# 國 立 高 雄 科 技 大 學
# 企 業 管 理 系 碩 士 班
# 碩 士 論 文

後疫情時代全球貨櫃裝卸量之預測：
機器學習法之應用

Forecast of Global Container Handled in the
Post-Pandemic Era: Application of Machine Learning

研 究 生：謝鋅翎
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碩士論文

# 後疫情時代全球貨櫃裝卸量之預測：機器學習法之應用

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## 中文摘要

現今國家經濟繁華，大多 80-90%的商品需仰賴海運及空運，從原先港對港的運輸模式，至後來發展需要各種複合式硬體設備及運輸工具，故運輸成為經濟發展重要原因之一，若國際發生重大金融事件，首當其衝影響必是進出口貿易。近年來，隨著世界貿易趨勢改變，碼頭作業設備更新及新興國家的深水碼頭一一落成，新港口逐漸受歡迎，舊港口漸漸淘汰，各國港埠也因地理位置或發展背景，而影響貨櫃裝卸量。在 2019 年新冠肺炎的發生，造成港口人員負載不足以及碼頭嚴重塞港，甚至嚴重擾亂全球貿易秩序，影響全球經濟。

本研究用機器學習，樣本期間為 1995 年 1 月至 2021 年 10 月，分別使用 OLS/FM-OLS、ARIMA 以及 SVR 三種方法進行預測並做比較。五國(美國、日本、新加坡、臺灣及中國)實證結果顯示，整體而言使用 SVR 來訓練經濟結構模型及時間數列模型，在五國預測績效上，表現皆優於 OLS/FM-OL 及 ARIMA 方法。首先，在經濟結構模型預測表現上，OLS/FM-OLS 平均 MAPE 為 237.269%、平均 RMSE 為 0.787； SVR 平均 MAPE 為 118.181%、平均 RMSE 為 0.7142。最後，在時間數列模型預測表現上，ARIMA 平均 MAPE 為 156.033%、平均 RMSE 為 0.811；SVR 平均 MAPE 為 118.181%、平均 RMSE 為 0.7142。

**關鍵字**：機器學習、預測、SVR、貨櫃裝卸量、單根檢定、共整合檢定、完全修正普通最小平方法、經濟復甦

# Forecast of global container throughput in the post-epidemic era:Application of Machine Learning

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# **Abstract**

Nowadays, as the flourishing economy between countries, there are up to 80-90% of the products have to rely on sea or air shipping. Methods of transportation begin with port-to-port shipping, evolving to depending on variously composite device and conveyances afterwards. If there is a global financial crisis, international trade will worst be affected by it. That one of the main reasons why transportation boosting economic development.

In recent years, with the transforming of the global trade, equipment rehabilitation of the dockside service, and accomplishment of the deep-water wharf in emerging countries, new harbor is getting much more popular, and ancient one is becoming obsolete. Volume of loading and discharging of harbor in each country is affected by position and their own development process. In 2019, covid 19 had not only caused port congestion, but also raided the order of global trade, which seriously affected world economy.

In this study, machine learning is used, and the sample period is from January 1995 to October 2021, and three methods of OLS/FM-OLS, ARIMA and SVR are used for prediction and comparison. The empirical results of the five countries (the United States, Japan, Singapore, Taiwan and China) show that, on the whole, the use of SVR to train the economic structure model and time series model is better than OLS/FM-OL and ARIMA in the prediction performance of the five countries. method. First, in terms of the prediction performance of the economic structure model, the average MAPE of OLS/FM-OLS is 237.269%, and the average RMSE is 0.787; the average MAPE of SVR is 118.181%, and the average RMSE is 0.7142.

Finally, in the prediction performance of the time series model, the average MAPE of ARIMA was 156.033%, and the average RMSE was 0.811; the average MAPE of SVR was 118.181%, and the average RMSE was 0.7142.