



**Università Commerciale
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Alternative Investments (30187)

Group Assignment: How do Alternative Investments
fit into Asset Allocations? – Emirates Investment
Trust Portfolio Simulation

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Executive Summary

Our fund manages the macro division for the Sovereign Wealth Fund of the United Arab Emirates. The overwhelming majority of the GDP of the country comes from oil exports, and most of our capital therefore does too. Our task is to create a portfolio that can hedge risks related to oil market, while aiming for positive returns and lowest possible volatility in all states of the world.

Firstly, we did a brief macro-perspective overview of main geographical areas where investments would be possible and viable, taking into account current political and economic situation of areas in question and our investment goals.

Secondly, we looked into different asset classes that would best suit our investment goals, trying to contemporaneously hedge risk exposures and boost our expected returns. Investments into alternative assets were given special consideration, both because of nature of our task and because of recent investment trends in real world Sovereign Investment Funds.

The main assumptions that we made are: our fund is denominated in US dollars, as our underlying asset, namely oil, is traded in this currency and all the investments in “indexes” are investments in ETF funds tracking the particular index stated - we found this investment strategy to be effective as a mean of diversification and overall risk reduction.

After all the considerations, we decided to invest into small-cap US Stocks (Russell 2000 Index), in FTSE All-Share Index (with currency exchange considerations), in Chinese A-shares, and, with regards to alternative investments, we opted to invest in renewable energy Ardour Global Index, in real estate, through FTSE/NAREIT global REIT index, and as well as in agricultural commodities (due to low correlation with oil observed from historical data). As we are enabled to make medium number of shorts, we used this possibility with industrial metals - due to their high correlation with oil we opted to short DBIQ Optimum Yield Industrial Metal Index.

Overall, our portfolio has expected monthly returns of 0.676% and expected volatility (standard deviation) of 0.214%. This means we would have returns of approximately 8% per annum, which is consistent with most SWFs goals (from 5 to 8 percent).

Client Profile

Our client is one of the biggest Sovereign Wealth Funds (SWF) of the United Arab Emirates and we are in charge of managing its “Global Macro” division with a \$1B budget. Since the great majority of the resources invested in the fund come from exporting oil, our main task is to build a portfolio that allows to protect the surplus revenues from oil.

As the basis of creating our portfolio of assets, we looked into the ways real sovereign fund of this sort invest their money, mainly looking at Middle East funds, whose hedging needs are similar to ours: a paradigm of this is the Abu Dhabi Investment Authority (ADIA), the third biggest SWF in the world.¹ Traditionally, SWFs are passive, long-term investors, and rarely reveal their full portfolios. However, while researching on ADIA, we found out that, in recent market developments, with decreasing or negative government interest rates and uncertain equity markets (see Macro Analysis for more details), an increasing number of SWFs invest in alternative asset classes. ADIA has expanded its alternative investments as well as real estate and infrastructure unit in 2015².

A peculiarity of SWFs is that, due to their cash flows growing rapidly in times when oil markets are up, it is not desirable for them to invest entirely in safe, fixed-income assets such as U.S. Treasury bonds or even in individual, publicly-listed companies. This means that when oil markets are up, our fund would have an abundant base for investments, and since SWFs are not bound by regulations similar to those encircling pension funds, we are free to invest in riskier assets and then diversify thanks to the abundance of economic resources. However, we must pay close attention not only to the diversification strategy of our portfolio, but also to the degree of diversification with oil market related risk, which should be the lowest possible. We have a possibility to make medium number of shorts which we will exploit, and we are allowed and even encouraged to invest in emerging markets which bear high risk, as that is what real-world SWFs do, as stated in International Monetary Fund's report on SWFs³.

In 2005 Kuwait Investment Authority started a trend of “decreasing of the fund's allocations to the traditional asset classes and increasing the allocation into nontraditional and uncorrelated asset classes.”⁴ This meant a shift from investments in slow-growth economies like United States, Great Britain, and Germany to rapidly-growing economies—namely, China, India, South Korea, and Turkey. A direct quote from one of the chief officers of the Kuwait Investment Authority read “If we can invest in 8% growth economies, why would we invest into 2% growth economies”. Following the same logic, we decided to look into possible investments in emerging markets, knowing that with the higher returns they also carry higher risks, but as stated before, SWFs such as the one we are in charge of are not exactly risk averse, as long as their main risk (in our case, a drop in oil

¹ SWFI (2016) *Fund rankings*. Available at: <http://www.swfinstitute.org/fund-rankings/> (Accessed: 27 November 2016).

² Martin, M. (2016) *Abu Dhabi wealth fund says long-term investment gains fell*. Available at: <http://www.bloomberg.com/news/articles/2016-07-20/abu-dhabi-sovereign-fund-says-long-term-investment-returns-fell> (Accessed: 27 November 2016).

³ "Report for Selected Countries and Subjects, United Arab Emirates," (2007) World Economic Outlook Database, International Monetary Fund, (accessed Nov. 23, 2016).

⁴ Raphaeli, N. and Gersten, B. (2008) *Sovereign wealth funds: Investment vehicles for the Persian gulf countries*. Available at: <http://www.meforum.org/1863/sovereign-wealth-funds-investment-vehicles-for> (Accessed: 27 November 2016).

prices) is hedged. However, after some macro considerations explained later, China remained to be our only focus in the sphere of emerging markets.

Nevertheless, it's important stating that although we have focused on alternative assets, we also did look into investments in economies stated to be characterized as "slow-growth" in the preceding statement - we had to take into account that global economic situation has changed severely after 2005, namely after 2007 and the global financial crisis. Also, we tried to incorporate the current political and economic uncertainties into our portfolio asset allocation, as discussed later.

Macro Analysis

The qualitative analysis of future economic and financial scenarios has played a truly pivotal role in gauging the composition of the Sovereign Fund's portfolio, especially given our managerial position within the Global Macro division: the implementation of a directional strategy implies that the accuracy of our expectations is closely bound with the actual future returns of the fund. Firstly, the breakdown of macro variables will be conducted according to different economic areas, to then shift focus on single asset classes.

US

The outlook of the United States economy is and will be a major catalyst of global markets. Recent economic data have pointed to an improving economy with domestic product expanding at a rate of 2.9% in 2016 Q3⁵ and the labor market back at pre-recession levels⁶. The decision of the Fed of leaving rates unchanged on November 2nd, awaiting for further economic stabilization in light of the presidential elections, has left the financial market in high uncertainty. In the aftermath of the results, markets realised that Trump's looser fiscal policies might stimulate the economy to run closer to potential output, thus likely increasing inflation and obliging the Fed to increase federal funds rate sooner than expected in order to counter possible stronger growth⁷. Bonds have in fact already adjusted interest rates, while equity indices have peaked at an all-time high. As higher rates lead to higher demand for the national currency, the USD has appreciated even more⁸. The real estate market outlook seems positive and in expansion⁹.

EU

While the general state of the economy in the euro zone still remains fragile, over the short term we expect the ECB to end unconventional monetary policies or at least to taper them¹⁰. In fact, market prices are too high and are driven by monetary policy and not by real growth: when the QE stops,

⁵ Federal Bank of St. Louis (2016) *Real gross domestic product*. Available at: <https://fred.stlouisfed.org/series/A191RL1Q225SBEA> (Accessed: 25 November 2016).

⁶ Federal Bank of St. Louis (2016) *Civilian unemployment rate*. Available at: <https://fred.stlouisfed.org/series/UNRATE> (Accessed: 25 November 2016).

⁷ Ft.com. (2016). *US Fed moves closer to raising interest rates*. Available at: <https://www.ft.com/content/29e4a95e-b19b-11e6-a37c-f4a01f1b0fa1> (Accessed 27 Nov. 2016).

⁸ Bloomberg (2016) *DOLLAR INDEX SPOT (DXY) spot rate*. Available at: <https://www.bloomberg.com/quote/DXY:CUR> (Accessed: 27 November 2016).

⁹ National Association of Home Builders and Wells Fargo (2016) *Housing Market Index (HMI)*. Available at: <http://www.nahb.org/~media/Sites/NAHB/Research/housing-economics/housing-indexes/housing-market-index/201611/Table2-National-HMI-HISTORY-201611> (Accessed: 27 November 2016).

¹⁰ Speciale, A. (2016) *Draghi signals ECB unlikely to stop QE plan without tapering*. Available at: <https://www.bloomberg.com/news/articles/2016-10-20/draghi-signals-ecb-could-boost-stimulus-as-inflation-stays-weak> (Accessed: 27 November 2016).

stocks and bond prices will immediately adjust, plummeting, and interest rates will rise once again, finally ending the controversy of bond yields that has affected markets recently¹¹. The Italian referendum on Dec 4 may outcast even more doubts in the euro zone: in case Renzi's government loses the majority in the parliament, Eurosceptic movements would be likely to win, casting even more doubts and uncertainty about the unity of the EU.

UK

After Brexit, the GBP has tumbled due to the prevailing trend of the market seeking for security in other currencies; however, this plunge has led to an increase in exports and thus to higher expected profits and equity prices¹². There has been a rise in bond prices, given the BoE aggressive expansionary monetary policy after the referendum result, also with the use of QE, both for corporate bonds and equity, which has amplified the positive gap of equity prices, resulting again in all-time high value for the FTSE 100¹³. The real estate market is flourishing, despite the slight bump due to Brexit¹⁴.

Nonetheless there is a lot of uncertainty in the overall picture about the way the United Kingdom will exit the European Union. In the case of a soft Brexit, the GBP exchange rate could increase again; in the case of a hard Brexit, the UK would have to apply WTO rules to exports in the EU, therefore leading to an even further collapse of the English Pound.

Asia

China's Renminbi has been depreciating since August 2015, when the PBoC stopped pegging the currency mainly to the USD. Since then, the Yuan fell from 6.25 USD to 6.70 USD¹⁵, as strategy to make exports more competitive. We therefore expect the value of the Renminbi to fall even further. Indeed, the CPC Central Committee's Proposal for the thirteenth five-year plan, pledges further opening-up of the service sector, including banking, insurance, securities, to foreign investment. Opening up might mean that many Chinese securities that tend to be mispriced, will converge towards an efficient valuation, with the possibility of even higher price for equity, given new foreign demand.

To what concerns Japan, president-elect Trump has recently announced that he will cancel the TPP, which may be the signaling for further suffering of the Japanese market, stuck in a negative output gap since the burst of its asset bubble of December 1989, and still struggles to show any sign of recovery to date.¹⁶

¹¹ As discussed during M. Maurelli lecture of November 17

¹² Charlton, E. (2016) *Weak pound drives U.K. Factories back from Brexit shock*. Available at: <https://www.bloomberg.com/news/articles/2016-09-01/u-k-factories-rebound-from-brexit-shock-as-pound-boosts-exports> (Accessed: 27 November 2016).

¹³ Yahoo Finance (Nov 2016) *Summary for FTSE 100*. Available at: <http://finance.yahoo.com/quote/%5EFTSE?ltr=1> (Accessed: 27 November 2016).

¹⁴ PricewaterhouseCoopers (2016) *Emerging Trends in Real Estate® The global outlook for 2016*. Available at: <http://www.pwc.com/gx/en/industries/financial-services/asset-management/emerging-trends-real-estate/global-outlook-2016/download.html> (Accessed: 27 November 2016).

¹⁵ Amadeo, K. (2016) *Does china manipulate its currency?* Available at: <https://www.thebalance.com/china-s-currency-the-yuan-or-renmimbi-3305906> (Accessed: 27 November 2016).

¹⁶ Jonathan Shaw (2014) *An aftermath to avoid*. Available at: <http://harvardmagazine.com/2010/07/an-aftermath-to-avoid> (Accessed: 27 November 2016).

Emerging Markets

Linking what had been stated above with regards to mounting interest rates in the US, emerging markets that raise capital through USD will have to pay higher rates, therefore their default risk will rise and bond prices fall. If EM were already highly volatile with low rates in the US, they do not seem to represent a viable asset for our investment purposes, apart from China.

Oil

The excess supply that has flooded the market since November 2014 is expected to halt: OPEC reached a preliminary deal in September to reduce collective output of 32.5 million to 33 million barrels a day, rising to 33.6 million in October.¹⁷ With rising prices, shale production will be profitable again and the US will be able to join again the crude oil market (their breakeven price is around \$50/55 per barrel)¹⁸. Prices of stocks such as Exxon Mobil are expected to rise as well as bolstering the economies of oil-rich countries.

Renewables

Given the substitutability of renewables with oil, the current low oil price environment has driven down the price of green energies, given the positive correlation between the two. As a result, it may seem illogical to invest in such asset class, given the objective of hedging oil risk.

Nevertheless, included renewables to hedge the incoming risk of a demand shift to alternative sources of energy, especially given many countries are incentivizing the development of alternative sources (ex. Paris Climate Agreement).

Real estate

Globally, the real estate market is stable. In Europe, investors consider it as safe haven during the current uncertainty environment, in China it has been booming since the financial crisis due to investors moving their asset allocation from falling US securities, while in US the market has always been highly appreciated by investors.

In the long-term, the market should steadily rise due to the many infrastructural investments proposed by the heads of government of many countries: for instance, in UK the Autumn Statement anticipated a large investment in infrastructure. On the same line, in the US, Trump pledged looser fiscal policies and an increase of the share of government spending devoted to infrastructure development^{19 20}.

¹⁷ Smith, G., Rascouet, A. and Mahdi, W. (2016) *OPEC agrees to First oil output cut in Eight years*. Available at: <http://www.bloomberg.com/news/articles/2016-09-28/opec-said-to-agree-on-first-oil-output-cut-in-eight-years> (Accessed: 27 November 2016).

¹⁸ Egan, M. (2014) *OPEC decision: To squeeze US shale oil producers by forcing prices down*. Available at: <http://money.cnn.com/2014/11/28/investing/opec-oil-price-us-shale/index.html> (Accessed: 27 November 2016).

¹⁹ PricewaterhouseCoopers (2015) *Spending on UK infrastructure forecast to increase to £110bn (\$182bn) by 2025*. Available at: <http://www.pwc.co.uk/industries/capital-projects-infrastructure/insights/spending-on-uk-infrastructure-forecast-to-increase-to-182bn-by-2025.html> (Accessed: 27 November 2016).

²⁰ Sahadi, J. (2016) *Trump's infrastructure plan: The bashing has begun*. Available at: <http://money.cnn.com/2016/11/22/news/economy/trump-infrastructure/index.html> (Accessed: 27 November 2016).

Industrial Metals

Industrial metals (copper, steel, aluminium, etc) historically showed a high correlation with oil: the reason is that metal extraction relies heavily on hard machineries, which require a high amount of fuel. By taking copper as a proxy for industrial metals, one can see that these assets' prices rallied during the Chinese boom, driving prices up fourfold in the first decade of the millennium²¹. Due to a never-ending demand, companies were concerned only about maximising production quantity without focusing specifically on innovations to decrease average cost of production.

Agricultural Commodities

The peculiarity of agricultural commodities is represented by its unpredictable and distinctive drivers, for instance: rain, temperature or wind. Historically, this asset class has performed uncorrelated to the market, with exceptions driven by catastrophes like wars or natural disasters.

²¹ Macrotrends LCC. (2016) *Copper prices - 45 year historical chart*. Available at: <http://www.macrotrends.net/1476/copper-prices-historical-chart-data> (Accessed: 27 November 2016).

Investments

The qualitative analysis of the global macro trends allowed us to select asset classes that best fit our portfolio: in this section they will be listed, along with their relative index and the respective funds that invest into such assets (in addition to expense ratios and currency denomination of such assets). The analysis will start off with traditional asset classes first, to then concentrate on alternative ones.

US Equity - Russell 2000 Index - iShares Russell 2000 ETF - Expense Ratio: 0.20% - USD

The divergence of higher US rates and looser fiscal policies led us to choose the Russell 2000 instead of the S&P 500. Their difference lies in the size of composing companies: while the S&P 500 is made by blue-chip stocks, the Russell 2000 is composed by small-cap stocks.

Our strategy is based on the expectation of looser fiscal policies that will benefit more small-cap companies. It is important to keep in mind that higher interest rates imply an appreciation of the USD: such effect, combined with Trump's protectionism, will diminish American exports.

UK Equity - FTSE All Share Index - HSBC FTSE All Share Index Class C - Accumulation - Expense Ratio: 0.07% - GBP

The FTSE All Share is a broader index than the FTSE 100 that comprises only the biggest market capitalized companies in the UK. By choosing the former we decided not to take a strong position on the pound movement since most companies are not multinational and do not rely on exports.

Even though in the Autumn Statement the UK revised down its growth forecast for 2017, we expect that in the long-run, the economy should react well to Brexit and steadily grow to even new highs.

Note that, since the fund is in GBP, which we expect very volatile in the long-run, we decided to offset the risk by entering into a forward agreement of the same amount of principal invested.

China Equity - MSCI China A 50 Net Return Index - ETFs-E Fund China A GO UCITS ETF - Expense Ratio: 0.88% - USD

Currently, foreign investment into Chinese equity is strictly regulated and limited by the Chinese government. Thus, we decided to invest in A-shares instead of B-shares: the former allows only qualified investors to purchase them, while the latter is readily denominated in USD or other foreign currencies, which makes it better priced. The choice was driven by our view regarding the opening-up of the A-shares equity markets to foreign investors and their subsequent expected demand for it.

The exposure to the Renminbi is not avoided, since the fund clearly states that it operates in USD but does not hedge any adverse currency movement. As a consequence, we opted to short the currency to hedge any adverse movement. The shorting position will equal the principal invested amount in this fund.

Real Estate - FTSE EPRA/NAREIT Global REIT Index - iShares Global REIT ETF - Expense

Ratio: 0.14% - USD

Real estate is highly exposed to geographical risks, like catastrophes or country risks. Therefore, the solution of choosing a global index has been adopted to overcome this drawback.

The allocation represents our most illiquid investment given the characteristics of real estate as an asset class, which requires many years of commitment before bearing the desired fruits, despite the market liquidity provided by REITs. This should not be a problem for our investment portfolio because, being a Sovereign Fund, we are allowed to keep very illiquid assets for a long period of time and should not assist to a withdrawal of funds by our sources.

Renewable Energies - Ardour Global Index Extra Liquid - Van Eck Vectors Global Alternative

Energy ETF - Expense Ratio: 0.62% - USD

In order to build up a portfolio that hedges the risk of oil, we must take into consideration the substitutes to oil: alternative energy sources. During his campaign, Trump has argued various times about cutting incentives to renewable source of energy, claiming that they lower the ability of the US of being competitive not only on the global energy production market, but also causing a rise in the variable costs of the economy as a whole. Therefore, since the US green market does not look favourable, we must not focus only on the US but on a global index.

Industrial Metals - DBIQ Optimum Yield Industrial Metals Index Total Return - PowerShares DB

Base Metal ETF - Expense Ratio: 0.82% - USD

As stated in the macro analysis, the correlation of industrial metals with oil is high. In addition, we believe that the outlook for the industrial metals is bearish (rising prices of oil, as stated previously). As a consequence, a short position in this fund has been deemed in line with our expectations and strategy.

Agricultural Commodities - DBIQ Optimum Yield Diversified Commodity Index Excess Return -

PowerShares DB Agriculture Fund - Expense Ratio: 0.89% - USD

The goal we seek by investing in agricultural commodities is not to boost returns but to lower risk, which is achieved by exploiting the uncorrelation to the other asset classes. Within agriculture we opted to invest in this diversified fund to offset any idiosyncratic risk, so that any excess supply in a type of commodities will be offset by any shortfall in its substitute.

Alternative Assets and Their Role Within Our Portfolio

In general, alternative assets are used to deliver returns that are uncorrelated with the market, and can diversify the risk an investor is exposed to. We specifically chose to include a large amount of them because our macro analysis has lead us that way. Indeed, we did not exclude any kind of investment a priori, but we instead thought of what logically made sense to put in the portfolio in order to hedge our country's exposure to oil.

As explained in the asset analysis, we decided to add renewable energy because we need to take into consideration the fact that energy consumption may shift towards more sustainable sources. On the other hand, the choice of agricultural commodities is driven by this alternative asset's historical low correlation with most traditional asset classes as well as oil. Real estate, on the other hand, is generally a stable asset class, which by no means follows the trends of the oil market. The fund we picked is moreover global and therefore diversifies geographical specific risk.

Results from Portfolio Analysis

The final aim of the fund's investment is to create a portfolio that has consistent returns, moderate volatility and, more importantly, a low correlation with oil. For the security selection process of the fund, weights are attributed to both alternative and traditional assets that are assumed to perform well (or bad if shorted) considering our macro analysis.

In order to optimize the allocation of the resources, as to minimize risk, the Excel solver was the tool of choice to minimize variance.

Firstly, we constructed the variance-covariance matrix, computed the historical average returns and standard deviation for each asset, and then we built our complete model, taking in consideration correlations in order to give each asset the optima weight.

Secondly, we set some constraints. In particular: the sum of the weights must be one, weights in shorted securities must be lower than zero, and the final portfolio should have an optimized volatility. The monthly risk free rate considered is that of monthly returns for 10Y US T-Bond, which currently stands at 0.194%, while our target monthly return is set approximately at 8%.

Finally, the solver solution (Exhibit 1) was used to create on E-views a reproduction of our portfolio, where we analyzed some of the characteristics that our portfolio had in the period considered. Note that, our incorporation of the shorting position of GBP and CNY has been implemented by not considering currency movements in historical returns and thus, a hedging position that considers returns as if they were in USD.

It is worth mentioning that this historical analysis has only the aim to show some characteristic of our portfolio and we do not expect that these results will occur again. The underlying logic for this consideration is that the returns in the different assets are expected to have a different behavior from the past, which is forecasted according our accurate macro analysis. For this reason, we focused more on correlation and standard deviation minimization, rather than returns, for the optimization of our portfolio.

Exhibit 2 shows all the characteristics of our portfolio over the historical period, while Exhibit 3 shows the distribution of the historical returns over the same sample. The distribution is left skewed but we need to take into consideration that the sample is small, and we are using a particular

historical period (starting in November 2012) in which the global economy was recovering from the great recession, and thus returns are biased toward the left.

The most important factors that we need to consider in our analysis is the correlation that our portfolio has with the market and the correlation that it has with oil. For this specific reason, we set up two distinctive equations, both estimated with the Least Square Residual method, obtaining the results shown in the two tables below. Exhibit 5 depicts the Beta with respect oil of our portfolio which is very low, as expected, showing that we have been successful in constructing a portfolio hedging the country's oil exposure.

On the other hand, the Exhibit 4 is the CAPM estimation, showing the sensitivity of our portfolio with respect to the market. As expected, the value is significant (probability of observing the null hypothesis is zero, which means that the probability that the portfolio beta is uncorrelated with the market is zero). This result can be justified by the fact that our portfolio is mostly made up of equity, and is thus correlated with the S&P500.

Finally, from Exhibit 7 we can see the role of the alternative asset classes in our portfolio allocation. The table in fact shows not only the average returns and standard deviation of each asset, but also show their respective correlation with oil. Due to their extremely low correlation, the alternative investments in the EPRA NAREIT Global and Agricultural sector are the one that contribute the most to our hedge against Oil underlining once again their fundamental role in pursuing our goal.

Conclusions

Ultimately, the constructed portfolio has expected monthly returns of 0.676% and expected volatility (standard deviation) of 0.214%. Results are therefore in line with other SWFs. However, the returns depend strictly on the direction of the market, given the directionality of our asset composition: it appears obvious how the reliability of our returns estimation is closely linked to our predictions. Could have we added non-directional instruments such hedge funds? Maybe so, but there would have been a tradeoff: firstly, returns might have been enhanced; nevertheless, the alpha would all have been wasted in fees. In any case, we have been successful at hedging out oil risk and minimizing returns deviations.

Alternative investments played a fundamental role in building up our portfolio, thanks to high returns, low correlation with traditional instruments and oil, and their unique exposure to the overall global market, rather than being focused on a specific economic area.

Appendix

Exhibit 1 (selected securities and allocation)

Asset	Weight
DIVERSIFIED_AGRICULTURAL	16%
OIL	0%
FTSE_ALL_SHARE	39%
FTSE_EPRA_NAREIT_GLOBAL	30%
MSCI_CHINA	5%
ARDOUR_GLOBAL	7%
RUSSEL_2000	8%
DEVELOPED_REAL_ESTATE_ET	0%
DBIQ_METALS	-5%
tot	100%

Exhibit 2: Statistics of our portfolio distribution

Sample: 2012M11 2016M10

PORT	
Mean	0.006734
Median	0.007889
Maximum	0.054421
Minimum	-0.051092
Std. Dev.	0.021563
Skewness	-0.392751
Kurtosis	3.435398
Jarque-Bera	1.613170
Probability	0.446380
Sum	0.323233
Sum Sq. Dev.	0.021853
Observations	48

Exhibit 3: distribution of our portfolio returns

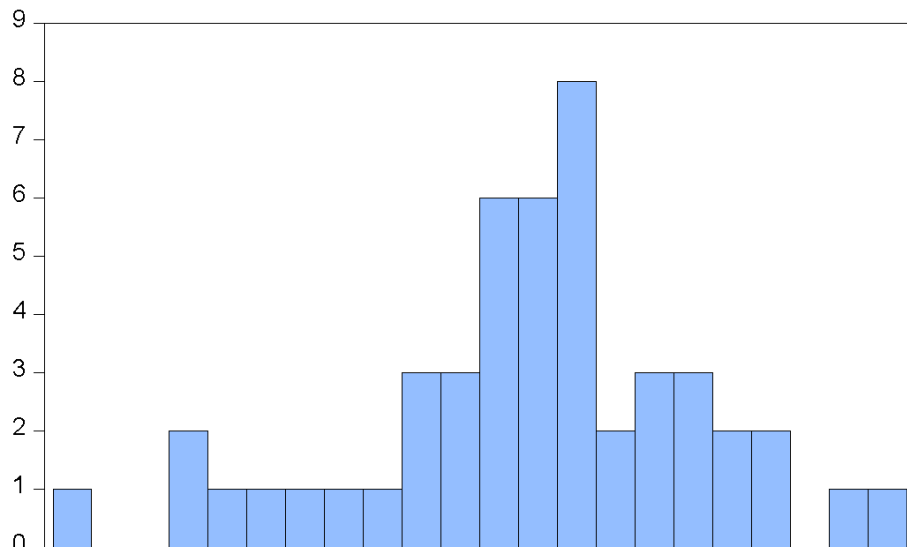


Exhibit 4 (sensitivity of our portfolio to market movements, c(2) is coefficient representing market beta)

Method: Least Squares

Sample: 2012M11 2016M10

Included observations: 48

PORT-rf=C(1) +C(2)*(S_P500-rf)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.001669	0.002559	0.652134	0.5176
C(2)	0.442564	0.084376	5.245141	0.0000
R-squared	0.374248	Mean dependent var		0.004789
Adjusted R-squared	0.360644	S.D. dependent var		0.021563
S.E. of regression	0.017242	Akaike info criterion		5.242211
Sum squared resid	0.013675	Schwarz criterion		5.164244
Log likelihood	127.8131	Hannan-Quinn criter.		5.212747
F-statistic	27.51150	Durbin-Watson stat		1.563178
Prob(F-statistic)	0.000004			

Exhibit 5 (sensitivity of our portfolio to movements in oil market, c(2) is coefficient representing oil beta)

Method: Least Squares

Sample: 2012M11 2016M10

Included observations: 48

PORT-rf=C(1) +C(2)*(OIL-rf)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.005325	0.003152	1.689227	0.0979
C(2)	0.036353	0.034978	1.039308	0.3041
R-squared	0.022943	Mean dependent var		0.004789
Adjusted R-squared	0.001703	S.D. dependent var		0.021563
S.E. of regression	0.021544	Akaike info criterion		4.796621
Sum squared resid	0.021352	Schwarz criterion		4.718654
Log likelihood	117.1189	Hannan-Quinn criter.		4.767157
F-statistic	1.080162	Durbin-Watson stat		1.464297
Prob(F-statistic)	0.304094			

Exhibit 6 (Market data used over period considered)

Exchange Date	diversified agricultural index	OIL	ftse all share	FTSE EPRA/NAREIT Global Index	MSCI china	ardour global	russe 2000	Developed Real Estate ETF	DBIQ metals	S&p500
11/30/2012	-2.54%	2.33%	+1.35%	+1.92%	+18.21%	+2.38%	+0.39%	+0.79%	+6.70%	+0.28%
12/31/2012	-3.99%	-0.11%	+0.92%	+1.23%	+7.71%	+5.88%	+3.34%	+0.54%	-0.38%	+0.71%
1/31/2013	5.98%	4.00%	+6.27%	+3.60%	-1.72%	+8.45%	+6.21%	+0.33%	+1.38%	+5.04%
2/28/2013	4.11%	-3.61%	+1.89%	+3.74%	-7.69%	+1.88%	+1.00%	+0.01%	-4.39%	+1.11%
3/31/2013	0.00%	-1.22%	+0.93%	+3.55%	-1.12%	+2.77%	+4.44%	+0.68%	-4.95%	+3.60%
4/30/2013	10.60%	-6.95%	+0.28%	-5.67%	+5.33%	+7.02%	-0.43%	+2.53%	-3.49%	+1.81%
5/31/2013	-6.17%	-1.93%	+2.47%	-4.66%	-13.57%	+14.58%	+3.87%	-3.87%	+2.50%	+2.08%
6/30/2013	15.71%	1.76%	-5.30%	-0.52%	-1.20%	-2.12%	-0.68%	-1.47%	-6.39%	-1.50%
7/31/2013	-8.77%	5.42%	+6.69%	-4.76%	+5.56%	+11.05%	+6.93%	+0.50%	+0.44%	+4.95%
8/31/2013	7.46%	5.86%	-2.84%	+3.21%	+4.31%	-4.77%	-3.29%	-0.66%	+2.06%	-3.13%
9/30/2013	12.77%	-4.95%	+0.98%	+1.35%	-0.21%	+9.44%	+6.22%	+2.34%	+1.20%	+2.97%
10/31/2013	-5.43%	0.43%	+4.11%	-3.21%	+1.48%	+3.43%	+2.45%	+0.44%	+0.02%	+4.46%
11/30/2013	2.65%	0.78%	-1.03%	-2.23%	-4.73%	+0.25%	+3.88%	-0.56%	-4.03%	+2.80%
12/31/2013	4.33%	1.01%	+1.72%	+0.48%	-6.16%	+2.68%	+1.82%	-2.55%	+4.45%	+2.36%
1/31/2014	7.13%	-3.97%	-3.13%	+2.42%	-3.17%	+2.35%	-2.82%	-1.74%	-4.53%	-3.56%
2/28/2014	2.46%	2.51%	+4.87%	-0.36%	-0.88%	+9.21%	+4.61%	+1.20%	+2.00%	+4.31%
3/31/2014	-5.45%	-1.20%	-3.03%	+2.35%	+1.28%	-2.41%	-0.84%	-0.26%	-2.56%	+0.69%
4/30/2014	-3.22%	0.29%	+1.81%	+4.31%	+0.33%	-3.25%	-3.94%	+0.83%	+0.76%	+0.62%
5/31/2014	11.21%	1.24%	+0.97%	+0.34%	+1.75%	+4.47%	+0.68%	+1.20%	+1.81%	+2.10%
6/30/2014	-9.61%	2.70%	-1.50%	+3.80%	+11.95%	+6.51%	+5.15%	+0.05%	+4.20%	+1.91%
7/31/2014	-9.14%	-5.64%	-0.40%	+1.73%	-2.32%	-7.90%	-6.11%	-0.05%	+4.24%	-1.51%
8/31/2014	-1.83%	-2.67%	+1.50%	-1.83%	+1.26%	+7.35%	+4.85%	+0.16%	+1.07%	+3.77%
9/30/2014	8.52%	-8.26%	-2.90%	+5.62%	+2.31%	-8.54%	-6.19%	-2.20%	-4.80%	-1.55%
10/31/2014	0.65%	-9.31%	-0.86%	+2.27%	+12.71%	-4.40%	+6.52%	+1.27%	+1.44%	+2.32%
11/30/2014	-0.81%	-18.30%	+2.56%	+2.67%	+33.48%	+0.63%	-0.02%	-0.48%	-3.82%	+2.45%
12/31/2014	-3.46%	-18.28%	-1.69%	+12.29%	-7.55%	-5.30%	+2.68%	-0.79%	-2.99%	-0.42%
1/31/2015	7.05%	-7.57%	+2.52%	-1.16%	+1.68%	-2.55%	-3.26%	+0.87%	-5.22%	-3.10%
2/28/2015	2.10%	18.10%	+3.38%	+4.89%	+12.39%	+10.71%	+5.83%	+0.95%	+0.50%	+5.49%
3/31/2015	6.36%	-11.94%	-2.15%	-3.84%	+18.18%	-1.50%	+1.57%	-0.81%	+0.41%	-1.74%
4/30/2015	0.52%	21.18%	+2.63%	-0.46%	-3.29%	+6.16%	-2.61%	+0.98%	+8.04%	+0.85%
5/31/2015	-2.73%	-1.83%	+0.99%	-6.77%	-6.15%	+3.17%	+2.16%	-0.66%	-7.06%	+1.05%
6/30/2015	-11.65%	-3.00%	-5.97%	+3.52%	-13.53%	-3.45%	+0.60%	-1.63%	-5.44%	-2.10%
7/31/2015	7.87%	-17.90%	+2.30%	-7.07%	-12.05%	-4.54%	-1.22%	+0.21%	-6.06%	+1.97%
8/31/2015	-7.56%	3.72%	-5.97%	-1.06%	-2.98%	-10.30%	-6.40%	-1.71%	-2.72%	-6.26%
9/30/2015	-9.95%	-10.67%	-2.87%	+8.84%	+8.23%	-5.64%	-5.07%	-0.23%	-2.94%	-2.64%
10/31/2015	0.04%	2.46%	+4.46%	+1.57%	-0.15%	+6.21%	+5.56%	+1.34%	-2.44%	+8.30%
11/30/2015	6.88%	-9.99%	+0.22%	-2.42%	+4.69%	-0.10%	+3.12%	-1.12%	-7.23%	+0.05%
12/31/2015	-0.01%	-16.43%	-1.37%	-6.48%	-17.66%	+4.39%	-5.19%	-0.34%	+3.15%	-1.75%
1/31/2016	-4.90%	-6.81%	-3.15%	+1.27%	-1.18%	-10.01%	-8.85%	-1.01%	-1.17%	-5.07%
2/29/2016	5.47%	3.54%	+0.30%	+4.78%	+10.52%	+0.43%	-0.14%	+0.10%	+4.82%	-0.41%
3/31/2016	-10.72%	10.09%	+1.47%	+0.52%	-0.83%	+6.55%	+7.75%	+2.24%	+1.07%	+6.60%
4/30/2016	7.30%	21.54%	+0.78%	+1.06%	-0.45%	-1.20%	+1.51%	+0.69%	+6.69%	+0.27%
5/31/2016	4.67%	3.24%	+0.24%	+2.63%	-1.00%	-2.72%	+2.12%	-0.53%	-4.98%	+1.53%
6/30/2016	-10.52%	-0.02%	+2.50%	+4.55%	+1.94%	-2.69%	-0.25%	-0.22%	+6.43%	+0.09%
7/31/2016	0.81%	-14.53%	+3.94%	-1.57%	+4.50%	+4.30%	+5.90%	+1.36%	+2.74%	+3.56%
8/31/2016	0.95%	10.79%	+1.19%	-1.43%	-1.05%	+0.94%	+1.64%	-0.36%	-1.34%	-0.12%
9/30/2016	0.53%	4.29%	+1.57%	-4.58%	+0.93%	+1.24%	+0.95%	+0.01%	+3.76%	-0.12%
10/31/2016	-8.57%	-1.55%	+0.34%	-1.06%	+2.14%	-3.37%	-4.81%	-1.75%	+2.16%	-1.94%

Exhibit 7 (Selected securities' expected returns, volatility, and correlation with oil as underlying asset)

	Avg return	St. dev.	Correlation with oil	
DIVERSIFIED_AGRICULTURAL		0.356%	6.901%	-2.839%
OIL		-1.278%	8.984%	100.000%
FTSE_ALL_SHARE		0.500%	2.877%	20.367%
FTSE_EPRA_NAREIT_GLOBAL_		0.613%	3.955%	3.264%
MSCI_CHINA		1.297%	8.786%	-2.614%
ARDOUR_GLOBAL		1.201%	5.781%	30.504%
RUSSEL_2000		0.868%	4.112%	20.114%
DEVELOPED_REAL_ESTATE_ET		-0.070%	1.275%	17.247%
DBIQ_METALS		-0.310%	4.035%	41.999%