



Prediction and Analysis of the Impact of Covid-19 on Luxury Goods Stock Prices

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ABSTRACT

COVID-19 has had a huge negative impact on the entire stock market, especially in the early period of the epidemic. At the start of the pandemic, global stock markets fell sharply. Luxury goods, as products with high price elasticity of demand, are more affected by the epidemic. According to research literature, sales of luxury goods have been greatly affected by the pandemic. As sales are an important factor that directly affects the price of luxury stocks, the price of luxury stocks has also declined significantly. This paper selects several luxury goods and establishes a linear regression model to predict the stock price in 2020 based on 2017-2009. By comparing the actual stock prices in 2020, the differences between the stock prices of luxury goods at the beginning of the epidemic and the predicted stock prices were further analyzed. By comparing the stock price forecast – an actual difference of several luxury goods and analyzing the correlation, this paper is concluded that COVID-19 has a large negative impact on the luxury goods stock market in the early period.

Keywords: Stock market, Luxury goods, COVID-19

1. INTRODUCTION

Uncertainties such as escalating trade protectionism, "anti-globalization" and the trade war between China and the US have already had a serious impact on the global economy. However, the COVID-19 pandemic aggravated the global economic recession and further hit the economic activities of countries around the world. In its 2020 annual report, the IMF said that "COVID-19 is an unprecedented crisis. In response to this health emergency, countries had to implement a 'lockdown', which brought economic life to a standstill and triggered the worst recession since the Great Depression." The spread of the virus had forced countries around the world to adjust their monetary, fiscal, and trade policies to mitigate its impact.

The negative impact of COVID-19 on the luxury market had been significant. Take Louis Vuitton as an example. After the epidemic broke out worldwide, most of Louis Vuitton's stores around the world were closed for a long time, resulting in a loss of more than \$1 billion in monthly profits. At the same time, the global party suspension has led to a sharp decline in sales of Louis Vuitton's champagne and dresses. According to the data in April 2020, Louis Vuitton's stock price fell 19%, and

the net worth of its leader Arnault dropped by more than 30 billion DOLLARS. Louis Vuitton's earnings for the first quarter of 2020 showed that the group's total revenue in the first quarter was 10.596 billion euros, down 15 percent year-on-year which was the first decline in nearly 10 years. Revenue fell in all five of its divisions, mainly due to store closures in Asia and reduced travel spending.

The impact of COVID-19 on global stock markets has been huge. He et al. empirically analyzed daily stock market returns for China, Italy, South Korea, France, Spain, Germany, Japan, and the United States using the traditional T-test and nonparametric Mann-Whitney test. The results showed that COVID-19 has a direct impact on stock markets in these countries, and the impact was negative and short-lived. Companies in these countries also suffered temporary negative effects [1]. Baker et al. by comparing the impact of influenza in the United States on stocks in 1918-19, 1957-58, and 1968, concluded that government restrictions on commercial activities and the public's willingness to maintain social distancing were important factors leading to stock market fluctuations; and that COVID-19 which was different from other epidemics, had an important impact on the stock market [2]. Li et al. studied the association between COVID-19 fear and stock market volatility by using AR (1) -

GARCH (1,1). Studies showed that as the number of COVID-19 cases increases, both stock returns and GDP would decline. The public's desire to buy was heavily dependent on the COVID-19 pandemic reported cases Index, the death index, and the Global Fear Index. As the COVID-19 expanded and the number of cases increased, the global fear index would rise, and share prices and GDP would fall accordingly [3]. Baek et al. studied the volatility pass-through effect between the US stock market and COVID-19. Using the BEKK-Multivariate GARCH model, it could be concluded that the volatility of the US stock market depends on both its past shocks and the past COVID-19 shocks. The volatility of the US stock market was positively affected by mortality (bad news) and negatively affected by recovery (good news). In addition, COVID-19 had an asymmetric, volatile impact on the US stock market: bad news had a far greater impact on the CURRENT US stock market than good news. The fixed effect panel regression results support the volatility spillover effect [4]. Chebbi et al. constructed a 2020 S&P500 stock liquidity and daily COVID-19 cases and deaths dataset, using regression analysis, COVID-19 is negatively correlated with stock liquidity. It follows that COVID-19 has significantly reduced corporate liquidity [5]. Shu et al. used the log-periodic power law singularity (LPPLS) method through the Wilshire 5000 Total Market Index), S index and other four major US stock market indexes systematically investigated the stock market crashes of US stock market sectors with different total market capitalization levels in 2020 [6]. Okorie and Lin used DMCA and DCCA techniques to study the fractal contagion effect of the COVID-19 pandemic on the stock market. Novel coronavirus infection (COVID-19) had a significant but short-lived effect on the stock market, according to a new study. This fractal contagion diminished over time (in the medium and long term) in stock market returns and volatility [7].

The COVID-19 pandemic has not only affected stock markets around the world, but also the sales of luxury goods. D'Arpizio et al. propose a new leadership framework based on the sharp decline in luxury sales in the first quarter of 2020. Accelerate the recovery of equity and commodity markets by optimizing the leadership structure to achieve profitability [8].

To better cope with the impact of COVID-19 on the global economy and stock markets, government intervention can promote economic and stock market recovery. Harjoto et al. studied the Federal Reserve's stimulus policies and found that the stimulus policies for the economy during the pandemic mainly affected large enterprises. The policy stimulus and recovery promoted the stock price of large enterprises and the recovery of the market. It has less impact on emerging industries and small and micro-enterprises [9]. Cao et al. perform a panel data analysis of 14 daily stock market indices during 01/21/2020 – 06/30/2020 to document a stock

market index's negative responsiveness to Covid-19's spread variations. the paper found that a stock market index's elasticity estimate is -0.028 (p -value <0.01) for local cumulative confirmed cases. As a stock market index tends to move with Covid-19's local and non-local spreads, international efforts of containment are expected to pare stock market losses [10]. Contessi and Pace, by combining 18 major countries during the first wave of COVID-19 with stories of mild explosive dynamics and periods of collapse, have concluded that stock market volatility is consistent with epidemiological models that follow a slow-spread -- rapid collapse pattern [11]. Choi applied multifractal volatility analysis to the average return series by defining the average prices of 11 sectors in the S&P 500 index. To test the efficient market hypothesis for multiple sectors of the US stock market during the COVID-19 pandemic. The analysis showed that during COVID-19, the consumer discretionary (goods with high price elasticity of demand) sector was the most efficient and the public sector was the least efficient. Affected by the price elasticity of demand, consumer discretionary must adjust its market strategy in time to ensure its profit. The public sector is highly regulated and pays high dividends, which leads to its stock market stability and low efficiency [12].

This paper studied the changes in luxury stock prices in the early period of COVID-19 by forecasting luxury stock prices in early 2020. Then analyzed the impact of COVID-19 on luxury stock prices. The first chapter mainly explained the negative impact of COVID-19 on the global economy and luxury goods as well as the relevant literature review. Chapter two detailed the methods used for forecasting. Chapter three presented the forecast results in charts and graphs. Chapter four explored the specific impact of COVID-19 on luxury stocks. And the reasons for the impact according to the forecast results were discussed. Chapter five gave a general description of the whole article.

2. METHOD

Based on stock data from 2017 to 2019, sci-kit-Learn linear regression was used to predict stock price movements at the beginning of 2020, and then compared with the actual stock price movements in 2020, to obtain the changes in stock price fluctuations at the beginning of the COVID-19.

2.1 Select the objects

As representative luxury brands in France, Louis Vuitton, Dior, and Hermes are more likely to draw universal rules through comparative study, and with the same pricing unit--EUR is easier to draw conclusions and avoid errors. Kering, as a group of luxury brands, is even more representative of its stock price changes.

2.2 Get the data

Taking the Paris Delayed price of Louis Vuitton, Dior, Hermes, and Kering as the research object, the stock prices from Yahoo Finance were selected. Stock prices from 2017 to 2019 were selected as the research object. As seen from the stock price trend charts of LV, Dior, Hermes, and Kering from 2000 to 2019, stock prices had been on a fast upward trend since 2017, and the price trends of the four stocks were the same.

2.3 Data preparation

Build the dataset, first selecting the variables needed and constructing two new columns: 'HL_PCT' (HL_PCT: the percentage change between the highest and lowest price of a stock.) and 'PCT_change' (PCT_change: the percentage change between a stock's closing price and its opening price.). Then consolidate into the fields which were needed.

'Close' was used as the forecast column variable and defined by 'forecast_col'.

Set the number of days to forecast, denoted by 'forecast_out'. Since stock prices in 2020 were compared, 0.05 of the DataFrame's length is taken as the forecast days. (Too large a prediction range would lead to a large error, and the prediction range was in the early stage of the COVID-19, so the prediction parameter was selected as 0.05 of the length of the DataFrame.)

Rebuild X and y. X = ['Close', 'HL_PCT', 'PCT_change', 'Volume']. Y = ['label'] to indicate the value of the stock after the 'forecast_out' column is moved 1% ahead of the 'Close' column. 'Preprocessing.scale' is used to normalize the data of X, so that the data of X obeys normal distribution.

2.4 Prediction

The data were divided into the training set and the test set, of which 80% was the training set and 20% was the test set. The Linear Regression function provided by 'Sklearn' was used for modeling, then the test set was used for testing. The accuracy of the model was calculated by testing data, and the 'forecast_set' is calculated by providing 'X_lately' to the model.

3. RESULT

3.1 Data visualization

According to the predicted data value and the actual stock close price, data visualizations were conducted to obtain the specific comparison line charts of Louis Vuitton, Dior, Hermes, and Kering (the red line is the predicted stock close price, the blue line is the actual stock close price).

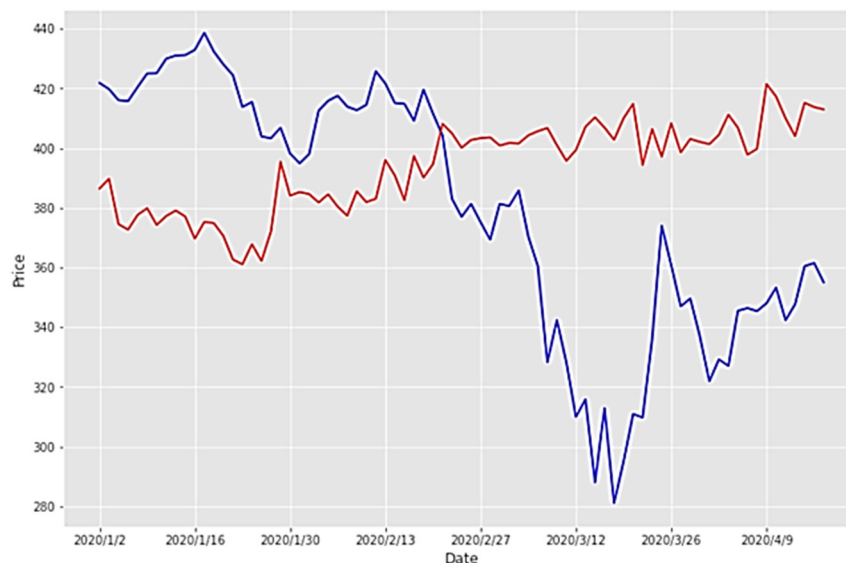


Figure 1. The predicted and actual stock price comparison of LVMH

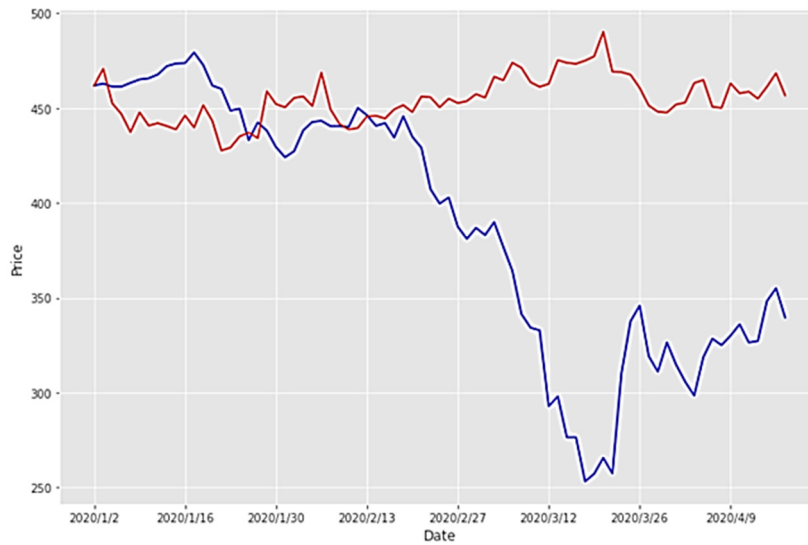


Figure 2. The predicted and actual stock price comparison of Dior

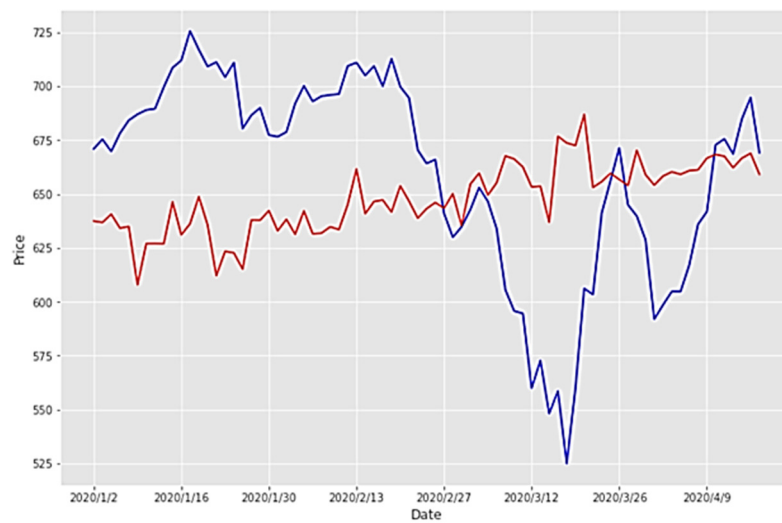


Figure 3. The predicted and actual stock price comparison of Hermes

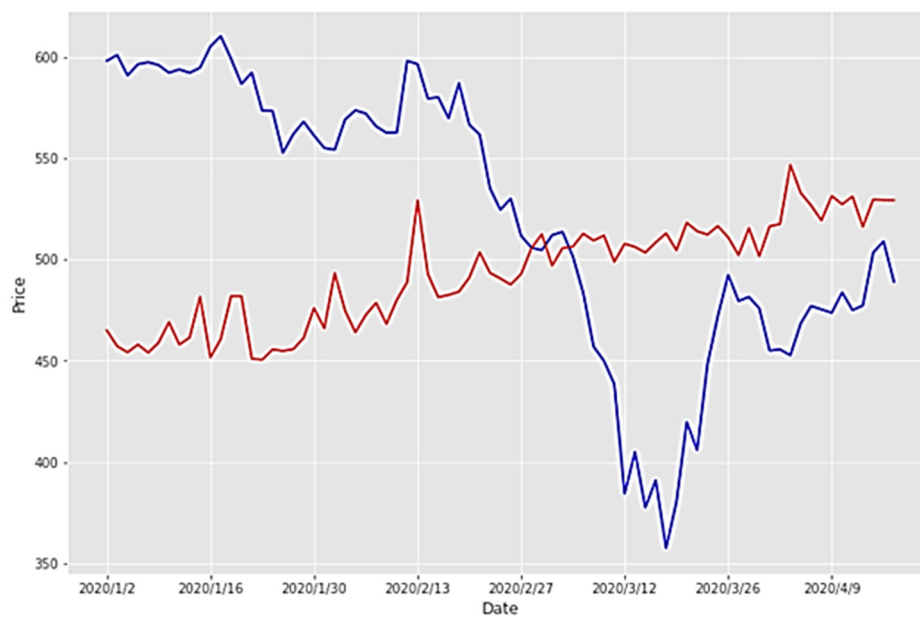


Figure 4. The predicted and actual stock price comparison of Kering

For the close price trend, the forecast price of four stocks showed a slow upward trend, and the overall price level was relatively stable. On the contrary, the actual stock price fluctuated greatly, showing a slump after the middle of January, followed by a relatively large recovery in the middle of March, and then a rapid decline and a slow recovery were shown after the beginning of April.

For the close price, the forecast price of the four stocks was lower than the actual price during the actual price trend showed the slump. Then the actual price was lower than the forecast price. It was worth mentioning that the price difference of Dior was more obvious than other stocks at the end of the test period. Also, the price difference of Kering was more obvious than the others at the beginning of the test period.

3.2 Calculation error

MAE and RMSE were used to calculate the error between the predicted price and the actual price of four stocks.

$$RMSE(S, h) = \sqrt{\frac{1}{m}} \quad (1)$$

$$MAE(X, h) = \frac{1}{m} \sum_{i=1}^m |h(x_i) - y_i| \quad (2)$$

Table 1. The error result of the prediction

	LVMH	Dior	Hermes	Kering
MAE	49.219	75.629	49.826	80.993
RMSE	55.767	100.603	58.178	91.388

From the value of MAE and RMSE, it is obvious that the predicted price based on the stock price from 2017 to 2019 had a huge error compared with the actual price. The error of Dior and Kering was larger than Louis Vuitton and Hermes.

4. DISCUSSION

Luxury goods are different from daily necessities. They are characterized by the high price elasticity of demand, and their price and sales volume will be affected by the size of the demand market. Luxury's stock price directly is affected by the sales volume, which is directly related to the purchasing power of the customers. Statistics show that in 2018, the global luxury market was about us \$347 billion, of which China's luxury consumption was the US \$145.7 billion, accounting for 42% of the global luxury consumption scale, indicating China's pivotal position in the world luxury consumption market. After 2018, the total amount is still increasing. As for luxury goods, their sales market is facing the whole world. The outbreak of the epidemic has sharply reduced the sales market of luxury goods. The continuous tightening of entry and exit control in various

countries and the great panic caused by the epidemic had reduced consumers' purchasing intention, leading to a sharp decline in the sales of luxury goods. In the stock market, stock prices were positively correlated with the operating performance of listed companies. If the performance was good, the stock price would rise; If the performance was bad, the share price would fall accordingly. The sharp drop in sales had led to sharp declines in earnings and corporate results for luxury goods companies. As the profits of luxury goods companies shrank, their market stock shrank and their competitiveness declined accordingly. Shareholders were pessimistic about the development of the company and choose to sell or not buy stocks, and the stock price declined accordingly.

The COVID-19 outbreak began in China in January 2020 and spread globally in late February and early March. Since the outbreak of COVID-19, China had adopted a strict lockdown policy. The loss of The Chinese market, the suspension of tourism, and the global outbreak had caused four stocks to plunge since February. However, based on the stock price from 2017 to 2019, the predicted price showed a slow upward trend, and the overall price level was relatively stable. Obviously, COVID-19 made a destructive influence on the stock price of these four stocks.

The sharp fall in capital markets led to sharp declines in stock markets, with the U.S. market, the world's leading stock market, experiencing four circuit breakers in March 2020, and European markets also taking a beating. The European and American governments adopted loose monetary policies to ease economic pressure to better cope with COVID-19 and reduce economic damage. The US, for example, had launched five rounds of monetary policies since early March to counter the impact of COVID-19. On March 17 and 18, the Federal Reserve resumed a series of rescue policy tools during the subprime mortgage crisis and the international financial crisis to further inject liquidity into non-bank financial institutions and the financial market. Under the Fed's targeted policy, the DOLLAR index fell from its high, and the "dollar shortage" basically ended. The global liquidity crisis eased and the market moved from panic to calm repair. Monetary easing (for example, the implementation of the "average inflation targeting system" in the United States set the short-term inflation target above 2%, which led to the rapid rise of price and the price of the luxury market) stimulated liquidity in financial and stock markets, leading to a significant recovery in luxury stock markets, followed by a dip. With the gradual control of the epidemic and the continuous promotion of economic policies, the rise of luxury stocks returned to normal and showed a trend of steady rise.

In terms of forecast stock prices, if not affected by COVID-19, the prices of the four luxury stocks should

be on a steady growth trajectory in early 2020, with slow growth but high prices. Stock prices had been volatile following the impact of COVID-19. From the perspective of actual stock prices, the aggregate groups of many brands, such as LVMH and Kering, adjusted their stock prices quickly under the influence of monetary policies, and the increase and price of stock prices were basically in line with the predicted price. On the contrary, the stock prices of single fashion brands, such as Dior and Hermes, fluctuated greatly, and still had a big gap with the forecast price after adjustment.

According to the prediction error value of the linear model, the prediction error rate is about 80%, but from the error data provided by MAE and RMSE, the error between the actual and forecast is large. Two conclusions can be drawn: 1. The COVID-19 pandemic had a significant impact on the luxury stock market. The forecast price was based on a relatively stable environment for capital markets and the global economy. In the absence of large fluctuations in the market economy and government intervention, the forecast error rate was about 80%. As a matter of fact, due to the global economic collapse caused by COVID-19 and the government's monetary policy intervention, the actual stock price was significantly different from the forecast stock price. 2. Traditional linear models are not suitable for predicting commodity stock prices with high demand price elasticity, such as luxury goods. Products with higher price elasticity of demand are more susceptible to the influence of commodity markets and their stock prices are more prone to fluctuations. Take luxury goods for example. Although they are sold globally, statistics show that the Chinese market accounts for 1/3 of the total sales. Therefore, China's economic fluctuations would lead to great fluctuations in the market and sales volume of luxury goods, thus affecting the stock price of the whole product. A small range of economic fluctuations may cause large fluctuations in the market of products with high price elasticity of demand, which will lead to large fluctuations in stock prices.

5. CONCLUSION

In addition, by comparing the predicted stock price with the actual stock price, it can be concluded that the traditional linear model is not suitable for predicting the stock of products with high price elasticity of demand, and the product with low price elasticity and the relatively stable price is more suitable for the linear model. During the period of COVID-19, the market shrank sharply and the suspension of tourism led to a sharp drop in luxury sales, which led to a sharp drop in luxury stock prices and a severe blow to the development of the luxury stock market. The loose monetary and economic policies issued by the government stimulated the circulation of the financial market and consumer market to a certain extent, thus promoting the recovery

of luxury stock prices. The luxury goods market must rely on the government's monetary policy if it wants to resume the upward trend of stock prices in the attack of the new round of COVID-19. Besides, appropriate corporate policies are used to stimulate consumption and raise commodity prices. For example, stimulating mass consumption, expanding commodity markets, and expanding sales volume can increase corporate profits and raise stock prices.

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