MARIANO DE MARTINO - RESEARCH PROPOSAL

Research Question

How do expectations of reduced consumption by U.S. consumers due to tariffs affect the stock returns of Chinese companies? An analysis of the electric vehicle, solar panel, and washing machine sectors.

I think this question is of paramount importance for several reasons. Firstly, the trade war between the US and China, which began in 2018, has represented a historic change in global economic relations, creating uncertainties for both stock markets and companies operating internationally. The tariffs imposed on trade between these two major economies have affected trade flows and investor and consumer expectations. Understanding how this is reflected in the stock returns of Chinese companies is crucial to capturing the dynamics of international trade in a tense economic environment.

The sectors we will consider in this analysis, in particular electric cars and solar panels, are relevant not only for Chinese exports but also for economic policies that focus on sustainability and reducing emissions. Expectations of reduced US consumption, if not fully understood, could lead to unpredictable consequences, both at the company and sector level. Assessing how the Chinese stock market responds to these changes provides a better understanding of the vulnerabilities of Chinese companies exposed to international markets and anticipates future economic developments.

Finally, the research is of crucial relevance to global investors and policymakers. If tariffs and uncertainty about US consumption cause significant fluctuations in the stock returns of Chinese companies, this indicates that markets are deeply influenced by geopolitical events and that investors need to consider the risks associated with such changes. On the other hand, policymakers both in the US and China can learn important lessons about how protectionist measures affect companies and markets, and how foreign consumer responses can undermine domestic economic stability. Analyzing these dynamics is essential for predicting and mitigating the long-term effects of tariff and protectionist policies.

Data

To analyze the behavior of returns within the sectors, I collected the time series of the daily closing prices of the following companies:

Electric vehicle: BYD CA,EVERGRANDE, BAIC MOTORS.
Solar panel: RISEN ENERGY, JA SOLAR, LONGi SOLAR.
Washing machine: MIDEA, HAIER, HISENSE.

The companies selected are the ones with available data in the selected time frame (01/03/2017 - 10/04/2024), chosen for their high capitalization within each sector in order to accurately reflect each sector trend. My idea is to measure the effect for each sector by constructing a weighted index from the various selected companies using their respective market capitalization as weights. Due to a lack of data, I took price quotations from the Beijing market for solar panels and washing machines and from the Hong Kong market for electric cars. My initial idea was to analyze the time series of prices of securities listed on the US stock market (ADR) as these in my opinion were more sensitive to expectations of reduced demand from US investors. However, this was not possible due to a lack of data.

As indicated in the research question, we analyze stock returns, for this reason, we calculate them using log stock returns.

$$r_{it} = \ln P_{i,t} - \ln P_{i,t-1}$$

Where $P_{i,t}$ is the price of the stock i at time t.
We construct the index of the j-th sector at time t as:

$$I_t^j = \frac{\sum_{i=1}^{N} r_{it} C_{it}^j}{\sum_{i=1}^{N} C_{it}^j}$$

Where r_{it} is the log return of the stock i at time t, C_{it}^j is the market capitalization of the stock i within the sector j at time t, and N is the number of stocks that I have chosen in the sector. Here we have a summary of the variables:

Washing machines:

```
    Min.    1st Qu.   Median     Mean   3rd Qu.     Max.
-0.093266 -0.009251  0.000000  0.000546  0.009792  0.076803
```

Electric vehicles:

```
Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
-0.1349511 -0.0129129  0.0000000  0.0008037  0.0130883  0.1609591
```

Solar panels:

```
Min.    1st Qu.    Median      Mean    3rd Qu.      Max.
-0.093266 -0.009251  0.000000  0.000546  0.009792   0.076803
```
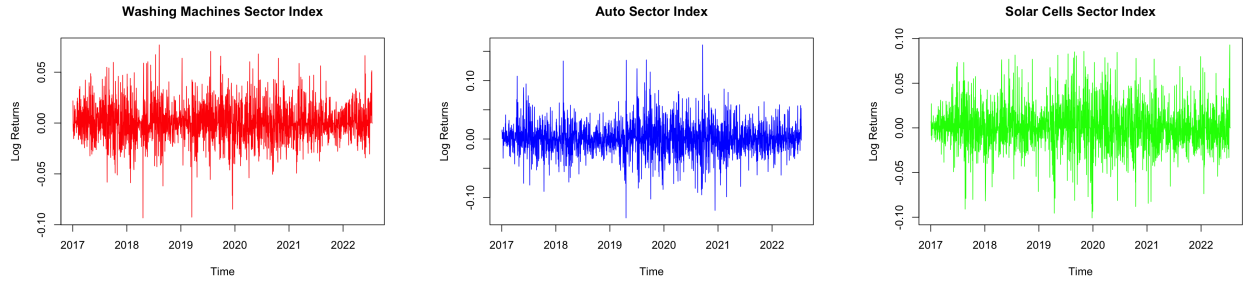

Figure 1: Plot of the log returns of sector indexes

Having defined the dependent variables, we can now assess the independent variables. In order to capture the effect of the introduction of tariffs I created a dummy variable for each tariff. The variables have the following structure:

$$D_i = \begin{cases} 0, & \text{for } t < t_i \\ 1, & \text{for } t \geq t_i \end{cases}$$

Where t_i represents the date in which the tariff i was introduced.

To ensure that the dummy variables capture only the effect of the tariffs, I introduced several control variables into the model to account for the general trend of my dependent variables. Some of these are common across all sectors, such as the USD/CNY exchange rate, Chinese market index CSI 300, Chinese inflation, Chinese interest rate SHIF 3M and Chinese GDP growth rate. My idea is to include sector-specific control variables in the model, such as oil prices for electric vehicles, steel prices for washing machines, and silicon prices for solar panels. However, I am having difficulty finding the spot prices for these commodities. To address this issue, I could use the prices of futures contracts with these commodities as the underlying assets. For easier interpretation of my model's output and to maintain consistency between the dependent and independent variables, I will also convert the latter from absolute values to percentage changes.

Proposed methodology

The proposed model for this analysis is a linear regression where the dependent variable is my sector index, and the independent variables will include the previously mentioned dummy variables to capture the effect of the introduction of a new tariff. To ensure these variables function properly, I will also include a set of control variables that capture the general performance of the index. The regression model for the j-th sector is as follows:

$$I_j = \alpha + D\beta_1 + X\beta_2 + \epsilon_t$$

Where:

- β_1 is a $k \times 1$ column vector, and D is a $T \times k$ matrix, with k representing the number of tariffs introduced and T the number of observations over the time horizon.

- β_2 is a $n \times 1$ column vector, and X is a $T \times n$ matrix, with n representing the number of control variables included in the model and T the number of observations over the time horizon.

The ultimate goal of my analysis is to examine β_1 to determine if it is significantly different from 0, indicating whether the introduction of tariffs has had a positive or negative effect on stock returns.