The Original Turtle Traders’ Trend Following System

Philosophy
The Turtle Traders’ system is a trend following trading system developed in the 1970’s. The idea is to catch breakouts in major liquid financial instruments and ride the momentum until the trend slows down.

Model Universe
The original model traded futures but we use CFDs and spot instead.

Equities: S&P 500
Softs: Coffee, Sugar, Cocoa
Metals: Gold, Silver, Copper
Energy: Crude Oil, Heating Oil, Natural Gas
Currencies: USDCHF, EURUSD, GBPUSD, USDJPY, USDCAD

The original Turtle Model traded in 21 futures instruments but due to obsolescence in some instruments and trading constrains on the Saxo Trader we have narrowed our model universe down to 15 instruments.

Trade Signals

Entry
Every day the model calculates a 55-day Donchian Channel and if last day’s close is higher or lower than the upper or lower band of the Donchian Channel a long or short position is initiated.

Position Sizing
The model calculates every day a variable called \( N \), which is essentially the 20-day exponentially moving average of the average true range (ATR). Basically it is factor that describes the current market volatility.

\[
ATR = \max(\text{high} - \text{low}, \text{high} - \text{last day’s close}, \text{last day’s close} - \text{low})
\]

\[
N = \frac{(19 \times \text{last day’s } N) + \text{ATR}}{20}
\]

To standardise positions the current volatility, defined by \( N \), is converted to dollar volatility by the formula below. This adjustment is essentially only relevant for CFDs as they are based on the underlying futures contract in which dollars per point is typically more than one as is the case with spot instruments such as S&P 500 and Gold Spot (XAU).

\[
\text{Dollar volatility} = N \times \text{Dollars per Point}
\]

Based on dollar volatility the model then calculates something called Units which is essentially the final step to volatility adjusting the positions. Units were sized so that 1 \( N \) represented one percent of the account equity.

\[
\text{Unit size} = \frac{1\% \times \text{account value (equity)}}{\text{Dollar volatility}}
\]
As the portfolio can be quite volatile in its original setup if many positions are added we have reduced the equity allocation per unit to only 0.25% of the account value.

**Adding Units following entry**
The model enters a single Unit at the breakout and adds to this position at 0.5 intervals of N until the maximum limit of four Units in the same instrument is reached.

Example: Natural gas, N = 0.25, 55 day breakout = 3.000

<table>
<thead>
<tr>
<th>Units added</th>
<th>Entry prices</th>
</tr>
</thead>
<tbody>
<tr>
<td>First unit added</td>
<td>3.000</td>
</tr>
<tr>
<td>Second unit added</td>
<td>3.000 + 0.25 * 0.5 = 3.125</td>
</tr>
<tr>
<td>Third unit added</td>
<td>3.125 + 0.25 * 0.5 = 3.250</td>
</tr>
<tr>
<td>Fourth unit added</td>
<td>3.250 + 0.25 * 0.5 = 3.375</td>
</tr>
</tbody>
</table>

If the Unit size in the natural gas example is 1,000 Mmbtu the model adds another 1,000 Mmbtu at every price point related to the next Unit (1,000 Mmbtu is a trade lot worth USD 2,815 as of 5th of September, 2012).

**Stops**
The model always has stop orders on open positions. The Turtle model places stops based on position risk. No trade could incur more than two percent risk (remember that one N represent one percent position risk).

Stops are thus placed 2 N below the entry for long positions and 2 N above the entry for short positions. In order to keep total position risk at a minimum, if additional units were added, the stops for earlier units were raised by 0.5 N. All units are stopped out at the same price.

Example (continuing with natural gas):

<table>
<thead>
<tr>
<th>Entry price</th>
<th>Stop</th>
</tr>
</thead>
<tbody>
<tr>
<td>First unit</td>
<td>3.000</td>
</tr>
<tr>
<td></td>
<td>3.000</td>
</tr>
<tr>
<td></td>
<td>3.125</td>
</tr>
<tr>
<td></td>
<td>3.000</td>
</tr>
<tr>
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<td>3.125</td>
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<td>3.250</td>
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<td>3.125</td>
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<tr>
<td></td>
<td>3.250</td>
</tr>
<tr>
<td></td>
<td>3.375</td>
</tr>
</tbody>
</table>

**Exit**
This is essentially taking profit. The signal is based on 20-day Donchian Channel. If our long position in natural gas (see previous examples) has moved up to 3.500 with the upper bound of
the 20-day Donchian Channel @3.390 then our exit signal is @3.390 and at the same time above the stop @2.875. All Units are sold when the exit price is reached.

Some positions do not move “deep” enough into profit territory for the upper bound of the Donchian Channel to move above our stop. If our long position moves down and reaches our stop the position goes from profit into loss territory and gets stopped out. So for exits to be used the positions have to trend up considerably.

**Portfolio Characteristics**

To avoid excessive exposure to individual markets, the Turtle Model also has positioning limits depending on how tightly correlated markets are with one another (see table below)

<table>
<thead>
<tr>
<th>Level</th>
<th>Type</th>
<th>Maximum Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Single market</td>
<td>4 Units</td>
</tr>
<tr>
<td>2</td>
<td>Closely correlated markets</td>
<td>6 Units</td>
</tr>
<tr>
<td>3</td>
<td>Loosely correlated markets</td>
<td>10 Units</td>
</tr>
<tr>
<td>4</td>
<td>Single direction – long or short</td>
<td>12 Units</td>
</tr>
</tbody>
</table>

It is not specifically defined what closely and loosely means but we will use the rolling 60-month correlation matrix (see below) as our guideline for determining the degree of correlation. We have decided that instruments with correlation below 0.5 are loosely correlated and above are closely correlated.

![Correlation Matrix](source-image)

Source: Bloomberg L.P., Saxo Bank Strategy & Research (correlations as of 5th of September, 2012)

In all CFD positions the model has to roll its positions before the underlying futures contract expires. This is done before the volume and open interest have declined too much.
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