistics for the coefficients are in parentheses.

We take these results to mean the following. The first variable means that GSCI investors need to be a sufficient fraction of a contract's trading volume in order for their impact on the contract to be meaningful. The second variable means that the market professionals who supply liquidity by taking the other side of investor transactions need to be paid more for this risk-taking activity if a contract's spread is quite volatile. After all, there are more forces at work in altering the value of a futures contract's calendar spread than just the activity of passive GSCI investors rolling their futures contracts. If the spread is quite volatile, one is taking on risk in pre-rolling the spread in advance of the GSCI rollers and post-rolling after the pressure resulting from their participation subsides. The market professionals need to be paid sufficiently for this risk in order to justify taking on this risk.

Conclusion

The impact of indexing is exceptionally well documented in the equity markets. The same is not the case for the commodity markets. The contribution of this article is to point out the impact of indexing on commodities

Our empirical results suggest that one should see increased price-pressure effects in the commodity markets with any increase in the popularity of index-based commodity investments. Our results also suggest one additional subtle point: when comparing price-pressure results across commodities, it is not just the amount of passive investment that matters. How risky the opportunity is for market professionals to take advantage of is also a very important factor.

Bibliography

- Bary, Andrew, "Wow! '98 Had Enough Thrills for Several Years," *Barron's*, 12/28/98, p. MW3.
- Bary, Andrew, "Indexers Trounce Active Managers and Roil Market, Too," *Barron's*, 1/4/99, p. MW3.
- Bear Stearns on-line morning commentary, 8/8/99.
- Farrell, Christopher, "Who Needs a Money Manager?," *Business Week*, 2/22/99, 127-136.
- Goldman, Sachs & Co., "1999 GSCI Commodities and Weights: Expanding Liquidity to Meet Increasing Investor Interest," Press Release, 7/23/98.
- Harris and Gurel, "Price and Volume Effects Associated with Changes in the S&P 500 List: New Evidence for the Existence of Price Pressures," *Journal of Finance* 41 (September 1986), 815-829.
- Karmin, Craig, "Investors Rediscover Taiwan, Malaysia After Index-Status Change," *Wall Street Journal*, 8/16/99, p. C14.

Founded in 1906, EDHEC Business School offers management education at undergraduate, graduate, post-graduate and executive levels. Holding the AACSB, AMBA and EQUIS accreditations and regularly ranked among Europe's leading institutions, EDHEC Business School delivers degree courses to over 6,000 students from the world over and trains 5,500 professionals yearly through executive courses and research events. The School's 'Research for Business' policy focuses on issues that correspond to genuine industry and community expectations.

Established in 2001, EDHEC-Risk Institute has become the premier academic centre for industry-relevant financial research. In partnership with large financial institutions, its team of ninety permanent professors, engineers, and support staff, and forty-eight research associates and affiliate professors, implements six research programmes and sixteen research chairs and strategic research projects focusing on asset allocation and

risk management. EDHEC-Risk Institute also has highly significant executive education activities for professionals. It has an original PhD in Finance programme which has an executive track for high level professionals. Complementing the core faculty, this unique PhD in Finance programme has highly prestigious affiliate faculty from universities such as Princeton, Wharton, Oxford, Chicago and CalTech.

In 2012, EDHEC-Risk Institute signed two strategic partnership agreements with the Operations Research and Financial Engineering department of Princeton University to set up a joint research programme in the area of risk and investment management, and with Yale School of Management to set up joint certified executive training courses in North America and Europe in the area of investment management.

Copyright © 2014 EDHEC-Risk Institute



For more information, please contact:
Carolyn Essid on +33 493 187 824
or by e-mail to: carolyn.essid@edhec-risk.com

EDHEC-Risk Institute
393 promenade des Anglais
BP 3116 - 06202 Nice Cedex 3
France
Tel: +33 (0)4 93 18 78 24

EDHEC Risk Institute—North America
One Boston Place, 201 Washington Street
Suite 2608/2640, Boston, MA 02108
United States of America
Tel: +1 857 239 8891

EDHEC Risk Institute—Europe
10 Fleet Place, Ludgate
London EC4M 7RB
United Kingdom
Tel: +44 207 871 6740

EDHEC Risk Institute—France
16-18 rue du 4 septembre
75002 Paris
France
Tel: +33 (0)1 53 32 76 30

EDHEC Risk Institute—Asia
1 George Street
#07-02
Singapore 049145
Tel: +65 6438 0030