The state of Africa's air transport market amid COVID19 and forecasting temporal recovery

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Introduction

- The emergence of COVID-19 is having multilayered impacts on African the aviation industry.
  - Losses in traffic and revenues
  - uncertainty about prospects
  - Airlines collapsed, eg.Air Namibia
- Countries are implementing different measures to help the industry survive the pandemic and facilitate the resumption of air transport to the pre-COVID19 point.

Introduction

- However, the industry stakeholders have still concerns about the state of the markets, the timing of recovery, and the restart in long-haul traffic.
- This concern needs an enquiry to restore the passengers' travel confidence, create travel safety awareness, and infer the recovery wait.
- This study has two main objectives:
  - Estimate the immediate and long-run effects of COVID19 on air transport markets
  - Forecasting the recovery time for domestic and international flights of nine African countries.

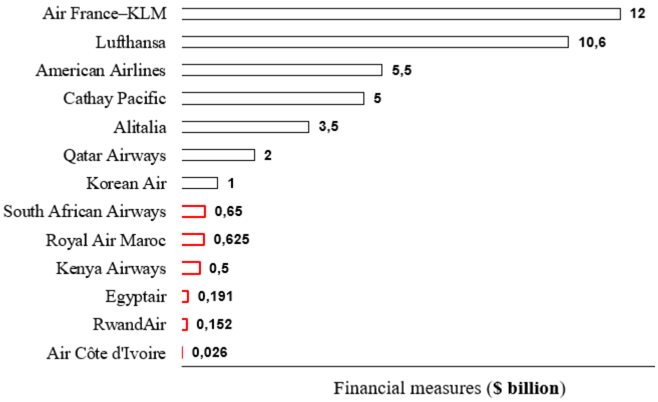
The countries' actions and aviation market responses to the outbreak can be considered from two aspects:

1. State restrictions and scheduled capacity.
2. Economic responses by African states.

1. State restrictions and scheduled capacity

State actions	Aviation market responses
◦ Restrictions of entries from high-risk countries	◦ Adjustment of standard commercial policies
◦ Mandated quarantine of entries from high-risk countries	◦ Network adjustment to high-risk countries
◦ Increased screening measures on all travellers/those from medium risk countries	◦ Network adjustment on all international flights
◦ Partial border closures	◦ Temporary cessation of international and regional flights
◦ Full border closures	◦ Temporary closure of operations
◦ Restricted/prohibited domestic travel	◦ Partial/no payment to airline staff; unpaid leave and retrenchments
	◦ Filing for business administration/restructuring
◦ Ease the lockdown measures	◦ Resume domestic routes
◦ Relax restrictions on international travellers	◦ Reinstating temporarily laid-off employees
◦ Replace quarantine by testing or vaccine certificates	◦ Restoring international networks

2. Economic responses



Data

- To closely observe the dynamics of the market, monthly time-series data from August 2003 to December 2021 is employed.
- April 2020 is considered as a point of intervention to assess the effects of COVID19 and make forecasting specifications.
- Nine countries: South Africa, Nigeria, Kenya, Mauritius, Rwanda, Ghana, Tanzania, Egypt & Morocco.
- Air transport market is proxied by the number of domestic and international flights in the country.

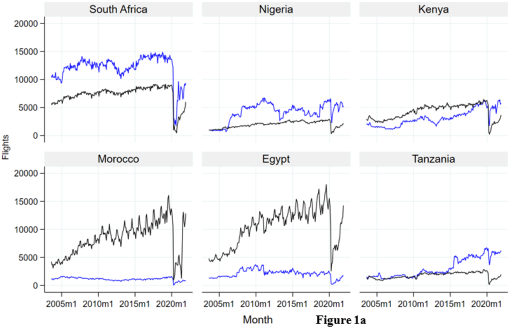


Figure 1a

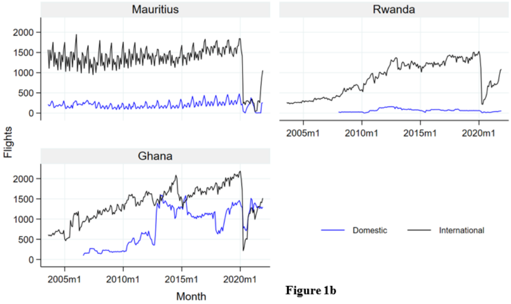


Figure 1b

Method (1)

- Two related methods are employed:
  1. Intervention analysis
  2. SARIMAX
- **Intervention analysis** is used to capture the critical response of the air transport market to COVID19.
- It helps to explore the **timing of the effects** and also consider the **feedback of the event** through the dynamics of the series itself.

Method (2)

For the AR(1) process, the intervention analysis of this study can be modelled as:

$$y_t = \alpha_0 + \alpha_1 y_{t-1} + \delta_0 COVID19_t + \varepsilon_t$$

where: y_t denotes flights frequency and $|\alpha_1| < 1$ (stationary).

- Prior to the intervention (COVID19), the long-run mean of the series $\alpha_0/(1-\alpha_1)$. Notice that for $t < 2020:4$, $COVID19_t = 0$.
- The **immediate effect** of the COVID19 is given by the magnitude of δ_0.
- The **long-run effect** of COVID19, $\delta_0/(1-\alpha_1)$, is equal to the new long-run mean $(\alpha_0 + c_0)/(1-\alpha_1)$ minus the value of original mean $\alpha_0/(1-\alpha_1)$.

$$\frac{\delta_0}{1-\alpha_1} = \frac{\alpha_0+\delta_0}{1-\alpha_1} - \frac{\alpha_0}{1-\alpha_1}$$

Method (3)

- The temporal recovery of the market is forecasted by applying **SARIMAX** model.
- SARIMAX model upgrades the ARIMA model by including two momentous components: **seasonality** and **exogenous** variables.
- The specified *ARIMA* model complemented with $SARIMAX(p, d, q)(P, D, Q, m)$ is defined as follows:

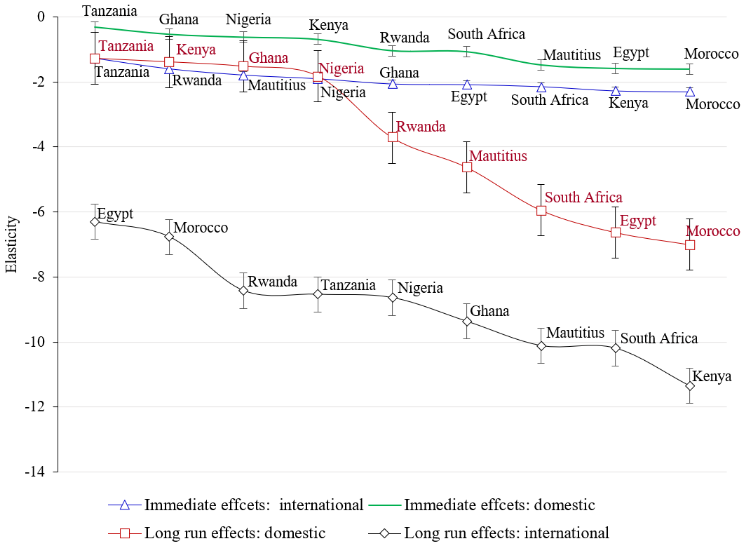
$$y_t = \alpha_0 + \sum_{n=1}^{p} \alpha_n y_{t-n} + \sum_{n=1}^{q} \theta_n \epsilon_{t-n} + \delta_0 COV19_t + \sum_{n=1}^{P} \phi_n y_{t-sn} + \sum_{n=1}^{Q} \beta_n \epsilon_{t-sn} + \epsilon_t$$

Method (4)

The best-fitting ARIMA (SARIMAX) models:

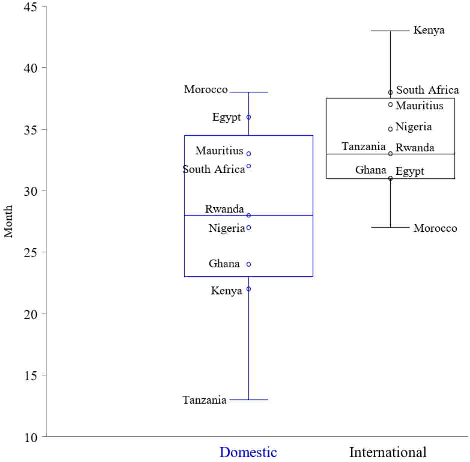
	Model
Egypt	ARIMA (1,1,1) SARIMA (1,1,1,12)
Ghana	ARIMA (1,1,0)
Kenya	ARIMA (1,1,1) SARIMA (1,1,0,12)
Mauritius	ARIMA (1,1,1) SARIMA (1,1,1,12)
Morocco	ARIMA (1,1,1) SARIMA (1,1,1,12)
Nigeria	ARIMA (1,1,1)
Rwanda	ARIMA (1,1,1)
Tanzania	ARIMA (1,1,1) SARIMA (1,1,0,12)
South Africa	ARIMA (1,1,1)

The immediate and long-run effects

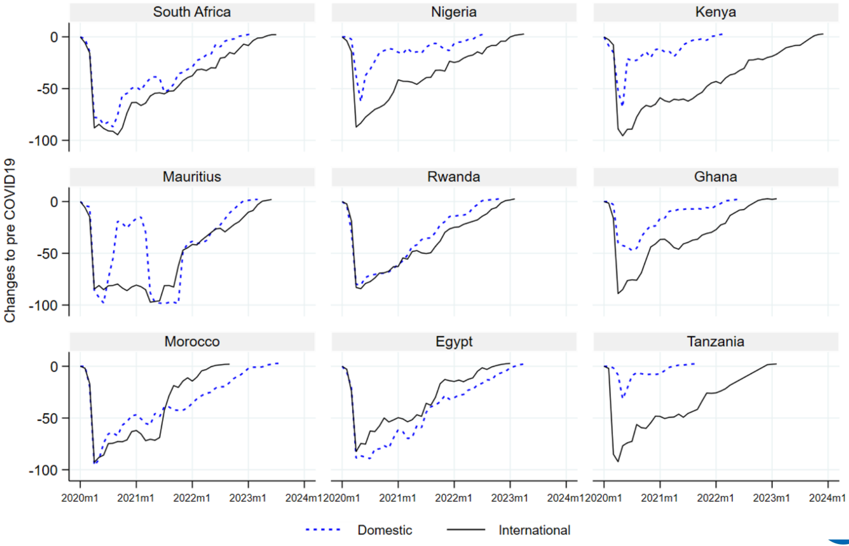


Temporal recovery of the aviation industry

The recovery needs, on average, 28 months (2.3 years) for domestic and 34 months (2.8 years) for international starting from 2020.



Shapes of recovery paths



Conclusions

- The results showed that air transport is elastic to the outbreak.
- Significant deviations across countries are observed in the timing of the effects (immediate vs long-run) than types of markets (domestic vs international).
- COVID19 has been episodic so that airlines need to make rolling changes in response to unpredictable state measures.
- However, the fluctuations observed in the aviation market due to the pandemic and the nature of rebound could be considered as cyclical than structural change.