**Investment project**

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**Aim:** To determine if CSX Corporation’s stock is overpriced or under-priced according to

a) Capital Asset Pricing Model (CAPM)

b) 3-Factor Model (Fama- French 3-Factor Model)

c) 4-Factor Model (Carhart’s Four-Factor Model)

regression model as of 11/30/2018.

**1) About CSX Corporation**



**Date of establishment:** November 1,1980

**Headquarters:** Jacksonville, Florida, USA

**CE0:** James M. Foote (Dec 22, 2017–Present)

**Number of employees:** 24,006 (December 2017)

**Revenue:** 11.4 billion USD (2017) (Wikipedia, 2019)

**Ticker symbol:** CSX

CSX Corporation is an American holding company focused on rail transportation and real estate in North America. It offers rail services, as well as transports intermodal containers and trailers. The company transports chemicals, automotive, agricultural and food products, minerals, fertilizers, forest products, and metals and equipment; and coal, coke, and iron ore to electricity-generating power plants, steel manufacturers, and industrial plants. It also exports coal to deep-water port facilities. In addition, the company offers intermodal transportation services through a network of approximately 30 terminals transporting manufactured consumer goods in containers in the eastern United States; drayage services, including the pickup and delivery of intermodal shipments; and trucking dispatch services. Further, the company serves the automotive industry with distribution centres and storage locations, as well as connects non-rail served customers through transferring products from rail to trucks, which includes plastics and ethanol. Additionally, it acquires, develops, sells, leases, and manages real estate properties. The company operates approximately 20,500 route mile rail network, which serves various population centres in 23 states east of the Mississippi River, the District of Columbia, and the Canadian provinces of Ontario and Quebec, as well as owns and leases approximately 3,900 locomotives. It also serves production and distribution facilities through track connections (Yahoo Finance, 2019).

**Stock performance**

CSX’s stock price was 29.94USD on October 10, 2014. It sunk to 22.42USD on January 22, 2016. The price then steadily increased for the next two years, resulting in a 52.22 USD spike on August 24, 2018 (74.64USD). A slight dip was observed on the 26th of October 2018 (65.92USD). This trend reversed and ended up at a value of 72.63USD on 30/11/2018 (Google, 2019).

**Competitors**

Canadian National Railway Company, Canadian Pacific Railway Company, Freightcar America Inc., Genesee & Wyoming Inc., Greenbrier Companies Inc., Guangshen Railway Company Limited, Kansas City Southern, Kelso Technologies Inc., Norfolk Souther Corporation, Trinity Industries Inc., Union Pacific Corporation, USD Partners LP and Westinghouse Air Brake Technologies Corporation (Nasdaq, 2019)

**2) Stock valuation**

**Note:** Evaluation of CSX Corporation’s stock was done using the data from Yahoo Finance. The chosen time frame for this study is from 5/10/1995 to 11/30/2018.

**Concepts behind CAPM, 3-Factor Model and 4-Factor Model**

The **CAPM or the Capital Asset Pricing Model** is a regression model that was used to calculate the expected return for a company. In other words, the model is used to determine a regression coefficient (Beta) between the company’s historical return and the market historical return.

The model is represented by the equation:

**E(ri)= RFR+ βi[E(rm)-RFR], where**

**E(ri)**: Expected return of the company’s stock\*

**RFR:** Risk free return

**βi**: Regression Coefficient for company i (risk measure) (relationship of the company i to the market)

**E(rm)**: Total market return

**E(rm)-RFR**: Market risk premium

**βi[E(rm)-RFR]**: Risk premium for company i

The **3-Factor Model** otherwise called as Fama-French Model is a regression model, which was formulated my two Scientists- Eugene Fama and Kenneth French. The scientists claimed that the CAPM model was not efficient in including all risk measures. They concluded that the CAPM model miscalculated the expected return. As a result, they included two more factors in addition to the market risk premium (CAPM) and termed them as 1) BE/ME Value 2) Size factor.

The BE/ME value was indicated as HML (high (-) low BE/ME value). To be specific, BE/ME value is the ratio of book equity to market equity of a company's stock. It can be a negative or a positive value. High BE/ME value indicates that the company is risky. Therefore, more return can be expected and vice versa.

The size factor is indicated by SMB ((small (-) big) size). As the Size factor increases, the company’s risk factor deceases and vice versa. It is the market capitalization of a company. It can be a negative or a positive value.

This model is represented by the following equation:

**E(ri) = RFR+ βi[E(rm) - RFR] + βHMLHML + βSMBSMB, where**

**E(ri)**: Expected return of the company’s stock\*

**RFR:** Risk free return

**βi**: Regression Coefficient for company i (risk measure) (relationship of the company i to the market)

**E(rm)-RFR**: Market risk premium

**βHML:** Regression coefficient for BE/ME value

**βSMB:** Regression coefficient for SMB value

**HML**- HML values

**SMB**- SMB values

**Carhart’s Four-Factor Model** involves the addition of a 4th factor to the 3-factor model. This is called the “Momentum factor”. The concept behind this factor is that, as the stock price is going up or down, there is a high probability that the trend will continue in that certain direction in the short run.

There are two types: a) short term momentum (the price keeps increasing/decreasing in a certain direction for a short period of time) and b) long-term reversal (there is a reverse in trend after a long period).

The following equation represents the 4-Factor model:

**E(ri) = RFR+ βi[E(rm) - RFR] + βHMLHML + βSMBSMB + βMOMMOM, where**

**E(ri)**: Expected return of the company’s stock\*

**RFR:** Risk free return

**βi**: Regression Coefficient for company i (risk measure) (relationship of the company i to the market)

**E(rm)-RFR**: Market risk premium

**βHML:** Regression coefficient for BE/ME value

**βSMB:** Regression coefficient for SMB value

**HML**- HML values

**SMB**- SMB values

**βMOM**: Regression coefficient for the momentum value

**MOM:** Momentum values

**\*Note:** i here is CSX Corporation

**Methodology, Observations & Inferences**

The historical (daily values for the given time frame) for the 4-factors (E(rm) – RFR, HML, SMB and MOM) were downloaded from [www.kennethfrench.com](http://www.kennethfrench.com) (Kennethfrench, 2019).

The software used to run the regression models was Microsoft Excel 2016. While carrying out the regression analysis, the X variables were the data from the Kenneth French website and the Y variable was the daily historical CSX stock price from Yahoo Finance (5/10/1995 to 11/30/2018). After running the above three regression models, the expected return (E(rCSX)) was calculated for 11/30/2018(by substituting the various values(E(rm) – RFR, HML, SMB and MOM) in the respective model equation that were framed after the regression analysis).

All the three results revealed that CSX’s stock price was **overpriced**. This is because, the expected return of the stock was greater than the actual return.

**For CAPM Model:**

Expected return **0.015914** (excel sheet) **>** Actual return **0.011983** (data as per Yahoo Finance)

**For 3-Factor Model:**

Expected return **0.013833** (excel sheet) **>** Actual return **0.011983** (data as per Yahoo Finance)

**For 4-Factor Model:**

Expected return **0.01404** (excel sheet) **>** Actual return **0.011983** (data as per Yahoo Finance)

**Note**: The numerical values are measured in USD (U.S. dollar)

**3) Analyst recommendation**

From the above analysis it is evident that the stock is overpriced on 11/30/2018. Therefore, the client needs to **short the stocks (sell**).

The 4-Factor model is preferred as it is practical, accurate and give us the highest rate of reliability. This is because it includes E(rm) – RFR, HML, SMB and MOM. Therefore, it captures all the risk components and let us make estimations on what the correct expected return for a specific company would be.

**References**

1) CSX General Information. (2019). Wikipedia. Retrieved from [link1](https://en.wikipedia.org/wiki/CSX_Corporation)

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5) E(rm) – RFR, HML, SMB and Momentum data. Kennethfrench. (2019). Retrieved from [link5](http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html)