



IMPORTING AND MANAGING FINANCIAL DATA IN R

# Welcome to the course

# About me

- Author and/or maintainer of several packages
  - TTR, xts, quantmod, quantstrat, blotter
- R/Finance Conference Organizing Committee
- St Louis R User Group

# What is `getSymbols()`?

- Provides access to multiple data sources
- Returns `xts` object by default
- Can import data two ways:
  - Return data like an ordinary function
  - Create an object like `load()` does in base R

# getSymbols() example

```
> getSymbols(Symbols = "AAPL", src = "yahoo")  
[1] "AAPL"
```

```
> getSymbols("AAPL")  
[1] "AAPL"
```

```
> head(AAPL)
```

	AAPL.Open	AAPL.High	AAPL.Low	AAPL.Close	AAPL.Volume	AAPL.Adjusted
2007-01-03	86.29	86.58	81.90	83.80	309579900	10.85709
2007-01-04	84.05	85.95	83.82	85.66	211815100	11.09807
2007-01-05	85.77	86.20	84.40	85.05	208685400	11.01904
2007-01-08	85.96	86.53	85.28	85.47	199276700	11.07345
2007-01-09	86.45	92.98	85.15	92.57	837324600	11.99333
2007-01-10	94.75	97.80	93.45	97.00	738220000	12.56728

# getSymbols() data sources

- Yahoo! Finance



- Google Finance



- FRED



- Oanda



- CSV



# Other `getSymbols()` data sources

- Yahoo! Finance Japan
- MySQL
- SQLite
- RData
- `rds` (created by `saveRDS()`)

# getSymbols() example

Default

```
> # Load data like load()
> getSymbols("AAPL", auto.assign = TRUE)
[1] "AAPL"
> head(AAPL, n = 3)
```

	AAPL.Open	AAPL.High	AAPL.Low	AAPL.Close	AAPL.Volume	AAPL.Adjusted
2007-01-03	86.29	86.58	81.90	83.80	309579900	10.85709
2007-01-04	84.05	85.95	83.82	85.66	211815100	11.09807
2007-01-05	85.77	86.20	84.40	85.05	208685400	11.01904

```
> # Return data like a normal function
> aapl <- getSymbols("AAPL", auto.assign = FALSE)
> head(aapl, n = 3)
```

	AAPL.Open	AAPL.High	AAPL.Low	AAPL.Close	AAPL.Volume	AAPL.Adjusted
2007-01-03	86.29	86.58	81.90	83.80	309579900	10.85709
2007-01-04	84.05	85.95	83.82	85.66	211815100	11.09807
2007-01-05	85.77	86.20	84.40	85.05	208685400	11.01904



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**Let's practice!**





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# Introduction to Quandl

# What is Quandl?

- **Data service:**
  - <https://www.quandl.com/>
- **R package:**
  - <https://CRAN.R-project.org/package=Quandl>
- **Function:**
  - `Quandl::Quandl()`

# Quandl() versus getSymbols()

- Both provide access to multiple data sources
- Quandl() always returns data (i.e. does not behave like load())

```
> # Instrument and source specified by Symbols and src arguments
> quantmod::getSymbols(Symbols = "AAPL", src = "yahoo")

> # Instrument and source specified by code argument
> aapl <- Quandl::Quandl(code = "YAHOO/AAPL")
```

# Quandl() versus getSymbols()

- type argument controls class of return object:
  - "raw" (data.frame), "ts", "zoo", "xts", "timeSeries"

```
> # Return ts object instead of data.frame  
> aapl <- Quandl::Quandl(code = "YAHOO/AAPL", type = "ts")
```

- Defaults:
  - getSymbols() returns xts
  - Quandl() returns data.frame



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**Let's practice!**

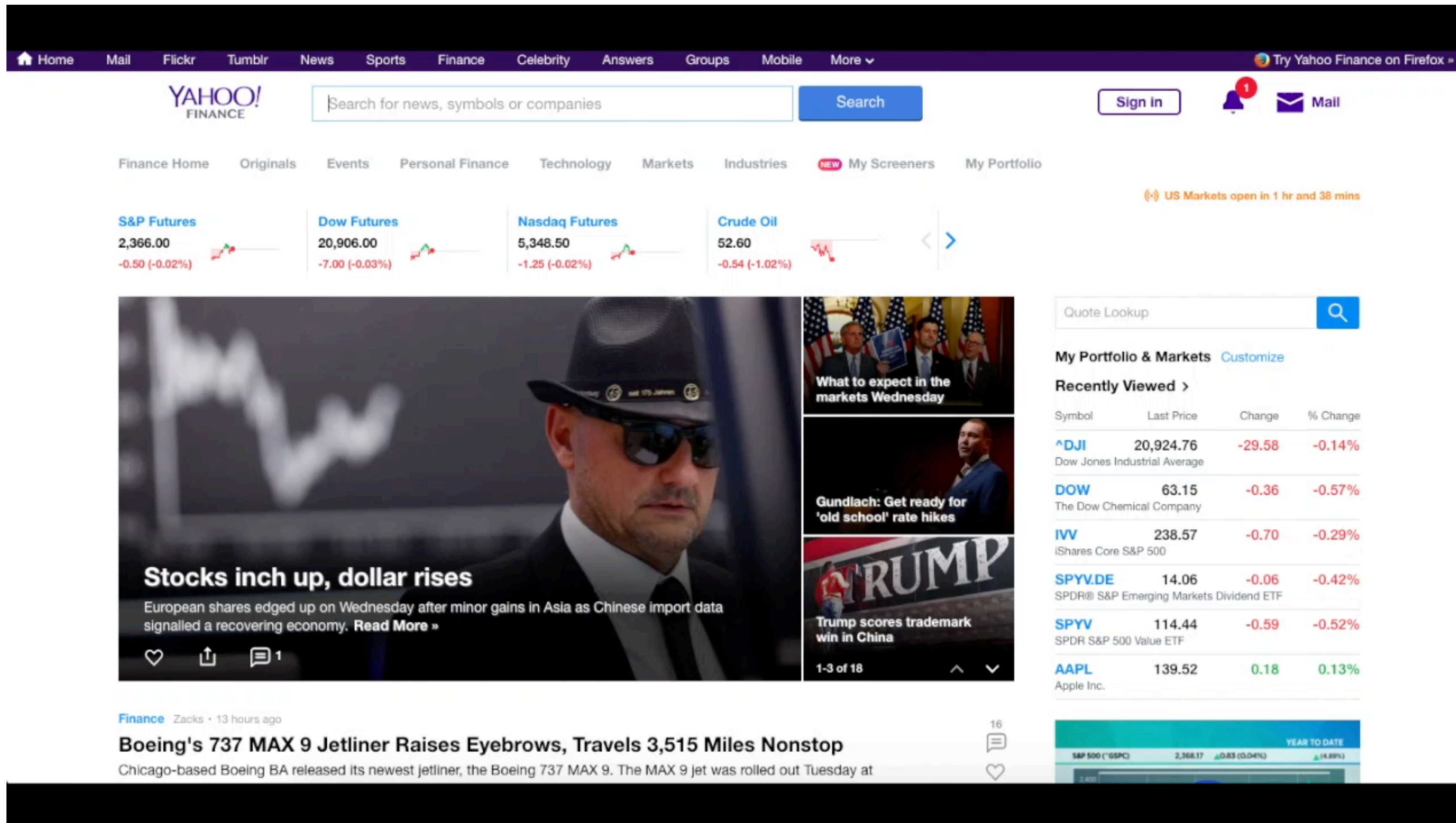


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# **Finding data from internet sources**



# Yahoo Finance



The screenshot shows the Yahoo Finance homepage. At the top is a navigation bar with links to Home, Mail, Flickr, Tumblr, News, Sports, Finance, Celebrity, Answers, Groups, Mobile, and More. Below this is a search bar with the placeholder text "Search for news, symbols or companies" and a "Search" button. To the right of the search bar are links for "Sign in", a notification bell with a red "1", and a "Mail" icon. Below the navigation bar is a secondary menu with links to Finance Home, Originals, Events, Personal Finance, Technology, Markets, Industries, My Screeners (marked as NEW), and My Portfolio. A status bar indicates "US Markets open in 1 hr and 38 mins".

The main content area features four market futures widgets: S&P Futures (2,366.00, -0.50, -0.02%), Dow Futures (20,906.00, -7.00, -0.03%), Nasdaq Futures (5,348.50, -1.25, -0.02%), and Crude Oil (52.60, -0.54, -1.02%). Each widget includes a small line chart. Below these is a large featured article titled "Stocks inch up, dollar rises" with a sub-headline "European shares edged up on Wednesday after minor gains in Asia as Chinese import data signalled a recovering economy. Read More »". The article features a photo of a man in a suit and sunglasses. To the right of the main article is a vertical stack of three smaller articles: "What to expect in the markets Wednesday", "Gundlach: Get ready for 'old school' rate hikes", and "Trump scores trademark win in China".

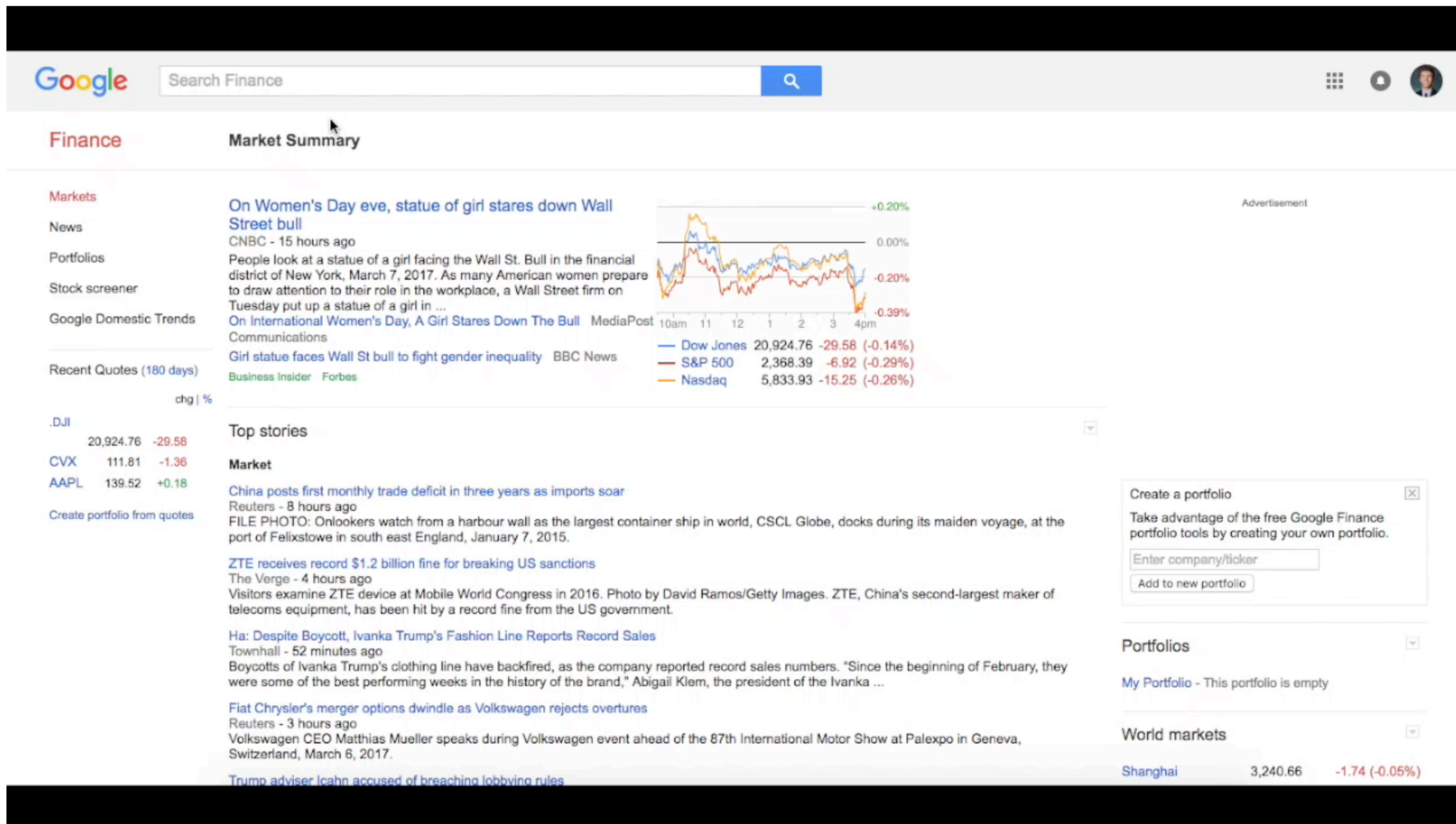
Below the featured article is a news feed item titled "Boeing's 737 MAX 9 Jetliner Raises Eyebrows, Travels 3,515 Miles Nonstop" with a sub-headline "Chicago-based Boeing BA released its newest jetliner, the Boeing 737 MAX 9. The MAX 9 jet was rolled out Tuesday at". To the right of the news feed is a "Quote Lookup" section with a search bar and a "My Portfolio & Markets" section with a "Customize" link. Below this is a "Recently Viewed" table with columns for Symbol, Last Price, Change, and % Change.

Symbol	Last Price	Change	% Change
<b>^DJI</b>	20,924.76	-29.58	-0.14%
Dow Jones Industrial Average			
<b>DOW</b>	63.15	-0.36	-0.57%
The Dow Chemical Company			
<b>IVV</b>	238.57	-0.70	-0.29%
iShares Core S&P 500			
<b>SPYV.DE</b>	14.06	-0.06	-0.42%
SPDR® S&P Emerging Markets Dividend ETF			
<b>SPYV</b>	114.44	-0.59	-0.52%
SPDR S&P 500 Value ETF			
<b>AAPL</b>	139.52	0.18	0.13%
Apple Inc.			

At the bottom right, there is a "YEAR TO DATE" performance chart for the S&P 500 (^GSPC) showing a current value of 2,366.17, a change of 0.83 (0.04%), and a year-to-date change of 4.89%.



# Google Finance



The screenshot shows the Google Finance homepage. At the top is a search bar with the Google logo and a search button. Below the search bar are navigation tabs for Finance and Market Summary. The main content area is divided into several sections: Markets, News, Portfolios, Stock screener, Google Domestic Trends, and Recent Quotes (180 days). The Markets section features a line chart showing the performance of the Dow Jones, S&P 500, and Nasdaq. The News section displays a list of top stories, including articles about Women's Day, a statue of a girl, and ZTE receiving a record fine. The Portfolios section includes a 'Create a portfolio' button and a list of existing portfolios. The Stock screener section is currently empty. The Google Domestic Trends section shows a bar chart of trends for various companies. The Recent Quotes section lists the current prices and changes for the Dow Jones, CVX, and AAPL. The World markets section shows the performance of the Shanghai market.

**Google Finance**

Search Finance

Finance Market Summary

**Markets**

News

Portfolios

Stock screener

Google Domestic Trends

Recent Quotes (180 days)

chg | %

.DJI 20,924.76 -29.58

CVX 111.81 -1.36

AAPL 139.52 +0.18

Create portfolio from quotes

**On Women's Day eve, statue of girl stares down Wall Street bull**

CNBC - 15 hours ago

People look at a statue of a girl facing the Wall St. Bull in the financial district of New York, March 7, 2017. As many American women prepare to draw attention to their role in the workplace, a Wall Street firm on Tuesday put up a statue of a girl in ...

On International Women's Day, A Girl Stares Down The Bull MediaPost Communications

Girl statue faces Wall St bull to fight gender inequality BBC News

Business Insider Forbes

**Top stories**

**Market**

China posts first monthly trade deficit in three years as imports soar

Reuters - 8 hours ago

FILE PHOTO: Onlookers watch from a harbour wall as the largest container ship in world, CSCL Globe, docks during its maiden voyage, at the port of Felixstowe in south east England, January 7, 2015.

ZTE receives record \$1.2 billion fine for breaking US sanctions

The Verge - 4 hours ago

Visitors examine ZTE device at Mobile World Congress in 2016. Photo by David Ramos/Getty Images. ZTE, China's second-largest maker of telecoms equipment, has been hit by a record fine from the US government.

Ha: Despite Boycott, Ivanka Trump's Fashion Line Reports Record Sales

Townhall - 52 minutes ago

Boycotts of Ivanka Trump's clothing line have backfired, as the company reported record sales numbers. "Since the beginning of February, they were some of the best performing weeks in the history of the brand," Abigail Klem, the president of the Ivanka ...

Fiat Chrysler's merger options dwindle as Volkswagen rejects overtures

Reuters - 3 hours ago

Volkswagen CEO Matthias Mueller speaks during Volkswagen event ahead of the 87th International Motor Show at Palexpo in Geneva, Switzerland, March 6, 2017.

Trump adviser Icahn accused of breaching lobbying rules

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Take advantage of the free Google Finance portfolio tools by creating your own portfolio.

Enter company/ticker

Add to new portfolio

**Portfolios**

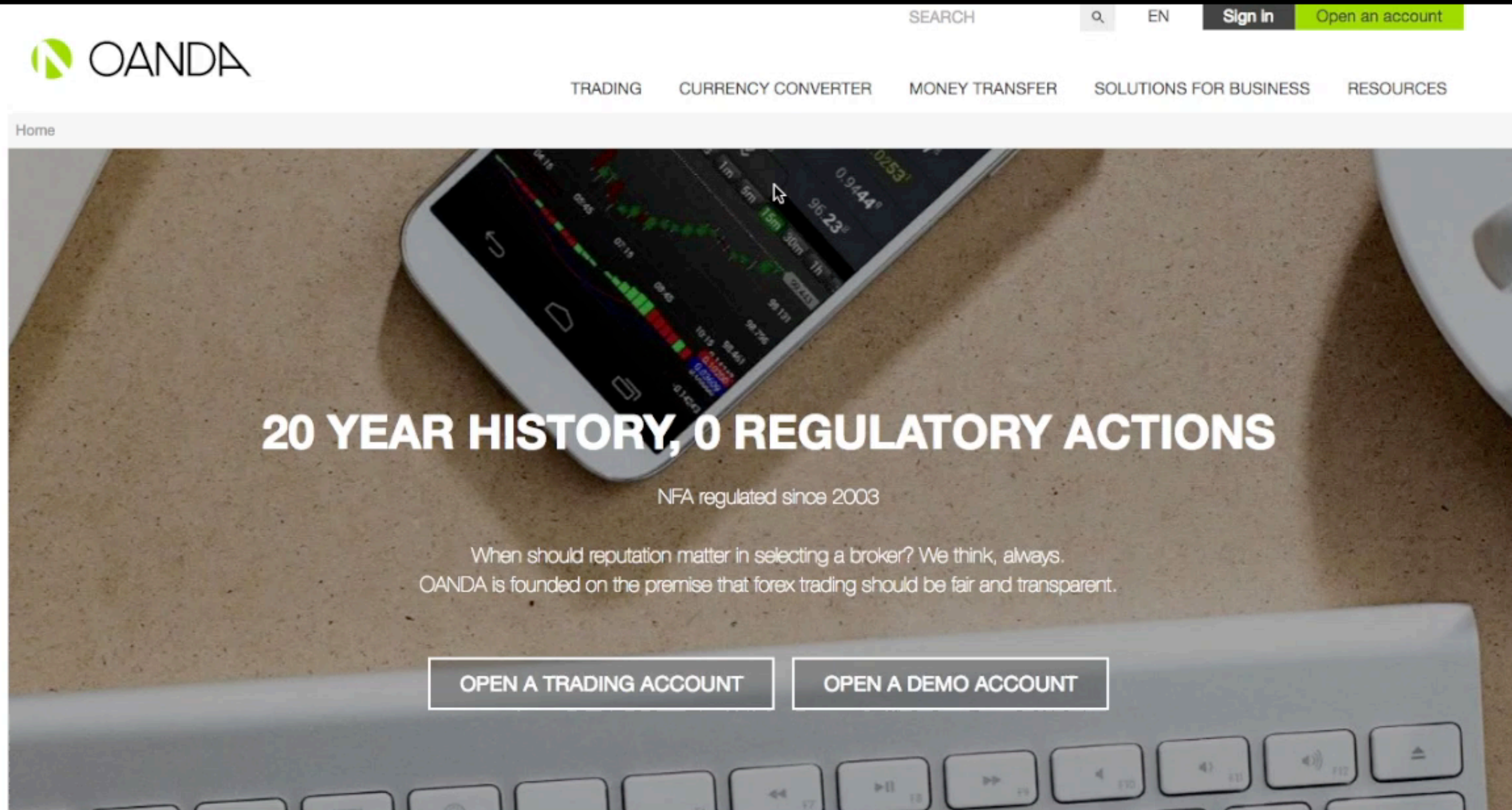
My Portfolio - This portfolio is empty

**World markets**

Shanghai 3,240.66 -1.74 (-0.05%)



# Oanda



The screenshot shows the Oanda website homepage. At the top, there is a navigation bar with a search bar, language selector (EN), and links for 'Sign In' and 'Open an account'. Below this is a secondary navigation bar with links for 'TRADING', 'CURRENCY CONVERTER', 'MONEY TRANSFER', 'SOLUTIONS FOR BUSINESS', and 'RESOURCES'. The main content area features a large background image of a smartphone displaying a forex trading chart. Overlaid on this image is the text '20 YEAR HISTORY, 0 REGULATORY ACTIONS' in large, bold, white letters. Below this, in smaller text, it says 'NFA regulated since 2003'. Further down, a paragraph reads: 'When should reputation matter in selecting a broker? We think, always. OANDA is founded on the premise that forex trading should be fair and transparent.' At the bottom of the main content area, there are two buttons: 'OPEN A TRADING ACCOUNT' and 'OPEN A DEMO ACCOUNT'.

SEARCH  EN [Sign In](#) [Open an account](#)

OANDA

TRADING CURRENCY CONVERTER MONEY TRANSFER SOLUTIONS FOR BUSINESS RESOURCES

Home

## 20 YEAR HISTORY, 0 REGULATORY ACTIONS

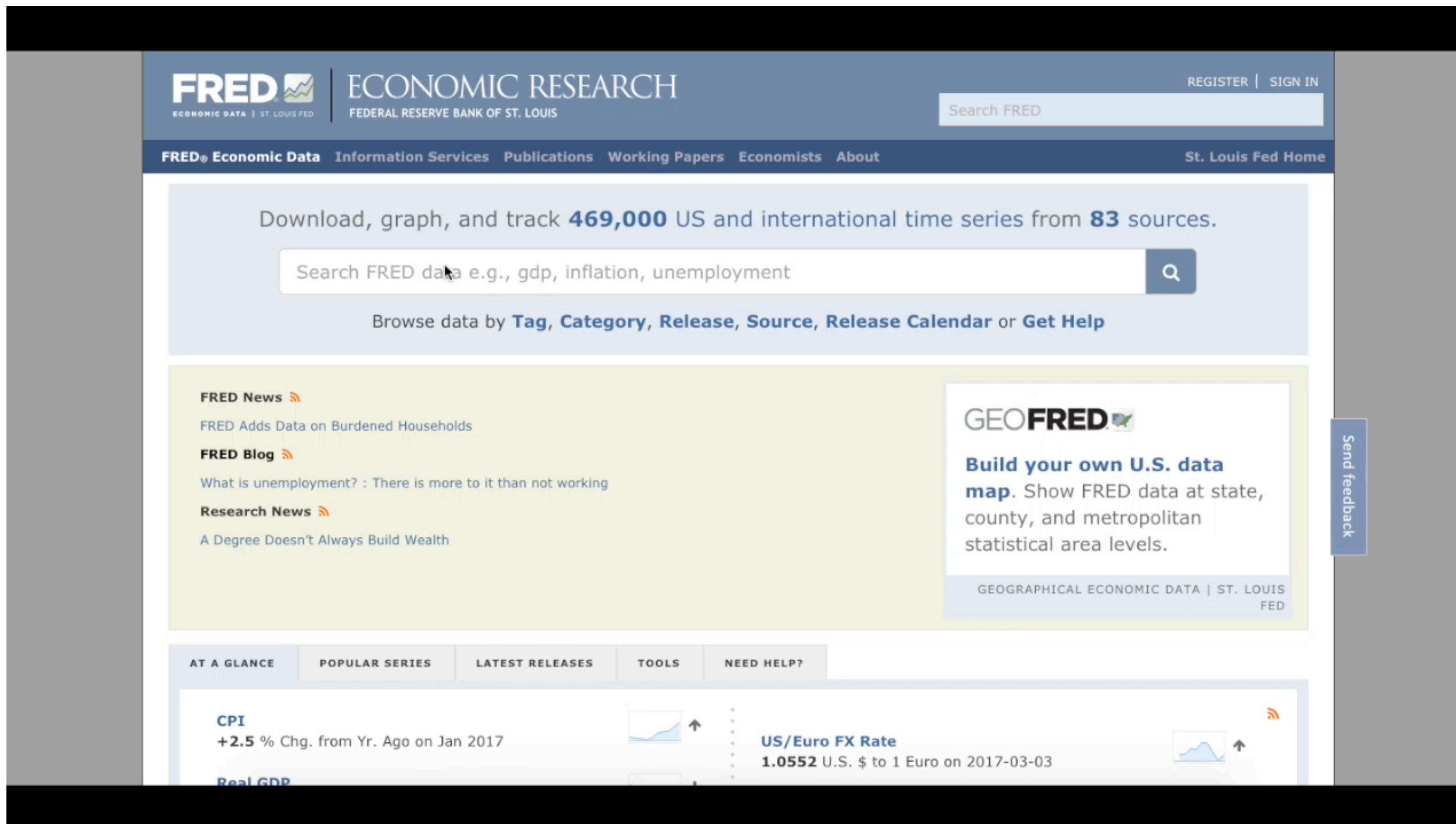
NFA regulated since 2003

When should reputation matter in selecting a broker? We think, always.  
OANDA is founded on the premise that forex trading should be fair and transparent.

[OPEN A TRADING ACCOUNT](#) [OPEN A DEMO ACCOUNT](#)



# FRED



The screenshot shows the FRED website interface. At the top, there's a header with the FRED logo, "ECONOMIC RESEARCH", and "FEDERAL RESERVE BANK OF ST. LOUIS". A search bar labeled "Search FRED" is on the right. Below the header, a navigation bar lists "FRED® Economic Data", "Information Services", "Publications", "Working Papers", "Economists", and "About". A "St. Louis Fed Home" link is also present.

The main content area features a large banner with the text: "Download, graph, and track **469,000** US and international time series from **83** sources." Below this is a search bar with the placeholder text "Search FRED data e.g., gdp, inflation, unemployment" and a magnifying glass icon. Underneath the search bar, it says "Browse data by **Tag**, **Category**, **Release**, **Source**, **Release Calendar** or **Get Help**".

On the left side, there's a "FRED News" section with a RSS icon, followed by "FRED Blog" and "Research News", each with a RSS icon. The "FRED News" section lists "FRED Adds Data on Burdened Households". The "FRED Blog" section lists "What is unemployment? : There is more to it than not working". The "Research News" section lists "A Degree Doesn't Always Build Wealth".

On the right side, there's a "GEOFRED" section with a map icon. It says "Build your own U.S. data map. Show FRED data at state, county, and metropolitan statistical area levels." Below this, it says "GEOGRAPHICAL ECONOMIC DATA | ST. LOUIS FED".

At the bottom, there's a navigation bar with tabs: "AT A GLANCE", "POPULAR SERIES", "LATEST RELEASES", "TOOLS", and "NEED HELP?". Below this, there are two data series displayed: "CPI" with a value of "+2.5 % Chg. from Yr. Ago on Jan 2017" and "US/Euro FX Rate" with a value of "1.0552 U.S. \$ to 1 Euro on 2017-03-03". Each series has a small line graph icon and an RSS icon.

A "Send feedback" button is located on the right side of the page.



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