

Small team Assignment 1 – to be completed in teams of 3-4 students.

Due May 8 – uploaded to the Course Canvas (1 per team).

Introduction

It has been over 50-years since Eugene Fama's seminal and very controversial Efficient Markets Hypothesis (EMH) paper. Under this hypothesis, price is an important source of information. However, this work started a debate between practitioners and academics, that is still ongoing today. Empirical interest in the EMH also led to popular finance books such as "A Random Walk Down Wall Street" by Malkiel which observed that security prices exhibit behavior that is consistent with a random walk. This finding makes it difficult to extract information from price because taking first-differences is required to create stationary price time series. However, more recent advances in econometric theory provided the important demonstration that if there is an underlying (equilibrium) relationship between two (or more) random walk series they can be combined to create a stationary (i.e., "cointegrated") series. In turn this allows information to be extracted from price levels and hedged positions constructed. This theory has positive implications for managing risk and engineering potentially profitable trading strategies. For example, pairs trading strategies can be designed to exploit the mean reverting property of stationary residuals.

The objective of this assignment is to introduce you to the issues raised in the above paragraph. This assignment focuses upon implementation and then in week 2's lecture we will take a deeper dive into the underlying theory. There are four main parts to the assignment:

Required

1. You need to form teams of 3-4 students.
2. Each team needs to identify two pairs of instruments that are predicted to be co-integrated, and therefore relevant to pairs trading strategies (see appendix 1). One pair should be a pair of ETFs or Currencies. The second pair is a pair of stocks. The set of available tickers for Assignment 1 for each pair are provided in Appendices 3 and 4.
3. Define your pairs' trading strategies and provide the results from a back-testing analysis of each strategy. The objective of this part is to become acquainted with AI's ability to help you code powerful Python programs.
4. Implement each strategy in a live trading session (see appendix 2).

The above four parts are designed so that each team acquires appropriate experience for the course project.

Pairs Trading Strategies

Pairs trading is a *market neutral* mean-reverting trading strategy. Systematic (or market) risk is eliminated by simultaneously being long and short the two instruments in the pair. If the

pair of instruments is cointegrated then residuals (i.e., unsystematic risk) from a long/short position are predicted to be stationary and therefore mean-reverting over time. Trading strategies are then engineered to exploit this predicted mean reversion.

Step 1: Identifying Two Pairs of Cointegrated Instruments (Appendix 1)

Identify two pairs of securities for which the following null hypothesis can be rejected for the alternative hypothesis of stationarity.

H₀: Residuals from the hedged pair follow a random walk process.

H_A: Random walk is rejected, and the residuals are stationary.

Python script, “Assign12025.txt,” is available on the course canvas in the Modules section “Module 1.” You are free to modify this script for your own team’s objectives. For the first step of assignment 1 the script provides the following for the set of tickers you enter:

- Correlation coefficient between each pair,
- Simple hedge ratios for each pair
- Results from testing the null hypothesis above, against the alternative hypothesis that the pair is cointegrated.
- Generation of a heatmap for cointegration

You can change important parameters such as tickers, significance levels, and others. It is noted that *statistical significance does not imply economic significance. It should also be noted that correlation coefficients are a poor predictor of relationships because of the spurious regression problem which we will cover in lecture 2.*

For economic significance you should be able to identify some common underlying economic driver(s) at the firm, industry, economy wide or international level as further support for the alternative hypothesis of cointegration if H₀ is rejected. As a result, when selecting candidate pairs for testing you need to consider both statistical and economic factors.

Aside: For this assignment only consider instrument pairs from the same trading case. That is, for the assignment you cannot choose one instrument from the FTS ETF Case and a second from the FTS International ETF Case.

The cases for this assignment are:

Cases for choosing pair number 1:

FTS ETF Case provides a large selection of domestic ETF’s (e.g., industries, sectors etc.,).

FTS International ETF Case provides a large selection of country ETF’s

FTS FOREX Case provides major currencies

Case for choosing pair number 2:

FTS 500 Stock Case (500 Stocks)

All tickers are provided in Appendices 3 and 4. In addition, you can look up any of the tickers in the above cases for additional information by referring to Yahoo finance or equivalent:

<https://finance.yahoo.com/>

Step 2: Defining Your Pairs Trading Strategy and Back-testing (Appendix 2)

The next step to consider is what your trading strategy is. Operationally, you need to define the following:

Market instrument rules (i.e., which instruments are you trading)

Time interval rules (i.e., how frequently are prices monitored – for assignment 1 this is 1-day)

Data rules for strategy (i.e., what historical, and other data is referred to).

Entry rules from strategy (i.e., when is an order initiated)

Exit rules from strategy (i.e., when is a trade closed out)

Step 1 identifies your market instruments and for this assignment the time interval rule is daily.

However, your Entry and Exit rules require a little thought.

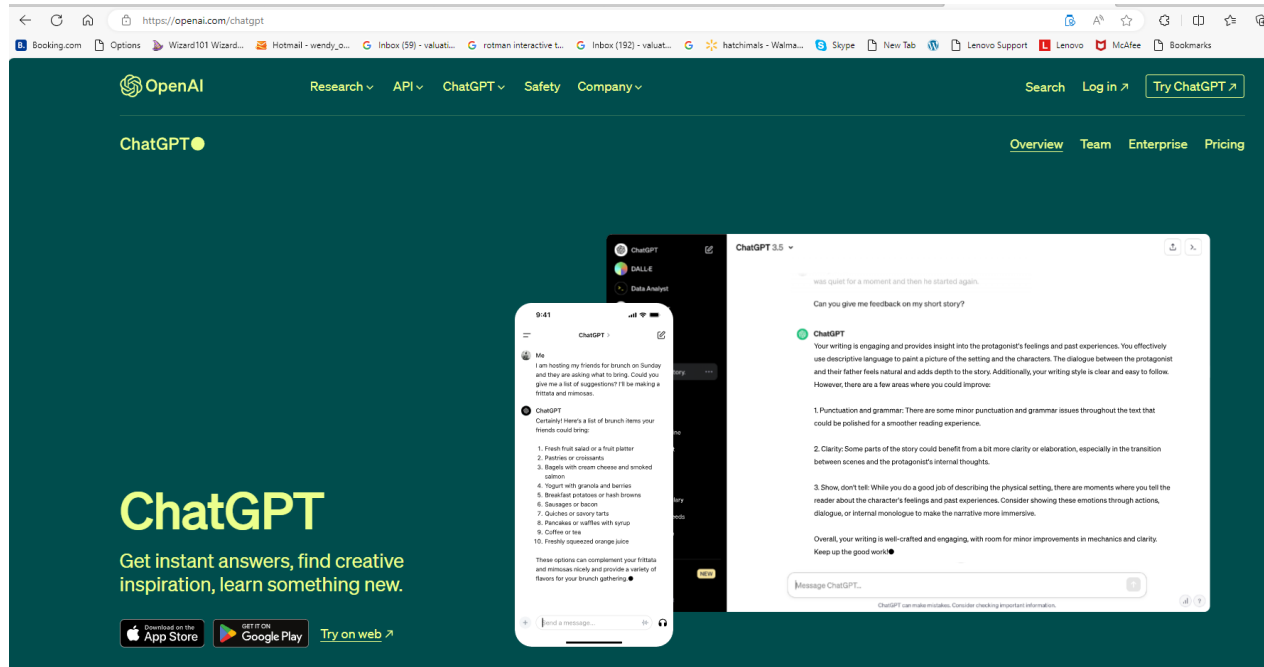
For defining entry and exit rules you are free to incorporate whatever additional indicators you want. In assignment 1 you are required to design a simple pairs trading strategy and provide some basic back-testing results in support of your trading strategy. For this part you will work with to gain experience with the powerful AI tools available today.

Working with AI

There are multiple approaches that can be employed to design a pairs trading strategy. For example, you may work with price differences, price ratios, OLS hedge ratios and so on when defining your pairs strategy. The main point is that there is some predicted mean reversion around the indicator that you choose to work with so deviations in a specific direction are predicted to revert back to the mean allowing you to strategically /buy the pair in relation to the deviation. In addition, you can work with simple statistics, technicals (such as moving averages, Bollinger Bands, RSI etc.,). However, in assignment 1 I am looking forward to some sophistication because the following will reveal how easy this task is!

Part of this course is to learn to work with the power of available tools today. In particular, AI can greatly speed up your program development by working with it if you want to. For example, you design and specify what you want and AI's powerful code generating ability will let you quickly speed up the programming side of the problem. It may not be perfect but again working interactively with it AI is a great debugger!


For example, consider Chat GPT. Do a search for Chat GPT and load the following page:



Click on Try on Web and the RHS will appear:



How can I help you today?

Recommend activities for a team-building day with remote employees	Brainstorm edge cases for a function with birthdate as input, horoscope as o...
Tell me a fun fact about the Roman Empire	Design a database schema for an online merch store
<input type="text" value="Message ChatGPT..."/> 	

ChatGPT can make mistakes. Consider checking important information.

Now enter a request along the following lines:

“Can you construct the Python Code to download the closing prices from yfinance using Google’s Colab, for a pair of stocks with tickers, (example IBM and INTC) for the last 5-years. Then create a pairs trading function for this pair of stocks and provide backtesting analysis and results including, maximum drawdown, Sharpe Ratio, and Profitability of trades”

You will be amazed at how quickly you can get this program up and running! I used to program from scratch but now have become a big fan of working with AI. Another free product is Microsoft’s CoPilot which is also very strong.

Copying and pasting the code generated from the above request into Google’s Colab generates the following example:

```
[*****100%*****] 2 of 2 completed  
Cointegration test p-value: 0.3778
```

```
--- Backtest Summary ---  
Total Trades Executed: 0  
Total Return: 188.21%  
Sharpe Ratio: 0.69  
Max Drawdown: -47.55%  
Profit per Trade: 376.41%
```



Required for this Part II.

Design and implement your pairs trading strategy for a pair of stocks selected from part 1 of this assignment. Your pairs trading strategy should include using technical analysis for your buy and sell decisions. You should then provide a screen shot of the output plus a description of exactly how your last 5 trades work. Finally provide your working python code in an appendix.

Step 3: Live Testing on the FTS Real Time Position Manager (Appendix 2)

For this assignment you are required to create a position in each pair (regardless of whether your entry requirements are met. A screen dump demonstrating that each pair has been implemented in a live position is required.

Summary of Requirements:

- A. Form into small teams (3-4 students per team).
- B. Provide concise support for your final pair of ETF or Forex, and Stock pair choices including identifying the hedge ratio (beta coefficient from the OLS regression). – see appendix 1.
- C. Provide the required results for part ii. Described above.
- D. Provide evidence for implementing your two pairs using the FTS Live Trading Software (cloud version). Provide a screen dump displaying your team's positions.

Note: It is not important in Assignment 1 whether your strategy works or not, the important part of this assignment is to gain experience with completing the steps at this stage. You will be free to change your pairs in later assignments/project if you want to.

Each student has been provided with a login and password that works for each trading case and so for the purpose of this assignment you can use one member of the team's trading account for each pair.

Your assignment should be submitted using either MS Word DOCX file or a Pdf file uploaded via the course canvas (only 1 submission per team – so any member of the team can submit the file). Be sure to include the names and Andrew ID email addresses for EACH member of the team to receive credit. Andrew ID's should be included **in the filename** and Actual names plus Andrew ID's should be included on the cover page of the Assignment file. In other words, I should be able to clearly identify each team both from the filename **and** any printout of the file. One point out of 10 will be deducted if this is not followed.

Finally, an indicative length for assignment 1 should be around 3-5 pages plus cover sheet. Any code that you want to highlight you can include in additional appendices to your team's assignment.

Appendix 1: Code for Checking for Cointegrating Pairs

Step 1: For **Session 1** (see modules section of the course canvas) a base form of the Python script is provided: “Assign12025.txt” It is a text file for easy downloading from the Canvas course site.

Formally, the test is whether the residuals from the hedged position are non-stationary (i.e., follow a random walk). The alternative hypothesis is either stationarity, or trend stationarity depending on the test parameters used.

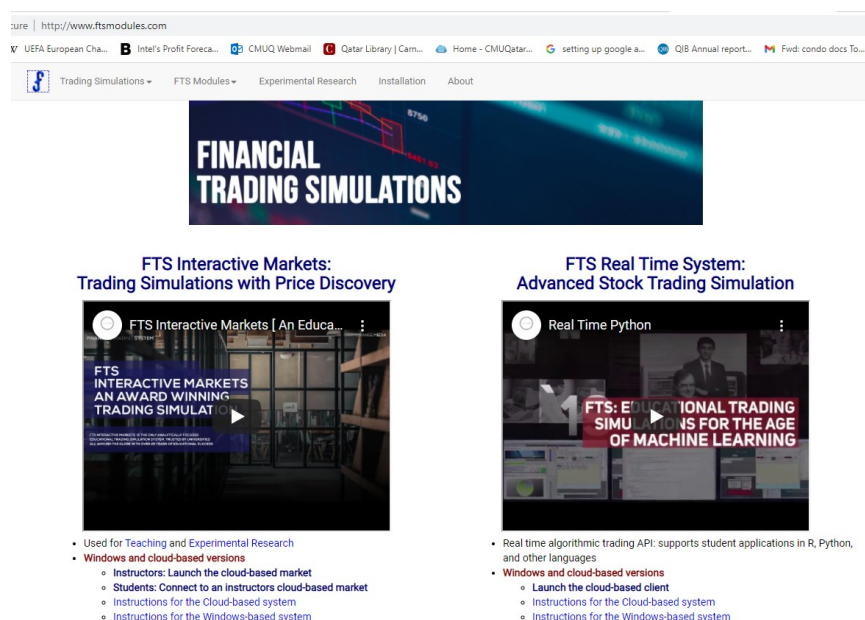
This script will automatically process the set of tickers you provide. It calculates the correlation coefficient, OLS hedge ratio and tests the random walk null-hypothesis using the Augmented Dickey-Fuller test (this test will be formally covered in session 2). It will then display the set of pairs that meet the statistical criteria that you specify within the script.

You are encouraged to modify this script over the course for your small team project. Bottom line the script “CointAssign1” provides you with candidates for pairs trading strategies. For example, at a minimum you will need to change tickers and dates.

Appendix 2: Cloud version of the FTS Real time position manager

Working with the FTS Real Time Position Manager (platform independent)

Go to www.ftsmmodules.com



The screenshot shows the website <http://www.ftsmmodules.com>. The navigation bar includes links for Trading Simulations, FTS Modules, Experimental Research, Installation, and About. Below the navigation bar is a large banner for "FINANCIAL TRADING SIMULATIONS". Two main product cards are displayed:

- FTS Interactive Markets: Trading Simulations with Price Discovery**
 - FTS Interactive Markets [An Educational Trading Simulation]
 - Used for Teaching and Experimental Research
 - Windows and cloud-based versions
 - Instructors: Launch the cloud-based market
 - Students: Connect to an instructors cloud-based market
 - Instructions for the Cloud-based system
 - Instructions for the Windows-based system
- FTS Real Time System: Advanced Stock Trading Simulation**
 - Real Time Python
 - Real time algorithmic trading API: supports student applications in R, Python, and other languages
 - Windows and cloud-based versions
 - Launch the cloud-based client
 - Instructions for the Cloud-based system
 - Instructions for the Windows-based system

Students can then click on: “Launch the Cloud-based client” (bottom RHS above).

10:56 AM Global Value: 0 Last Activity: 0 min, 1 secs

Not Logged in

Login Position Trade Limit Orders Quotes/Filings Reports Research

Select Trading Case

Trading Name

Password

Login Logout

Students then select their Trading Case and enter their login/password. For illustrative purposes the case selected is the FTS500 case.

Note: You will be provided with your personal password in your grade sheet on the course Canvas. Your login is your assigned CMU Andrew ID. The same login and password applies to each of the following cases (ticker details provided in Appendices 4 and 5):

FTS ETF Case

FTS International ETF Case

FTS Forex Case

FTS 500 Stocks Case

Each of the above can be selected from the dropdown illustrated below. Feel free to make practice trades using your personal logins and passwords as your trading will not affect your later project. Each student has access to all cases for practice purposes.

4:18 PM Global Value: 0 Last Activity: 0 min, 1 secs

Not Logged in

Login Position Trade Limit Orders Quotes/Filings Reports Research

Select Trading Case

Trading Name

Password

Notes:

- You can find analyti
- The 'Text' button dis
- If you have a proble
 - Your trading
 - The trading c
 - The informat
- We will email you an

DTCs Real Time Trader

DTCs Real Time Trader

Note: Each team will be provided with a separate team account login and password after teams have been successfully formed.

Trading is then straightforward:

3/14/2022 10:59:35 AM Global Value: 508,243.94 Last Activity: 1 min, 30 secs

Login Position **Trade** Limit Orders Quotes/Filings Reports Research

Enter Ticker and Click Go Go

Select Trade Type v

Enter Quantity Submit Order

Item	Value
------	-------

Plus a powerful fundamental support system is available:

3/14/2022 11:01:37 AM

Global Value: 508,243.94

Last Activity: 0 min, 16 secs

Login

Position

Trade

Limit Orders

Quotes/Filings

Reports

Research

Business Ratios

- Fundamental Growth
- Analyzing ROE
- Analyzing Profitability
- Analyzing Operations
- Analyzing Cash Flows
- Analyzing Risk
- Quality of Earnings
- Price Ratios
- Factor Models

Summary

- Business Ratios: Summary
- Summary: Price Ratios

Basic Data

Financial Statement Analysis

Screener

● Stocks

● Industries

● Sectors

Select

Agilent Technologies Inc. (A)

Basic Data	Agilent Technologies Inc. (A)	Testing Laboratories	Professional, Scientific, and Technical Services	All Stocks	Field	% of Testing Laboratories	% of Professional, Scientific, and Technical Services	% of All Stocks
Market Price	131.44	467.367	271.614	513.248	Annual Dividend	43.2014	3.3113	0.0898
Period Ending	10/31/2021	N/A	N/A	N/A	Book Value of Equity	23.8004	9.2417	0.1135
SEC Filing Date	12/17/2021	N/A	N/A	N/A	Capital Expenditures	20.4104	4.1723	0.0406
Shares Outstanding (End of Year)	608.0M	453.03M	426.0M	5.787B	Cash & Cash Equivalents	22.7742	4.9601	0.0227
Market Weight	0.00168	0.00625	0.01491	1	Cash Flow from Financing Activities	321.4781	7.2527	-0.1308
Market Cap	79.916B	211.729B	115.709B	2970.349B	Cash Flow from Investing Activities	49.8005	12.9253	0.0638
Income Statement					Cash Flow from Operations	26.3789	6.4647	0.1204
Sales	12.638B	26.951B	26.307B	207.094B	Cost of Goods Sold	26.4271	4.7858	0.0743
Cost of Goods Sold	5.824B	13.419B	13.35B	111.091B	Current Assets	25.708	5.2765	0.0271
Gross Profit	6.814B	13.532B	12.957B	96.004B	Current Liabilities	24.898	2.9057	0.0134

The above provides each team with easy and immediate access to their positions.

Appendix 3

FTS ETF Case

SPX.XO	S&P 500 INDEX
AGQ	ProShares Trust - ProShares Ultra Silver
ARKK	ARK Investment Management LLC - ARK Innovation ETF
ARKW	ARK Investment Management LLC - ARK Next Generation Internet ETF
BIB	ProShares Trust - ProShares Ultra Nasdaq Biotechnology
BOIL	ProShares Trust - ProShares Ultra Bloomberg Natural Gas
BRZU	Direxion Shares ETF Trust - Direxion Daily MSCI Brazil Bull 2X Shares
CHAU	Direxion Shares ETF Trust - Direxion Daily CSI 300 China A Share Bull 2X Shares
CNYA	BlackRock Institutional Trust Company N.A. - BTC iShares MSCI China A ETF
CORN	Teucrium Trading, LLC - Teucrium Corn Fund
CURE	Direxion Shares ETF Trust - Direxion Daily Healthcare Bull 3X Shares
CWEB	Direxion Shares ETF Trust - Direxion Daily CSI China Internet Index Bull 2X Shares
DBA	Invesco DB Multi-Sector Commodity Trust - Invesco DB Agriculture Fund
DBB	Invesco DB Multi-Sector Commodity Trust - Invesco DB Base Metals Fund
DBE	Invesco DB Multi-Sector Commodity Trust - Invesco DB Energy Fund
DBO	Invesco DB Multi-Sector Commodity Trust - Invesco DB Oil Fund
DBP	Invesco DB Multi-Sector Commodity Trust - Invesco DB Precious Metals Fund
DBS	Invesco DB Multi-Sector Commodity Trust - Invesco DB Silver Fund
DDM	ProShares Trust - ProShares Ultra Dow30
DFEN	Direxion Shares ETF Trust - Direxion Daily Aerospace & Defense Bull 3X Shares
DGL	Invesco DB Multi-Sector Commodity Trust - Invesco DB Gold Fund
DIG	ProShares Trust - ProShares Ultra Oil & Gas
DPST	Direxion Shares ETF Trust - Direxion Daily Regional Banks Bull 3X Shares
DRN	Direxion Shares ETF Trust - Direxion Real Estate Bull 3x Shares
DUSL	Direxion Shares ETF Trust - Direxion Daily Industrials Bull 3X Shares
ECH	BlackRock Institutional Trust Company N.A. - iShares MSCI Chile ETF
EDC	Direxion Shares ETF Trust - Direxion Daily Emerging Markets Bull 3X Shares
EDEN	BlackRock Institutional Trust Company N.A. - iShares MSCI Denmark ETF
EET	ProShares Trust - ProShares Ultra MSCI Emerging Markets
EFNL	BlackRock Institutional Trust Company N.A. - iShares MSCI Finland ETF
EFO	ProShares Trust - ProShares Ultra MSCI EAFE
EIRL	BlackRock Institutional Trust Company N.A. - iShares MSCI Ireland ETF
ENOR	BlackRock Institutional Trust Company N.A. - iShares MSCI Norway ETF
EPOL	BlackRock Institutional Trust Company N.A. - iShares MSCI Poland ETF
ERX	Direxion Shares ETF Trust - Direxion Daily Energy Bull 2X Shares
EUFN	BlackRock Institutional Trust Company N.A. - BTC iShares MSCI Europe Financials ETF
EUO	ProShares Trust - ProShares UltraShort Euro
EURL	Direxion Shares ETF Trust - Direxion Daily FTSE Europe Bull 3x Shares
EWA	BlackRock Institutional Trust Company N.A. - iShares MSCI Australia ETF

EWC	BlackRock Institutional Trust Company N.A. - iShares MSCI Canada ETF
EWD	BlackRock Institutional Trust Company N.A. - iShares MSCI Sweden ETF
EWG	BlackRock Institutional Trust Company N.A. - iShares MSCI Germany ETF
EWGS	BlackRock Institutional Trust Company N.A. - BTC iShares MSCI Germany Small-Cap ETF
EWH	BlackRock Institutional Trust Company N.A. - iShares MSCI Hong Kong ETF
EWI	BlackRock Institutional Trust Company N.A. - iShares MSCI Italy ETF
EWJ	BlackRock Institutional Trust Company N.A. - iShares MSCI Japan ETF
EWJE	iShares Trust - iShares MSCI Japan Equal Weighted ETF
EWJV	iShares Trust - iShares MSCI Japan Value ETF
EWK	BlackRock Institutional Trust Company N.A. - iShares MSCI Belgium ETF
EWL	BlackRock Institutional Trust Company N.A. - iShares MSCI Switzerland ETF
EWM	BlackRock Institutional Trust Company N.A. - iShares MSCI Malaysia ETF
EWN	BlackRock Institutional Trust Company N.A. - iShares MSCI Netherlands ETF
EWO	BlackRock Institutional Trust Company N.A. - iShares MSCI Austria ETF
EWP	BlackRock Institutional Trust Company N.A. - iShares MSCI Spain ETF
EWQ	BlackRock Institutional Trust Company N.A. - iShares MSCI France ETF
EWS	BlackRock Institutional Trust Company N.A. - iShares MSCI Singapore ETF
EWT	BlackRock Institutional Trust Company N.A. - iShares MSCI Taiwan ETF
EWU	BlackRock Institutional Trust Company N.A. - iShares MSCI United Kingdom ETF
EWUS	BlackRock Institutional Trust Company N.A. - BTC iShares MSCI United Kingdom Small-Cap ETF
EWV	ProShares Trust - ProShares UltraShort MSCI Japan
EWV	BlackRock Institutional Trust Company N.A. - iShares MSCI Mexico ETF
EWY	BlackRock Institutional Trust Company N.A. - iShares MSCI South Korea ETF
EWZ	BlackRock Institutional Trust Company N.A. - iShares MSCI Brazil ETF
EZA	BlackRock Institutional Trust Company N.A. - iShares MSCI South Africa ETF
EZU	BlackRock Institutional Trust Company N.A. - BTC iShares MSCI EMU ETF
FAS	Direxion Shares ETF Trust - Direxion Daily Financial Bull 3x Shares
FTEC	Fidelity Covington Trust - Fidelity MSCI Information Technology Index ETF
FTXL	First Trust Exchange-Traded Fund III - First Trust Nasdaq Semiconductor ETF
FXB	Rydex Investments - Invesco CurrencyShares British Pound Sterling Trust
FXI	BlackRock Institutional Trust Company N.A. - iShares China Large-Cap ETF
FXP	ProShares Trust - ProShares UltraShort FTSE China 50
FXV	Rydex Investments - Invesco CurrencyShares Japanese Yen Trust
GDX	VanEck Vectors ETF Trust - VanEck Vectors Gold Miners ETF
GLD	SSgA Active Trust - SPDR Gold Shares ETF
GLL	ProShares Trust - ProShares UltraShort Gold
GUSH	Direxion Shares ETF Trust - Direxion Daily S&P Oil & Gas Exp. & Prod. Bull 2X Shares
GXC	SSgA Active Trust - SPDR S&P China ETF
HEWC	BlackRock Institutional Trust Company N.A. - iShares Currency Hedged MSCI Canada ETF
HEWG	BlackRock Institutional Trust Company N.A. - BTC iShares Currency Hedged MSCI Germany ETF
HEWJ	BlackRock Institutional Trust Company N.A. - iShares Currency Hedged MSCI Japan ETF
HEWU	BlackRock Institutional Trust Company N.A. - iShares Currency Hedged MSCI United Kingdom ETF

HEZU	BlackRock Institutional Trust Company N.A. - iShares Currency Hedged MSCI EMU ETF
HIBL	Direxion Shares ETF Trust - Direxion Daily S&P 500 High Beta Bull 3X Shares
HJPX	BlackRock Institutional Trust Company N.A. - iShares Currency Hedged JPX-Nikkei 400 ETF
IAU	BlackRock Institutional Trust Company N.A. - iShares Gold Trust
IDU	BlackRock Institutional Trust Company N.A. - iShares U.S. Utilities ETF
IEUR	BlackRock Institutional Trust Company N.A. - iShares Core MSCI Europe ETF
IEUS	BlackRock Institutional Trust Company N.A. - BTC iShares MSCI Europe Small-Cap ETF
IEV	BlackRock Institutional Trust Company N.A. - iShares Europe ETF
IGE	BlackRock Institutional Trust Company N.A. - BTC iShares North American Natural Resources ETF
IHI	BlackRock Institutional Trust Company N.A. - iShares U.S. Medical Devices ETF
INDA	BlackRock Institutional Trust Company N.A. - BTC iShares MSCI India ETF
INDL	Direxion Shares ETF Trust - Direxion Daily MSCI India Bull 2X Shares
ITB	BlackRock Institutional Trust Company N.A. - BTC iShares U.S. Home Construction ETF
IVV	BlackRock Institutional Trust Company N.A. - iShares Core S&P 500 ETF
IYC	BlackRock Institutional Trust Company N.A. - iShares U.S. Consumer Services ETF
IYE	BlackRock Institutional Trust Company N.A. - iShares U.S. Energy ETF
IYF	BlackRock Institutional Trust Company N.A. - iShares U.S. Financials ETF
IYG	BlackRock Institutional Trust Company N.A. - iShares U.S. Financial Services ETF
IYH	BlackRock Institutional Trust Company N.A. - iShares U.S. Healthcare ETF
IYJ	BlackRock Institutional Trust Company N.A. - BTC iShares U.S. Industrials ETF
IYK	BlackRock Institutional Trust Company N.A. - iShares U.S. Consumer Goods ETF
IYM	BlackRock Institutional Trust Company N.A. - iShares U.S. Basic Materials ETF
IYR	BlackRock Institutional Trust Company N.A. - iShares U.S. Real Estate ETF
IYT	BlackRock Institutional Trust Company N.A. - BTC iShares Transportation Average ETF
IYW	BlackRock Institutional Trust Company N.A. - iShares U.S. Technology ETF
IYZ	BlackRock Institutional Trust Company N.A. - BTC iShares U.S. Telecommunications ETF
JNUG	Direxion Shares ETF Trust - Direxion Daily Junior Gold Miners Index Bull 2X Shares
JPXN	BlackRock Institutional Trust Company N.A. - iShares JPX-Nikkei 400 ETF
KORU	Direxion Shares ETF Trust - Direxion Daily South Korea Bull 3X Shares
KSA	BlackRock Institutional Trust Company N.A. - iShares MSCI Saudi Arabia ETF
LABU	Direxion Shares ETF Trust - Direxion Daily S&P Biotech Bull 3X Shares
MCHI	BlackRock Institutional Trust Company N.A. - BTC iShares MSCI China ETF
MEXX	Direxion Shares ETF Trust - Direxion Daily MSCI Mexico Bull 3X Shares
MIDU	Direxion Shares ETF Trust - Direxion Daily Mid Cap Bull 3x Shares
MTUM	BlackRock Institutional Trust Company N.A. - BTC iShares MSCI USA Momentum Factor ETF
MVV	ProShares Trust - ProShares Ultra MidCap400
NAIL	Direxion Shares ETF Trust - Direxion Daily Homebuilders & Supplies Bull 3X Shares
NUGT	Direxion Shares ETF Trust - Direxion Daily Gold Miners Index Bull 2X Shares
OEF	BlackRock Institutional Trust Company N.A. - iShares S&P 100 ETF
PFFA	ETFis Series Trust I - Virtus InfraCap U.S. Preferred Stock ETF
PGJ	Invesco Capital Management LLC - Invesco Golden Dragon China ETF
PILL	Direxion Shares ETF Trust - Direxion Daily Pharmaceutical & Medical Bull 3X Shares

PSCF	Invesco Capital Management LLC - Invesco S&P SmallCap Financials ETF
PSI	Invesco Capital Management LLC - Invesco Dynamic Semiconductors ETF
QAT	BlackRock Institutional Trust Company N.A. - iShares MSCI Qatar ETF
QLD	ProShares Trust - ProShares Ultra QQQ
QQQ	Invesco Capital Management LLC - Invesco QQQ Trust Series 1
RETL	Direxion Shares ETF Trust - Direxion Daily Retail Bull 3x Shares
ROM	ProShares Trust - ProShares Ultra Technology
RXL	ProShares Trust - ProShares Ultra Health Care
SAA	ProShares Trust - ProShares Ultra SmallCap600
SCJ	BlackRock Institutional Trust Company N.A. - iShares MSCI Japan Small-Cap ETF
SCO	ProShares Trust - ProShares UltraShort Bloomberg Crude Oil
SMH	VanEck Vectors ETF Trust - VanEck Vectors Semiconductor ETF
SMIN	BlackRock Institutional Trust Company N.A. - BTC iShares MSCI India Small-Cap ETF
SOXL	Direxion Shares ETF Trust - Direxion Daily Semiconductor Bull 3X Shares
SPUU	Direxion Shares ETF Trust - Direxion Daily S&P 500 Bull 2X Shares
SPXL	Direxion Shares ETF Trust - Direxion Daily S&P 500 Bull 3X Shares
SPXU	ProShares Trust - ProShares UltraPro Short S&P 500 ETF
SPY	SSgA Active Trust - S&P 500 ETF TRUST ETF
SSO	ProShares Trust - ProShares Ultra S&P500
TECL	Direxion Shares ETF Trust - Direxion Daily Technology Bull 3X Shares
TLT	BlackRock Institutional Trust Company N.A. - BTC iShares 20+ Year Treasury Bond ETF
TMF	Direxion Shares ETF Trust - Direxion Daily 20+ Year Treasury Bull 3X Shares
TNA	Direxion Shares ETF Trust - Direxion Dialy Small Cap Bull 3X Shares
TPOR	Direxion Shares ETF Trust - Direxion Daily Transportation Bull 3X Shares
TQQQ	ProShares Trust - ProShares UltraPro QQQ
TYD	Direxion Shares ETF Trust - Direxion Daily 7-10 Year Treasury Bull 3X Shares
UAE	BlackRock Institutional Trust Company N.A. - iShares MSCI UAE ETF
UBOT	Direxion Shares ETF Trust - Direxion Daily RoboticsArtificial Intelligence&Automation Ind Bull 2x
UBT	ProShares Trust - ProShares Ultra 20+ Year Treasury
UCC	ProShares Trust - ProShares Ultra Consumer Services
UCO	ProShares Trust - ProShares Ultra Bloomberg Crude Oil
UDOW	ProShares Trust - ProShares UltraPro Dow30
UGE	ProShares Trust - ProShares Ultra Consumer Goods
UGL	ProShares Trust - ProShares Ultra Gold
UMDD	ProShares Trust - ProShares UltraPro MidCap400
UPRO	ProShares Trust - ProShares UltraPro S&P 500 ETF
UPW	ProShares Trust - ProShares Ultra Utilities
URE	ProShares Trust - ProShares Ultra Real Estate
URTY	ProShares Trust - ProShares UltraPro Russell2000
USD	ProShares Trust - ProShares Ultra Semiconductors
USL	United States Commodity Funds LLC - United States 12 Month Oil Fund LP
UST	ProShares Trust - ProShares Ultra 7-10 Year Treasury

UTSL	Direxion Shares ETF Trust - Direxion Daily Utilities Bull 3X Shares
UVXY	ProShares Trust - ProShares Ultra VIX Short-Term Futures ETF
UWM	ProShares Trust - ProShares Ultra Russell2000
UXI	ProShares Trust - ProShares Ultra Industrials
UYG	ProShares Trust - ProShares Ultra Financials
UYM	ProShares Trust - ProShares Ultra Basic Materials
VGT	Vanguard Group, Inc. - Vanguard Information Technology ETF
VIXM	ProShares Trust - ProShares VIX Mid-Term Futures ETF
VIXY	ProShares Trust - ProShares VIX Short-Term Futures ETF
VNQ	Vanguard Group, Inc. - Vanguard Real Estate Index Fund ETF
VOO	Vanguard Group, Inc. - Vanguard S&P 500 ETF
VTI	Vanguard Group, Inc. - Vanguard Total Stock Market ETF
VV	Vanguard Group, Inc. - Vanguard Large Cap ETF
WANT	Direxion Shares ETF Trust - Direxion Daily Consumer Discretionary Bull 3X Shares
WEAT	Teucrium Trading, LLC - Teucrium Wheat Fund
WEBL	Direxion Shares ETF Trust - Direxion Daily Dow Jones Internet Bull 3X Shares
XLB	SSgA Active Trust - Materials Select Sector SPDR
XLE	SSgA Active Trust - The Energy Select Sector SPDR Fund
XLF	SSgA Active Trust - Financial Select Sector SPDR
XLI	SSgA Active Trust - Industrial Select Sector SPDR
XLK	SSgA Active Trust - Technology Select Sector SPDR ETF
XLP	SSgA Active Trust - Consumer Staples Select Sector SPDR
XLU	SSgA Active Trust - Utilities Select Sector SPDR ETF
XLV	SSgA Active Trust - Health Care Select Sector SPDR
XLY	SSgA Active Trust - Consumer Discretionary Select Sector SPDR
XPP	ProShares Trust - ProShares Ultra FTSE China 50
YANG	Direxion Shares ETF Trust - Direxion Daily FTSE China Bear 3X Shares
YCS	ProShares Trust - ProShares UltraShort Yen
YINN	Direxion Shares ETF Trust - Direxion Daily FTSE China Bull 3X Shares

FTS International ETF Case

SPX.XO S&P 500 INDEX

AFK	VanEck Vectors ETF Trust - VanEck Vectors Africa Index ETF
BRF	VanEck Vectors ETF Trust - VanEck Vectors Brazil Small-Cap ETF
ECH	BlackRock Institutional Trust Company N.A. - iShares MSCI Chile ETF
ECNS	BlackRock Institutional Trust Company N.A. - iShares MSCI China Small-Cap ETF
EEM	BlackRock Institutional Trust Company N.A. - iShares MSCI Emerging Markets ETF
EGPT	VanEck Vectors ETF Trust - VanEck Vectors Egypt Index ETF
EIDO	BlackRock Institutional Trust Company N.A. - iShares MSCI Indonesia ETF
EIS	BlackRock Institutional Trust Company N.A. - iShares MSCI Israel ETF
ENZL	BlackRock Institutional Trust Company N.A. - iShares MSCI New Zealand ETF
EPHE	BlackRock Institutional Trust Company N.A. - iShares MSCI Philippines ETF
EPI	WisdomTree Trust - WisdomTree India Earnings Fund
EPU	BlackRock Institutional Trust Company N.A. - iShares MSCI Peru ETF
EWA	BlackRock Institutional Trust Company N.A. - iShares MSCI Australia ETF
EWG	BlackRock Institutional Trust Company N.A. - iShares MSCI Germany ETF
EWI	BlackRock Institutional Trust Company N.A. - iShares MSCI Italy ETF
EWJ	BlackRock Institutional Trust Company N.A. - iShares MSCI Japan ETF
EWK	BlackRock Institutional Trust Company N.A. - iShares MSCI Belgium ETF
EWL	BlackRock Institutional Trust Company N.A. - iShares MSCI Switzerland ETF
EWM	BlackRock Institutional Trust Company N.A. - iShares MSCI Malaysia ETF
EWN	BlackRock Institutional Trust Company N.A. - iShares MSCI Netherlands ETF
EWO	BlackRock Institutional Trust Company N.A. - iShares MSCI Austria ETF
EWP	BlackRock Institutional Trust Company N.A. - iShares MSCI Spain ETF

EWQ BlackRock Institutional Trust Company N.A. - iShares MSCI France ETF
EWS BlackRock Institutional Trust Company N.A. - iShares MSCI Singapore ETF
EWT BlackRock Institutional Trust Company N.A. - iShares MSCI Taiwan ETF
EWU BlackRock Institutional Trust Company N.A. - iShares MSCI United Kingdom ETF
EWV ProShares Trust - ProShares UltraShort MSCI Japan
EWW BlackRock Institutional Trust Company N.A. - iShares MSCI Mexico ETF
EWY BlackRock Institutional Trust Company N.A. - iShares MSCI South Korea ETF
EWZ BlackRock Institutional Trust Company N.A. - iShares MSCI Brazil ETF
EWZS BlackRock Institutional Trust Company N.A. - BTC iShares MSCI Brazil Small-Cap ETF
EZA BlackRock Institutional Trust Company N.A. - iShares MSCI South Africa ETF
FXI BlackRock Institutional Trust Company N.A. - iShares China Large-Cap ETF
FXP ProShares Trust - ProShares UltraShort FTSE China 50
GXC SSgA Active Trust - SPDR S&P China ETF
IDX VanEck Vectors ETF Trust - VanEck Vectors Indonesia Index ETF
ILF BlackRock Institutional Trust Company N.A. - iShares Latin America 40 ETF
INDY BlackRock Institutional Trust Company N.A. - BTC iShares India 50 ETF
PGJ Invesco Capital Management LLC - Invesco Golden Dragon China ETF
THD BlackRock Institutional Trust Company N.A. - iShares MSCI Thailand ETF
TUR BlackRock Institutional Trust Company N.A. - BTC iShares MSCI Turkey ETF
VNM VanEck Vectors ETF Trust - VanEck Vectors Vietnam ETF

FTS FOREX Case

Ticker	Security Name
USDUSD	US Dollar
EURUSD	Euro
USDJPY	Yen
USDCAD	Canadian Dollar
AUDUSD	Aussie Dollar
USDCHF	Switzerland Franc

USDCZK	Czech Koruna
GBPUSD	Great Britain Pound
USDHKD	Hong Kong Dollar
USDINR	India Rupee
USDPKR	Pakistan Rupee
USDSGD	Singapore Dollar
USDTHB	Thailand Baht
USDMXN.FXCM	Mexican Pesos
NZDUSD	New Zealand Dollar
MYRUSD	Malaysian Ringgit
IDRUSD	Indonesian Rupiah
USDCNY	Yuan
SPX.XO	S&P 500 INDEX

FTS 500 Case

Appendix 4: Stock Tickers

FTS 500 Stock Case

Ticker	Name
A	Agilent Technologies Inc.
AAL	American Airlines Group Inc
AAP	Advance Auto Parts Inc
AAPL	Apple Inc
ABBV	Abbvie Inc
ABC	Amerisource Bergen Corp.
ABMD	Abiomed Inc.
ABT	Abbott Laboratories
CAN	Accenture plc - Class A
ADBE	Adobe Inc
ADI	Analog Devices Inc.
ADM	Archer Daniels Midland Co.
ADP	Automatic Data Processing Inc.
ADSK	Autodesk Inc.
AEE	Ameren Corp.
AEP	American Electric Power Company Inc.
AES	AES Corp.
AFL	Aflac Inc.
AIG	American International Group Inc
AIZ	Assurant Inc

AJG	Arthur J. Gallagher & Co.
AKAM	Akamai Technologies Inc
ALB	Albemarle Corp.
ALGN	Align Technology, Inc.
ALK	Alaska Air Group Inc.
ALL	Allstate Corp (The)
ALLE	Allegion plc
ALXN	Alexion Pharmaceuticals Inc.
AMAT	Applied Materials Inc.
AMCR	Amcor Plc
AMD	Advanced Micro Devices Inc.
AME	Ametek Inc
AMGN	AMGEN Inc.
AMP	Ameriprise Financial Inc
AMT	American Tower Corp.
AMZN	Amazon.com Inc.
ANET	Arista Networks Inc
ANSS	Ansys Inc. - Registered Shares
ANTM	Anthem Inc
AON	Aon plc. - Class A
AOS	A.O. Smith Corp.
APA	APA Corporation
APD	Air Products & Chemicals Inc.
APH	Amphenol Corp. - Class A
APTV	Aptiv PLC
ARE	Alexandria Real Estate Equities Inc.
ATO	Atmos Energy Corp.
ATVI	Activision Blizzard Inc
AVB	Avalonbay Communities Inc.
AVGO	Broadcom Inc
AVY	Avery Dennison Corp.
AWK	American Water Works Co. Inc.
AXP	American Express Co.
AZO	Autozone Inc.
BA	Boeing Co.
BAC	Bank Of America Corp.
BAX	Baxter International Inc.
BBY	Best Buy Co. Inc.
BDX	Becton, Dickinson And Co.
BEN	Franklin Resources, Inc.
BF.B	Brown-Forman Corp. - Class B
BIIB	Biogen Inc

BIO	Bio-Rad Laboratories Inc. - Class A
BK	Bank Of New York Mellon Corp
BKNG	Booking Holdings Inc
BKR	Baker Hughes Co - Class A
BLK	Blackrock Inc.
BLL	Ball Corp.
BMJ	Bristol-Myers Squibb Co.
BR	Broadridge Financial Solutions, Inc.
BRK.B	Berkshire Hathaway Inc. - Class B
BSX	Boston Scientific Corp.
BWA	BorgWarner Inc
BXP	Boston Properties, Inc.
C	Citigroup Inc
CAG	Conagra Brands Inc
CAH	Cardinal Health, Inc.
CARR	Carrier Global Corp
CAT	Caterpillar Inc.
CB	Chubb Limited
CBOE	Cboe Global Markets Inc.
CBRE	CBRE Group Inc - Class A
CCI	Crown Castle International Corp
CCL	Carnival Corp. (Paired Stock)
CDNS	Cadence Design Systems, Inc.
CDW	CDW Corp
CE	Celanese Corp - Series A
CERN	Cerner Corp.
CF	CF Industries Holdings Inc
CFG	Citizens Financial Group Inc
CHD	Church & Dwight Co., Inc.
CHRW	C.H. Robinson Worldwide, Inc.
CHTR	Charter Communications Inc. - Class A
CI	Cigna Corp.
CINF	Cincinnati Financial Corp.
CL	Colgate-Palmolive Co.
CLX	Clorox Co.
CMA	Comerica, Inc.
CMCSA	Comcast Corp - Class A
CME	CME Group Inc - Class A
CMG	Chipotle Mexican Grill
CMI	Cummins Inc.
CMS	CMS Energy Corporation
CNC	Centene Corp.

CNP	Centerpoint Energy Inc.
COF	Capital One Financial Corp.
COG	Cabot Oil & Gas Corp.
COO	Cooper Companies, Inc.
COP	Conoco Phillips
COST	Costco Wholesale Corp
CPB	Campbell Soup Co.
CPRT	Copart, Inc.
CRL	Charles River Laboratories International Inc.
CRM	Salesforce.Com Inc
CSCO	Cisco Systems, Inc.
CSX	CSX Corp.
CTAS	Cintas Corporation
CTLT	Catalent Inc.
CTSH	Cognizant Technology Solutions Corp. - Class A
CTVA	Corteva Inc
CTXS	Citrix Systems, Inc.
CVS	CVS Health Corp
CVX	Chevron Corp.
CZR	Caesars Entertainment Inc
D	Dominion Energy Inc
DAL	Delta Air Lines, Inc.
DD	DuPont de Nemours Inc
DE	Deere & Co.
DFS	Discover Financial Services
DG	Dollar General Corp.
DGX	Quest Diagnostics, Inc.
DHI	D.R. Horton Inc.
DHR	Danaher Corp.
DIS	Walt Disney Co (The)
DISCA	Discovery Inc - Class A
DISCK	Discovery Inc - Series C
DISH	Dish Network Corp - Class A
DLR	Digital Realty Trust Inc
DLTR	Dollar Tree Inc
DOV	Dover Corp.
DOW	Dow Inc
DPZ	Dominos Pizza Inc
DRE	Duke Realty Corp
DRI	Darden Restaurants, Inc.
DTE	DTE Energy Co.
DUK	Duke Energy Corp.

DVA	DaVita Inc
DVN	Devon Energy Corp.
DXC	DXC Technology Co
DXCM	Dexcom Inc
EA	Electronic Arts, Inc.
EBAY	EBay Inc.
ECL	Ecolab, Inc.
ED	Consolidated Edison, Inc.
EFX	Equifax, Inc.
EIX	Edison International
EL	Estee Lauder Cos., Inc. - Class A
EMN	Eastman Chemical Co
EMR	Emerson Electric Co.
ENPH	Enphase Energy Inc
EOG	EOG Resources, Inc.
EQIX	Equinix Inc
EQR	Equity Residential Properties Trust
ES	Eversource Energy
ESS	Essex Property Trust, Inc.
ETN	Eaton Corporation plc
ETR	Entergy Corp.
ETSY	Etsy Inc
EVRG	Evergy Inc
EW	Edwards Lifesciences Corp
EXC	Exelon Corp.
EXPD	Expeditors International Of Washington, Inc.
EXPE	Expedia Group Inc
EXR	Extra Space Storage Inc.
F	Ford Motor Co.
FANG	Diamondback Energy Inc
FAST	Fastenal Co.
FB	Facebook Inc - Class A
FBHS	Fortune Brands Home & Security Inc
FCX	Freeport-McMoRan Inc
FDX	Fedex Corp
FE	Firstenergy Corp.
FFIV	F5 Networks, Inc.
FIS	Fidelity National Information Services, Inc.
FISV	Fiserv, Inc.
FITB	Fifth Third Bancorp
FLT	Fleetcor Technologies Inc
FMC	FMC Corp.

FOX	Fox Corporation - Class B
FOXA	Fox Corporation - Class A
FRC	First Republic Bank
FRT	Federal Realty Investment Trust
FTNT	Fortinet Inc
FTV	Fortive Corp
GD	General Dynamics Corp.
GE	General Electric Co.
GILD	Gilead Sciences, Inc.
GIS	General Mills, Inc.
GL	Globe Life Inc
GLW	Corning, Inc.
GM	General Motors Company
GNRC	Generac Holdings Inc
GOOG	Alphabet Inc - Class C
GOOGL	Alphabet Inc - Class A
GPC	Genuine Parts Co.
GPN	Global Payments, Inc.
GPS	Gap, Inc.
GRMN	Garmin Ltd
GS	Goldman Sachs Group, Inc.
GWW	W.W. Grainger Inc.
HAL	Halliburton Co.
HAS	Hasbro, Inc.
HBAN	Huntington Bancshares, Inc.
HBI	Hanesbrands Inc
HCA	HCA Healthcare Inc
HD	Home Depot, Inc.
HES	Hess Corporation
HIG	Hartford Financial Services Group Inc.
HII	Huntington Ingalls Industries Inc
HLT	Hilton Worldwide Holdings Inc
HOLX	Hologic, Inc.
HON	Honeywell International Inc
HPE	Hewlett Packard Enterprise Co
HPQ	HP Inc
HRL	Hormel Foods Corp.
HSIC	Henry Schein Inc.
HST	Host Hotels & Resorts Inc
HSY	Hershey Company
HUM	Humana Inc.
HWM	Howmet Aerospace Inc

IBM	International Business Machines Corp.
ICE	Intercontinental Exchange Inc
IDXX	Idexx Laboratories, Inc.
IEX	Ilex Corporation
IFF	International Flavors & Fragrances Inc.
ILMN	Illumina Inc
INCY	Incyte Corp.
INFO	IHS Markit Ltd
INTC	Intel Corp.
INTU	Intuit Inc
IP	International Paper Co.
IPG	Interpublic Group Of Cos., Inc.
IPGP	IPG Photonics Corp
IQV	IQVIA Holdings Inc
IR	Ingersoll-Rand Inc
IRM	Iron Mountain Inc.
ISRG	Intuitive Surgical Inc
IT	Gartner, Inc.
ITW	Illinois Tool Works, Inc.
IVZ	Invesco Ltd
J	Jacobs Engineering Group, Inc.
JBHT	J.B. Hunt Transport Services, Inc.
JCI	Johnson Controls International plc - Registered Shares
JKHY	Jack Henry & Associates, Inc.
JNJ	Johnson & Johnson
JNPR	Juniper Networks Inc
JPM	JPMorgan Chase & Co.
K	Kellogg Co
KEY	Keycorp
KEYS	Keysight Technologies Inc
KHC	Kraft Heinz Co
KIM	Kimco Realty Corp.
KLAC	KLA Corp.
KMB	Kimberly-Clark Corp.
KMI	Kinder Morgan Inc - Class P
KMX	Carmax Inc
KO	Coca-Cola Co
KR	Kroger Co.
KSU	Kansas City Southern
L	Loews Corp.
LB	L Brands Inc

LDOS	Leidos Holdings Inc
LEG	Leggett & Platt, Inc.
LEN	Lennar Corp. - Class A
LH	Laboratory Corp. Of America Holdings
LHX	L3Harris Technologies Inc
LIN	Linde Plc
LKQ	LKQ Corp
LLY	Lilly(Eli) & Co
LMT	Lockheed Martin Corp.
LNC	Lincoln National Corp.
LNT	Alliant Energy Corp.
LOW	Lowe`s Cos., Inc.
LRCX	Lam Research Corp.
LUMN	Lumen Technologies Inc
LUV	Southwest Airlines Co
LVS	Las Vegas Sands Corp
LW	Lamb Weston Holdings Inc
LYB	LyondellBasell Industries NV - Class A
LYV	Live Nation Entertainment Inc
MA	Mastercard Incorporated - Class A
MAA	Mid-America Apartment Communities, Inc.
MAR	Marriott International, Inc. - Class A
MAS	Masco Corp.
MCD	McDonald`s Corp
MCHP	Microchip Technology, Inc.
MCK	Mckesson Corporation
MCO	Moody`s Corp.
MDLZ	Mondelez International Inc. - Class A
MDT	Medtronic Plc
MET	Metlife Inc
MGM	MGM Resorts International
MHK	Mohawk Industries, Inc.
MKC	McCormick & Co., Inc. (Non Voting)
MKTX	MarketAxess Holdings Inc.
MLM	Martin Marietta Materials, Inc.
MMC	Marsh & McLennan Cos., Inc.
MMM	3M Co.
MNST	Monster Beverage Corp.
MO	Altria Group Inc.
MOS	Mosaic Company
MPC	Marathon Petroleum Corp
MPWR	Monolithic Power System Inc

MRK	Merck & Co Inc
MRO	Marathon Oil Corporation
MS	Morgan Stanley
MSCI	MSCI Inc
MSFT	Microsoft Corporation
MSI	Motorola Solutions Inc
MTB	M & T Bank Corp
MTD	Mettler-Toledo International, Inc.
MU	Micron Technology Inc.
MXIM	Maxim Integrated Products, Inc.
NCLH	Norwegian Cruise Line Holdings Ltd
NDAQ	Nasdaq Inc - 144A
NEE	NextEra Energy Inc
NEM	Newmont Corp
NFLX	NetFlix Inc
NI	Nisource Inc. (Holding Co.)
NKE	Nike, Inc. - Class B
NLOK	NortonLifeLock Inc
NLSN	Nielsen Holdings plc
NOC	Northrop Grumman Corp.
NOV	NOV Inc
NOW	ServiceNow Inc
NRG	NRG Energy Inc.
NSC	Norfolk Southern Corp.
NTAP	Netapp Inc
NTRS	Northern Trust Corp.
NUE	Nucor Corp.
NVDA	NVIDIA Corp
NVR	NVR Inc.
NWL	Newell Brands Inc
NWS	News Corp - Class B
NWSA	News Corp - Class A
NXPI	NXP Semiconductors NV
O	Realty Income Corp.
ODFL	Old Dominion Freight Line, Inc.
OGN	Organon & Co.
OKE	Oneok Inc.
OMC	Omnicom Group, Inc.
ORCL	Oracle Corp.
ORLY	O`Reilly Automotive, Inc.
OTIS	Otis Worldwide Corp
OXY	Occidental Petroleum Corp.

PAYC	Paycom Software Inc
PAYX	Paychex Inc.
PBCT	People`s United Financial Inc
PCAR	Paccar Inc.
PEAK	Healthpeak Properties Inc
PEG	Public Service Enterprise Group Inc.
PENN	Penn National Gaming, Inc.
PEP	PepsiCo Inc
PFE	Pfizer Inc.
PFG	Principal Financial Group Inc - Registered Shares
PG	Procter & Gamble Co.
PGR	Progressive Corp.
PH	Parker-Hannifin Corp.
PHM	PulteGroup Inc
PKG	Packaging Corp Of America
PKI	Perkinelmer, Inc.
PLD	Prologis Inc
PM	Philip Morris International Inc
PNC	PNC Financial Services Group
PNR	Pentair plc
PNW	Pinnacle West Capital Corp.
POOL	Pool Corporation
PPG	PPG Industries, Inc.
PPL	PPL Corp
PRGO	Perrigo Company plc
PRU	Prudential Financial Inc.
PSA	Public Storage
PSX	Phillips 66
PTC	PTC Inc
PVH	PVH Corp
PWR	Quanta Services, Inc.
PXD	Pioneer Natural Resources Co.
PYPL	PayPal Holdings Inc
QCOM	Qualcomm, Inc.
QRVO	Qorvo Inc
RCL	Royal Caribbean Group
RE	Everest Re Group Ltd
REG	Regency Centers Corporation
REGN	Regeneron Pharmaceuticals, Inc.
RF	Regions Financial Corp.
RHI	Robert Half International Inc.
RJF	Raymond James Financial, Inc.

RL	Ralph Lauren Corp - Class A
RMD	Resmed Inc.
ROK	Rockwell Automation Inc
ROL	Rollins, Inc.
ROP	Roper Technologies Inc
ROST	Ross Stores, Inc.
RSG	Republic Services, Inc.
RTX	Raytheon Technologies Corporation
SBAC	SBA Communications Corp - Class A
SBUX	Starbucks Corp.
SCHW	Charles Schwab Corp.
SEE	Sealed Air Corp.
SHW	Sherwin-Williams Co.
SIVB	SVB Financial Group
SJM	J.M. Smucker Co.
SLB	Schlumberger Ltd.
SNA	Snap-on, Inc.
SNPS	Synopsys, Inc.
SO	Southern Company
SPG	Simon Property Group, Inc.
SPGI	S&P Global Inc
SRE	Sempra Energy
STE	Steris Plc
STT	State Street Corp.
STX	Seagate Technology Holdings Plc
STZ	Constellation Brands Inc - Class A
SWK	Stanley Black & Decker Inc
SWKS	Skyworks Solutions, Inc.
SYF	Synchrony Financial
SYK	Stryker Corp.
SYY	Sysco Corp.
T	AT&T, Inc.
TAP	Molson Coors Beverage Company - Class B
TDG	Transdigm Group Incorporated
TDY	Teledyne Technologies Inc
TEL	TE Connectivity Ltd - Registered Shares
TER	Teradyne, Inc.
TFC	Truist Financial Corporation
TFX	Teleflex Incorporated
TGT	Target Corp
TJX	TJX Companies, Inc.
TMO	Thermo Fisher Scientific Inc.

TMUS	T-Mobile US Inc
TPR	Tapestry Inc
TRMB	Trimble Inc
TROW	T. Rowe Price Group Inc.
TRV	Travelers Companies Inc.
TSCO	Tractor Supply Co.
TSLA	Tesla Inc
TSN	Tyson Foods, Inc. - Class A
TT	Trane Technologies plc - Class A
TTWO	Take-Two Interactive Software, Inc.
TWTR	Twitter Inc
TXN	Texas Instruments Inc.
TXT	Textron Inc.
TYL	Tyler Technologies, Inc.
UA	Under Armour Inc - Class C
UAA	Under Armour Inc - Class A
UAL	United Airlines Holdings Inc
UDR	UDR Inc
UHS	Universal Health Services, Inc. - Class B
ULTA	Ulta Beauty Inc
UNH	Unitedhealth Group Inc
UNM	Unum Group
UNP	Union Pacific Corp.
UPS	United Parcel Service, Inc. - Class B
URI	United Rentals, Inc.
USB	U.S. Bancorp.
V	Visa Inc - Class A
VFC	VF Corp.
VIAC	ViacomCBS Inc - Class B
VLO	Valero Energy Corp.
VMC	Vulcan Materials Co
VNO	Vornado Realty Trust
VRSK	Verisk Analytics Inc
VRSN	Verisign Inc.
VRTX	Vertex Pharmaceuticals, Inc.
VTR	Ventas Inc
VTRS	Viatis Inc
VZ	Verizon Communications Inc
WAB	Westinghouse Air Brake Technologies Corp
WAT	Waters Corp.
WBA	Walgreens Boots Alliance Inc
WDC	Western Digital Corp.

WEC	WEC Energy Group Inc
WELL	Welltower Inc
WFC	Wells Fargo & Co.
WHR	Whirlpool Corp.
WLTW	Willis Towers Watson Public Limited Co
WM	Waste Management, Inc.
WMB	Williams Cos Inc
WMT	Walmart Inc
WRB	W.R. Berkley Corp.
WRK	WestRock Co
WST	West Pharmaceutical Services, Inc.
WU	Western Union Company
WY	Weyerhaeuser Co.
WYNN	Wynn Resorts Ltd.
XEL	Xcel Energy, Inc.
XLNX	Xilinx, Inc.
XOM	Exxon Mobil Corp.
XRAY	DENTSPLY Sirona Inc
XYL	Xylem Inc
YUM	Yum Brands Inc.
ZBH	Zimmer Biomet Holdings Inc
ZBRA	Zebra Technologies Corp. - Class A
ZION	Zions Bancorporation N.A
ZTS	Zoetis Inc - Class A