

**Developmental Case Study of Hedge Fund  
Clone Program as Knowledge Creation Means:  
Action Research Using Soft Systems  
Methodology and Social Learning**

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### ABSTRACT

This study aims to fill the purpose of empirically indicating an example of the general development process of an investment strategy that accompanies knowledge creation within an organization. The task here is to deal with a complex system of the financial markets, while creating expert knowledge in an organization. In order to research this, we carried out the hedge fund clone program under development as action research. For dealing with complex features of the task we have used soft systems methodology. Next, we focused on the SECI model to create professional knowledge within the financial market. In developing the clone program, we studied preliminary research and conducted interview research towards hedge funds. For the construction method, we selected the process analysis approach, and chose the Diversified Trend Follow Strategy which is the representative investment strategy of the CTA(Commodity Trading Advisor) as the subject to making the clone. As a result, the development and management of clone programs can improve the process of professional knowledge being acquired. The developmental process itself highly accelerates the cyclical interaction between implicit knowledge and explicit knowledge in the SECI model, and therefore provides high speed knowledge creation within an organization.

Keywords: Hedge Fund Clone, Knowledge Creation, Soft Systems Methodology, Quantitative Investing.

## 1. INTRODUCTION

Hedge funds have been well known to investors as an investment method. However, to Japanese investors hedge funds have been considered to be less convenient compared to other traditional investment funds in the aspect of liquidity, clarity and cost. Due to these reasons, some investors in Japan still hesitate to invest in hedge funds.

On the other hand, onshore investment funds are familiar to the domestic investors and have provided high liquidity and clarity. In this study, we carried out an action research that uses domestic fund scheme with an absolute return investment strategy by carrying out the organizational knowledge creation process mentioned by Nonaka and Konno in 2003.

## 2. BACKGROUND OF THE RESEARCH

Asset Management companies conduct their business in the financial market and client market, which are both considered to be complex human activity Systems (Checkland 1985). Due to the maturity of the market, there are difficulties in developing the products. However, even though the problems come from the same systematic complexity, there is a significant difference in the developmental paradigm and problems between the development of the traditional investment management strategy and absolute return investment strategy.

### 2.1 General method of developing an investment fund

Generally speaking, the role of the asset management company is to set an investment fund and manage assets gathered from the investors. In addition, the asset management company gathers and analyzes various economic and financial data, and the experts of the market decide how to invest in which asset class. The asset management company may instruct the trust bank as to how to manage the asset, from time to time, according to The Investment Trust Association of Japan<sup>1</sup>. However, as is shown in Figure 1, the asset management company has contact with only the distributor, trust bank and the financial market and not directly with the client. Therefore, it has difficulties in grasping the overt/potential needs and wants of the client and developing products that focus on those client requirements.

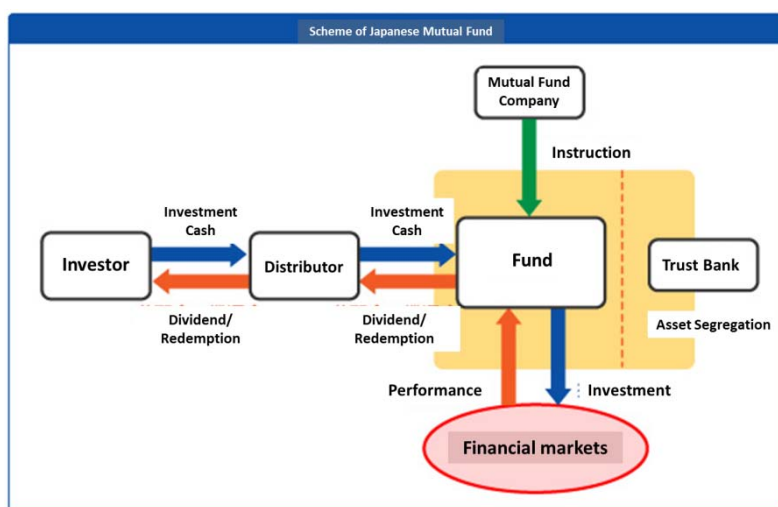


Figure 1: Scheme of Japanese mutual fund (The Investment Trust Association, Japan), Modified by the author<sup>2</sup>

<sup>1</sup><http://www.toushin.or.jp/english/>

<sup>2</sup><http://www.toushin.or.jp/investmenttrust/about/scheme/>

Asset management companies also buy and sell securities in the financial market, but the financial market is a human activity system (Checkland 1985) in which there is little universality. The price movement is mostly random in the financial market, and therefore the cause and effect relation between the two are weak. Therefore, it is hard to inductively gain expert knowledge through investment activities (Mauboussin 2013). This is because that in order for a rule to be inductively gained, there is the need for the existence of the correct and incorrect case, hence there needs to be a strong cause-effect relationship between the action and reaction (Inagaki, Hatano 1989). Whereas the financial market shows little of these, and even though inductive learning can be done to some extent, it will take a very long time.

In order to solve these problems and provide value to the investment fund's beneficiaries, asset management companies create prototypes (Kelley 2002, Konno 2008). More specifically, in the traditional development of the investment strategy of the asset management company, a mental model which is formed in the shape of a story that shows the movement of the financial market is created (Johnson-Laird 1998). The next step is to increase the variables and optimize the past by simulation or construct an investment strategy that matches the story using the deductive reasoning. In this case, as long as the investment strategy is in line with the mental model's story, objectiveness, logicalness and reproduction are not questioned. Generally, the client does not consider these scientific factors much, when selecting a fund (Nagao, Kanda 2015). In other words, in the traditional investment strategy, if one has the knowledge and ability to carry out the practical operations of the fund, high level knowledge of the financial market is not necessary needed. Prototypes made in this procedure are released into the market as actual products (Investment funds).

This kind of product did not exist in the financial market before, and therefore the evaluation from the client is unknown beforehand. Hence the asset management companies do not have the evaluation function to select the superior product which is understandable. As Lusch and Vargo pointed out in 2014, the enterprise cannot provide the value but only can propose value and value is assessed phenomenologically and contextually. However, the products released from the asset management company are evaluated and selected by the client (potential beneficiary). If the products story which is inserted in the form of a mental model is attractive, the evaluation of the product will rise and likely to become more selected. This will lead to the rise in sales. On the contrary, if the story is unattractive to the client, the product sales will not grow.

Here, the evaluation and selection process from the client is functioning as the verification of the prototype. The evaluation function here is the "satisfaction level of the client" and potentially the matching level of the client's mental model and the product mental model that grasps the financial market. Thus, the asset management companies can tell what kind of product is "good" (i.e. which product has the story that matches the mental model of the client), and feedback the result to mass produce similar products. In other words, the client is given the massive opportunity to buy an investment fund which he/she may deem as an attractive story, because of this structure. As Popper mentioned in 1972, induction has its flaws as an exact scientific proof. However, this paradigm has been useful in the practical world, to develop and produce products under the restrictions that asset management companies face.

## 2.2 The development of absolute return investment strategy

However, unlike most traditional investment strategy development, most asset management companies are not familiar with the absolute return investment strategy, and therefore may not hold expertise knowledge or experience. This study was originally carried out as one corner of a new developmental project in the asset management company business, but met some obstacles at the beginning of the project when there was significant difference in the method of development design and knowledge creation, and therefore had difficulties in agreeing to a unified perspective. In these problems, there are ones that come from lack of experience and knowledge, and there are ones that come from human psychology or difference in perception and recognition. On the other hand, the root of problems came from the complexity of the system. They were categorized in the following two. Firstly, there is the problem of evaluation and verification. Generally, when developing an investment strategy of a fund, one would only need to focus on the “what”, and “how” to efficiently and effectively solve the problem. And then carry out the prototyping of design thinking by using the familiar development design. However, the “what” of the development of the absolute return investment strategy is unclear, because what is considered to be a good investment strategy is not uniquely objectively defined, but is defined socially and contextually. This means that the evaluation function is undetermined and therefore cannot be evaluated or verified.

Therefore, when trying to develop an absolute return investment strategy, one would need to switch the problem into a problem that can be solved with the existing developmental design.

Also, there is the problem of gaining expertise knowledge in the financial market as the second problem. Most investment strategy of funds requires compatibility with the client and stories and investment style itself will hold value, whereas in the absolute return investment strategy, there is value in the expected return. For this value to be realized, gaining high expertise knowledge in the financial market is essential.

Generally speaking, the number of information chunks that an expert with an ability to solve problem has is around 50,000, and will take around 10 years to gain (Simon 1987).

Therefore, in order to shorten the length of time needed and to share the knowledge within the organization, organizational knowledge creation is conducted (Nonaka, Konno 1999). Here the creation of knowledge can be explained as the cyclical interaction of implicit knowledge and explicit knowledge of the SECI model. The model consists of four knowledge conversion patterns. They are Socialization, Externalization, Combination and Internalization (Nonaka, Konno 1999).

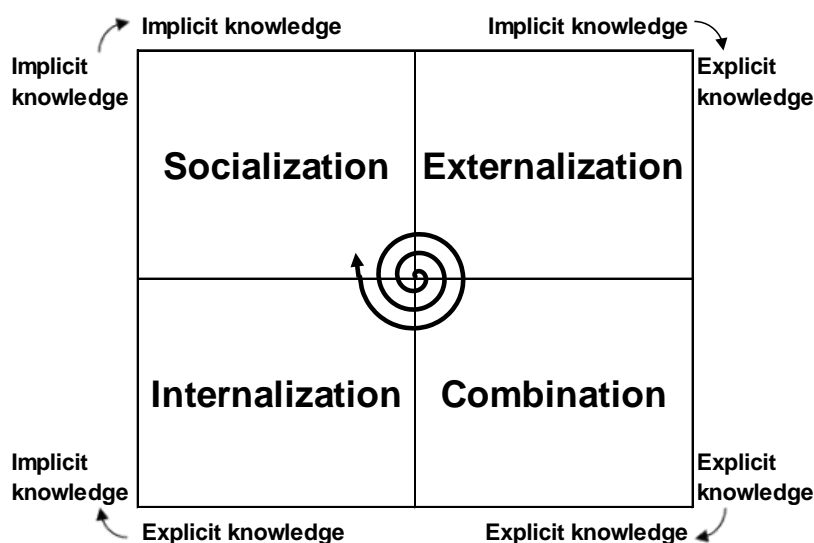


Figure 2: SECI Model (Nonaka, Konno, 2003), Modified by the author

Because the price movement of the financial market is mostly random, it is hard to inductively gain expertise knowledge through investment activities. However, if there is an expert in the organization, Legitimate Peripheral Participation through joining Community of Practice would be a solution (Lave 1993). This would be considered as Socialization in the SECI model.

However, if there are no experts in the organization, Socialization process does not function and cannot gain implicit knowledge. Externalization process will not function properly, since there is no implicit knowledge (no implicit knowledge to be made as explicit knowledge). Therefore knowledge creation process within the organization will not function properly and the knowledge sharing in the organization or gaining expertise knowledge in a short term is not likely to be achievable. So when developing absolute return investment strategy, it is essential to find an alternative way of the Socialization process.

### 3. RESEARCH QUESTIONS

The research questions set for this study are stated in the following.

MRQ: When developing an absolute return investment strategy, what should the process be like, when wanting to make the product as well as conducting organizational knowledge creation?

SRQ1: How should be solved the problem of systematic complexity when developing an investment strategy?

SRQ2: What should one do to create high level expertise knowledge in financial organization?

SRQ3: Which approach should be taken when constructing hedge fund clone program?

#### **4. METHOD OF RESEARCH**

We conducted action research in the following manner, from September 2013 to August 2015.

- Step1. Acquire accommodation of the project with SSM
- Step2. Select investment strategy of subjected to the hedge fund clone program
- Step3. Conduct literature review and interview research of diversified Trend follow strategy.
- Step4. Construct conceptual mode and quantitative model(prototype) of diversified Trend follow strategy
- Step5. Improve clone program with the feedback and Hypothesis testing of the actual management of the clone program(prototype)

#### **5 . ACQUIRING ACCOMMODATION WITH SOFT SYSTEMS METHODOLOGY**

We used SSM to form accommodation for the whole development project. According to Nakamori (2010), SSM stands in the aspect where “It is based on the accurate observation that complex problems related to human psychology does not have a precise mathematical model, and nor can it be represented in such a model”. Hence “Will try to observe based on systems that are have been differently perceived and recognized by different individuals minds” and thus has been “recognized as a beneficial approach towards problems with unclear structure.”

One of the major problems we faced in our study was that there are no criteria in the development of the investment strategy. However, we were able to switch this into the hard system problem, where mechanism and structure of the system is clear. Although it is not possible to evaluate/verify fairly which hard system is superior, it is possible to reach agreement among the stakeholders, to agree to an answer where systemically preferable and culturally accomplishable (Checkland 1994). Complexity within the financial market is irrelevant here.

In this study, we applied SSM to the development project with underlying use (Mode 2) (Checkland 1994). This means that SSM was not clearly stated to the related parties but was only applied at a meta-level. This was because our undisclosed aim was to revise the project plans and put the thoughts towards the project in order.

As a consequence, we were able to receive consensus to “Develop a hedge fund clone program that has similar performance to the original strategy”. If it were hedge fund clone program, we could write it as a hard system, and there would be an Evaluation function which would mean that evaluation and verification is possible. And to solve a problem that has an Evaluation function, Design Thinking can be applied. It means that we can build a prototype and improve it.

#### **6. KNOWLEDGE CREATION WITHIN THE FINANCIAL MARKET**

For the development of absolute return strategy, the creation of high level expertise knowledge is indispensable. In the financial market, the cause and effect relation between the investment action (cause) and the performance (effect) is thin. Therefore, it

is hard to inductively gain expertise knowledge through investment activities in the financial market. This means that in order for knowledge creation to occur (i.e. for Socialization process to be taken) an expert needs to be existing within the organization. The learner may gain the implicit knowledge by entering the community (Legitimate Peripheral Participation) in which the expert belongs to.

However, if there are no experts in the organization, Socialization process does not function and cannot gain implicit knowledge. Externalization process will not function properly, since there is no implicit knowledge (no implicit knowledge to be made as explicit knowledge).

In order for knowledge creation to be done short term under these circumstances, the Socialization process must be done in an alternative way. In our study, we tested if Socialization would occur through management of clone program, as a social learning (Pentland, 2015). More specifically, we constructed a hedge fund clone program prototype that copies expert actions and formed implicit knowledge. Through this process, Socialization was done and we were able to carry out the cyclical process of knowledge creation.

## **7. METHOD TO CONSTRUCT HEDGE FUND CLONE PROGRAM AND SELECTION OF INVESTMENT STRATEGY**

In order to develop the hedge fund clone program, we studied the Method to construct hedge fund clone program and selection of investment strategy.

### **7.1 Overview of hedge fund clone program**

Recently, Liquid Alternatives (LA) that has improved the hedge fund problems such as liquidity, clarity, costs has been focused on (Matsuo 2015). This is an investment product that is designed to provide similar returns to hedge fund, but has high liquidity and clarity with low cost. There are many variations of constructing LA, but the major way is to collect hedge fund index or set a peer group that has the similar style to the hedge fund and construct a clone.

Of course not all investment strategies of hedge fund are subjected to the clone program and just because cloning is possible it does not mean that the original hedge fund will lose its meaning of existence. However, with some limitations, the hedge fund clone program as LA may be able to provide prominent investment to the investors who have evaded hedge funds investing.

### **7.2 Method to construct the hedge fund clone program**

Currently, there are generally three types of construction method of the hedge fund clone program (Sueyoshi 2007, Nakano 2012).

1. Multivariate analysis approach focused on regression analysis of historical return data and risk factor (Factor based, return clone)
2. Distribution analysis approach focused on the distribution of hedge fund returns (distribution based, statistical clone)
3. Process analysis approach (Rule based, strategy clone)

Traditionally, the clone of multivariate analysis was the mainstream (Lo 2007, Iwanaga 2007, Jaeger 2008, and Hecht 2014). However, this clone program based on

regression analysis of past data had a few problems. It lacked explanation to future returns, and the returns were low even though the approach cloned the dispersion and moreover, the clone program that used the general multi factor model did not provide diversification towards investors (Hecht 2014). Also, the multifactor model is a model that is based on the correlation phenomenon and is not based on the cause-effect relation. Therefore, should the model be irrelevant, it is hard to search the cause and scientifically make improvements. Thus, in this study we chose the Process analysis approach.

This approach is compatible with prototyping models designed in developmental projects, and is easy to explain the investment contents and process, as well as clarity in the portfolio management. This makes it relevant to the other two approaches from a practical point of view. Also, by establishing the development methods using this approach, we thought that future development of other various hedge fund investment strategies could be less difficult to study.

## 7.2 Selecting the investment strategy for cloning

It may be difficult to categorize hedge funds clearly when there are many variations of alternative investments. According to Hecht (2014), in the main stream hedge fund strategies in which the clone program is constructible are the following;

- Convertible arbitrage
- Merger arbitrage
- Quantitative market neutral
- Systematic macro
- Managed futures
- CTA (Diversified Trend Follow, Value, Relative momentum, Carry etc.)

Among the hedge fund strategies in which the clone program can be constructed, we have selected the diversified Trend Follow strategy which is the major investment method of the CTA(Commodity Trading Advisor), as the original of the clone program. The factors needed in the hedge fund investment strategy subjected to the Process analysis approach is: (A) The investment process is consistent and does not change over time, (B) The investment management is rule based, using quantitative models and not managed by discretion. The diversified Trend Follow strategy meets these factors sufficiently.

## 8. INVESTIGATING THE INVESTMENT PROCESS OF THE DIVERSIFIED TREND FOLLOW STRATEGY

In order to identify the process of the diversified Trend Follow strategy, we conducted literature review and interview research.

### 8.1 literature review

Overview of diversified Trend Follow strategy

According to Sands (1997) and Clenow (2012), the overview of the diversified Trend Follow strategy is as follows.



Channel breakout is used in order to judge the trend in the diversified Trend Follow strategy. Trend observation (look back) period is 4 weeks or 10 weeks. Risk exposure and loss cutting is decided based on volatility. Many trades are done in order to gain diversification. Flexibility of the model is minimized to evade curve fitting (Sands 1997).

Trend following means to wait until the price either rises or falls, and then set the position to the relevant direction. Once the trend seems to be reversed, the position is liquidated. Diversified Trend Follow strategy has existed from the 1970s but has been no basic structure formed yet. Variables such as diversification of the universe, position sizing, trend observation (look back) period and risk levels are the parameters. The investment process of the CTAs that use this strategy is very alike and is possible to copy the same level of return by using a simple model (Clenow 2012).

In addition, we referred to the company brochure and fund prospectus of major CTAs that use diversified Trend Follow strategy, and confirmed that descriptions that Sands (1997) and Clenow (2012) mention grasp the strategy accurately.

## 8.2 Interview Research 1 at Miami, USA

### Outline of Interview

As qualitative research, we conducted interviews towards hedge funds (mainly CTAs). We attended the annual Managed Funds Association<sup>3</sup> conference and interviewed each representatives of hedge fund separately. Originally, the research was intended to gather data to build the hypothesis to investigate the mechanism of Investment management process for Diversified Trend Follow strategy. However, we decided to interview the LA and hedge fund's recent trend and investment process in general as well. This is due to the fact that we wanted to construct the triangulation of data and information combined with Interview 2, hence carried out the Combination process that has already been set as explicit knowledge, by analyzing and systemizing external knowledge.

Time: Monday January 26<sup>th</sup> –Wednesday January 28<sup>th</sup> 2015

Place: InterContinental — Miami, Miami USA

Number of managers interviewed: 42

Interview time: Approximately 30 minutes per manager

Interview method: Unstructured interview

Language: English, Japanese

### Results of the interview

- Most investment processes of the programs of the CTA that carry out the Diversified Trend Follow strategy are alike and therefore has high correlation in performance.
- Most CTA implement systematic investment methodologies, but there are some who manage by discretionary.
- In terms of investment strategy construction approach, knowledge concentrated deductive approach had become more popular than data concentrated inductive

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<sup>3</sup> <http://www.managedfunds.org/>

approach than before.

- There are CTAs that provide programs that specialize in hedge fund clone program.

### 8.3 Interview Research 2 at Monte Carlo, Monaco

#### Outline of Interview

As Qualitative research, we conducted Interviews towards hedge funds (mainly CTAs). We attended the conference held by The International Centre for Business Information<sup>4</sup> (Gaim2015) and interviewed each representatives of hedge fund separately. This interview was intended to research the hedge fund clone program's investment process that utilizes LA, hence gather information about the current status and trend, problems of LA.

Time: Monday June 22<sup>nd</sup>-Wednesday June 24<sup>th</sup>, 2015

Place: LE MERIDIEN BEACH PLAZA Monaco, Monaco

Number of managers interviewed: 20

Interview time: Approximately 20 minutes per manager

Interview method: Unstructured interview

Language: English, Japanese

#### Results for the overall interview

- Multivariate analysis(methods based on factor, duplicate returns)clone were the main stream of hedge fund clone programs that use LA, but recent performance and track ratio suggests that it has not been successful.
- Trend Follow and systematic Global Macro will be the choice that matches hedge fund clone program that uses LA. This is due to the fact that these strategies have less impact from "Illiquid premium", compared to other hedge fund strategies
- Due to the problems that the hedge fund Index has (i.e. Difference in performance caused by no fixed criteria in the Index, survival bias etc.), the clone program of the hedge fund Index has not been popular in both development and investment.
- Recently, the low cost of LA has been putting pressure towards existing hedge fund and therefore the cost of hedge fund has also is decreasing. There is a high possibility that this trend will continue.

Considering these findings, we have set the outline of the diversified Trend Follow strategy used by CTA as follows:

1. Construct the portfolio with futures that have low correlation, in order for the portfolio to be diversified.
2. Consider liquidity as a factor to be included in the portfolio (i.e. Do not include names with low liquidity).
3. Set the algorithm to follow the trend as simple as possible.
4. Take equal risk exposure in each position.

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<sup>4</sup> <http://www.icbi-events.com/page/about-us>

## 9 . CONCEPTUAL MODEL OF DIVERSIFIED TREND FOLLOWING STRATEGY AND CONSTRUCTING THE PROTOTYPE OF THE QUANTITATIVE MODEL

Based on Sands (1997), Clenow (2012), and the interview research, we have outlined a conceptual model of the diversified Trend Following strategy (Figure 3). The variables in which the parameters can be adjusted here are the stocks subjected to investment, position size and trend observation period.

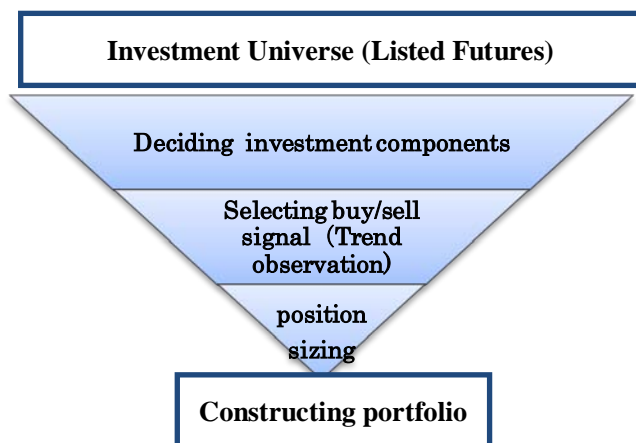


Figure 3: Conceptual model for diversified Trend Follow strategy

Based on this concept model, we carried out the simulation and decided the settings as seen below and constructed a diversified Trend Following quantitative model as a prototype.

< Settings of the prototype model >

Original program: Credit Suisse Managed Futures Liquid Index (CSLABMF Index)

Outline of Trend Following Algorithm: If 50 days moving average went above (below) 100 days moving average, and market closed higher (lower) than 50 days high (low), buy (sell) on next morning. If market closed lower (higher) than 25 days low (high), liquidate on next morning.

Position sizing: ATR (Average True Range, 100 days length)

$TR(\text{True Range}) = \max(H_{(t)}, C_{(t-1)}) - \min(L_{(t)}, C_{(t-1)})$

$ATR_{(n)} = TR$  average of n days length

Position size: 0.12% (Level of effect that each position gives to the portfolio)

Number of contracts = (Nominal Asset under Management x Position Size) / (ATR x contract unit)

Table1 List of Investment Universe

Agriculture	Soft	Currency	Stock Index	Interest Rate
Cotton	Gas Oil	AUD/USD	CAC40	Euro 2yn
Corn	Crude Oil	GBP/USD	DAX	Euro 10yn
Lumber	Heating Oil	EUR/USD	FTSE100	UK 10yn
Live Cattle	Natural Gas	JPY/USD	China H stock	US 2yn
Hog	Gasoline	NZD/USD	Hang Seng Stock	US 10yn
Oats	Gold	EUR/CHF	Nasdaq100	Eurodollar
Rice	Copper	EUR/GBP	Nikkei 225	Euro Swiss
Soybean	Palladium	EUR/JPY	S&P500	Euribor
Sugar	Platinum	CHF/USD	EuroStoxx50	Sterling
Wheat	Silver	CAD/USD	Russel 2000	Canadian BA

The reason as to why we selected the CSLABMF Index as an index is because firstly that we could extract daily data in the CTA index, and that we could carry out the evaluation and verification, improvement process at high frequency. The second reason is that the rule based index does not style drift and does not have any survival bias. As for the selection of the universe, we considered the correlation with the liquidity.

## 10 . MANAGEMENT AND VERIFICATION OF THE CLONE PROGRAM(PROTOTYPE), FEEDBACK AND IMPROVEMENT OF CLONE PROGRAM (CYCLE OF HYPOTHESIS DEDUCTIVE AND VERIFICATION)

As we actually managed the prototype, we also continued with the cycle of evaluation/verification and improvement. Firstly, we made the clone program of the proto type and managed it from November 2014. We held positions and constructed the portfolio according to the guidance of the prototype model.

We observed the performance of this portfolio at a daily basis and compared it with the performance of the original program. Generally speaking, there is no consensus within the performance evaluation of the absolute return investment strategy (Schwager 2012). However, for clone programs, it is possible to statistically evaluate by setting the difference of the clone and the original as the evaluation function. In this study, we aimed to minimize this as much as possible. Should there be a significant difference between the two, we considered its reasons and set hypothesis, and then reconsidered and reset the model. Further details are as follows:

- (1) Carry out actual management of prototype and observe difference between original return
- (2) If there is a significant difference in the return of the clone program and the original program, build hypothesis for its reasons
- (3) Quantitatively simulate each scenario on computer
- (4) Revise clone program according to the most possible hypothesis(Universe, position size and reset trend observation length)
- (5) Carry out actual investment and observe performance

- (6) Investigate the difference between clone program and original program, then feedback
- (7) Loop (1) through (6)

This improvement process was reported to the Investment committee which is organized with the related stakeholders, and received hearings and approval for the changes. We made changes until August 2015.

The results of the investment with the prototype and the changes made in the process are stated in Table 2 below.

Table 2 Changes in the clone program

Time	Contents
2014/11/10	Start investing
2015/1/15	Excluded CHF/USD, EUR/CHF and Euro Swiss
2015/3/4	Excluded Canadian BA and EUR/JPY
2015/5/12	Excluded Lumber, Rice and Oats

As a result, the difference of the performance after the revision was smaller in each phase, and thus can be said that our hypothesis was correct. As for the revision, the only adjustments made were to those towards the investment names. For the trend observation period, the influence of change it had was limited and therefore had not been adjusted from the original setting. Within the diversified Trend Follow strategy, the variables in which the parameters can be adjusted are the universe and the position size and the trend observation period but we think that the adjustment in the trend observation period is not necessary needed. As a result, the settings for the final program became as stated in the following.

< Final settings of the model >

Original program: CSLABMF Index

Outline of trend following algorithm: If 50 days moving average went above (below) 100 days moving average, and market closed higher (lower) than 50 days high (low), buy (sell) on next morning. If market closed lower (higher) than 25 days low (high), liquidate on next morning.

Position sizing: ATR (Average True Range, 100 days length)

$TR(\text{True Range}) = \max(H_{(t)}, C_{(t-1)}) - \min(L_{(t)}, C_{(t-1)})$

$ATR_{(n)} = TR$  average of n days length

Position size: 0.12% (Level of effect that each position gives to the portfolio)

Number of contracts = (Nominal Asset under Management x Position Size) / (ATR x contract unit)

Table3 List of investments

Agriculture	Soft	Currency	Stock Index	Interest Rate
Cotton	Gas Oil	AUD/USD	CAC40	Euro 2yn
Corn	Crude Oil	GBP/USD	DAX	Euro 10yn
Live Cattle	Heating Oil	EUR/USD	FTSE100	UK 10yn
Hog	Natural Gas	JPY/USD	China H Stock	US 2yn
Soybean	Gasoline	NZD/USD	Hang Seng Stock	US 10yn
Sugar	Gild	EUR/GBP	Nasdaq100	Eurodollar
Wheat	Copper	CAD/USD	Nikkei 225	Euribor
	Palladium		S&P500	Sterling
	Platinum		EuroStoxx50	
	Silver		Russel2000	

The result of the comparison between the original and the clone program are as stated in Figure 4 and 5 below. The daily correlation between the two during November 10<sup>th</sup> 2014 through August 31<sup>st</sup> 2015 was 0.75. Also, there were no significant differences of the paired t-test in the average of the daily return ( $t(210) = 0.029, ns$ ). Thus we came to the conclusion that the clone program has a high precision and therefore can be said that the validity of the hypothesis and verification which was gained during the paper research and the interview research, had been confirmed.

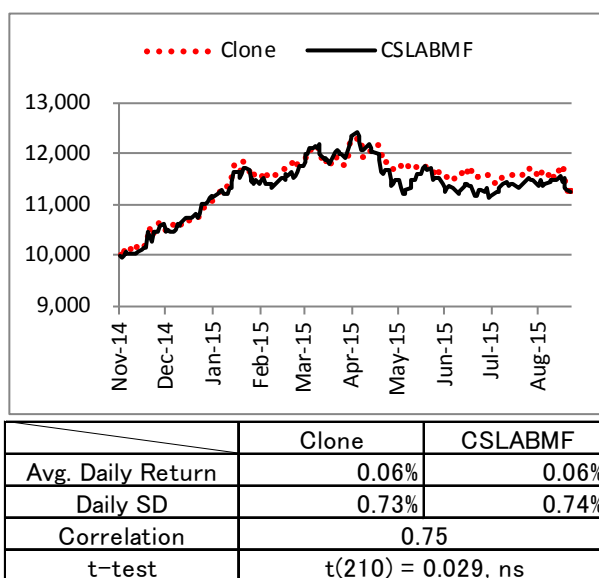


Figure 4: Comparison of the original versus the clone program on a daily basis  
 Note: Curve out from actual investing (Carried out simulation for the data of before May 12<sup>th</sup>, 2015). Indexation (The end of November, 2014: 10000) Prepared by the author based on data from Bloomberg

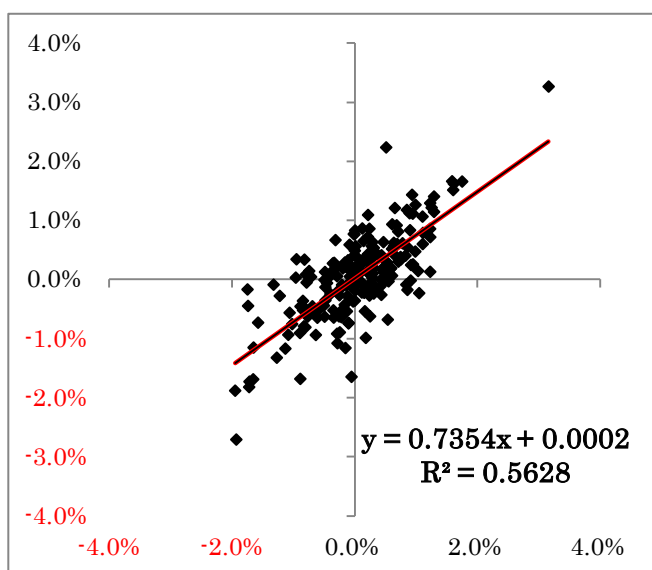


Figure 5: Scatter plot (daily data) of original program and clone program(Y axis: clone program, X axis: original program, from November 11<sup>th</sup> 2014 to August 31<sup>st</sup>, 2015)  
Prepared by the author

## 11. APPLYING TO DIVERSIFIED TREND FOLLOW STRATEGY OF EACH CTA

The clone program of this quantitative model that has been developed during this study can be used towards cloning other diversified Trend Follow strategies of each CTA. Generally, most clone programs clone the hedge fund index and not the investment strategy of the hedge fund itself. However, according to Clenow (2012), each investment process of CTA that uses diversified Trend Following Strategies are very alike. Therefore, by changing the universe and the position size of the clone program prototype, it is possible to clone most of the diversified Trend Follow strategy. The following Figures 6, 7, 8 are the simulations.

Note: Only the position size of these simulations was adjusted during the simulation, and the universe remains unchanged from the prototype.

< Example1 >

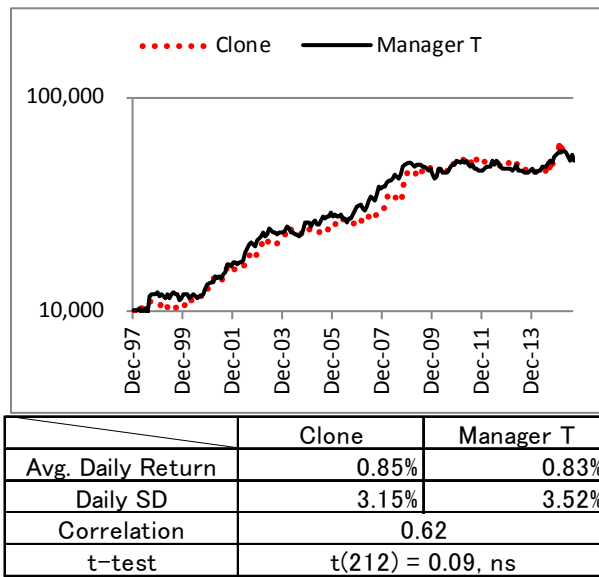


Figure 6: Comparison between Manager T and clone program on a monthly basis  
 Note: Indexation (The end of December, 1997: 10000) Prepared by the author based on data from IASG<sup>5</sup>

< Example2 >

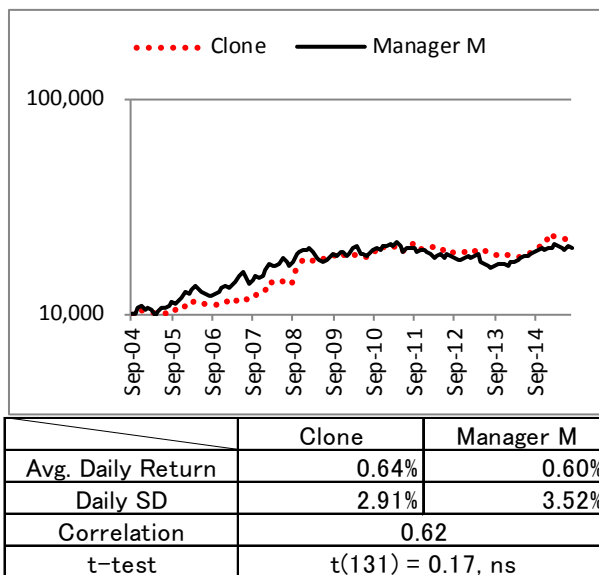


Figure 7: Comparison between Manager M and clone program on a monthly basis  
 Note: Indexation (The end of September, 2004: 10000) Prepared by the author based on data from IASG

<sup>5</sup> <http://www.iasg.com/About>



< Example3 >

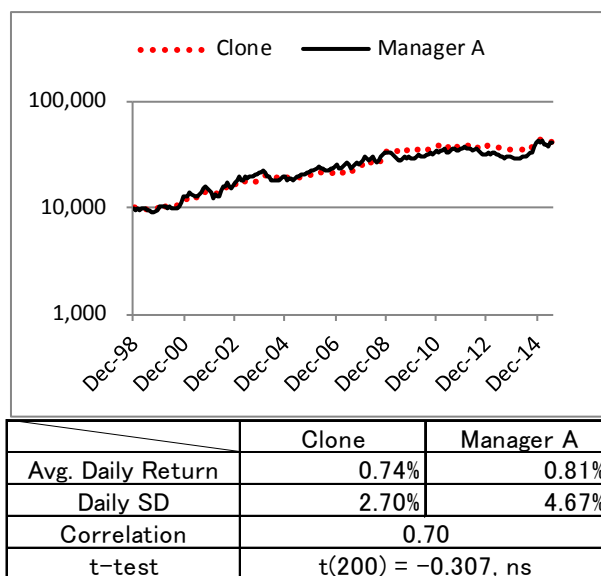


Figure 8: Comparison between Manager A and clone program on a monthly basis  
 Note: Indexation (The end of September, 1998: 10000) Prepared by the author based on data from IASG

**12. RESULTS**

During this study, we solved difficult problems caused from the complexity of the system, and constructed hedge fund clone program. In addition, we also came up with the method that can be used in order to create knowledge in asset management.

12.1 Applying Soft Systems Method (SSM)

In order to switch the development project (constructing absolute return investment strategy) to the hard system problem, we applied SSM in the form of Mode 2. As a result, we were able to acquire an effective accommodation which was the hedge fund clone program development. Due to this, we were able to carry out Combination and Socialization within the cyclical process of knowledge creation.

12.2 Prototyping and knowledge creation

As the developmental design of this research, we created a prototype and aimed to visualize the complex situation. Due to this, comparison with the actual world and the model had become possible. We were able to confirm that although we subjected a system like the financial market that has low causality, strategy development in investment style or asset classes with little experience, were less difficult. Also, by observing the return of the clone program and the original and evaluating the correlation coefficient and t-value, we were able to carry out the cycle of evaluate/verify and improve at a high frequency. This allowed us to make progress in knowledge creation needed for the development and management of absolute return strategy.

12.3 Superiority of the Process analysis approach

In this research, we have found out that the Process analysis approach can easily develop the hedge fund clone program by combining prototyping and Hypothesis deductive method. In addition, this approach can be applied to a wider range of investment strategies, should it meet the below factors.

1. The investment process is consistent and does not change over time
2. The investment management is done on a rule base and not on one's discretion
3. Data can be gained at high frequency when improving the clone program

More specifically, in the case of the diversified Trend Following strategy, by adjusting the two variables (universe and position size), it is possible to create the applicable clone program for not only hedge fund index but other individual CTA strategies. It is also possible to create an original program.

### **13. FINDINGS TOWARDS RESEARCH QUESTIONS**

Our Findings towards research questions are as stated below.

SRQ1: How should be solved the problem of systematic complexity when developing an investment strategy?

A: Switch the SSM problem to the hard system problem, where verifications can be made. As to what dimension to switch to, forming accommodation by using SSM is possible.

SRQ2: What should one do to create high level expertise knowledge in financial organization?

A: In the finance market, inductive learning through experience and short term experiment is difficult to achieve. If there is an expert in the field in that organization, it is possible for Socialization by Legitimate Peripheral Participation from the involvement of Community of Practice to take place. If not, this can be substituted by "hedge fund clone program development and management" as Social learning. Also, editing and systemizing the existing knowledge through literature examination and interview research will allow Combination to be conducted.

SRQ3: Which approach should be taken when constructing hedge fund clone program?

A: Apply the process analysis approach and improve using the hypothesis deductive method. The investment strategy that has been developed with this procedure carries the merits of easy explanation in investment contents and process, with clear in portfolio management.

MRQ: When developing an absolute return investment strategy, what should the process be like, when wanting to make the product as well as conducting organizational knowledge creation?

A: The development of the absolute return investment strategy including hedge fund clone program is a difficult task, where knowledge and experience does

not exist in the organization. Developmental paradigms of traditional asset classes or investment style cannot be applied here. In our research, we formed accommodation by SSM first and then switched the problem that comes from the complexity of the system to the problem of hard system. After that, we chose an investment strategy with an objective evaluation function, and constructed a prototype. We applied Hypothesis deductive method to the management of the prototype and made improvements. Thus we were able to process of organizational knowledge creation cyclically, and were also able to create expertise knowledge of the financial market in the process. As a result, we were able to complete swift knowledge creation within the organization and were able to actualize the development of absolute return investment strategy with scientific factors (objective, logical and reproducible).

#### **14. FINDINGS AND FUTURE WORK**

The implication of this study as an action research is firstly that we used the Process analysis approach and secondly that we carried out prototyping as the development design and third, in order to apply this framework, we had to understand the organization and the problems, hence used SSM to build the accommodation. Lastly, that we were able to empirically confirm the new knowledge creation process within the in development of the absolute return investment strategy.

In our study, we were able to solve the problem in the development project of the absolute return strategy, and were able to find the methodology to construct the hedge fund clone program. Notably, our research process can be easily reproduced.

##### **14.1 Actual model for constructing hedge fund clone program**

The following shows the practical model by the process analysis approach

- (1) Select original investment strategy
- (2) Investigate investment process, consider applicability
- (3) Set hypothesis for investment management process and construct concept model
- (4) Set prototype, construct quantitative model
- (5) Manage prototype of quantitative model
- (6) Verify the results of investment management, feedback
- (7) Reset hypothesis, revise quantitative model
- (8) Loop (5) through (7)

##### **14.2 Development of swift and safe absolute return investment strategy**

In general, asset management companies need good resources such as experience, knowledge, analysts and superior models. However, the development and investment management created by the approach in this study do not require the before mentioned resources beforehand. The developmental process itself acts as the cyclical interaction of implicit knowledge and Formal knowledge of the SECI Model, and creates new knowledge within the organization at high speed.

Also, in the clone program, it is easy to set the criteria of whether the investment strategy is sufficient or not, which is not the case when developing an absolute return investment strategy independently. Thus it can be said that one can judge if the

investment strategy is sufficient or not after a very short testing period, or even ex-ante. On the other hand, if the investment strategy is developed independently, it would be difficult to learn from experience, given the nature of the financial market. Also, one would only be able to evaluate the outcome on Ex-post basis, after a very long investment management period (If one applies inductive approach to a limited number of samples, the result has the risk of being inaccurate). Therefore the improvement process would become rather slow and no knowledge creation will be done.

In addition, should one use the Process analysis approach to develop a clone program, setting a hypothesis is indispensable. This is possible by collecting public data such as hedge fund prospectus, Terms and Condition of funds, and previous research. These hypothesis must be verifiable, but what is different from the investment strategy developed by oneself is that with the hedge fund clone program, observation of the difference between the original and the clone can be done at a daily basis and can be evaluated using various methods, such as testing the difference in average. Therefore, it is possible to conduct alternative investment, including hedge fund or other asset classes that were previously unfamiliar.

#### 14.3 The limits of process analysis approach

On the other hand, the process analysis approach has limits. For example, in the diversified Trend Following strategy, hedge fund that include individual stocks and hedge fund that act in the trend of the synthetic markets are hard to clone. The same can be said about hedge fund with style drifts.

#### 14.4 The limit of knowledge creation using the clone program

The approach to carry out Socialization through the usage of clone programs is one form of social learning. It can be used when high level knowledge exists outside of an organization, but it cannot create knowledge that is non-existing in this world.

#### 14.5 Suggestions towards future research

As seen in this study, because the clone program of LA can be easily constructible, we think that the same can be said in the alternative investment areas. Obstacles of hedge fund such as illiquidity and unclearness, high costs can ultimately be overcome. We think that it would be useful to conduct research to other hedge fund strategies using the clone program approach methods shown in our research.

### **DISCLAIMER**

The contents shown in this paper are not the official view of affiliations of author(s) in anyway, thus solely the opinion of the author(s).

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