ABSTRACT

This paper examines the likely return behavior of investments in natural resources. It briefly describes the universe and discusses the investment issues involved. It primarily focuses on private market investments in natural resources assets, as private equity offers attractive and durable benefits over similar public market investments.

We find that natural resources are a suitable substitute for equities, especially during periods of high inflation. Meketa Investment Group recommends that long-term investors allocate a small percentage (3% to 5%) of their portfolios to natural resources investments, and that this come from their public equity allocations.

INTRODUCTION

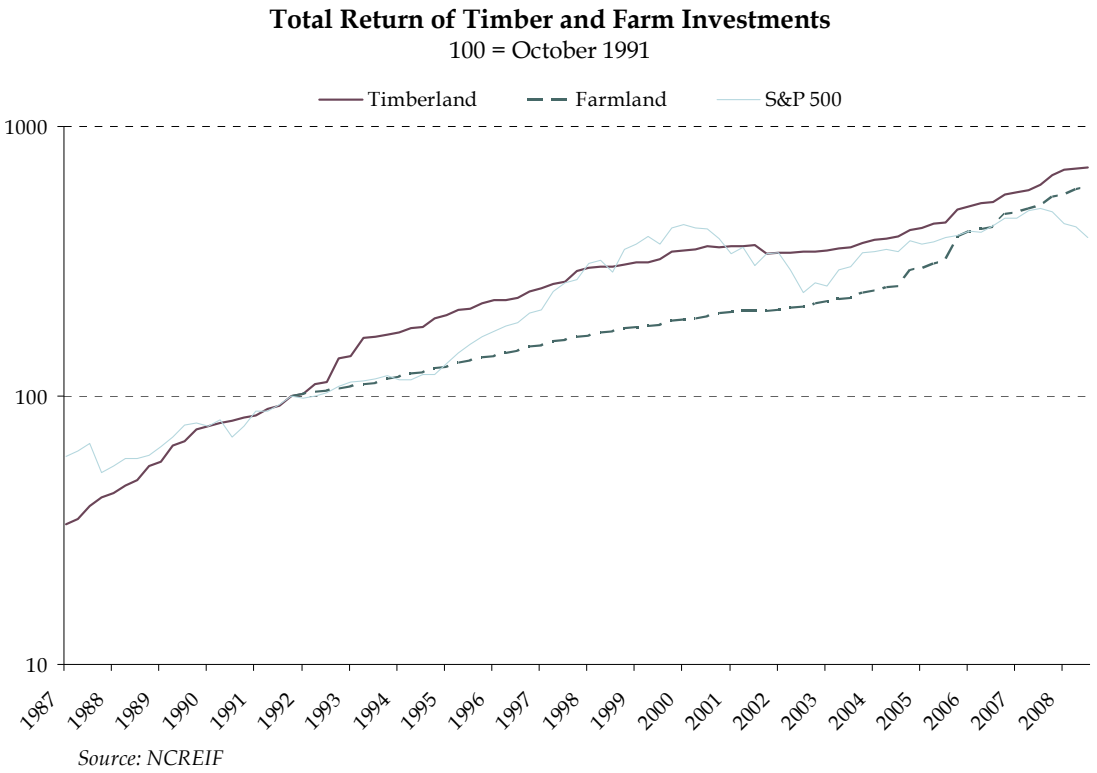
Natural resources are essentially products of the Earth that are considered valuable in a relatively unmodified form. A broad category, natural resources include everything from what we commonly refer to as commodities (e.g., oil, copper, wheat, apples, timber) to more exotic items (e.g., solar and wind power, geothermal heat, biofuels). In a financial context, natural resources funds focus on opportunities among a wide array of relevant economic activities, from extraction to transportation to refining, that are tied to the underlying value of commodities.

For exposition, it is useful to decompose the natural resources investment universe into three areas by whether they focus on harvested, extracted, or renewable resources.

Harvested Resources

Harvested resources strategies generate returns primarily through agricultural husbandry. That is, funds purchase farmland or timberland in order to derive returns from the growth and sale of, for example, grapes or pulpwood. In general, returns to these strategies mimic those for real estate: there is both an income component, based on the sale of goods harvested, and a capital appreciation or depreciation component, based on the eventual sale of the land. Since these strategies generally take place "upstream"—or early in the entire economic value chain—returns can be sensitive to the price of the associated commodities.

Though husbandry is as old as civilization itself, harvesting strategies in a modern portfolio context are relatively new, having only been popular since the late 1980s. In the early 2000s, the Harvard Management Company, which oversees Harvard's endowment, helped legitimize the field when it allocated 6% of its portfolio at the time to timber strategies, citing its attractive historical returns and diversification properties (Kovaleski, 2001). The short-term historical returns of investing in both timberland and farmland have indeed been attractive, as the following chart demonstrates. From 1987 through 2008, timberland has generated a 15.1% annualized return with an 8.4% annualized standard deviation; from 1987 through 2008, farmland has generated an 11.1% annualized return with a 6.8% annualized standard deviation. Note the lack of volatility in both time series, and how they outperformed—and were weakly correlated with—the S&P 500 over the relevant time frames.



Source: NCREIF

Extracted Resources

Extracted resources strategies generate returns from a variety of economic activities related to non-renewable products of the environment. These non-renewable products form the basis for two broad areas: (a) the oil, natural gas, and coal energy complex and (b) the industrial and precious metals sectors. Within these two areas, most strategies focus on exploration and production (E&P), which usually involves exploring for resources, leasing promising tracts of land, drilling or mining, and extracting the resources. Others complement these strategies by engaging in midstream activities, such as transporting, storing, and refining energy products. In general, returns to these strategies are similar to those of equities: investors partly or fully own a company that pays dividends and attempts to grow earnings. Furthermore, midstream investments may be relatively less sensitive to the price of the relevant commodity as they profit from a spread, which may not move in sympathy with changes in the cost of either the input or the output commodity.

There is little available data on the historical returns of private market investments in extracted resources. Thus we focus our examination on public market history, noting that it may not be wholly indicative of what a private market investor may expect.

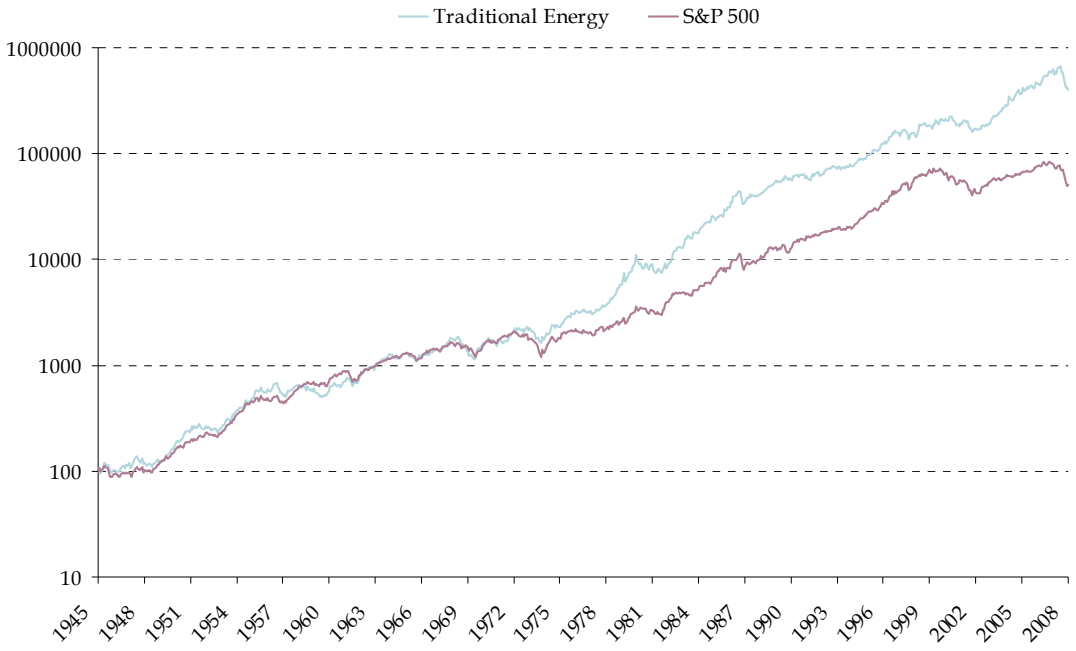
Oil, Natural Gas, and Coal Investments

The oil, natural gas, and coal energy complex is the dominant focus of extracted resources strategies. These "traditional" energy sources have a rich history in developed countries; the rewards for having been invested in large oil, natural gas, and coal companies since 1945—which may serve as a proxy for similar natural

resources investments—is shown in the following chart. From 1945 through 2008, investing in a basket of traditional energy equities has generated a 14.1% annualized return with a 17.9% annualized standard deviation; from 1970 through 2008, the same basket has generated a 15.7% annualized return with an 19.1% annualized standard deviation. Note that traditional energy sector investments outperformed the S&P 500, which has returned 10.4% with a 14.5% standard deviation since 1945.

Total Return of Traditional Energy Investments

100 = December 1945

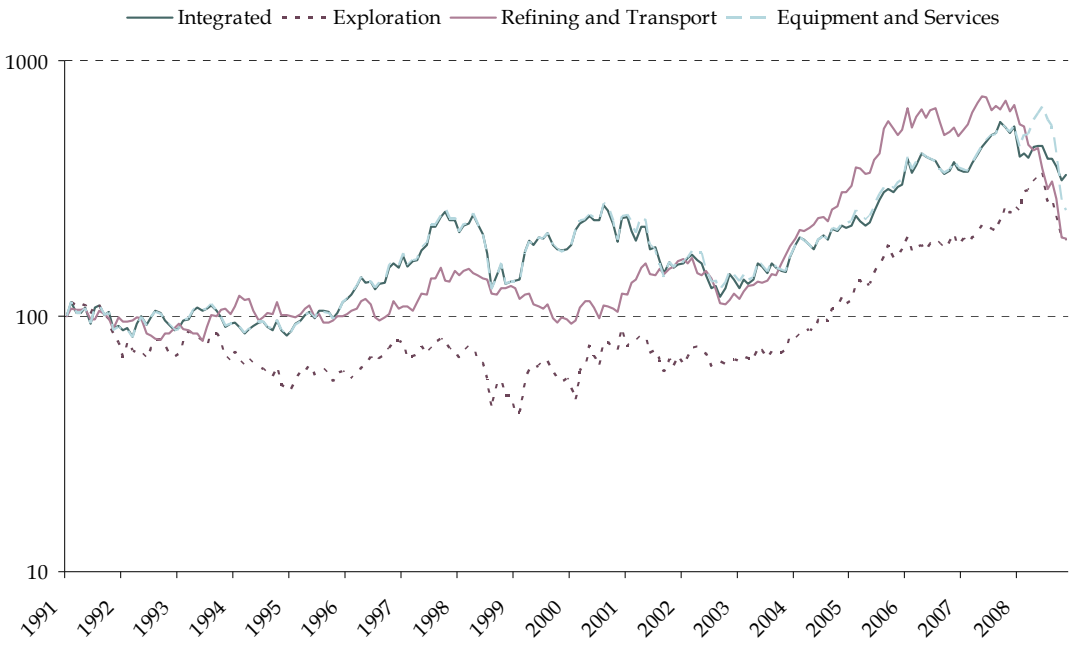


Source: Global Financial Data

Of course, the universe of investable energy companies is diverse. Within the oil and natural gas segment (as opposed to coal), there are firms that specialize in drilling, others that manufacture rig equipment and provide services, others that transport the material, and still others that refine the products into end-user fuels. Furthermore, many firms engage in one or more of the above activities. The market prices of these various subsectors have fluctuated differently over time, as shown in the following chart, which displays price returns for various energy sub-sectors since 1991.

Market Price of Traditional Energy Sub-sectors

100 = January 1991



Source: Global Financial Data

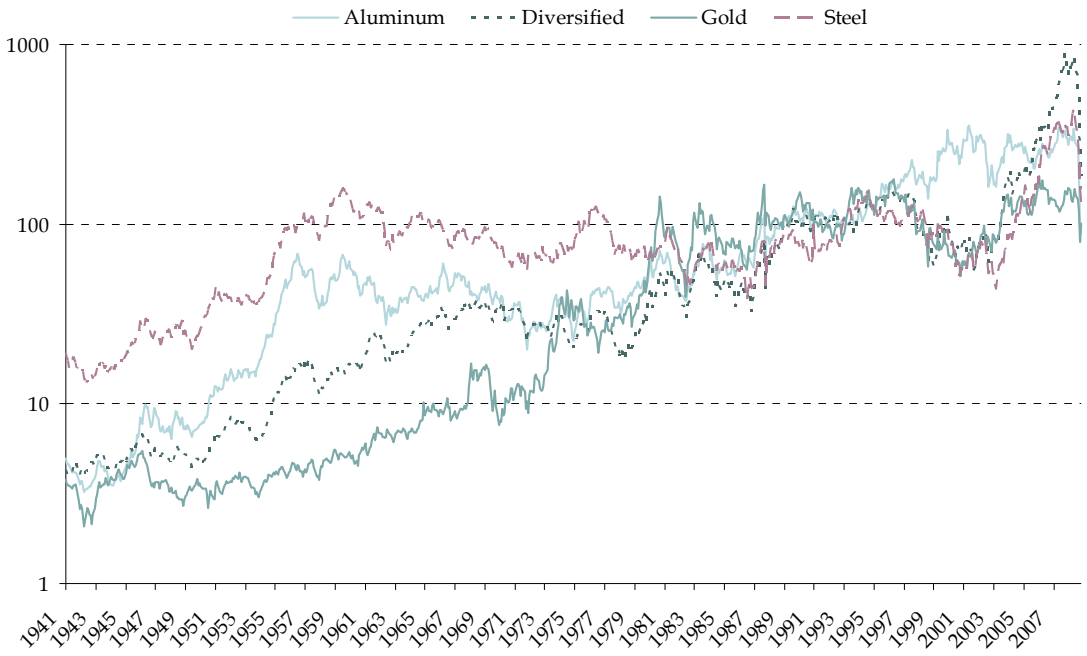
These subsectors do not move in total sympathy: although the market price of integrated energy companies doubled from 1991 to 2000, the market price of refining and transport companies only maintained their value, while the market price of exploration companies lost 30%. Historically, integrated companies have outperformed the more specialized players in the oil and natural gas complex. In addition, the midstream activities pursued by the refining and transportation segment have been less correlated with changes in the price of oil than the upstream activities pursued by the exploration companies and the equipment and services firms that support them (see Appendix A).

Metals Investments

Humans have been mining for precious and base metals for millennia. Unfortunately, there are no reliable total return indices to track the long-term historical performance of metals and mining stocks. However, we do have data for the price of large metals and mining stocks dating back to 1941, and this data is shown in the following chart.

Market Price of Metals and Mining Investments

100 = January 1991



Source: Global Financial Data

Since 1941, an equal investment in each of the various metals and mining equities would have generated a 4.8% annualized *price* return with a 24.4% annualized standard deviation[1]; during that time, the S&P 500 annualized *price* return and standard deviation was 6.8% and 14.3%, respectively. As in the traditional energy complex, the market value of companies in the metals and mining sector are positively correlated with the spot prices of relevant commodities (see Appendix A).

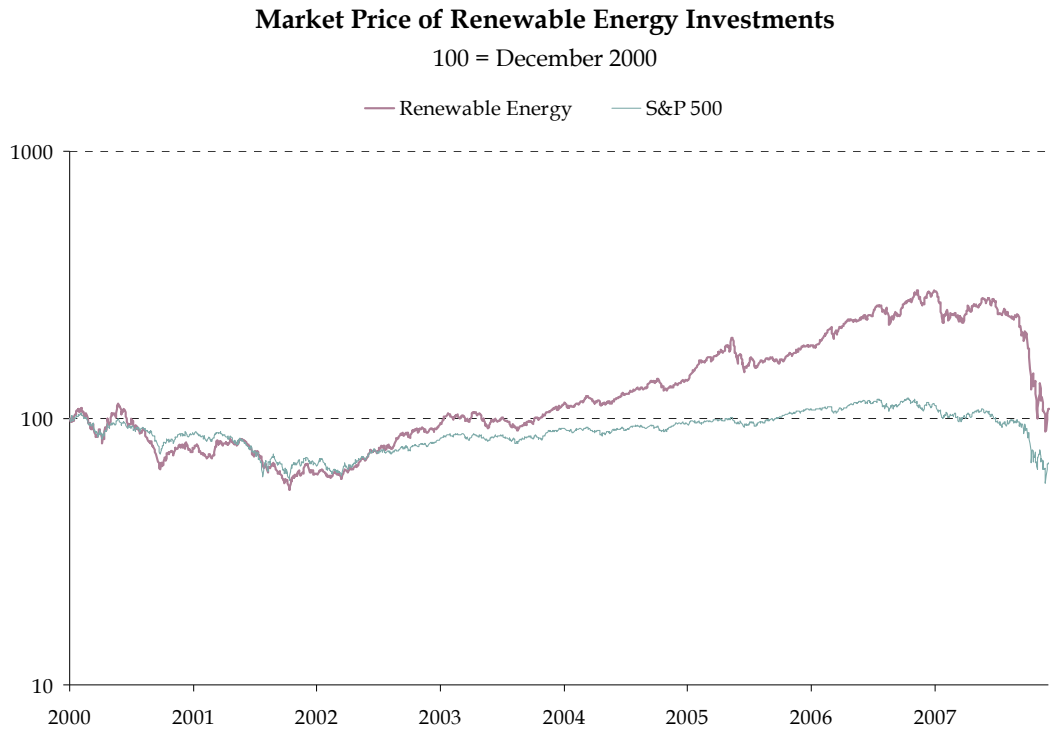
Renewable Energy

Renewable energy investment strategies generate returns from a variety of economic activities within the emerging alternative energy complex. Among other things, these strategies concentrate on solar, hydro, geothermal, and wind power, as well as biofuels and biomass. Depending on strategy and focus, returns to renewable energy strategies could be similar to those of equities (e.g., in the case of solar technology companies) or for real estate (e.g., in the case of wind farms). However, unlike the land and traditional energy categories, this area is relatively new and historical data is fairly uninformative. Furthermore, many investments in this sector are only viable with the assistance of government subsidies. As long as this is the case, there will remain considerable uncertainty about the long term prospects for returns, as governments frequently alter their political priorities and spending.

Some representative data regarding renewable energy investments do exist, courtesy of an index that tracks the share prices of approximately 100 small cap stocks involved in the

[1] Dividend, and hence, total return data was not available for the metals and mining composite.

development of new energy technologies; the historical returns for this composite are shown in the following chart.



Source: WilderHill NEX

Since 2000, investing in these alternative energy companies generated a 1.0% annualized price return with a 24.4% annualized standard deviation. Note that, on a price basis, this renewable energy index outperformed, but was highly correlated with, the S&P 500 over this brief time period (-4.7% return, 21% standard deviation).

EXPECTED RETURN COMPONENTS

Generally, there are two sources of returns from investing in risky asset classes: income and appreciation.

Income

Income is the money that accrues on a fixed schedule, much like dividends or bond coupon payments. In the context of natural resources strategies, income may derive from the periodic sale of harvested, extracted, or renewable energy goods, lease payments from tenant farmers, potential subsidy payments from the government, or dividends from equity stakes in common shares. We expect income to be a bigger component of timberland, farmland, and pure exploration and production strategies.

Appreciation

Appreciation is the capital gain from the sale of an asset. In the context of natural resources strategies, appreciation may stem from an increase in the value of the underlying land (e.g., farmland that a residential real estate developer covets) or from an increase in the value of the natural resources company owned (e.g., through steady earnings growth). Appreciation will often be driven by GDP growth and the state of the business cycle.

Expected (Commodity) Price Return

Natural resources investments are in some ways a superset of more traditional, futures-based commodity investments. Certainly, some component of the return to a natural resources investment stems from exposure to the price of a particular set of commodities. Indeed, this exposure is one of the primary reasons that natural resources investments are specifically recommended. For this reason, it is important to discuss the common arguments regarding expected commodity prices.

Throughout history, there has been a debate about the long-term future path of commodity prices. Generally, commodity bulls may make two arguments in favor of expected price increases. First, some will cite increasing (and inelastic) demand from newly industrializing nations and the inelasticity of supply.[2] Second, others will argue that the world faces an inflationary future, driven by intentional devaluation of global currencies. On the other hand, commodity bears may make two arguments in favor of expected price decreases. First, some will expect continued improvements in production that will increase the supply of—or offer substitutes for—many commodities, leading to only modest price changes (or, at least, to modest *real* price changes). Second, others may argue that an imbalanced, overleveraged world faces a lengthy period of economic stagnation. Such an outcome should diminish aggregate demand and cause prices to stagnate or decline.

RELATIONSHIP WITH CONSUMER PRICE INFLATION

Since many advisors advocate natural resources investments to protect against consumer price inflation, it is worthwhile to investigate whether this protection exists. For this analysis, we used the total return series for the traditional energy complex since 1945 (described above) and examined the returns during periods when the CPI-U was in the top and bottom quintiles. The results are summarized in Appendix B. From the results, *it appears as though the inflation benefit to energy investments is strong and robust, especially over longer time periods: energy companies have benefited enormously during the highest periods of inflation*. Conversely, during periods of low inflation, traditional energy stocks perform slightly worse than the broader market over most time frames.

However, this evidence is not meant to suggest that other natural resource investments (e.g., metals and mining, renewables, and farmland) will necessarily fare just as well as an inflation hedge. Furthermore, most natural resources investments are focused on smaller firms than may not be accurately represented by the large energy sector. Finally, note that

[2] The "peak oil" argument belongs to this category as well.

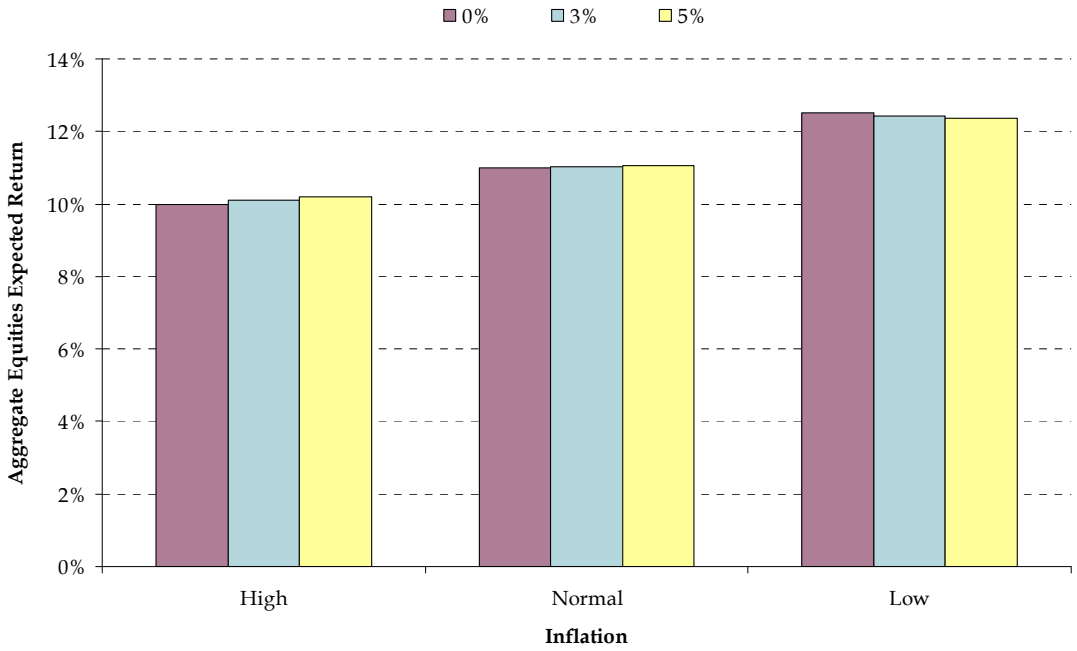
historical returns are simply guides to the future and should not be considered immutable market facts. Nevertheless, the results suggest that, over most time horizons, investments in energy companies may provide an investor's portfolio with a reasonable hedge against high inflation (relative to equities generally).

INVESTMENT APPROACH

A general expectation that inflation will be high (at the consumer price level) could motivate an investment in natural resources. In these cases, the investor may expect returns of public natural resources stocks to be above public equity market returns, with similar volatility. This inflation benefit alone may be reason enough to shift a portion of a fund's portfolio to natural resources investments.

The most pronounced effect of an allocation to natural resources investments is to diminish the downside risk of the portfolio during periods of high inflation. The following chart demonstrates the magnitude of this effect for 0%, 3%, and 5% allocations to natural resources investments.[3] Increasing a natural resources allocation from 0% to 5% may be expected to improve the return of the total equity portfolio (including natural resources) during periods of high inflation. However, if inflation is unexpectedly low, the investor would suffer a modest opportunity cost.

Natural Resources Allocation and Inflation



[3] The analysis assumes that returns to natural resource investments are 14%, 12%, 10% during periods of relatively high, normal, and low inflation, respectively. The analysis further assumes that returns to public equity investments are 10%, 11%, and 12.5% during periods of relatively high, normal, and low inflation, respectively. These numbers are based on an analysis of twenty-year annualized returns, in conjunction with MIG's 2009 Annual Asset Study expectations.

STRATEGIC ALLOCATION

Besides hedging against inflation, there are other motivating factors for investing in natural resources. These include the diversification benefit of investing in assets that are not highly correlated with the rest of an investor's portfolio, as well as the possibility of producing returns in excess of public markets via a private market approach.

Natural resources as an investable universe have become a rich area for private equity. As an investment structure whereby managers purchase and then operate companies, private equity has historically added a few hundred basis points to comparable returns of public equity. Since private market investments in the natural resources space are (1) not fully mature (i.e., the manager universe is not deep) and (2) require high levels of operational and engineering expertise, there is every reason to suspect this pattern to continue for the foreseeable future. Furthermore, the natural resources universe—especially in the traditional energy space—is extremely inefficient due to its unique industry structure, which is heavily concentrated. Lastly, an investor might expect an additional positive return contribution because of the relative illiquidity of private equity investments.

Regarding manager selection, our research indicates that the spread between top quartile and median private equity funds is approximately 1,000 basis points; this spread is unlikely to be smaller in the natural resources space. Such a large spread highlights the potential gains to be achieved through the careful selection of natural resources funds.

As private equity matures and the attractive opportunities become exhausted, the character of returns should approach those of the public market. Nevertheless, we expect that private and public equity investments in natural resources have not yet converged. Indeed, private equity should continue to post superior returns to public stocks over long periods of time, due to market inefficiency, aligned incentives, skillful use of control, and greater growth potential.

Private equity investments have historically exhibited low-to-moderate correlation with the public equity market and, at the same time, lower *observed* volatility.[4] In essence, natural resources investments may properly be considered equity investments that perform best in periods of high inflation. Therefore, it is recommended that any allocation to natural resources investments be funded from public equity market investments.

Plan sponsors new to natural resources investing should consider allocating 3% to 5% to this asset class, achieving this allocation over a period of years (see the following table). Like private equity partnerships, most natural resources funds require an advance commitment of capital. The majority of the commitment is drawn down ("called") by the general partner over a period of usually two to five years, during which time the actual investment is less than the committed amount. Also, while one commitment is being drawn down, other partnerships may be paying off, effectively reducing the plan sponsor's allocation to the asset

[4] This lower observed volatility and correlations are largely due to the historical accounting methods used by private equity firms. Indeed, as accounting methodologies have recently become "less favorable" by requiring assets be marked to market, private equity investments have become more volatile.

class. Therefore, to maintain a fixed level of actual investment in natural resources, it is necessary to commit more than the target allocation (i.e., over-commit). There is insufficient history to establish a hard rule on how much to over-commit, but we estimate it will be necessary to commit 1.2x to 1.8x the desired allocation.

	0%	3%	5%
Equities	60%	57%	55%
Bonds	40%	40%	40%
Natural Resources	0%	3%	5%
Exp. Return	7.4%	7.5%	7.5%
Exp. Std. Dev.	10.5%	10.2%	10.1%

Source: MIG 2009 Annual Asset Study

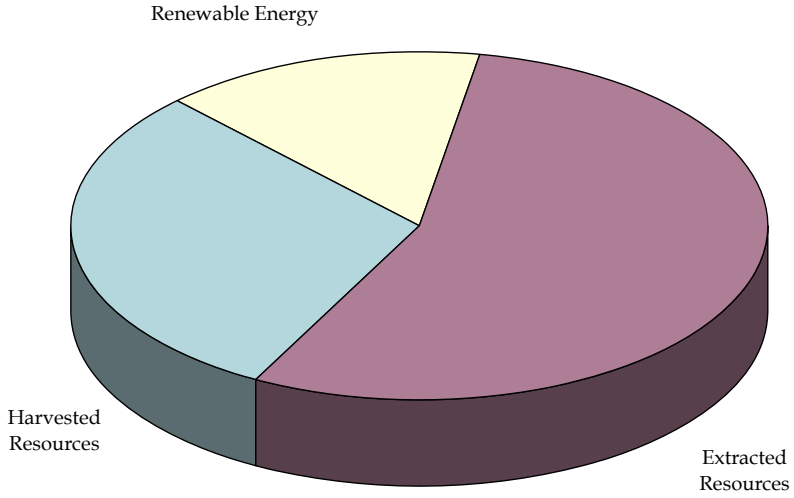
PORTFOLIO CONSTRUCTION

We expect that a diversified natural resources portfolio will in aggregate produce returns in excess of those of the public equity markets. We expect that a diversified portfolio of natural resources, in aggregate, will experience higher volatility than that of stocks, but its inclusion as a non-highly correlated asset class should reduce overall portfolio volatility, as seen in the table above.

A portfolio of natural resources investments should be well diversified to reduce the risks for which an investor is not compensated. This includes diversification by strategy, geography, manager, vehicle, individual investment, and vintage year.

The construction of a diversified natural resources portfolio will be partly determined by the available set of investment opportunities. For example, there are only a handful of firms that make available vehicles to invest in U.S. farmland, and some of these are limited to large separate accounts (e.g., $50 million or more). The number of U.S. timberland managers has grown in the past decade to more than two dozen, and many have expanded their investments to include non-U.S. timberland. Though there are occasionally attractive renewable energy investment opportunities, the most robust universe of investment opportunities remains within the traditional energy complex, specifically focused on extraction, production, and distribution of hydrocarbons.

Given the opportunity set and the investment characteristics of each component, a mature natural resources portfolio should likely emphasize extracted resources while placing the least emphasis on renewable resources. A sample allocation is depicted in the following chart. However, there is no single allocation appropriate for all investors. A key component of developing an investment policy for natural resources would include determining the allocation most appropriate for a plan sponsor's risk and return expectations.



IMPLEMENTATION

Private vs. Public

Plan sponsors may invest in natural resources assets through both privately and publicly traded vehicles. These two types of vehicles will exhibit different volatility characteristics. Publicly traded vehicles are likely to exhibit equity-like volatility. Private vehicle volatility is expected to be somewhat lower. Furthermore, private equity funds run by quality managers should provide an additional alpha over similar public market investments. *As such, we have a preference for achieving the majority of a plan sponsor's allocation to natural resources via private market funds.*

However, it may take some years to fully achieve the desired target allocation via investments in private market funds. Therefore, plan sponsors may wish to consider investing the balance of their target allocation in listed (public) natural resources vehicles. The largest downside of a public market allocation is the very high correlation to the returns of energy and related stocks. A public market investment will behave more like public equities than will private market investments. Note that exposure to some natural resources sectors may only be available as a pure play in one format or the other (e.g., water funds, commodities futures, timberland).

During periods of high inflation, natural resources stocks may be assumed to return more than broad public equity markets. If an investor is confident that such a period is forthcoming, then a larger allocation to natural resources stocks—especially stocks of upstream companies—may be warranted.

Benchmarks

The natural resources asset class is in the early stages of development, and while benchmarks exist for certain components (e.g., timberland and commodities), no standard industry benchmark has yet emerged for the entire class.

Timing

Most of the underlying industries in the natural resources category can be highly cyclical, driven by the cyclicality of commodity prices. Commodity prices themselves are largely dependent on the rate of global growth. Therefore, the least attractive time to invest in natural resources is when global growth is at a peak, if such a peak could be identified.

Trying to time a market on a quarter-by-quarter basis is extremely difficult, and we recommend against doing so. Rather, we recommend a more tactical approach, by setting target allocation ranges wide enough to allow for modest shifts relative to the long-term target. A plan sponsor who is concerned about an entry point might consider allocating assets to the space gradually, and if a particular sector appears temporarily unattractive, a more gradual approach to investment in that sector may be warranted.

Vehicle

There are two categories of investment vehicles available for investors who wish to invest in natural resources. The private vehicles are usually "closed-end" funds, though some separate account options are available. The publicly traded vehicles are traditional open-end funds and strategies (like mutual funds) whose share prices fluctuate daily.

Most of the current universe of natural resources funds is structured like private equity partnerships in nearly every manner. They are closed-end private funds, generally with ten-year terms and two to three one-year extensions. They are structured with an investment period of three to five years, and will usually invest in ten to fifteen assets.

Costs

Like private equity partnerships, the fees on private natural resources funds are high, and generally include both a management fee (ranging from 1.5% to 2.0% per year) and a performance-based fee. The latter may or may not involve an 8% to 10% hurdle rate and commonly includes a carried interest of 20%. All of the costs and fees associated with natural resources investing are higher than for public market securities and will be dilutive on returns. Any investor must consider these costs carefully.

Another characteristic that natural resources funds will share with private equity partnerships is the J-curve. However, this is mitigated by the income stream generated by many natural resources assets shortly after their acquisition. Hence, the J-curve should be less pronounced than that to which private equity investors are accustomed.

An allocation to natural resources will require added commitments by the plan sponsor in time and resources. Administratively, the capital calls and distributions associated with natural resources funds are unpredictable. Fund administrators need procedures to

accommodate these cash flows reliably and efficiently. These assets will require additional monitoring by the plan sponsor.

SUMMARY AND RECOMMENDATION

Natural resources represent a new asset class for many institutional investors. Although the majority of natural resources funds have short histories, historical data suggest (1) that public market natural resources strategies should perform best during periods of high inflation, and (2) that natural resources should produce returns in excess of those of broader public equities.

Meketa Investment Group recommends that long-term investors allocate a small percentage (3% to 5%) of their assets to natural resources investments and that this come from their broad public equity allocation. Plan sponsors should focus on private market funds, gradually increasing their exposure to natural resources and building a diversified portfolio of funds over a period of years. However, if an inflationary period is anticipated, a plan sponsor may consider investing the as-yet-unfunded portion of their private natural resources allocation in public natural resources stocks in order to mitigate the negative impact of inflation on their portfolio.

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GLOSSARY

Base metals: Non-precious, non-ferrous metals that include copper, aluminum, lead, nickel, tin, and zinc.

Biofuels: Biofuels are combustible fuels, such as bio-ethanol, that are made and processed from vegetation sources such as corn, sugar cane, barley, or wheat.

Cleantech: A broad term used to classify products or services that improve energy productivity, performance, or efficiency while reducing input costs, consumption, waste, or pollution. Common products associated with cleantech are wind farms, photovoltaics, fuel cells, biofuels, and smart grid technologies.

Downstream: Portion of the energy chain that includes oil refineries, petrochemical plants, power generation, and distribution outlets.

E&P: Acronym for "Exploration and Production" that relates to the exploration, development, and production of crude oil or natural gas reserves. E&P is also referred to as the upstream sector.

Hedging: Strategy used to limit or offset exposure to pricing risk of an underlying commodity. A common way to execute this strategy is through the use of futures contracts, a financial derivative that allows for the sale of a commodity at a pre-specified price in the future, whether or not the market price increases or decreases at the time.

Hydrocarbon: A hydrogen and carbon compound created from the decomposition of organic material over time. Most hydrocarbons are found naturally in fossil fuels such as crude oil, natural gas, and coal.

Midstream: The portion of the energy chain that transports and stores commodities such as oil and natural gas.

Natural Gas: A gaseous fossil fuel consisting primarily of methane and other heavier hydrocarbons. Natural gas burns cleaner than oil and coal and is a major source of electricity generation through the use of gas and steam turbines.

Oil Sands: Naturally occurring mixtures of a very dense, tar-like form of petroleum called bitumen and sand or clay. Because of the high production and refining costs associated with oil sands, economic feasibility only occurs with high oil prices.

Operator: An individual or company responsible for the exploration, production, and development of an oil or gas well.

Precious Metals: Precious metals include gold, silver, palladium, and platinum. These metals have wide industrial uses but are better known for their usage in jewelry, art, and store of value.

Renewable Energy: Energy derived from natural resources such as solar, wind, geothermal, or biofuels. Unlike oil, natural gas, or coal, these sources of energy are naturally replenished, providing a potential source of cleaner and more sustainable energy.

Upstream: Portion of the energy industry engaged in the exploration, production, and development of crude oil and natural gas reserves.

APPENDIX A

HISTORICAL RETURN DATA

Extracted Resources

	Full History Corr. Oil[5]	Since 1991 Corr. Oil
Integrated ('41-'08)	0.19	0.37
Exploration ('89-'08)	0.43	0.44
Refining and Trans. ('91-'08)	0.22	0.22
Equipment and Serv. ('89-'08)	0.38	0.45

Precious and Base Metals

	Corr.[6]
Aluminum	0.34
Diversified	0.36
Gold	0.52
Steel	0.25
Metals and Mining	0.34

[5] Historical spot price or near-month WTI price; monthly return series. Most companies are focused on crude oil, a smaller proportion on natural gas.

[6] Historical spot price or near-month price for aluminum and gold, CRB spot metals index for diversified, steel, and the equal-weighted basket. Monthly correlations starting when spot prices were either available or started varying in dollar terms: aluminum, since 1986; gold, since 1941; diversified, steel, and equal-weighted basket, since 1947.

APPENDIX B

BEHAVIOR OF ENERGY STOCKS DURING PERIODS OF HIGH AND LOW INFLATION

	Top Quintile Inflation	Bottom Quintile Inflation	Total Sample Correlation w/ CPI-U
One-Year			
CPI-U	9.8%	0.7%	1.00
Energy	16.8%	14.0%	0.08
S&P 500	5.7%	17.8%	-0.26
Three-Year			
CPI-U	8.2%	1.2%	1.00
Energy	15.6%	14.8%	0.11
S&P 500	6.6%	16.0%	-0.01
Five-Year			
CPI-U	8.0%	1.5%	1.00
Energy	18.2%	13.4%	0.22
S&P 500	8.2%	14.4%	-0.27
Ten-Year			
CPI-U	7.4%	1.6%	1.00
Energy	19.5%	12.0%	0.42
S&P 500	9.6%	14.1%	-0.34
Twenty-Year			
CPI-U	6.3%	2.5%	1.00
Energy	18.0%	12.6%	0.54
S&P 500	10.2%	12.6%	-0.31