972 Project - GRAB Summary

Yunfeng Liu

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1 Paper Summary

1.1 Introduction

This project is about the analysis of a trend following trading strategy described in the book *"Trend Following"* by Michael W. Covel. The strategy we are focusing on is in Chapter 25 *"How to GRAB a Bargain trading futures...Maybe"*. We will describe the strategy, analyze its pros and cos, replicate the strategy and back test it on a couple of markets.

The main idea of all the trend following strategies is to buy low and sell high. Here the author is based on the assumption that the market is indeed predictable in some sense, contrary to the martingale assumption that most mathematical finance models are based on. In reality, the market is indeed not a martingale and this creates free money for the buy side institutions and retail investors. However, the hardest part is finding such market inefficiency and consistently profit from it.

A trend following trader assumes that market has a trend. When it goes up it tends to go up for some period, when it goes down, it tends to go down for some period. This is similar to volatility clustering effect. A typical trend following system waits until it sees a new up trend and only then it buys. What the author has experienced is that the buy signal comes long after the bottom, and this could eventually ends up with buying high and selling low. The main reason is the timing for entering and exiting a trade. The author devised a trending following system called GRAB where he tried to catch the right timing of each trade.

In simple words, GRAB looks at two trends: far and near trends. Each trend has a support level and resistance level. Support level is the minimum of all lows in a candle stick chart, and resistance level is the the maximum of all highs. Far trend is used as an trending indicator and near trend is used for swing trading. When the price cross above the high of the far trend resistance level, the GRAB system emits an "Up trending" signal, until the price drops below the support level of the far trend, the system flipped the trend to "Down". The near term trend signals a buy if the price drops below.

When author runs the GRAB system, in addition to finding it buy dips and sell rallies as he expected, he noticed the GRAB system loses money. What he observed is that GRAB does not always picking off the highs and lows as he hoped. The system either enters the buy position too early or not at all, and when it enters too early, the price continues dropping and could potentially miss the move up trend.

1.2 GRAB Algorithm

The author does not describe the algorithm in a mathematical approach but rather a plain descriptive approach. Here, for clarity, I will describe the GRAB algorithm in a more clear and mathematically understandable way.

Let N_f and N_n be two integers representing two number of days the GRAB system looks back to determine support and resistance levels. $N_f > N_n$, N_f represents number of days for far term look back and

N_n represents near term look back.

Let S_t be the spot price, let H_t be the highest price at day t, let L_t be the lowest price at day t. We define the support ($K_s^f(t)$ and $K_s^n(t)$) and resistance ($K_r^f(t)$ and $K_r^n(t)$) levels at time t as follows:

$$K_s^f(t) = \min(L_{t-N_f}, ..., L_{t-1}) \tag{1}$$

$$K_r^f(t) = \max(H_{t-N_f}, ..., H_{t-1}) \tag{2}$$

$$K_s^n(t) = \min(L_{t-N_n}, ..., L_{t-1}) \tag{3}$$

$$K_r^n(t) = \max(H_{t-N_n}, ..., H_{t-1}) \tag{4}$$

Note that $K_r^f \geq K_r^n$ and $K_s^f \leq K_s^n$. Define $g(t, S_t, V, T_0)$ as a single execution when the spot price has been changed. Define $G(N_f, N_n, T)$ as the entire trading procedure from time 0 to time T that repeatably calls the single execution procedure g whenever spot is updated. To measure the performance of the system, we let G return the final total portfolio value at time T.

The author does not clearly describe his exit procedures and the exit procedures described in Algorithm 1 is based on my understanding and reasoning, which may not be the same as what the original author described. The algorithm is as follows, which corresponds to the function g defined above:

Algorithm 1 GRAB trading algorithm for a single execution

procedure $g(t,\, S_t,\, V,\, T_0)$ ▷ spot S_t, number of shares holding V and current trend T_0
  $T \leftarrow T_0$ ▷ T is the trend indicator
  if $S_t > K_r^f(t)$ **then**
    $T \leftarrow 1$
  else if $S_t < K_s^f(t)$ **then**
    $T \leftarrow -1$
  else
    Return ▷ Return if trend is not determined yet
  end if
  if $T = 1$ **then** ▷ major uptrend
    if $T \neq T_0$ and $V \neq 0$ **then** ▷ major trend flipped, exit any shorted shares
      set buy limit $= K_s^n$ ▷ buy limit price set to near support
      set buy stop $= K_r^f$ ▷ buy stop at far resistance
      $V \leftarrow 0$ ▷ recover shorted position
    else if $S_t \leq K_s^n$ and $V = 0$ **then**
      set buy limit $= K_s^n$
      $V \leftarrow 1$ ▷ buy one share
    else if $S_t \geq K_s^n$ and $V \neq 0$ **then**
      set sell limit $= K_r^n$
      $V \leftarrow 0$ ▷ sell the holding share
    end if
  else if $T = -1$ **then** ▷ Short sell starts.
    if $T \neq T_0$ and $V \neq 0$ **then** ▷ major trend flipped to down, exit my long position.
      set sell limit $= K_r^n$ ▷ sell limit price set to near resistance
      set sell stop $= K_s^f$ ▷ sell stop at far support
      $V \leftarrow 0$ ▷ sell the holding share
    else if $S_t \geq K_r^n$ and $V = 0$ **then**
      set short sell limit $= K_r^n$
      $V \leftarrow -1$ ▷ shorted one share
    else if $S_t \leq K_s^n$ and $V \neq 0$ **then**
      set buy limit $= K_s^n$
      $V \leftarrow 0$ ▷ buy one share back to recover the shorted position
    end if
  end if
  $T_0 \leftarrow T$
end procedure