

Agriculture Hedge Funds

by

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ABSTRACT

The concept of managed money as a hedge fund is rapidly changing. At the close of 2017, there was sentiment that the days of easy returns and high compensation for fund managers were gone. More hedge funds closed than opened after 2015. Faced with increased pressure over high fees, lagging returns, increased competition and alternative investment options, from firms such as Vanguard Group, that offer passive investments with quantitative strategies, the ability to attract and retain capital has become increasingly challenging. As a result, the managed money landscape is open to new opportunities for fund managers with unique strategies to earn money.

This study compares and contrasts characteristics of successful hedge funds. Identifying characteristics from those funds will assist in determining if there is an opportunity for creating alternative investment portfolios. Additionally, researching investment fund failures provides support to evaluate alternative investment portfolios.

The purpose of this research is to evaluate the possibility and potential success of starting an agricultural hedge fund while identifying and testing a trading strategy that can generate a consistent return.

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CHAPTER I: INTRODUCTION

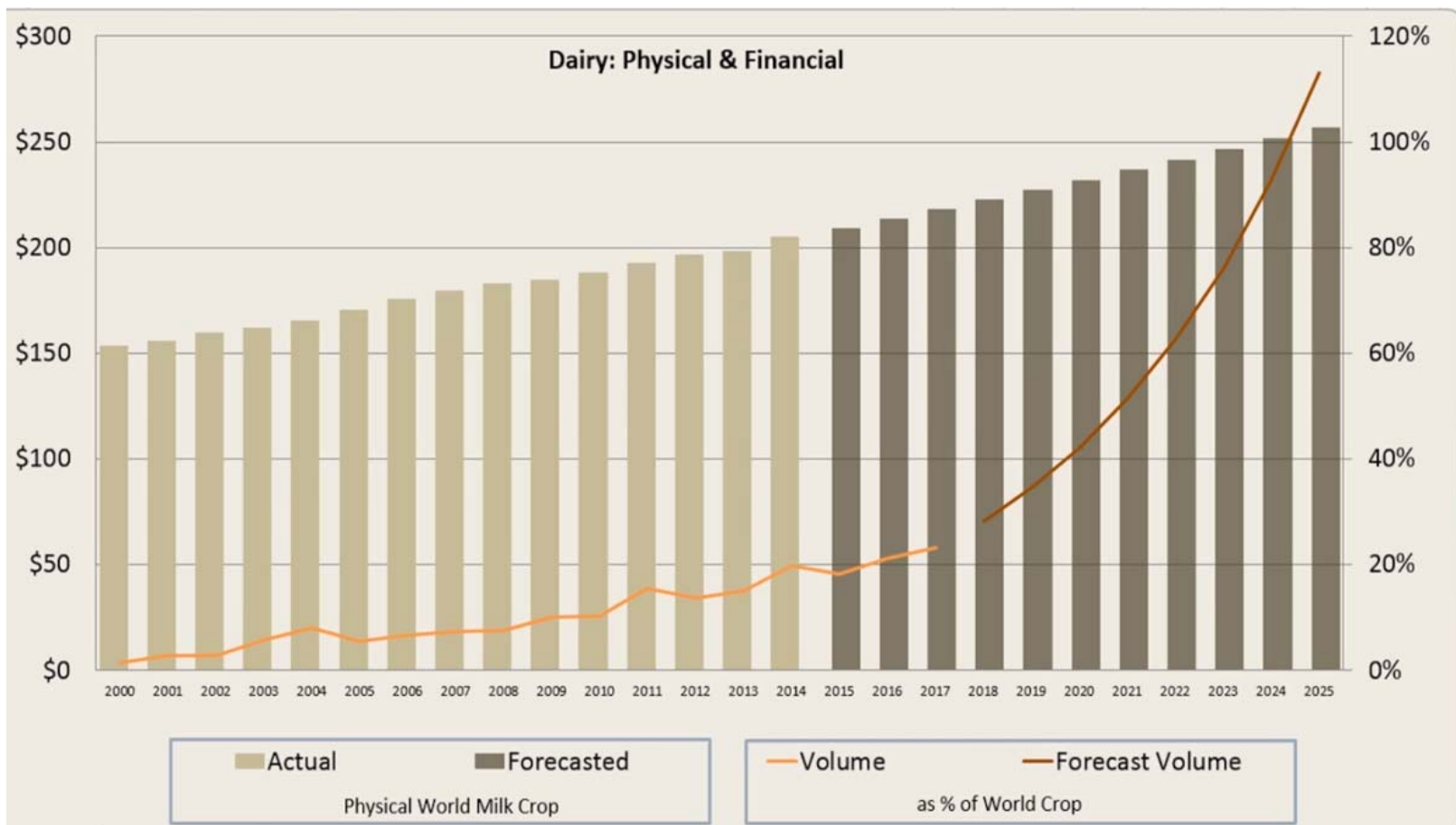
This research evaluates the feasibility of attracting capital for an agriculture hedge fund. The interest in the research stems from a personal goal and passion to create a fund concept by outlining a business plan in a unique commodity market with a successful team with a long proven record of accomplishment that requires specialized skill sets. The fund concept applies a unique blend of financial trading strategies within the dairy industry.

In the U.S., federal and state governments regulate many agricultural commodities, but no market is more regulated than dairy. The evolution of government involvement dates back to the early 1900s with the expansion of fluid milk market demand and the rapid development of milk cooperatives. In the 1990s two international trade agreements, the North American Free Trade Agreement (McBride 2018) signed into law in 1993 and the World Trade Organization (World Trade Organization 2019), set the stage for U.S. international dairy trade in 1995. The result of government regulation and U.S. support of international trade deals was the foundation for globalization of dairy trade (Brown 2009; Erba 2008).

Subsequently, dairy trade globalization contributed to increased price volatility, thus creating opportunities for managed money. The U.S. dairy market has a unique pricing structure that determines the dairy farmer's milk settlement price for exchange traded financial instruments at the Chicago Mercantile Exchange (CME). Participants within the dairy supply chain commercially use financial instruments to manage risk that creates opportunities for speculators. According to Blimling and Associates, dairy financial markets were designed to reflect the complex dairy pricing system, while providing risk management instruments for dairy producers, manufacturers, and end users. The continued

development of commodity based financial markets reverberates into the physical markets that create similar opportunities for market participants including speculators. The dairy financial market represents a fraction of the physically transacted product annually in the United States. Currently, the dairy market trades financially less than 20% of the annual world crop (United States Department of Agriculture 2014). As a result, there is tremendous upside potential with financial market development (Figure 1.1). Therefore, given the limited depth of financial liquidity, dairy market prices can move on more than fundamental information. As a result, dairy pricing, throughout the year, is subject to rumors, and qualitative information influencing price. Until world milk complex trades on about a 1:1 ratio financially on an annualized basis, the market dynamics allow for greater volatility compared to other commodities (Meyer 2019).

Figure 1.1: Dairy Market: Physical & Financial Trade Volume as a Percentage of Annual World Milk Crop



Source: (Rice n.d.)

1.1 Dairy Market Structure

Dairy has many unique characteristics with one specific attribute that creates trading opportunities, shelf life. Milk is comprised of water, protein and fat that is processed into many ingredients and finished goods ranging from fluid milk, which is perishable, to cheese that can be stored for years. Cooperatives play a critical role within the dairy supply chain managing over 80% of the U.S. milk supply, which returns 98% of net revenue back to the dairymen (United States Department of Agriculture 2014). As a result, milk products must be turned into cash in a timely manner while avoiding inventory buildup. Cooperative cash flows back to the dairymen biweekly and is regulated by the Federal Milk Marketing Order (FMMO) (United States Department of Agriculture 2019).

1.2 Dairy Pricing

The USDA administrative function, FMMO, is legally required to oversee and pay dairies for their milk twice a month based on the relative value of milk products made from the raw milk. There are four classes of milk with varying uses and pricing structures: Class I; fluid milk, Class II; milk used in ice cream and yogurt, Class III; milk used to make cheese, dry whey and butter, and Class IV; milk used to make butter and nonfat dried milk (United States Department of Agriculture Agricultural Marketing Service 2017).

Fluid milk produces the highest return for farmers to guarantee a supply of fresh milk for the consumer. As a result, milk is processed and sold as a revenue return cascade by the cooperative. In addition, the cooperative manages the perishability of milk based on asset capability. Therefore, once fluid milk demand is met, cooperatives make Class II products, ice cream and yogurt, Class III products and Class IV (United States Department of Agriculture 2014). Regional differences and asset capabilities create variances in the use

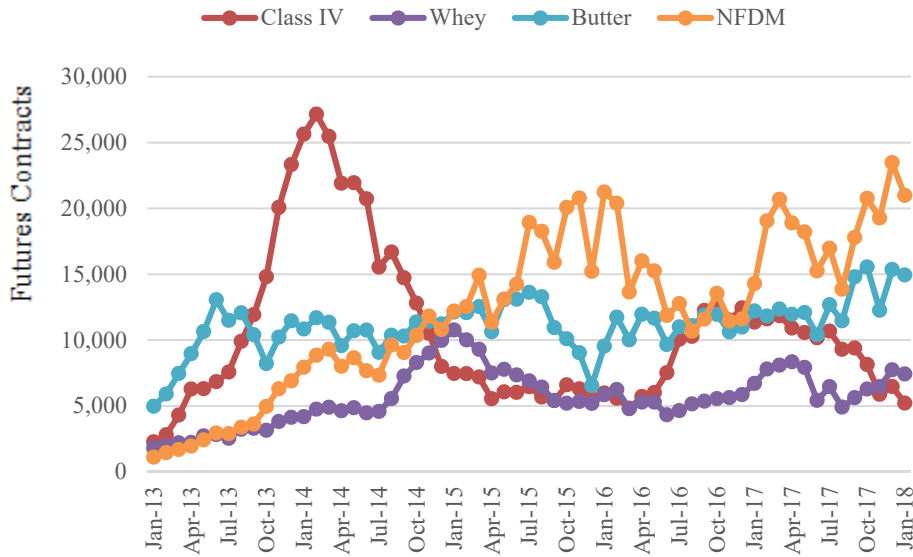
of milk. For example, Idaho processes roughly 80% of milk into Class III products based on asset capability. Other regions within the U.S. have similar nuances with asset capability at the cooperative level.

1.3 Dairy Financial Market

Commodity milk products Class III; cheese, whey, butter, and Class IV; butter and nonfat dried milk are less volatile compared to Class I and II given their greater shelf life (Figure 1.2). As a result, the National Dairy Product Survey Report (NDPSR) (United States Department of Agriculture Economics, Statistics and Marketing Information System 2019) collects and publishes sales volumes weekly and monthly from cooperatives to end users. The monthly weighted average price for each commodity determines the monthly milk class use and price received for milk by the farmer. Correspondingly, the pay price to the farmer is the cost of raw milk for the processor (United States Department of Agriculture 2019).

Dairy financial contracts trade at the CME for commodity milk products Class III; cheese, whey, butter, and Class IV; butter and nonfat dried milk. The financial instruments are cash settled monthly to the weighted average price for each commodity product published by the NDPSR overseen by the USDA (Chicago Mercantile Exchange 2019).

Figure 1.2 Historical Combined Open Interest of Selected Commodity Milk Prices



(Meyer, Dairy Market Activity 2018)

1.4 Hedge Fund Industry

According to Barclays, a hedge fund is an alternative investment vehicle available to sophisticated investors, such as institutions or individuals with significant assets. The designation of a hedge fund provides a wider range of investment opportunities as these funds are not regulated by the Securities and Exchange Commission (SEC). As a result, hedge funds have the ability to invest capital in opportunistically and creative ways to obtain a return in a global market (Barclay Hedge 2012).

The first hedge fund, A.W. Jones & Co., was created in 1949 by former writer and sociologist Alfred Winslow Jones. Mr. Jones raised \$100,000 and incorporated a strategy that is still used today, the classic long/short equity model. Jones minimized the risk of long-term equity holdings by short selling other stocks while employing leverage to enhance returns. Jones's ideas resulted in him being referred to as the father of the hedge fund. Today, the A.W. Jones fund still manages money (Jones 2019).

In 2017, over \$3 billion was managed under the designation of a hedge fund. However, a recent shift from passive investing to active investing, macro-economic conditions, the global political climate, and market advancement with electronic traded funds (ETF) have resulted in over one thousand traditional hedge funds ending in 2016 (Watts 2017).

1.5 Research Problem

Some financial experts have stated the hedge fund concept and financial landscape have changed rapidly. The result of this change created new opportunities for fresh ideas to attract capital. Hedge fund managers that establish flexibility and creative investment ideas are having success attracting capital (Hartmann 2017).

1.6 Research Objectives

The objective of this thesis is to evaluate, compare and contrast an agricultural hedge fund idea to the characteristics of successful hedge funds. Identifying characteristics of successful hedge funds will provide valuable insight. This insight, coupled with a trading strategy, record of accomplishment, and fresh ideas will be used in an effort to obtain future funding for a hedge fund.

1.7 Scope of Opportunity

In 2017, the USDA conducted the agriculture census to over 3 million producers. As the results are not published yet, this thesis evaluates research based on the 2012 USDA agriculture census. According to the census, U.S. milk sales account for 9% of total U.S. Agriculture sales totaling \$35.5 billion. The U.S. dairy herd is comprised of 9.3 million cows on 64,098 farms creating 1.6 million jobs (United States Department of Agriculture National Agriculture Statistics Service 2012). The USDA milk production report for December 2017 indicates 9.4 million cows with 48 consecutive months of year over year

milk production growth (United States Department of Agriculture 2019). As the industry grows, continued consolidation at the farm level is expected. To survive and prosper, dairy farmers require increased levels of sophistication that includes increased dependency on risk management. That increased participation at the farm enhances market depth and liquidity. As a result, there is greater opportunity for speculators to generate returns.

CHAPTER II: LITERATURE REVIEW

2.1 What is a Hedge Fund

According to the Federal Reserve, a hedge fund is a pool of money from investors used to generate income in a wide variety of ways. Hedge funds are unregulated and have the ability to invest aggressively while acting quickly to move money based on profits, losses and overall market conditions (Warsh 2007).

Traditionally there are four main classifications of hedge funds; directional, global macroeconomic, event driven, and relative value (Arora 2019). A hedge fund with a directional strategy has a basic approach to making money. Funds are invested based on an outlook with a market trend. The scope of funds willing to be invested is immense. Typically, the fund only invests in markets with strong trends that provide high returns and risk. Overall, directional strategy funds have significant exposure to global markets and sudden volatility fluctuations.

A global macroeconomic hedge fund infuses capital opportunistically based on global events such as government fiscal policy, geopolitical events and instability. The strategy attempts to exploit market inefficiencies and imbalances. Based on the global strategy, there are unique risks that impact financial markets such as political risk, exchange rates, etc. George Soros's Quantum Fund is an example of a hedge fund with a global macroeconomic strategy. In 1992, the Quantum Fund was credited with the crash of the British Pound currency while profiting \$10 billion (Schaefer 2015).

According to Barclay's, a hedge fund with an event driven strategy seeks to exploit pricing inefficiencies that may occur before, during and or after an event. Investment opportunities include security, initial public offering, scandals, mergers, wars, political turmoil, etc. (Barclay Hedge 2012).

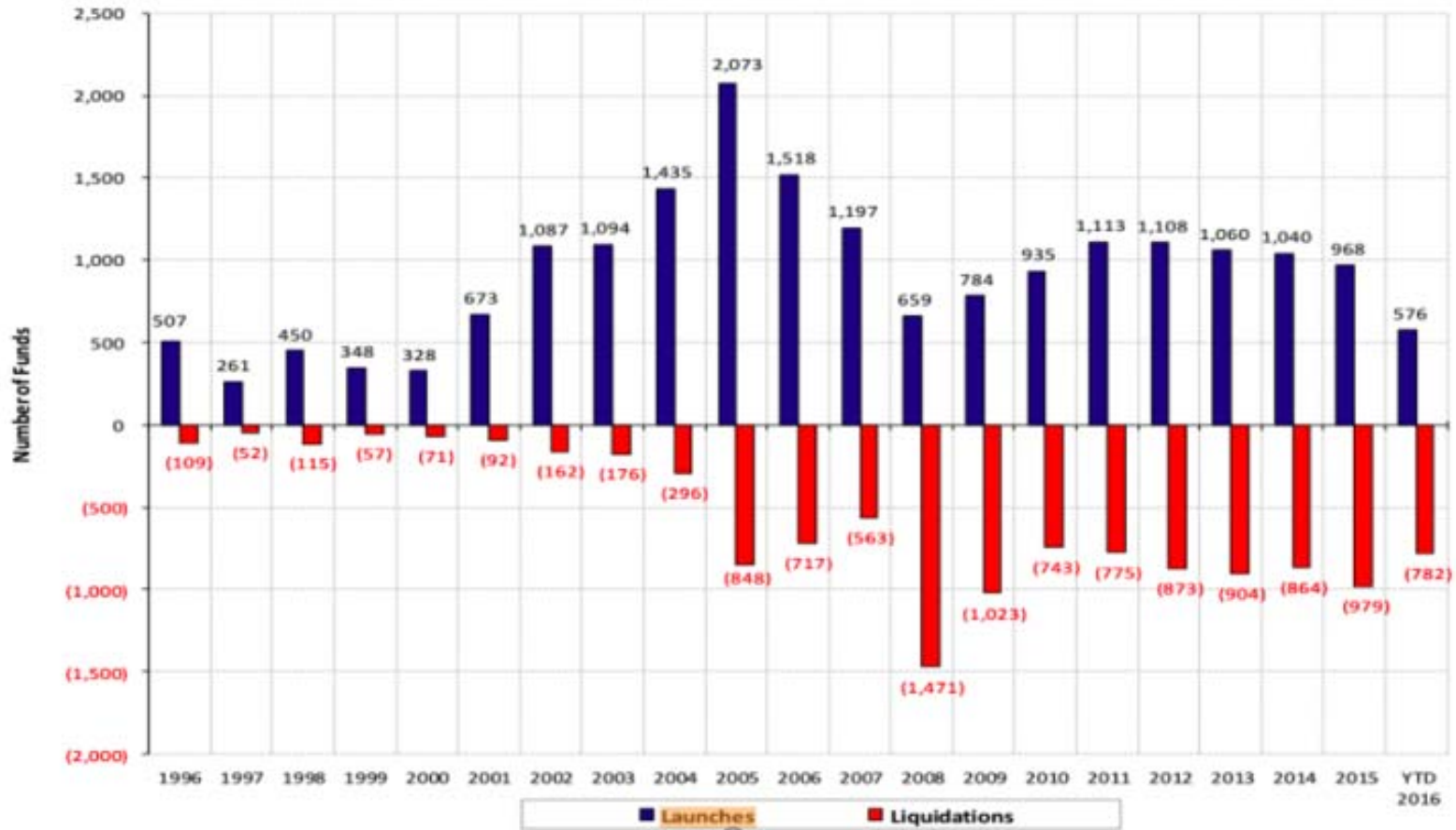
A relative value fund investment strategy relies on fundamental analysis and value investing. This approach attempts to forecast and realize valuation discrepancies between multiple securities based on relationships with the ability to buy and sell financial instruments.

2.2 Raising Capital

After the 2008 financial crisis, the financial landscape changed significantly in the way institutions raised capital. Aspiring fund managers focus on two key areas, investment performance and raising capital. Having a proven track record, for at least three years, as a trader or a group of traders with physical experience is a baseline requirement. However, aspiring fund managers are currently having more success raising only adequate capital to have critical mass for a strategy while limiting the focus for growth potential.

Since 2013, the number of hedge fund launches have declined while liquidations have increased (Figure 2.1). According to Business Insider, having niche strategies and a different approach to generating profits while being creative with fee structure can help attract capital for new fund ideas (Hartmann 2017). The ability for new hedge fund ideas to attract capital has tapered off as evidenced by the number of newly launched funds since 2015 (Figure 2.1).

Figure 2.1: Hedge Fund Launched/Liquidated 1996 – Q3 2016

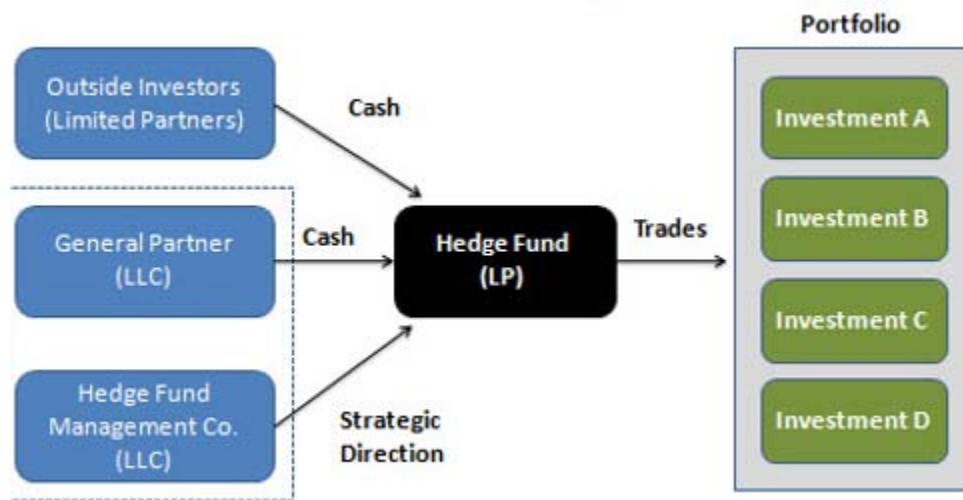


Source: (Hartmann 2017)

Hedge funds launch using a variety of capital structures. A successful strategy for raising funds in the first two years focuses on obtaining capital from general partners, personal funds, friends and family and professional networks (Prince 2015). The structure of a hedge fund is primarily derived from the investment strategy and tax status of the prospective investors. As a result, hedge funds are typically set up as a General Partnership, with a limited liability company acting as the funds General Partner. The value is that the entity structure limits liability for the investors and managers while also capitalizing on "pass through taxation" that eliminates the double-taxation characteristics of most corporate structures.

Capital investment starts with the hedge fund management's network and personal contributions from the Limited Partners and available Partners. The founder investment in the fund is classified as General Partner capital, while all other funds received are from Limited Partners. Upon investment success and adequate seed capital, a hedge fund looks to institutional sources such as pension funds, foundations, and endowments (Figure 2.2) for cash.

Figure 2.2: Hedge Fund Structure



Source: (Hedge Fund Marketing Association 2019)

2.3 Defining Successful Performance

Hedge fund performance is evaluated by absolute returns that are aligned with strategies applied within the fund. A standard metric used in the industry to assess performance is the Sharpe Ratio. The Sharpe Ratio is a measure to calculate risk adjusted returns that exceed the risk free rate per unit of volatility or total risk. There are criticisms with the Sharpe Ratio and alternative methods are proposed to evaluate performance (Sharpe 1994). Additionally, a fund's performance is also compared to a benchmark, mostly commonly, the S&P 500 as means of evaluating opportunity cost.

There are many other criteria industry experts believe are required for a hedge fund to be successful. Effective leadership is vital for managing people and culture while also retaining staff. Nonfinancial factors and positive culture are important to financial performance (Parrino 2018). The ability to manage the fund infrastructure operationally while balancing the extent of support is also a key contributor to fund success. Consistent with financial performance and non-financial factors is the ability to manage investor relations. Effective communication providing clarity and transparency while anticipating

investor expectations is invaluable. In addition, fund managers that accurately balance trade strategy data disclosure, compliance, and investor appeasement ultimately retain funds and their competitive advantage. Overall, the factors for success are interlinked (Parrino 2018).

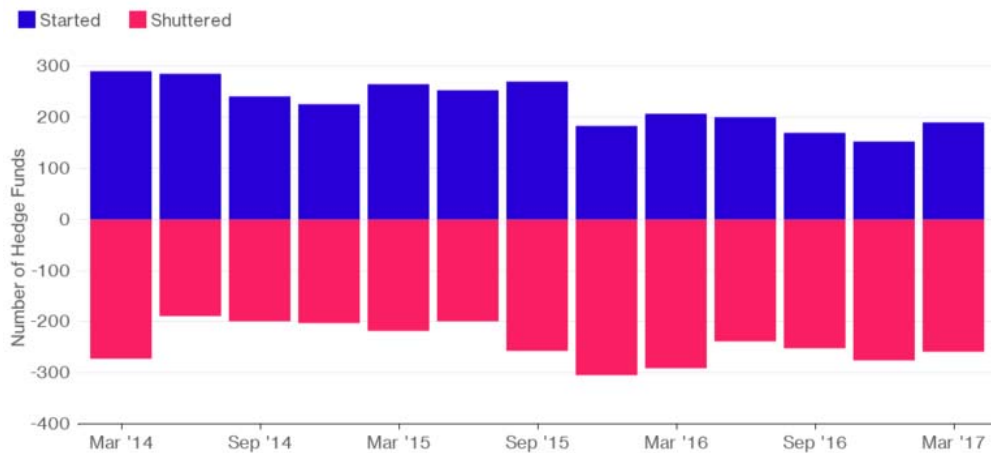
CHAPTER III: HYPOTHESIS AND TESTING METHODS

3.1 Introduction

The purpose of the thesis is to examine the feasibility of constructing an agricultural hedge fund. According to Bloomberg, 2016 saw a wide range of hedge fund returns even within the same sector that used similar investment strategies. The hedge funds reviewed included a sample of 20 large and prestigious funds that incorporated strategies such as quantitative, event driven, macro, distressed, relative value, credit and equity. The range of performance return for the funds was from 45% to -48% annualized. Investor backlash against traditional high fees in the hedge fund industry, the explosion of exchange traded funds (ETF), and challenging market opportunities have resulted in a systematic change in attracting and retaining capital for investment. Disappointing performance, high fees, and market saturation exist for the foreseeable future. As a result, investors are reevaluating how and where to invest money (Porzecanski 2016). A shift from the traditional "2 and 20" model has created an opportunity for new ideas to attract capital as performances has not met expectations (Shin 2017). The traditional fee model of a hedge fund is a 2 percent management fee, in addition to a 20 percent performance fee (Financial Times 2018).

If in fact, there is a continued deterioration of established hedge funds success, while the environment attracts less traditional new entrants, the result is an opportunity for new ideas in niche markets with unique fee structures (Figure 3.1).

Figure 3.1: A History of New and Closed Hedge Funds 2014-2017



(Porzecanski 2016)

Over the last three years the hedge fund has witnessed the opening of a significant amount of new funds while existing funds, presumably poor performing, have closed (Figure 3.1). This result has created an atmosphere allowing for unique and niche fund ideas to attract capital.

This thesis examines the feasibility of an investment alternative to attract capital. A fund with a different fee structure that invests in agriculture may have an opportunity to be funded based on the current financial market, macroeconomic environment, and investor climate where capital is evaluated to determine where and when to make investments.

3.2 Hypothesis

Hypothesis 1: Fresh ideas for hedge fund startups are attracting new capital

If the current market saturation and high fee hedge funds continue to disappoint investors, it is expected investors will evaluate alternative investments. According to Hedge Fund Research, in 2016 a net of over \$70 billion was removed from hedge fund investing (HFR). At the same time, 15 new hedge funds were launched in the first half of 2017 that

invested in crypto currencies (Shin 2017). A crypto currency is a digital or virtual currency in which encryption techniques are used to regulate the generation of the units of currency and verify the transfer of funds, operating independently of a central bank (Shin 2017).

Interest in starting cryptocurrency-based funds supports an example of how money deployment has changed, as cryptocurrencies are unique.

Hypothesis 2: An Agriculture Dairy focused hedge fund offers better returns than traditional benchmarks.

A hedge fund is a formal partnership of investors who pool funds to be guided by professional management for one goal. The goal of both the investor and the hedge fund team is to generate a maximum return on investment provided a level of risk. The average annual return of the S&P 500 over the last decade is 9.25% (YCharts 2018).

3.3 Testing Model

A hedge fund, representing an alternative investment that can garner an alpha within dairy would attract capital. Thus, the expectation supports capital investment to supply the hedge fund. Alpha is the active return on an investment that evaluates the performance of an investment against an industry benchmark.

The fund trade plan incorporates a combination of contrarian, and momentum strategies while referencing the term structure of the contracts in financial dairy markets. A contrarian strategy is to buy undervalued physical and or financial commodities and sell overvalued instruments. Essentially, a trader has to identify overreactions to a market move. A momentum trade is a strategy that profits from a market direction that is assumed to continue, essentially rejecting a random walk hypothesis that any market move is entirely by revealed information. The fund trade plan includes term strategies that evaluate

spot pricing as it relates to futures prices identifying opportunities with storage, convenience yield and mispriced qualitative information.

The analysis performed reviews, compared, and contrasted capital investment alternatives; the S&P 500 Index versus agriculture performance while evaluating the comparative advantage. Further analysis with comparing the values of diversification for the fund for alpha and risk adjusted performance could help support the likelihood of an alternative investment agricultural fund acquiring capital.

Many investors base the success of portfolio performance without considering the risk taken to achieve those returns. As a result, there are performance measures and calculations that measure risk with the variability of returns including the Treynor Ratio. The Treynor Ratio or reward to volatility ratio measures how well an investment has compensated its investors given its risk. The ratio relies on beta that measures an investment's sensitivity to market movements. An important attribute of the Treynor Ratio is systematic risk, the kind of risk inherent to the entire market that should not be penalized because it cannot be diversified away (Morningstar n.d.).

The Treynor Ratio is calculated as follows:

$$\text{Treynor Ratio} = \frac{r_i - r_f}{\beta_i}$$

r_i = Portfolio's return

r_f = risk free rate

β_i = Portfolio's beta

The slope is the relationship between risk premiums per unit of risk. As a result, the greater the slope of the capital market line the better risk returns for a trader. Therefore, a high Treynor Ratio indicates better performance.

By applying the capital market line to account for the rate of return for efficient portfolios, subject to the risk level for a market portfolio and risk free rate, a comparison is conducted (Ganti 2019). Differences in investment performance provide a basis for capital allocation.

The hypothesis is tested by applying comparative performance and diversification methodology theory measuring alpha while estimating beta.

CHAPTER IV: DATA AND RESULTS

4.1 Objective in Review

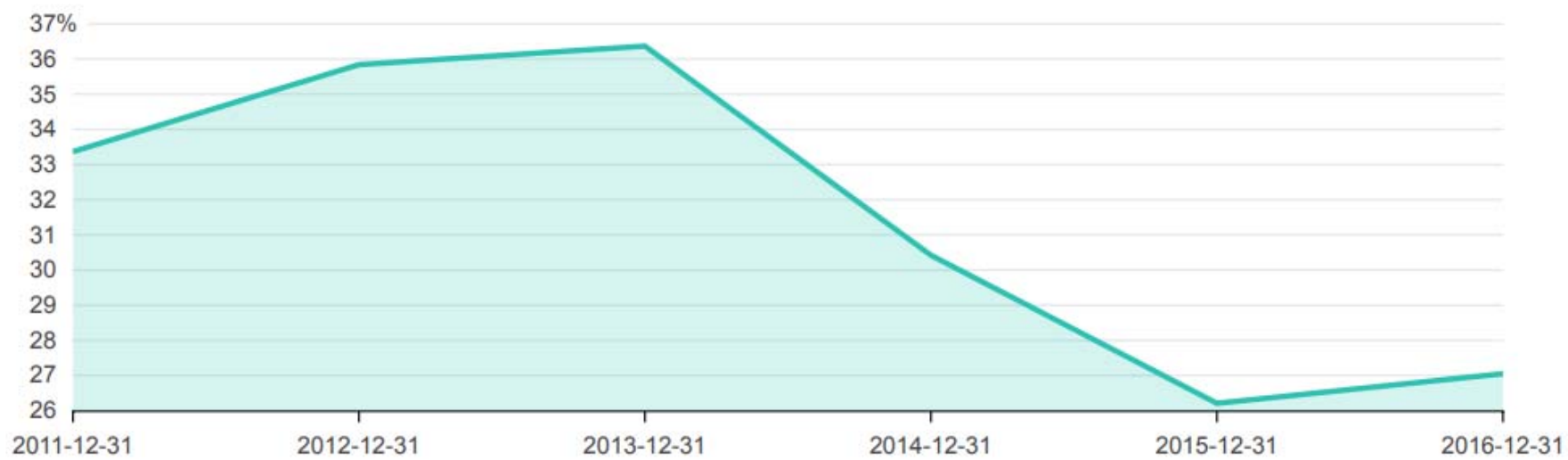
The objective of this thesis is to evaluate, compare and contrast an agricultural hedge fund to the characteristics of successful hedge funds. Identifying characteristics of successful hedge funds provide valuable insight. This insight, coupled with a trading strategy, record of accomplishment, and fresh ideas hopes to obtain future funding for a hedge fund.

Hypothesis 1: Fresh ideas for hedge fund startups are attracting new capital

4.2 Hedge Fund Current State

In May of 2017, the best investors in the world attended the Sohn conference to discuss their investment ideas. According to Bloomberg, the result of the conference was there is an epidemic of a lack of new ideas in hedge funds. As reported by Goldman Sachs based on a survey of 813 hedge funds with nearly \$2 trillion in assets, turnover in portfolios has hit a new low and has fallen steadily for the past seven years (Figure 4.1) (Gandel 2017).

Figure 4.1: Hedge Fund Turnover

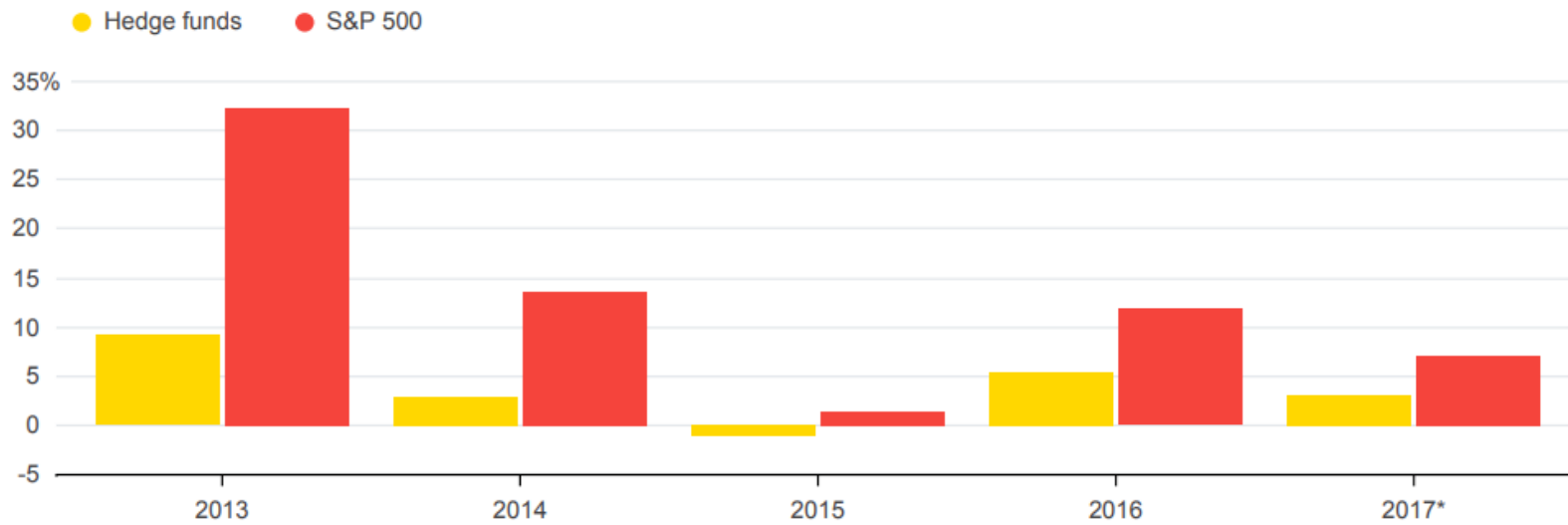


Source: (Gandel 2017)

Hedge funds with a longer holding positions have resulted in under performance dating back to 2013. Between 2015 and 2016, on average, there was a 0.8% increase in new positions. Over the timeframe from 2012 to 2016 hedge funds new positions entered, within a year, peaked in 2013 at 36.4% of managed money. However, since 2013, there has been a decline of 10.1%, that supports the lack of better ideas to deploy capital.

A contributing factor to the strategy and performance relates to the pool of capital hedge funds have more recently obtained (Figure 4.2). Hedge funds are chasing capital from pension funds, endowments and sovereign wealth funds that have longer time horizons and different risk profiles than traditional high net worth individuals (Ritholtz 2018).

Figure 4.2: Hedge Fund Performance, the Real Dumb Money



Source: (Gandel 2017)

Never have so many investors paid so much for uninspiring returns according to Bloomberg. An inflated estimate of expected returns has been a contributing factor to pension fund investment in hedge funds. According to Businessweek, hedge funds that invest in stocks returned 7.2% annually from 2009 to 2017, which was less than half the S&P 500 return (Ritholtz 2018).

Hedge fund capital sourcing and recent performance has been lackluster. As a result, there is an opportunity for new managers to attract capital from high net worth individuals who were replaced by pension funds. According to Business Insider, managers with a three-year record of accomplishment, who are flexible and creative with fees, are getting opportunities. In addition, having tempered expectations with initial capital is equally important to attract new money. According to one New York based manager who recently launched a fund, people are looking for differentiation; whether a sector focus, derivatives that other people do not understand, or some kind of specialized skill set (Hartmann 2017).

Identifying the unique investment opportunities to attract capital requires extensive analysis. One of many evaluation processes includes price variances and correlations, thus calculation mean price reversion and standard deviation. When reviewing dairy derivative contracts with other commodities, which effect on farm supply and publically traded companies, or consumers of dairy, therein lies potential opportunity.

Table 4.1 illustrates relatively low annual volatility for commodities while the equities, Dean Foods, Lifeway Foods, and Kroger have higher volatility in comparison.

Table 4.1: Standard Deviation and Monthly Mean Returns for the Dairy Supply Chain, April 1, 2014 through April 1, 2019

Monthly Standard Deviation									
Class III Milk	Dean Foods	Lifeway Foods	Kroger	Soy Meal	Soybeans	Corn	Cheese	Butter	S&P 500
6.17%	12.02%	14.20%	8.00%	6.32%	4.83%	5.01%	5.95%	7.48%	3.23%

Mean Monthly Return									
Class III Milk	Dean Foods	Lifeway Foods	Kroger	Soy Meal	Soybeans	Corn	Cheese	Butter	S&P 500
-0.51%	-2.63%	-1.91%	0.51%	-0.57%	-0.47%	-0.07%	-0.50%	0.80%	0.80%

Hypothesis 2: Agriculture Dairy focused hedge funds offer better returns than traditional benchmarks

4.3 Common Trade Strategies and Participants

In commodity markets, there are four classifications of participants based on how the Commodity Futures Trading Commission (U.S. Commodity Futures Trading Commission n.d.)(CFTC) tracks trade activity. The four classifications are as follows: producer/merchant/processor/user (PMPU), swap dealer, money manager, and other reportables. According to the CFTC, PMPU is an entity that predominantly engages in the production, processing, packing or handling of a physical commodity and uses the futures markets to manage or hedge risks associated with those activities. Swap dealers are entities that deal primarily in swaps for commodities and use the futures markets to manage or hedge risk associated with those transactions. Another classification of trade activity is managed money. The CFTC defines managed money as a registered commodity trader advisor (CTA); a registered commodity pool operator (CPO); or even an unregistered fund identified by CFTC. These trades are engaged in managing and conducting organized futures trading on behalf of clients. Other reportables include any other trader that is not represented in one of the other three categories (U.S. Commodity Futures Trading Commission n.d.).

There are suppliers of the commodity that include farms and cooperatives that may participate in financial trading to mitigate risk. The end users or consumers of the commodity are the buyers or commercial users. Managed money is also a classification of participants that includes speculators. Lastly, the CFTC has another status of participants, commercial traders of the physical product.

Many different trading strategies can be incorporated for a wide variety of financial instruments. Commodity markets represent a unique dynamic due to weather. Supply and demand dynamics are ever changing globally that impact the market. The focus of this thesis is for the managed money classification of financial trading of commodity markets. Traders, or speculators use fundamental market information such as supply and demand, seasonality, weather patterns, macroeconomic indicators, Free Trade Agreement (FTA) status, foreign exchange volatility as it impacts the purchasing power of dollars, and other factors to determine a trading strategy. In addition, traders can use technical analysis with pricing patterns as a means to identify trading strategies. Traders can also incorporate both a technical analysis view as it relates to fundamental trading and vice versa. An example of a hybrid trade strategy would be a fundamental trader evaluating a pricing chart to determine the entry price for a long-term position. Conversely, a technical trader might read market analytics about the fundamental commodity to verify the fundamental price shift that would dissipate a price pattern.

Organized commodity trading on an exchange has occurred since 1848 starting at the Chicago Board of Trade (CBOT). The history of commodity markets and participation has evolved over time. As a result, there are varieties of strategies used by various participants. Among the strategies, there are three common trade strategies, trend also known as momentum, counter trend or contrarian, and term structure investing. Within the dairy industry, momentum strategies have been incorporated in the physical market for years by participants, buy when the market price is going higher and sell when the market prices is moving lower. Commercial dairy trading entities have used momentum strategies and initiated trades when a turn in the market or price direction change is perceived.

The net result of various views and business objectives fulfilled increases the market liquidity of a financial instrument. As a result, speculators have the ability to participate and scale trade activity using various strategies.

Momentum strategies or trend strategies are derived from moving averages in price. The moving average price is calculated by various timelines to determine patterns and suggest trade action. Steeper drawdowns compared to many other strategies make momentum a riskier trading approach. However, financial instruments that move in one direction tend to continue (Simon Moore 2019).

A contrarian market strategy attempts to capitalize on a price movement, which is exaggerated either higher or lower. A trade strategy that incorporates this tactic tends to be riskier than momentum trades, but have a larger potential return. Contrarian strategies incorporate a variety of trade objectives that capitalize on a market move, that has been exaggerated. Being contrarian for the sake of being contrarian is a bad idea for trading. However, the basis of a contrarian strategy includes other fundamental approaches to trading that take into account various quantitative and qualitative analysis. Contrarian trading alone is not a strategy; however, when other strategies support a trade, a contrarian approach can exploit the common investor/trader overacting (Reese 2018).

A term strategy predominately affects the commercial trader. As a result, the strategy reviewed in this thesis references the commodity term structure as it relates to the momentum and contrarian combined strategy. Traders can incorporate trade strategies in isolation and in combination. A comprehensive approach, that evaluates a commodity term structure in conjunction with momentum and contrarian tactics, can provide more conviction with a trade.

Applying the trading strategies to the same consumption and production variables yielded some interesting findings when reviewing monthly data for the last five years. The equity company, Dean Foods, had support for momentum trading, this month's returns and indicator of next months; however, the findings were not statistically significant at the 5% level (Table 4.2). The correlation of next months' return was correlated with the current months' return. Conversely, Lifeway Foods and Kroger supporting a contrarian relationship with a negative correlation, which was also not statistically significant.

The on-farm components, milk, soy meal, and soybeans all provided statistically significant momentum trading indicators. However, corn was not statistically significant at the 5% level with suggesting a momentum strategy opportunity. Lastly, a use of milk, cheese and butter, yielded nothing statistical significant to support momentum with positive correlations within the five year data set, but butter was statistically significant at the 5% level.

Table 4.2 Correlation between the Monthly Return in Period t+1 and the Return in Period t for Various Dairy Related Markets, April 1, 2014 through April 1, 2019

Correlation Analysis										
	Dean Foods	Lifeway Foods	Kroger	Soy Meal	Class III Milk	Soybeans	Corn	Cheese	Butter	S&P 500
Autocorrelation	0.11	-0.08	-0.03	0.31	0.30	0.36	0.21	0.24	0.32	-0.18
T-Statistic	0.83	-0.59	-0.25	2.42	2.35	2.90	1.59	1.88	2.54	-1.36
P - Significance	0.41	0.56	0.80	0.02	0.02	0.01	0.12	0.06	0.01	0.18

4.4 Preliminary Diversification Opportunities within the Dairy Sector

To determine effective trading strategies within the dairy sector, an analysis was performed on trading opportunities that correlate to the dairy sector; including commodity correlations to equities, input cost correlation to equities and/or dairy derivatives and a correlation analyses compare to the S&P 500 benchmark. Asset correlation is a measure of how investment prices move in relation to one another. The statistic measures the degree to which one financial instrument moves in relation to the other. The computation is called the correlation coefficient that is bounded by -1.0 to +1.0.

Figure 4.3: Correlation Formula

The Formula for Correlation Is

$$r = \frac{\sum(X - \bar{X})(Y - \bar{Y})}{\sqrt{\sum(X - \bar{X})^2} \sqrt{\sum(Y - \bar{Y})^2}}$$

where:

r = the correlation coefficient

\bar{X} = the average of observations of variable X

\bar{Y} = the average of observations of variable Y

In addition to testing correlations, risk was calculated by estimating a beta of an investment. Beta is a measure of a specific financial instrument relative to risk to a broader market. The beta looks at the correlation in price movement between the stock and the benchmark S&P 500 (McNulty 2019).

Figure 4.4: Beta Formula

$$\text{Beta} = \frac{\text{Covariance}}{\text{Variance}}$$

Covariance = Measure of a stock's return relative to that of the market

Variance = Measure of how the market moves relative to its mean

Beta is calculated by dividing the securities standard deviation of returns by the benchmark standard deviation of returns. The resulting value is multiplied by the correlation of the investment returns and the benchmark returns (McNulty 2019).

Equities and commodities that were included in the beta and correlation analysis took into account dairy focused equities, on farm dairy inputs, dairy derivative components with first the price of class III milk and the S&P 500.

Table 4.3: Monthly Beta Results for the Dairy Supply Chain, April 1, 2014 through April 1, 2019

Beta									
Class III Milk	Dean Foods	Lifeway Foods	Kroger	Soy Meal	Soybeans	Corn	Cheese	Butter	S&P 500
	-0.39	-0.06	-0.39	-0.22	0.20	0.03	-0.26	-0.15	0.05
S&P 500	Dean Foods	Lifeway Foods	Kroger	Soy Meal	Soybeans	Corn	Cheese	Butter	Class III Milk
	0.21	0.72	0.56	0.26	0.44	0.39	-0.09	-0.30	0.19

Table 4.4 Monthly Correlation Results for the Dairy Supply Chain, April 1, 2014 through April 1, 2019

	Correlation								
	Dean Foods	Lifeway Foods	Kroger	Soy Meal	Soybeans	Corn	Cheese	Butter	S&P 500
Class III Milk	-0.20	-0.03	-0.30	-0.21	0.26	0.04	-0.27	-0.12	0.10
Dean Foods	1.00	0.21	0.34	0.13	-0.24	-0.21	0.03	0.14	0.06
Lifeway Foods		1.00	0.05	-0.10	0.21	0.18	-0.21	0.15	0.16
Kroger			1.00	0.04	-0.20	-0.07	0.18	0.13	0.23
Soy Meal				1.00	-0.10	-0.07	0.02	-0.21	0.13
Soybeans					1.00	0.74	-0.20	-0.20	0.30
Corn						1.00	-0.33	-0.23	0.25
Cheese							1.00	0.40	-0.05
Butter								1.00	-0.13
S&P 500									1.00

The Beta results, using milk as a benchmark, illustrate no dairy equities with a positive beta. The dairy equities, Dean Foods, Lifeway Foods and Kroger stocks move inversely to Class III milk. As input cost rises, the equities make less money. This idea suggests dairy equity companies do not pass on the addition cost or provide savings, if milk price declines, to the customers. The Beta testing for input cost suggest they are significantly less correlated with Class III milk price.

When evaluating all the dairy companies beta compared to the S&P 500 index, Kroger and Lifeway Foods resulted in higher betas than Dean Foods, which suggest price moves more in line with the index. However, the dairy outputs had negative betas (cheese and butter), that suggest prices move in opposite directions of the S&P 500.

The correlation analysis did not provide any statistically viable combination of dairy equity, dairy input cost and/or dairy derivative, which would directly affect a trading decision.

Overall, the beta testing and correlation analysis provide limited insight into how the data can be used in a trading strategy to consistently make profits. Therefore, additional testing procedures would be suggested before moving forward with the fund.

CHAPTER V: CONCLUSION AND RECOMMENDATION

5.1 Conclusion

The opportunity to attract capital for a new type of hedge fund exists in the current market environment. However, the analysis, suggesting dairy focused hedge funds offer better returns than a traditional benchmark, provided inconclusive support. Additional testing and research would be warranted before proceeding forward.

5.2 Future Recommendations

The analysis and test method completed in the thesis represents one way to attract capital to start an agriculture dairy hedge fund. There are many various trade strategies and approaches that could garner similar or different outcomes with funding. In addition, there were many challenges to testing the trade strategy while comparing the returns to a benchmark average, the S&P 500. For example, evaluating settlement trade data as a means to identify entry and exit does not allow for the same return capability if daily trading ranges are included. In addition, a unique strategy, as a means for alternative investment, requires a longer time horizon to support proof of concept compared to an annual return benchmark. For example, a commodity super cycle can take 3 years to play out thus creating trade strategies that may perform better or worse in the cycle.

Another aspect, that was briefly mentioned, but not tested, is a combination of various trading strategies such as contrarian and term. Further research to evaluate the performance of a combined strategy may impact returns differently. In addition, the evaluation of a financial market providing insight and or opportunity to trade a physical dairy commodity was not reviewed but could be another attribute to further research. Lastly, the trading methodology was not compared to other commodities to determine scalability.

The characteristics and additional scope noted could be analyzed in the future with additional resources to better determine the ability to attract capital for a unique trading strategy in the dairy markets. In addition, future studies may provide different results when incorporating fundamental seasonality of a market as well as price cycles, which create market reactions.

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