Turtle Trading Rules (TTR)

Executive Summary

This is a paper in module FE5101 – Financial Engineering Project. The purpose of this paper is to examine and validate the Turtle Trading Rules (TTR) which provide traders with a strategy (or a set of rules) to follow in order to make profits in financial markets.

The paper consists of the following sections:

1. **TTR Overview:**

A brief overview of the entire trading rules and specifications

1. **Implementation and Adjustment:** 
   1. Data source and data selection to implement TTR
   2. Assumptions and adjustments during the implementation of TTR.
2. **Result and Evaluation:**

A discussion about results, strengths and weaknesses of TTR

1. **Experiment:**

A discussion about tweaks in TTR parameters.

1. TTR Overview

The complete details of the Turtle Trading Rules can be downloaded free at

* <http://bigpicture.typepad.com/comments/files/turtlerules.pdf>
* <http://www.dailystocks.com/turtlerules.pdf>

The TTR is a complete trading system which covers all aspects of a trading decision and this section describes briefly key components of TTR

1. Markets

TTR focuses on trending markets and the targeted instruments are future contracts with the underlying of good liquidity and trading volume.

1. Position Sizing

This is the heart of TTR on which all of the following components depend. The position sizing algorithm normalizes the dollar volatility of a position by adjusting the position size based on the dollar volatility of the market.

Position sizing calculates the quantity N which represents the underlying volatility of a market. N is simply the 20-day exponential moving average which is now known as the ATR.

TTR defines a position as a collection of pieces which is called Units. Units are sized so that one N is equal to 1% of the account equity

1. Entries

Generally speaking, traders enter a trade when a breakout happens. A breakout is defined as the price exceeding the high or low of a particular number of days. In TTR, there are 2 entry systems:

* 1. Short-term system based on 20-day breakout
  2. Long-term system based on 55-day breakout

1. Stops

Turtle traders stop loss when the position risk is at 2% which would be equal to two N of price negative movement.

1. Exits

Turtle traders also use breakout-based exits to make profits from profitable positions. Similar to Entries, Exits are also based on 2 systems

1. 10 day low/high for long/short positions
2. 20 day low/high for long/short positions
3. Implementation and Adjustment

The entire TTR model is written in R programming language from scratch. One of the main supporting libraries is the XTS (eXtensible Time Series) package which stores time-series data from the beginning to the end for the purpose of back testing.

1. Data Source and Data Selection

All future data including high, low, settlement, and etc. are sourced from Quandl (<https://www.quandl.com/c/futures>).

Quandl provides one R package which allows to download a future contract data as an XTS object.

Following the future contract list detailed in the original document, future contracts of

* + heating oil
  + cocoa
  + copper
  + silver

are selected in this paper for back testing and experiments (details in the following sections).

1. Adjustment

During implementation, there are a few adjustments and assumptions which lead to better analysis yet make minimal deviation from the original models.

* We assume that on a day, there is only one breakout which is either high breakout or low breakout.
* Breakouts are checked at end of the day with settlement price, therefore traders can enter a trade at the next day open price should breakout happen.
* All of entry, exit and stop-loss trades are made at breakout even though original rules define particular levels of price at which exit and stop-loss trades can happen.

For the purpose of better back testing, we allow traders to re-enter a position of the same future contract even after the position has already realized its profit and loss. This kind of re-entering is possible until the last day of future contract.

All of profit/loss and capital of the previous position will be used for the re-entering. Profit and loss are accumulated during the entire life of future contract.

1. Evaluation

Strength

Weakness

1. Improvements

Adjust the periods of breakout, Exit and ATR

Reduce all by half

1. Result comparison

Graph