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Introduction

The AlgoTrader Quick Start Guide is based on the AlgoTrader 30-day trial provided via Amazon AWS\(^1\) which can be requested here\(^2\).

The AlgoTrader 30-day trial version includes a fully functional AlgoTrader installation as well as the following example strategies:

- *Box Strategy*\(^3\)
- *Break Out Strategy*\(^4\)
- *Exponential Moving Average Strategy*\(^5\)
- *IPO Strategy*\(^6\)
- *Pairs Trading Strategy*\(^7\)
- *Random Strategy*\(^8\)

There is also a simple Python strategy in the examples sub-directory `python-strategies`, which shows how to use AlgoTrader as a market data supplier and execution engine for a Python strategy through WebSockets and REST interfaces.

Since AlgoTrader 5.1 it is also possible to fully integrate a Python Strategy with AlgoTrader and to make use of all the AlgoTrader strategy services directly (including backtesting) through Py4J, as highlighted in Section 4.3, “Adding Strategy Logic in Python”.

The AlgoTrader 30-day trial version contains the following pre-installed components:

- Java JDK
- AlgoTrader Server
- AlgoTrader Eclipse IDE
- PyCharm CE IDE
- Python 2.7 and 3.7
- Pip package installer for Python

\(^1\) https://aws.amazon.com/
\(^2\) https://www.algotrader.com/product/trial-version/
\(^3\) http://doc.algotrader.ch/html/Box_Strategy.html
\(^5\) http://doc.algotrader.ch/html/EMA_Strategy.html
\(^6\) http://doc.algotrader.ch/html/IPO_Strategy.html
\(^7\) http://doc.algotrader.ch/html/PairsTrading_Strategy.html
\(^8\) http://doc.algotrader.ch/html/Random_Strategy.html
- MySql Database
- InfluxDB Database
- dbForge Studio Express
- Interactive Brokers Gateway
- Tortoise Git
- Git for Windows
- Notepad++
- Google Chrome
- MS Excel (not activated)

**Warning**

Amazon AWS usage cost will apply based on the instance type select. For further details, please visit [https://aws.amazon.com/ec2/pricing/](https://aws.amazon.com/ec2/pricing/)

**Warning**

It is prohibited to reverse engineer, decompile, disassemble, or copy any parts of the AlgoTrader 30-day trial
Chapter 2. Installation

The following steps will guide through the installation of a Windows AWS Instance containing the AlgoTrader 30-day trial version:

1. Open the Amazon AWS console:
   
   https://console.aws.amazon.com/console/home

   and Login using the Amazon username and password.

2. In the upper right-hand corner of the screen make sure the N. Virginia Region is selected:

3. Select EC2

4. Click Launch Instance in the middle of the screen

5. In the menu on the left-hand side select My AMIs and check Shared with me
6. Select the **AlgoTrader-x.x.x-Trial-WIN-xxxx.xx.xx**

![Image of AlgoTrader-x.x.x-Trial-WIN-xxxx.xx.xx](image)

**Important**

The **AlgoTrader-x.x.x-Trial-WIN-xxxx.xx.xx** image is only available in the N. Virginia Region but not in any other Regions. It is thus necessary that the N. Virginia Region is selected in the top-right corner of the screen.

7. On the next screen select the **Instance Type**. We recommend at least instance type **t2.medium**, ideally instance type **m5.large**

<table>
<thead>
<tr>
<th>Type</th>
<th>vCPUs</th>
<th>Memory (GiB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>t2.medium</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>m5.large</td>
<td>2</td>
<td>8</td>
</tr>
</tbody>
</table>
8. Click **Review and Launch** on the bottom right of the screen

9. Click **Launch** on the bottom right of the screen

10. On the Dialog that shows select **Proceed without a key pair**, **select I acknowledge...** and click **Launch Instance**

   Note: The selected key pair will be added to the set of keys authorized for this instance. Learn more about removing existing key pairs from a public AMI.

11. Click **View Instances** on the bottom right of the screen

12. On the next screen, you can see the Instance starting up. Wait until it is running and note the **Public IP address**.
Note

It will take at least 4 minutes for the Instance to startup and become available.

13. Use Microsoft Remote Desktop to connect to the instance by typing in the Public IP address that was noted in the previous step.

![Remote Desktop Connection](image)

Note

- You need to use Remote Desktop Connection (RDP), a Web Browser will NOT work for this.
- For more information on Remote Desktop Connections please visit: Windows¹, Mac² and Linux³.

14. Specify **User name** and **Password** that was provided in the Email after signing up for the AlgoTrader free 30-day trial.

---

15. On the next dialog select *Don't ask...* and click *Yes*

16. Microsoft Excel is pre-installed on the machine to view the AlgoTrader Excel based Back Test Report. However due to licensing restrictions Microsoft Excel has not been activated yet. If a Microsoft Office license is available, please active Microsoft Excel using the license key. Alternatively, one can request a free 30-day trial through:

   https://products.office.com/en-us/try

17. The Amazon Instance including AlgoTrader is now ready for usage!
Note

- Amazon Windows Instances tend to run a bit slow when they are first created. Responsiveness will however increase after some time.
- The performance of the Amazon Instance also depends on the instance type selected in step 7.
Starting a Trading Strategy

This section gives a quick introduction on how to start a trading strategy by discussing the Box example strategy\(^1\).

To start any of the other strategies please consult the relevant parts in the documentation:

- **Break Out Strategy**\(^2\)
- **Exponential Moving Average Strategy**\(^3\)
- **IPO Strategy**\(^4\)
- **Pairs Trading Strategy**\(^5\)
- **Random Strategy**\(^6\)

First one needs to start the AlgoTrader Eclipse IDE (Integrated Development Environment) using the Eclipse icon in the task bar.

As a first step, please copy the license key that was provided in the Email after signing up for the AlgoTrader free 30-day trial into the file /algotrader-conf/src/main/resources/conf.properties.

---

3.1. Starting a Back Test

The back-test in this example strategy runs with CSV files. If you have a historical data provider that AlgoTrader supports, you could also run vs. InfluxDB and would have to load the historical data first by running a HistoricalDataStarter (see Historical Data\(^7\)).

Launch the SimulationStarter-simulate-box by first clicking the downward facing arrow next to the green start icon.

The system will now perform a back test based on historical data.

Once the back test has finished, the Excel based back test report will open automatically.

\(^7\) http://doc.algotrader.ch/html_single/index.html#Historical_Data
You will need to activate the Excel license on the trial box to properly view the report or to move the files under `box/files/report/` to a machine that has Excel installed and open `BackTestReport.xlsm`.

For further information regarding back testing, visit the following chapters in the documentation:

- **Strategy Backtesting**
  

- **Starting a Strategy in Simulation Mode**
  
  - [http://doc.algotrader.ch/html/Starting_Algotrader.html#Simulation_Mode](http://doc.algotrader.ch/html/Starting_Algotrader.html#Simulation_Mode)
Note
In case the console shows an error message like "Address already in use" this means that there is already an instance of AlgoTrader running. Please check the list of currently running process and stop the existing AlgoTrader instances before starting a new one.

3.2. Starting Live Trading

The following sections describes how to use AlgoTrader in Live Trading mode by using Interactive Brokers for market data and trading.

If you already have an Interactive Brokers account, use the IB Gateway.

If you do not, use the Trader Workstation demo account, as described further below.

To start the IB Gateway, click the Windows Start button, type ibgateway and click on the application.

Then select IB API, enter the Interactive Brokers username and password and select Paper Trading:
Warning

Do not use a live account until absolutely sure that the trading strategy works as expected. Until then use this demo account or an IB paper trading account.

Once the Interactive Broker Gateway has started, go to Configure / Settings, then select API / Settings, make sure that Read-Only API is disabled and Socket port is set to 4001.

Note

In case the Interactive Broker Gateway shows a blank window this means that your screen resolution is probably lower than the size of the Interactive Brokers Gateway. In this case please try the keyboard combination Alt+Space Bar followed by R. Then repeat Alt+Space Bar followed by M for move or S for resize.
For further information please see this article\textsuperscript{10}.

If the above does not solve your problem, try to execute \texttt{Alt + Spacebar} and tap 4 times on the down arrow on the keyboard and hit \texttt{Enter}.

\textbf{Note}

The run configurations on the trial image have been configured to run with the TWS demo account and have IB delayed market data enabled. If you've got a proper IB account, simply remove the setting that enables delayed market data – \texttt{Dib.pricefeed.allowDelayedMarketData=true} from the argument list of the starter:

If you do not have an Interactive Brokers account, you can create a demo account on the Interactive Brokers Trader Workstation (TWS) using the icon in the task bar.

\textsuperscript{10}https://www.techsupportalert.com/content/how-use-keyboard-move-or-resize-window-too-big-screen.htm
The downside of the TWS demo account is that it uses delayed market data, your orders/trades/positions are reset at the end of each day and that it automatically shuts down on a daily basis.

After starting the TWS, go to Try the demo or Return to the demo and enter your email address.

**Figure 3.1. IB Demo Account Login**

The first time you start TWS, go to File / Global Configuration, then select API / Settings, make sure that Enable ActiveX and Socket Clients is enabled, Read-Only API is disabled and Socket port is set to 4001.
You can now launch the AlgoTrader EmbeddedStrategyStarter-box by first clicking the downward facing arrow next to the green start icon. This will start the AlgoTrader server as well as the Box strategy and will connect to the Interactive Brokers Gateway.

Once the system is started up it will automatically open the AlgoTrader UI (within the Chrome browser).
Note

In case the frame on the right side of the screen named Box Strategy does not show up, please click Shift + Reload

For further information on live trading, please visit Starting a Strategy in Live Trading Mode

For further information on the AlgoTrader Web UI please visit the AlgoTrader documentation regarding the HTML5 UI

11 http://doc.algotrader.ch/html/Starting_Algotrader.html#Live_Trading_Mode
12 http://doc.algotrader.ch/html/Client.html#HTML5_Client
Creating a Trading Strategy

This section will give a quick introduction on how to create a trading strategy by discussing the EMA (Exponential Moving Average) Strategy

4.1. AlgoTrader Strategy Wizard

The AlgoTrader Strategy Wizard provides an easy way to automatically create all artifacts necessary for an AlgoTrader based trading strategy. The Wizard can be started via the File / New / Other which will bring up the following screen where the Maven Project wizard can be selected:

Configure the next screen as displayed on the picture and click Next.
On the next screen please select the Catalog AlgoTrader select algo-trader-archetype-simple and click Next.

On the next screen, the following items have to be entered:

Group Id
The maven group id (e.g. algo-trader), all lower-case, can contain periods

Artifact Id
The maven artifact id (e.g. ema), all lower-case, can contain dashes
Version

The maven version (e.g. `1.0.0-SNAPSHOT`), `x.y.z`, plus optionally `-SNAPSHOT`.

Package

The java package name (e.g. `ch.algotrader.strategy`), all lower-case, can contain periods.

name

The name of the strategy (e.g. `ema`), all lower-case, no periods, no dashes.

serviceName

The name of the strategy service (e.g. `EMA`), first letter upper-case or all upper-case, do not include Service at the end (e.g. do not specify `EMAService`).

Note

For Spring Auto-Wiring to work the package name needs to be `ch.algotrader.strategy`. If a different package is assigned services (e.g. `OrderService` and `LookupService`) will not be available.

New Maven Project

Specify Archetype parameters

<table>
<thead>
<tr>
<th>Group Id</th>
<th>algotrader</th>
</tr>
</thead>
<tbody>
<tr>
<td>Artifact Id</td>
<td><code>ema</code></td>
</tr>
<tr>
<td>Version</td>
<td><code>0.0.1-SNAPSHOT</code></td>
</tr>
<tr>
<td>Package</td>
<td><code>ch.algotrader.strategy</code></td>
</tr>
</tbody>
</table>

Properties available from archetype:

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>name</code></td>
<td><code>ema</code></td>
</tr>
<tr>
<td><code>serviceName</code></td>
<td><code>EMA</code></td>
</tr>
</tbody>
</table>

When clicking Finish the Strategy Wizard will create a new Eclipse project called `ema`. 
4.2. Adding Strategy Logic

The Strategy Wizard also generated boiler plate code that needs to be replaced with the actual logic of the EMA strategy.

AlgoTrader strategies are regular Java programs. Due to this any type of java library or add-ons can be used. The EMA strategy is based on the TA4j\(^1\) library which contains a collection of over 100 technical indicators.

Now, double click the EMAService.java file which contains the main logic of the EMA strategy.

The header of the EMAService.java is already generated and no further changes are necessary. It contains the java class name (EMAService) as well as the name of the interface it is derived from (StrategyService).

Note

For Spring Auto-Wiring to work the package name needs to be ch.algotrader.strategy. If a different package is assigned services (e.g. OrderService and LookupService) will not be available.

The next part of the EMAService.java contains settings the strategy will use. Three of them are already generated by the Wizard but a few more need to be added.

```java
private final long accountId = 100;
private final long securityId = 25;
private final BigDecimal orderQuantity = new BigDecimal("10000");
private final int emaPeriodShort = 10;
private final int emaPeriodLong = 20;
private final String defaultAdapterType = "IB_NATIVE";
```

\(^1\) https://github.com/mdeverdelhan/ta4j-origins
private TimeSeries series;
private DifferenceIndicator emaDifference;

- The `accountId` defines the id of the account the strategy will use for trading.
- The `securityId` will define the id of the instrument the strategy will trade.
- The `orderQuantity` is the number of contracts the strategy will trade.
- The `emaPeriodSort` is the look back period of the shorter EMA indicator.
- The `emaPeriodLong` is the look back period of the longer EMA indicator.
- The `defaultAdapterType` indicates we want to get market data from Binance by default.

In addition, the following two fields need to be defined:

- The `TimeSeries` object used by the exponential moving average indicators
- The `DifferenceIndicator` which will contain the difference between the short and the long EMA

Next, the Java Constructor for the `EMAService` class needs to be created:

```java
public EMAService() {
    setStrategyName("EMA");

    this.series = new BaseTimeSeries();
    this.series.setMaximumBarCount(this.emaPeriodLong);

    ClosePriceIndicator closePriceIndicator = new ClosePriceIndicator(this.series);
    EMAIndicator emaShort = new EMAIndicator(closePriceIndicator, this.emaPeriodShort);
    EMAIndicator emaLong = new EMAIndicator(closePriceIndicator, this.emaPeriodLong);
    this.emaDifference = new DifferenceIndicator(emaShort, emaLong);
}
```

- First the `EMAService` constructor sets the name of the Strategy used during the back test.
- Next the `TimeSeries` object is initialized to a length of one Bar. In addition, the number of bars the Time Series is set (in this case 20 Bars).
- Next a `ClosePriceIndicator` is created which causes the system to look at closing prices of Bar events.
• Then both the short and the long EMA indicator need to be created by associating them with the ClosePriceIndicator and setting the lookbackPeriod (in this case 10 and 20).

• Last the DifferenceIndicator needs to be created which contains the difference between the short EMA and the long EMA indicator.

Next, update the onStart (an AlgoTrader Live Cycle Method) method, which will be called when the strategy starts up.

```java
@Override
public void onStart(final LifecycleEventVO event) {
    getSubscriptionService().subscribeMarketDataEvent(getStrategyName(), this.securityId, defaultAdapterType);
}
```

For further details please visit the AlgoTrader documentation regarding Life Cycle Events.2

The onStart methods calls subscribeMarketDataEvent of the SubscriptionService by passing the strategyName and the securityId of the instrument the strategy wants to receive market data for. The SubscriptionService is automatically made available to the strategy through Spring Auto Wiring.

Next, update the onBar method, which will be invoked on every incoming Bar:

```java
@Override
public void onBar(BarVO bar) {

    this.series.addBar(toBar(bar));

    int i = this.series.getEndIndex();
    Num currentValue = this.emaDifference.getValue(i);
    Num previousValue = this.emaDifference.getValue(i - 1);

    if (currentValue.isPositive() && previousValue.isNegativeOrZero()) {
        sendOrder(Side.BUY);
    } else if (currentValue.isNegative() && previousValue.isPositiveOrZero()) {
        sendOrder(Side.SELL);
    }
}
```

• The method first calls the addBar method which will add the incoming Bar to the Time Series defined above

• Next, the index i of the last element of the Time Series is retrieved

• Then the value of the last and the second-last element of the DifferenceIndicator is retrieved

2 http://doc.algotrader.ch/html_single/index.html#Strategy_Life_Cycle_Events
Then the actual trading rules need to be defined:

- If the current value of the **DifferenceIndicator** is positive and the previous value was negative or zero a **BUY** order is sent. In other words, if the short EMA crossed above the long EMA a **BUY** order is sent.

- If the current value of the **DifferenceIndicator** is negative and the previous value was positive or zero a **SELL** order is sent. In other words, if the short EMA crossed below the long EMA a **SELL** order is sent.

The trading logic is depicted in the following chart also.

As the last item, create the **sendOrder** method, which will take care of constructing an order object and handing it over to the **OrderService**:

```java
private void sendOrder(Side side) {

    MarketOrderVO order = MarketOrderVOBuilder.create()
        .setStrategyId(getStrategy().getId())
        .setAccountId(this.accountId)
        .setSecurityId(this.securityId)
        .setQuantity(this.orderQuantity)
        .setSide(side)
        .build();

    getOrderService().sendOrder(order);
}
```

The **sendOrder** method creates a **MarketOrder** by using the **MarketOrderVOBuilder** and assigns the **strategyId**, the **accountId**, the **securityId**, the **orderQuantity**, the **order side** (**BUY** or **SELL**) and finally
calls build to create the `MarketOrder` object. The order object is then handed over to the `OrderService` which will execute the order. The `OrderService` is automatically made available to the strategy through Spring Auto Wiring.

For further details on how order are please visit the AlgoTrader documentation regarding [Order Management](http://doc.algotrader.ch/html/OrderManagement.html).

In addition the following Java import statements need to be added to the top:

```java
import ch.algotrader.entity.marketData.BarVO;
import ch.algotrader.entity.trade.MarketOrderVO;
import ch.algotrader.entity.trade.MarketOrderVOBuilder;
import ch.algotrader.enumeration.Side;
import ch.algotrader.service.StrategyService;
import ch.algotrader.vo.LifecycleEventVO;

import org.springframework.stereotype.Component;
import org.ta4j.core.BaseTimeSeries;
import org.ta4j.core.TimeSeries;
import org.ta4j.core.indicators.EMAIndicator;
import org.ta4j.core.indicators.helpers.ClosePriceIndicator;
import org.ta4j.core.indicators.helpers.DifferenceIndicator;
import org.ta4j.core.num.Num;

import java.math.BigDecimal;

import static ch.algotrader.util.TA4JUtil.toBar;
```

The implementation of the trading strategy is now finished a first back test can be started according to *Chapter 3, Starting a Trading Strategy.*

The EMA strategy is an example strategy based on Java code only. For details on how to build a trading strategy using Esper please visit the AlgoTrader documentation regarding [Strategy Development](http://doc.algotrader.ch/html/Strategy_Development.html#Python_Strategy_Development).

### 4.3. Adding Strategy Logic in Python

The AlgoTrader Python Interface allows you to implement strategies in Python 2 and 3.


The AlgoTrader trial version has an example Python strategy installed. You can find it by searching for `ema-python-strategy.py` and opening the file in your Python IDE.

The header of the file contains all necessary imports, in particular the `algotrader_com.interface`.

---

```python
import logging
from decimal import Decimal

import numpy as np

from algotrader_com.domain.order import MarketOrder
from algotrader_com.interfaces.connection import connect_to_algotrader,
wait_for_algotrader_to_disconnect
from algotrader_com.services.strategy import StrategyService
...
```

The next part of the file contains settings that the strategy will use.

```python
ACCOUNT_ID = 1
SECURITY_ID = 25
ORDER_QUANTITY = Decimal("10000")
DEFAULT_ADAPTER_TYPE = "IB"
EMA_PERIOD_SHORT = 10
EMA_PERIOD_LONG = 20
...
```

- The `ACCOUNT_ID` defines the id of the account, which the strategy will use for trading.
- The `SECURITY_ID` defines the id of the instrument, which the strategy will trade.
- The `ORDER_QUANTITY` is the number of contracts the strategy will trade.
- The `DEFAULT_ADAPTER_TYPE` indicates from where we get market data and where we want to trade (Interactive Brokers by default).
- The `EMA_PERIOD_SHORT` is the lookback period of the shorter EMA indicator.
- The `EMA_PERIOD_LONG` is the lookback period of the longer EMA indicator.

In addition, the following fields need to be defined:

- The `close_price_window1` and `close_price_window2`, used by the exponential moving average indicators.
- The `strategy_id`, a strategy variable that holds the Strategy Id, fetched from the AlgoTrader server.

Next, the Python Class for the EMAStrategyService needs to be created:

```python
...
class EMAStrategyService(StrategyService):
```
```python
def __init__(self):
    StrategyService.__init__(self)

    STRATEGY_NAME = "EMA"
    previous_difference = 0
    first_order_sent = False
    position = 0.0
...
```

- First, the Superclass `StrategyService` constructor is called.
- Next, the `STRATEGY_NAME` global variable is set. That will be later passed to the Entry Point
- The `previous_difference` variable is initialized. This will be used to hold a difference between two EMA series.
- Then, the `first_order_sent` boolean variable is initialized with false value. This will be used to determine the closing quantity of orders (First order will have size `ORDER_QUANTITY`, all following orders must have size `ORDER_QUANTITY * 2` since they have to close existing position and open new in the opposite direction).
- Next, the `position` variable is initialized. This will be used to store the current position size.

Implement the `on_init` method, which will be called when the strategy gets initialized. We have to pass `STRATEGY_NAME` to the Entry Point in this method.

```python
...
def on_init(self, lifecycle_event):
    self.python_to_at_entry_point.set_strategy_name(self.STRATEGY_NAME)
...
```

Next, update the `on_start` (an AlgoTrader Live Cycle Method) method, which will be called when the strategy starts up.

```python
...
def on_start(self, lifecycle_event):
    # noinspection PyBroadException
    try:
        self.python_to_at_entry_point.subscription_service.subscribe_market_data_event(
            self.STRATEGY_NAME, SECURITY_ID, DEFAULT_ADAPTER_TYPE)
    except:
        pass
...
```

For further details please visit the AlgoTrader documentation regarding *Life Cycle Events*.

7 http://doc.algotrader.ch/html_single/index.html#Strategy_Life_Cycle_Events
The **on_start** method calls `subscribe_market_data_event` of the `subscription_service` exposed by the AlgoTrader's Python interface by passing the `STRATEGY_NAME` and the `SECURITY_ID` of the instrument the strategy wants to receive market data for.

Next, update the **on_bar** method, which will be invoked on every incoming Bar:

```python
...  
def on_bar(self, bar):
    close_price_window1.append(float(bar.close))
    close_price_window2.append(float(bar.close))

    ...  

    if len(close_price_window1) > EMA_PERIOD_SHORT + 1:  # remove the oldest element from the list
        close_price_window1.pop(0)  # remove the oldest element from the list
    if len(close_price_window2) > EMA_PERIOD_LONG + 1:  # remove the oldest element from the list
        close_price_window2.pop(0)  # remove the oldest element from the list

    # if we have enough data already, calculate EMA averages difference, buy/sell on cross
    if len(close_price_window2) >= EMA_PERIOD_LONG:
        ...
```

- The method first updates `close_price_window1` and `close_price_window2` with the latest bar received in the method's parameter.
- Then the lengths of the price windows (`close_price_window1` and `close_price_window2`) must be cut to the desired size. In our case, `close_price_window1` will have a maximum length of 10 (10 period EMA) and `close_price_window2` will have a maximum length of 20 (20 periods EMA).
- Next, we check if we already have enough data to compute the EMA, which we need to proceed with the strategy logic.

Then the actual trading rules are defined:

```python
...  
    close_price_window1.pop(0)

    ema1 = _numpy_ewma_vectorized_v2(np.array(close_price_window1),
                                      EMA_PERIOD_SHORT)
    ema2 = _numpy_ewma_vectorized_v2(np.array(close_price_window2),
                                      EMA_PERIOD_LONG)
```

---

[260x789]CONFIDENTIAL

Adding Strategy Logic in Python
difference = ema1[-1] - ema2[-1]
global strategy_id
if strategy_id is None:
    strategy_id = self.python_to_at_entry_point.get_strategy_id()

account_id = ACCOUNT_ID
security_id = SECURITY_ID
if not self.first_order_sent:
    quantity = ORDER_QUANTITY
else:
    quantity = ORDER_QUANTITY * 2  # closing opposite position and opening
new one

if difference > 0.0 and (self.previous_difference == 0 or
    self.previous_difference < 0.0):
    side = "BUY"
    market_order = MarketOrder(quantity=quantity, side=side,
        strategy_id=strategy_id, account_id=account_id,
        security_id=security_id)
    self.python_to_at_entry_point.order_service.send_order(market_order)
    self.position += float(market_order.quantity)
    self.first_order_sent = True
if difference < 0.0 and (self.previous_difference == 0 or
    self.previous_difference > 0.0):
    side = "SELL"
    market_order = MarketOrder(quantity=quantity, side=side,
        strategy_id=strategy_id, account_id=account_id,
        security_id=security_id)
    self.python_to_at_entry_point.order_service.send_order(market_order)
    self.position -= float(market_order.quantity)
    self.first_order_sent = True
self.previous_difference = difference
...

- Calculate both EMA indicators (in the example we use a custom function for fast EMA calculation, see _numpy_ewma_vectorized_v2 for details).
- Calculate the difference indicator (ema1 - ema2).
- If the current value of the difference indicator is positive and the previous value was negative or zero a BUY order is sent. In other words, if the short EMA crossed above the long EMA a BUY order is sent.
- If the current value of the difference indicator is negative and the previous value was positive or zero a SELL order is sent. In other words, if the short EMA crossed below the long EMA a SELL order is sent.

The trading logic is depicted in the following chart:
The orders are sent through AlgoTrader's Python interface using the `send_order` method in the `order_service` provided by Entry Point.

```python
market_order = MarketOrder(quantity=quantity, side=side, strategy_id=strategy_id,
                           account_id=account_id, security_id=security_id)
self.python_to_at_entry_point.order_service.send_order(market_order)
```

The above creates a MarketOrder entity and assigns the `strategy_id`, the `account_id`, the `security_id`, the `quantity`, the `order side` (BUY or SELL). The order object is then handed over to the `order_service` which will execute the order.

For further details on how order are created and behave, please consult the AlgoTrader documentation regarding [Order Management](http://doc.algotrader.ch/html/OrderManagement.html).

In addition, the following statements were added to the bottom of the strategy.

The first is optional. If not specified, all callback methods are subscribed:

```python
only_subscribe_methods_list = ["onInit", "onStart", "onExit", "onBar", "onTick"]
```

The line below connects the Python interface to the AltoTrader server:

```python
...```

---

Adding Strategy Logic in Python

```python
_python_to_at_entry_point = connect_to_algotrader(EMAStrategyService(),
    only_subscribe_methods_list)
...
```

The below tries to subscribe to market data if the AlgoTrader server is already running on strategy start-up. Otherwise, the subscriptions will be initialized during the onStart lifecycle event:

```python
# noinspection PyBroadException
try:  # try subscribing to market data, if AT is already up. otherwise data will be
    # subscribed on START lifecycle event
    _python_to_at_entry_point.subscription_service
    .subscribe_market_data_event(EMAStrategyService.STRATEGY_NAME, SECURITY_ID,
        DEFAULT_ADAPTER_TYPE)
except:
    pass
...
```

This example strategy will stop when the server process is stopped, after which it will display a Pyplot chart with some metrics of this run. Here it waits until the AlgoTrader server disconnects:

```python
...
    wait_for_algotrader_to_disconnect(_python_to_at_entry_point)
...
```

The EMA strategy is an example strategy based on Python code only. For details on how to build a trading strategy using Java or Esper please visit the AlgoTrader documentation regarding *Strategy Development*.

---

Managing data

During live trading, all relevant information like orders, positions and transactions are stored in the MySQL database.

To view database data please open dbForge Studio for MySQL.

On the left-hand side of the application double click on Algotrader, then algotrader and Tables.

You now see all AlgoTrader tables listed below
To view the contents of a table (e.g. the `exchange` table), double-click its name and go to the `Data` tab.
The table `security` contains a list of all available instruments that can be traded with the system. This table can for example be used to find the `securityId` for the `BTC/USDT` pair traded on Binance.

### 5.1. Reference Data

Reference Data like instrument definitions, strategies etc. are also stored in MySQL (in tables like `security`, `security_family`, `strategy`, etc.)

Before an AlgoTrader based trading strategy can trade a particular instrument in needs to be defined in the database.

**Note**

- The AlgoTrader fee 30-day trial version is pre-configured with sample reference data for commonly used FX pairs, US & European Equities, Futures & Cryptocurrencies.
- Per default AlgoTrader uses an in-memory H2 database instead of MySqL during Back Testing. Same as with the MySql data the AlgoTrader 30-day trial version already contains sample reference data for the in-memory H2 database.
- The MySQL data can also be managed through the AlgoTrader UI, using the Reference Data Manager.

For further details visit the AlgoTrader documentation regarding Reference Data.

5.2. Historical Data

For Back Testing AlgoTrader can use historical data provided by .csv files. For the EMA strategy the AlgoTrader Strategy Wizard created a sample historical bar data file /algotrader-ema/files/bardata/fx/EURUSD.csv. The file name (EURUSD) needs to match the symbol column in the database table security of the instrument the strategy is going to trade.

For further details on naming conventions and the location of historical data .csv files see the AlgoTrader documentation regarding Market Data File Format\(^3\).

As a more sophisticated alternative to providing historical data through .csv files, the Time Series database InfluxDB\(^4\) can be used for storage and retrieval of historical data. For further details on downloading, storing and using InfluxDB data for back testing please visit the AlgoTrader documentation on Historical Data\(^5\).

You can also import historical data csv files into InfluxDB through our historical data manager\(^6\) (Historical Data Import).

The InfluxDB data can also be browsed and managed in the Historical Data Manager.

\(^3\) http://doc.algotrader.ch/html/Market_Data.html#Market_Data_File_Format
\(^4\) https://www.influxdata.com/products/influxdb-overview/
\(^5\) http://doc.algotrader.ch/html/Historical_Data.html
\(^6\) http://doc.algotrader.ch/html_single/index.html#HDM
Cryptocurrency Trading

The AlgoTrader 30-day trial version can also be used to trade Bitcoin and other Cryptocurrencies via the following exchange adapters:

- *Binance*¹
- *Bitfinex*²
- *Bitstamp*³
- *Bitflyer*⁴
- *BitMEX*⁵
- *Coinbase Pro*⁶
- *Coinigy*⁷

This chapter describes how to setup trading with the Binance exchange.

To setup a connection to Binance the following steps have to be taken:

- Sign-up for a Binance account on *Register with Binance*⁸

- Enable two factor authentication (2FA) on the account following the 2FA instructions (either SMS or Google Authenticator) on the *Account Page*⁹

- On the account page generate a new Binance API key and Secret Key and use it in the settings below.

- On the trial instance, we have already run the ReferenceDataStarter for Binance. If you intend to use another exchange, you will have to run the corresponding reference data starter for it first.

First the Binance API key, then the Secret Key noted above need to be added by clicking the downward facing arrow next to the green start icon and then selecting *Run Configurations.*

---

¹ [http://www.binance.com](http://www.binance.com)
² [http://www.bitfinex.com](http://www.bitfinex.com)
³ [https://www.bitstamp.net](https://www.bitstamp.net)
⁴ [https://bitflyer.com](https://bitflyer.com)
⁵ [https://www.bitmex.com](https://www.bitmex.com)
⁶ [https://pro.coinbase.com/](https://pro.coinbase.com/)
⁷ [https://www.coinigy.com](https://www.coinigy.com)
⁸ [https://www.binance.com/register.html](https://www.binance.com/register.html)
⁹ [https://www.binance.com/userCenter/myAccount.html](https://www.binance.com/userCenter/myAccount.html)
In this example we are going to use the existing EMA strategy to trade via Binance. For this purpose the Binance API key and Secret Key need to be added to the Eclipse launch configuration `EmbeddedStrategyStarter-ema-binance` by selecting it on the left-hand side and going to the Arguments Tab. Here the Binance API key and Secret Key noted above need to be added. Then click Apply.

Per default the EMA strategy trades the EUR/USD currency pair through Interactive Brokers. To now switch the strategy to trade through Binance we need to update the settings at the top of the `EMAService`.

- Update the `accountId` to match the Binance account in the database (should be 115).
- Update the `securityId` (Whichever Id represents the BTC/USDT cryptocurrency pair on Binance in table `security` - should be 860).
- Update the `orderQuantity` to a small enough number
- Update the `defaultAdapterType` BNC in order for the strategy to subscribe for market data through the Binance adapter.
- Add the exchange order flag in the `SendOrder` method since Binance does not support margin trading.
Now the strategy can be started by selecting the **EmbeddedStrategyStarter-ema-binance** and click **Run**.
Cryptocurrency Trading with Python

The AlgoTrader 30-day trial version can also be used to trade Bitcoin and other Cryptocurrencies via the following exchange adapters:

- *Binance*¹
- *Bitfinex*²
- *Bitstamp*³
- *Bitflyer*⁴
- *BitMEX*⁵
- *Coinbase Pro*⁶
- *Coinigy*⁷

This chapter describes how to setup trading with the Binance exchange.

To setup a connection to Binance the following steps have to be taken:

- Sign-up for a Binance account on *Register with Binance*⁸
- Enable two factor authentication (2FA) on the account following the 2FA instructions (either SMS or Google Authenticator) on the *Account Page*⁹
- On the account page generate a new Binance API key and Secret Key and use it in the settings below.
- On the trial instance, we have already run the ReferenceDataStarter for Binance. If you intend to use another exchange, you will have to run the corresponding reference data starter for it first.

First the Binance API key, then the Secret Key noted above need to be added by clicking the downward facing arrow next to the green start icon and then selecting *Run Configurations.*

---

¹ [http://www.binance.com](http://www.binance.com)
² [http://www.bitfinex.com](http://www.bitfinex.com)
³ [https://www.bitstamp.net](https://www.bitstamp.net)
⁴ [https://bitflyer.com](https://bitflyer.com)
⁵ [https://www.bitmex.com](https://www.bitmex.com)
⁶ [https://pro.coinbase.com/](https://pro.coinbase.com/)
⁷ [https://www.coinigy.com](https://www.coinigy.com)
⁸ [https://www.binance.com/register.html](https://www.binance.com/register.html)
⁹ [https://www.binance.com/userCenter/myAccount.html](https://www.binance.com/userCenter/myAccount.html)
In this example we are going to use the existing EMA strategy to trade via Binance. For this purpose the Binance API key and Secret Key need to be added to the Eclipse launch configuration EmbeddedStrategyStarter-ema-python-binance by selecting it on the left-hand side and going to the Arguments Tab.

Here the Binance API key and Secret Key noted above need to be added. Then click Apply.

Per default the EMA strategy trades the EUR/USD currency pair through Interactive Brokers. To now switch the strategy to trade through Binance we need to update the settings at the top of the ema-python-strategy.py. Open your Python IDE and edit following:

- Update the ACCOUNT_ID to match the Binance account in the database (should be 115).
- Update the SECURITY_ID (SECURITY_ID 860 represents the BTC/USDT cryptocurrency pair for Binance in table security).
- Update the ORDER_QUANTITY to a small enough number
- Update the DEFAULT_ADAPTER_TYPE BNC in order for the strategy to subscribe for market data through the Binance adapter.
• Set the exchange order flag in the order you create since Binance does not support margin trading

ACCOUNT_ID = 204
SECURITY_ID = 898
ORDER_QUANTITY = Decimal("10000")
DEFAULT_ADAPTER_TYPE = "BNC"
EMA_PERIOD_SHORT = 10
EMA_PERIOD_LONG = 20

Now the strategy can be started by selecting the EmbeddedStrategyStarter-ema-python-binance and click Run.

You can now launch ema-python-strategy.py in your Python IDE or from commandline.
Shutting down the System

You can shut down the system by clicking on the Start Menu in the lower left-hand corner of the Windows Desktop and then select Power Options in the upper right-hand corner:

Alternatively, the system can be shutdown via the Amazon AWS Console https://console.aws.amazon.com/console/home by first selecting the Amazon Instance and the under Actions select Instance State and then either Stop or Terminate

Note

• If Stop is clicked the instance can be restarted at a later point in time. In the stopped state the Amazon Instance will still incur disc space using costs as mentioned in: https://aws.amazon.com/ec2/pricing/

• If Terminate is clicked the instance cannot be restarted. In the terminated state, no further Amazon instance costs apply