

MALDIVES MONETARY AUTHORITY

QUARTERLY ECONOMIC BULLETIN

FIRST QUARTER 2023

VOLUME 29 ISSUE 1



mma.gov.mv

Editorial Team:

Idham Hussain

Mariyam Rashfa

Mansoor Zubair

Aminath Shafwath

Mohamed Amdhan

Dhaha Shuaib

This bulletin is compiled by the Research Division (RD) of the Maldives Monetary Authority (MMA). It covers developments in the domestic and international economy during the first quarter of 2023. The analyses are based on information provided by relevant government authorities, commercial banks operating in the country, public enterprises and other private sector sources, as at 4 May 2023. Where actual data is not readily available, estimates have been made by RD based on available information. The timely receipt of data is therefore crucial to the compilation of this publication and the analyses contained herein.

Contents

Recent Economic Developments

Macroeconomic Outlook	6
Near-term Inflation Outlook	8
Overview	11
International Economic Developments	12
Global Output	12
Global Inflation	14
Commodity Price	15
Global Financial Markets	16
Economic Developments in the Maldives	18
Real Economy	18
Inflation	22
Public Finance	24
Monetary Developments	26
Financial Sector	29
External Trade	33

Articles 37

Nowcasting Monthly Sectoral Economic Growth Indices	38
---	----

Statistical Appendix

Abbreviations

BPT	business profit tax
CPI	consumer price index
FAO	Food and Agriculture Organization
GDP	gross domestic product
GST	goods and services tax
G-GST	general goods and services tax
GIR	gross international reserves
GWP	Gross Written Premium
HICP	Harmonised Index of Consumer Prices
IMF	International Monetary Fund
MBS	Maldives Bureau of Statistics
MIFCO	Maldives Industrial Fisheries Company
MMA	Maldives Monetary Authority
NCG	net claims on central government
NDA	net domestic assets
NFA	net foreign assets
NII	net interest income
NPL	non-performing loan
NWP	net written premium
ODF	overnight deposit facility
PMI	purchasing managers' index
ROA	return on assets
ROE	return on equity
QBS	quarterly business survey
QNA	quarterly national accounts
RBI	Reserve Bank of India
SOE	state-owned enterprise
STO	State Trading Organization
T-GST	tourism goods and services tax
UNWTO	United Nations World Tourism Organization

UAE	United Arab Emirates
UK	United Kingdom
US	United States
WEO	World Economic Outlook



RECENT ECONOMIC DEVELOPMENTS

Macroeconomic Outlook

Following the surprisingly strong performance in the latter half of 2022, global economic activity is anticipated to moderate in 2023 amid sustained impact of the Russia-Ukraine war and persistent tightening of financial conditions, stemming from the impact of the continued central bank rate hikes to combat inflationary pressures across the globe as well as the recent financial sector turmoil. As per the IMF World Economic Outlook (WEO) April 2023 report, following an estimated growth of 3.4% in 2022, global growth is projected to moderate further and bottom out at 2.8% in 2023—0.1 percentage point higher than the projections of October 2022. Global growth is projected to rise modestly to 3.0% in 2024, reflecting further easing of supply chain disruptions, and the moderation of fallout from the Russia-Ukraine war, with inflationary pressures expected to recede significantly.

Driven by the strong performances estimated for all major sectors, the Maldivian economy is anticipated to continue the upward trajectory during 2023¹, after having reached pre-pandemic growth levels by the end of 2022. According to the forecasts made in April 2023, following the 13.9% rebound in growth in 2022, real GDP growth is estimated to reach 9.4% in 2023—1.8 percentage points higher than the moderate scenario for real GDP growth estimated in October 2022. Further, with the stronger-than-expected performance of the tourism sector during the first quarter of 2023, and reflecting the buoyant arrivals from Russia, India, and other key European markets, total tourist arrivals are expected to exceed the pre-pandemic (2019) levels, reaching over 1.9 million for 2023.

As per the projections of October 2022, the current account deficit is expected to narrow to

15% of GDP in 2023, from 17% in 2022, reflecting the anticipated moderation of oil prices during the year, together with the forecasted growth of tourism-related receipts and overall domestic economic activity. During the year, the current account deficit is expected to be financed primarily by foreign direct investments (FDI) inflows, together with borrowings by the government and the private sector. However, the overall balance of payments is anticipated to record a deficit of US\$32.1 million in 2023. The GIR is set to decline to US\$606.3 million in 2023, from US\$832.1 million in 2022.

Following an inflation rate of 3.1% during Q4-2022, the rate of inflation picked up to 3.9% during Q1-2023, predominantly reflecting the hike in G-GST rate, from 6% to 8% from January 2023 onwards. However, with the anticipated moderation of global oil and commodity prices, inflation is projected to decelerate modestly over Q2 and Q3-2023 and stabilise during Q4-2023. As per the forecasts of April 2023, the domestic inflation rate is projected to accelerate to 3.4% for the year 2023—2 percentage points lower than that of October 2022 (refer to the Near-term Inflation Outlook for additional details). The latest forecasts exclude the assumption based on the implementation of electricity subsidy reform during 2023, while the revised forecasts for global energy and commodity prices were considered. Risks to inflation remain tilted towards the upside, with major risks emanating from supply chain disruptions due to the Russia-Ukraine war and geopolitical fragmentation. Nonetheless, potential downward contributors could emanate from a larger-than-projected decline in global crude oil prices during the year.

The moderation of the adverse risks to growth outlook persist for both the global and

¹ According to growth forecast scenarios estimated in April 2023 jointly by the MMA and the Ministry of Finance.

domestic economy since the growth projections of October 2022, although the balance of risks to the growth outlook remains firmly tilted to the downside. One factor that could exacerbate both financial conditions and debt distress is the potential escalation of the Russia-Ukraine war. Additionally, the recent financial turmoil illustrated the substantial vulnerabilities in the financial sectors of the United States (US) and Europe in the face of sharp tightening of monetary policy over the past 12 months to control inflationary pressures, although a crisis has been averted thus far owing to the swift and strong action taken

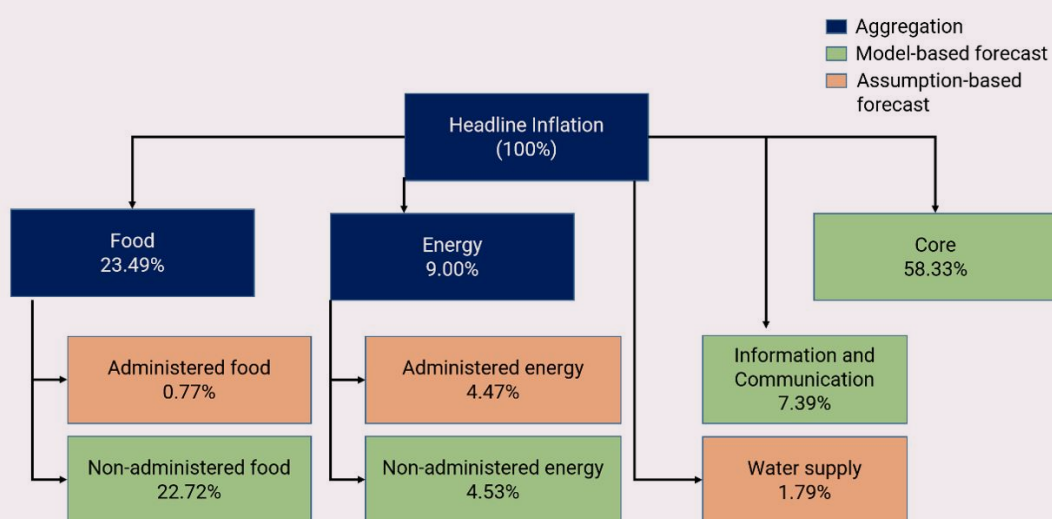
by the regulators to curb the contagion effects. Further tightening of global financial conditions could hinder access to global financial markets, and potentially lead to worsening debt distress. Such shocks could result in weakened growth in the Europe, dampening travel demand and lowering the anticipated number of total tourist arrivals from the region. However, growth could be lifted by higher-than-anticipated tourist arrivals from key source markets—particularly with the resumption of air travel between China and the Maldives—providing a strong boost to the tourism sector performance.

Near-term Inflation Outlook

From the outset, it is important to note that forecasts will not be precisely accurate on account of the random shocks that hit the economy. This is especially true for the Maldives, as the economy is highly exposed to external sector developments due to its small size and high degree of openness. Rather, forecasts are meant to serve as indicators about future developments and are important inputs in the policymaking process.

The Maldives Monetary Authority produces quarterly forecasts for inflation on a one-year horizon. The latest near-term inflation forecasts for 2023 were made in April 2023, based on the available data. To forecast annual inflation of the Republic Consumer Price Index (CPI), the CPI has been disaggregated into food, energy, information and communication, and water supply, with the remaining categories of the CPI grouped into a core residual group. The food and energy groups have been further disaggregated into administered and non-administered prices. The seven disaggregated groups of the CPI were forecasted using a combination of model-based or assumption-based forecasts. Figure 1 summarizes the disaggregated CPI groupings, the associated weights, and the approach used for forecasting. The bottom-level forecasts were then aggregated to construct a forecast for headline inflation of the Republic CPI.

Figure 1: Summary of the Disaggregated CPI Used for Forecasting Inflation



For the near-term inflation forecasts of 2023, the actuals of the CPI data were available only for the months of January and February 2023. Given this, the average index values for the two months of available data were treated as actuals to estimate inflation for the quarter. The estimated inflation for Q1-2023 was utilised as the last data point in the estimation samples, and inflation was forecasted for the remaining three quarters of the year. With the release of the data for March 2023 (on 24 April 2023), actual inflation for the quarter recorded 3.9%—one percentage point higher than the estimate of 3.8% used in the forecasting process.

The model-based projections utilise information from past trends and cycles of the inflation rates of the disaggregated CPI groupings and additionally consider the movements of several exogenous variables over the forecast horizon, including crude oil and commodity prices in international markets. Further, variables were incorporated into the models to capture the impact of expected domestic policy changes on consumer prices. In particular, the inflationary impact of the G-GST rate increase of 2 percentage points, implemented from 1 January 2023 onwards, has been factored into the forecasts for non-administered food, information and communication and core consumer price indices.

Furthermore, in terms of movements in the external sector, crude oil prices were expected to decrease over the year to average at US\$80 per barrel during the year 2023 according to the US Energy Information Administration (EIA), which represents a decline of 18% compared with the previous year. The crude oil price forecasts are also expected to feed into other commodities such as the world food prices, which is forecasted to decline by 6% in 2023 compared with 2022.

Figure 2 depicts the forecasted trajectory of the mean inflation forecasts over the remaining three quarters of the year alongside the contributions from the disaggregated groups. While the lower prices of the international commodities moderated the forecasted

inflation rates during the year, the domestic policy change of increasing the G-GST rate has resulted in an increase in the forecasted inflation rate which is expected to average at 3.4% for the year 2023—2 percentage points lower than the 5.4% forecasted in October 2022, partly explained by the removal of the assumption on the implementation of the electricity subsidy reform during 2023.

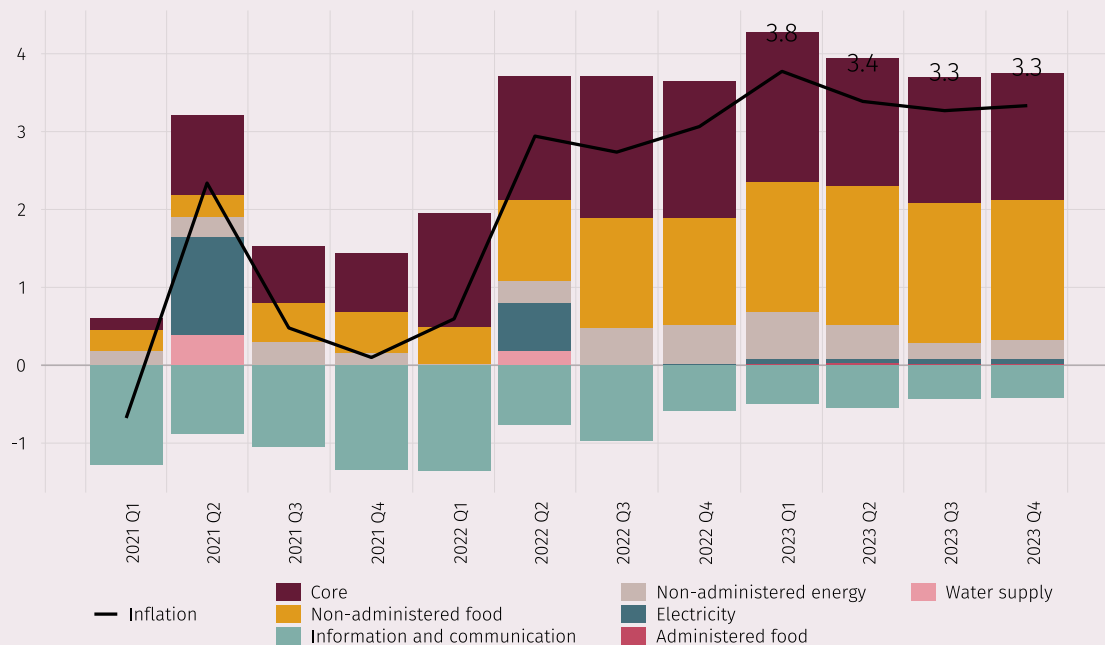
Figure 3 shows the upper and lower 80% and 90% prediction intervals around the baseline forecasts, to account for uncertainty and risks. The risks around the projections largely center around the volatility of global commodity prices in the international markets and their passthrough to domestic inflation.

As such, it should be noted that EIA has further revised the forecasts down to US\$76 for the year since the forecasts were made. However, on the other hand, following the recent announcement of a surprise production cut by the Organization of the Petroleum Exporting Countries (OPEC), there is an upside risk that crude oil prices could surge towards the end of the year. Such an increase is likely to pass through to the prices of other commodities in international markets and domestic inflation.

On the domestic front, unanticipated changes in the policy environment, specifically changes to the subsidy policies could pose either upside or downside risks to the projections.

Figure 2: Mean Inflation Forecasts and Contributions to Inflation from the Disaggregated Groups of the CPI, 2021 - 2023

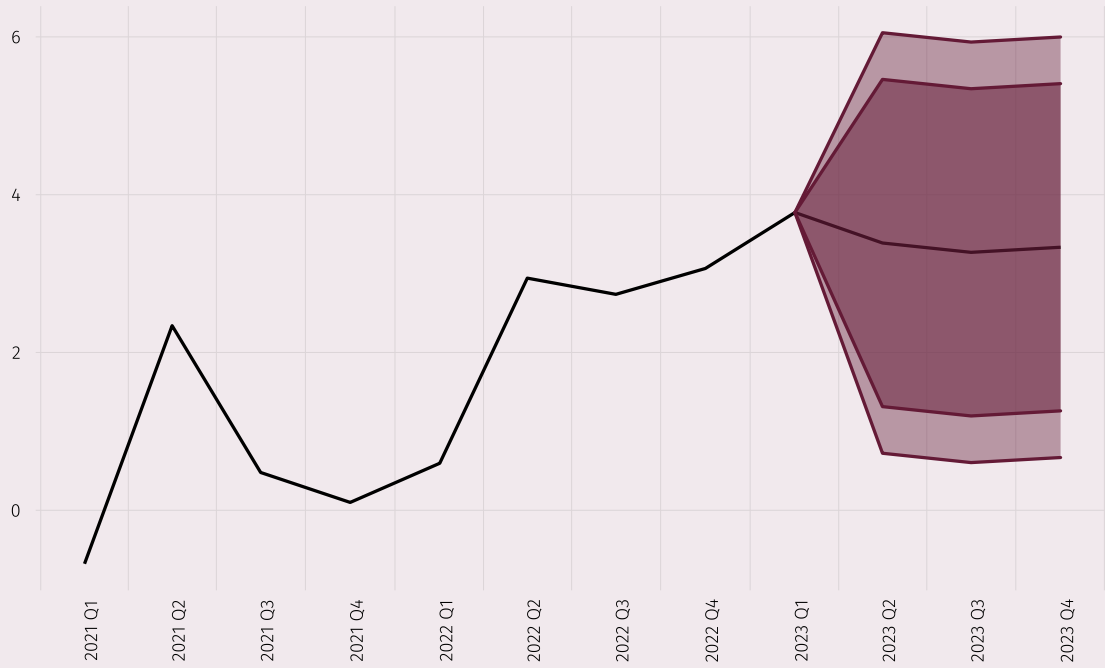
(percent)



Source: Maldives Monetary Authority, Maldives Bureau of Statistics

Figure 3: Inflation Forecasts, with 80% and 90% Prediction Intervals, 2021 - 2023

(percent)



Source: Maldives Monetary Authority, Maldives Bureau of Statistics

Overview

Domestic economic activity is estimated to have expanded in Q1-2023, according to the available high frequency indicators and business survey results. During the quarter, growth was supported by the buoyant performance of the tourism sector and related sectors such as the transport and communication sector as well as the construction and real estate sector. As such, growth of the tourism sector reflected higher tourist arrivals and bednights stemming from the surge in arrivals from major source markets of Europe and Asia. Similarly, available high-frequency indicators point to an expansion in both fisheries, and wholesale and retail trade sector during the review quarter.

Meanwhile, the rate of inflation (as measured by the annual percentage change in the national Consumer Price Index [CPI]) accelerated to 3.9% in Q1-2023 from 3.1% in Q4-2022. The acceleration in domestic inflation during the quarter was mainly attributable to higher inflation on food together with cost of certain services such as transport services, restaurant and accommodation services, outpatient care services and education services. In contrast, a decline was observed in information and communication services, which was also the main downward contributor to inflation.

Turning to fiscal developments, total government revenue (excluding grants) recorded an annual increase during Q4-2022, owing to an increase in non-tax revenue, together with a growth in tax revenue during the quarter. Meanwhile, total expenditure (excluding debt amortisation) also observed an increase during the review quarter, driven primarily by the rise in capital expenditure,

while recurrent expenditure also posted an increase. The growth in recurrent expenditure stemmed from the growth in salaries and wages, whereas the growth in capital expenditure mainly reflected higher spending on infrastructure assets.

As for monetary developments, annual broad money growth decelerated to 5% at the end of March 2023, mirroring the marked decline in net foreign assets (NFA), despite the sizeable growth of net domestic assets (NDA) of the banking system. The decline in NFA largely reflected a decrease in the MMA's foreign currency other deposits held abroad as well as increase in the foreign liabilities of the MMA owing to the foreign currency swap obtained from the Reserve Bank of India (RBI) together with growth in foreign liabilities of the commercial banks. Meanwhile, the growth in NDA stemmed from the rise in net credit to the government (NCG) by both the commercial banks and the MMA, as well as the expansion in bank credit to the private sector, public non-financial corporations, and other financial corporations.

With regard to the external sector, total merchandise exports registered an annual increase during the review quarter, driven by a sizeable growth in merchandise re-exports, together with an increase in domestic exports. The rise in merchandise re-exports mirrored the increase in jet fuel re-exports, while the increase in domestic exports stemmed from notable growth in export earnings from frozen skipjack tuna. Meanwhile, merchandise imports recorded an increase owing to a growth in import expenditure of most of the major categories.

International Economic Developments

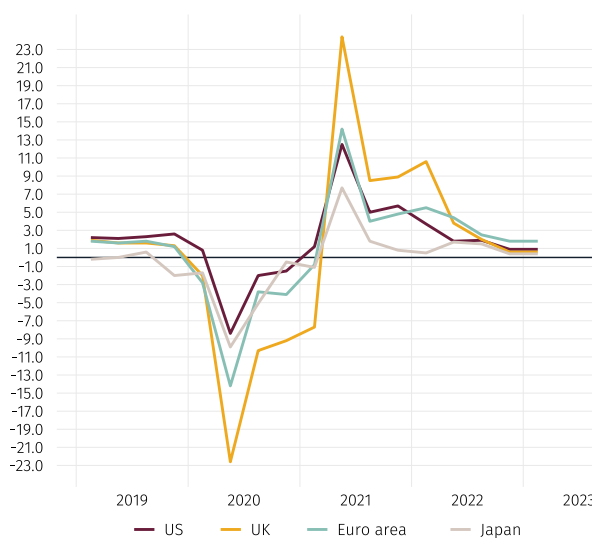
Global Output

The global economic growth is projected to moderate in 2023 amid heightened uncertainties and the accumulated consequences of the past three years' negative shocks—most notably, the COVID-19 epidemic and war in Ukraine—manifesting in unexpected ways. As such, after registering a growth of 3.4% in 2022, global growth² is estimated to moderate to 2.8% in 2023—a downward revision of 0.1 percentage points from estimates made in January 2023. The global economy experienced varied growth outcomes in Q1-2023, with diverging trends across both advanced and emerging markets, and developing economies. Although economic activity in most countries remained robust, surging global commodity prices and persisting supply disruptions hampered economic performance in others. As such, growth in some of the advanced economies observed deceleration, while others remained robust. Meanwhile, most major emerging markets and developing economies outperformed expectations during the quarter.

Looking at the advanced economies, the US economy observed a slowdown and registered a growth of 1.1% in Q1-2023, after recording 2.6% in Q4-2022 (Figure 1). The deceleration of economic growth quarter-on-quarter was primarily owing to a decline in private inventory investment and a deceleration in residential fixed investment. However, this was offset by the increase in consumer expenditure, exports, both federal and local government expenditure, as well as non-residential fixed investment.

² International Monetary Fund, 'World Economic Outlook (WEO) April 2023'.

Figure 1: Real GDP Growth in the Advanced Economies, 2019 - 2023 (annual percentage change)



Source: Bloomberg Database

As per the Eurostat flash estimates, the euro area recorded a growth of 0.1%, turning slightly positive, after remaining stable during the previous quarter. The upturn was primarily driven by business activity in the services sector, while the manufacturing industry benefited from the easing of supply chain disruptions as depicted by the decline in the supplier delivery times indicator. Despite this, weak domestic demand and business investment continued to weigh on economic activity in the area. Among major eurozone countries, economic growth in Germany stagnated during the first quarter of the year, following a contraction during the fourth quarter of 2022.

Similarly, growth in France remained stationary, mirroring muted domestic demand. Meanwhile, both the Italian and Spanish economies expanded slightly during the quarter.

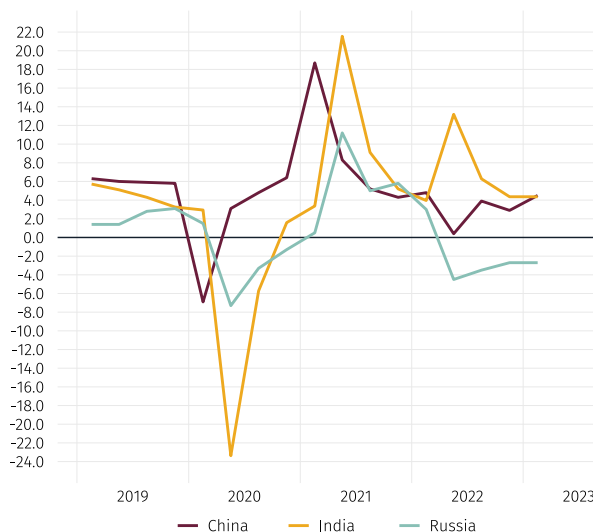
After expanding to 0.4% in Q4-2022, the growth momentum of the Japanese economy is expected to remain robust in Q1-2023. In this regard, the average Purchasing Manager's Index (PMI) for Q1-2023 recorded a further expansion, after increasing slightly during the preceding quarter. Elevated commodity prices and a slowdown in the rate of recovery in other economies weighed on economic growth in the country. Nevertheless, economic growth in Japan is expected to be supported by factors such as the realisation of pent-up demand.

Meanwhile, the growth momentum in the United Kingdom (UK) is estimated at 0.1% in Q1-2023, following a growth of 0.6% in Q4-2022, as reflected by the expansion of the average PMI for the review quarter. Moreover, high frequency indicators depicted that debit and credit card spending as well as labour market and construction activity picked up during the quarter. Despite subdued recovery of business activity in key sectors of the economy, services and construction sectors expanded during the quarter, boosting economic growth in the UK.

Looking at the emerging markets and developing economies, China's economic growth accelerated to 4.5% in Q1-2023 from 2.9% in the previous quarter (Figure 2). This rebound in economic growth is indicated by the significant increase in mobility and congestion in major cities as the wave of COVID-19 infections receded during the quarter. However, other indicators of economic performance such as those pertaining to the price of coal and air quality depicted muted recovery. Similarly, the rebound of the real estate sector of the country also remained subdued.

The growth momentum in India has been retracting since the Q3-2022 and stood at 4.4% in

Figure 2: Real GDP growth in the Emerging Economies, 2019 - 2023 (annual percentage change)



Source: Bloomberg Database

Q4-2022. Accordingly, high frequency indicators of the economy depicted further deceleration in economic activity during Q1-2023, due to tightened financial conditions and elevated oil prices. Despite this, the average PMI figure for the quarter showed a modest improvement. This is following the previous quarter's moderate expansion, amid worries about a worldwide recession and persistent geopolitical conflicts.

The Russian economy is expected to have observed a faster-than-anticipated rebound during the first quarter of 2023, following a contraction of 2.7% in Q4-2022. This mirrored both the increase in domestic demand as well as the ongoing restructuring of the Russian economy. Moreover, the composite PMI also recorded an expansion during the quarter. Despite the persistent challenges of the external environment, the growth in domestic demand was supported by the improvement in business sentiments. However, it is noteworthy that although consumer demand in the country continued to recover, it remained largely muted. Additionally, despite the record-low unemployment levels, growth continued to be hampered by tight labour market conditions (owing

to the partial mobilisation of reservists and higher labour demand by businesses) which continued to severely restrict the ability of the economy to boost production.

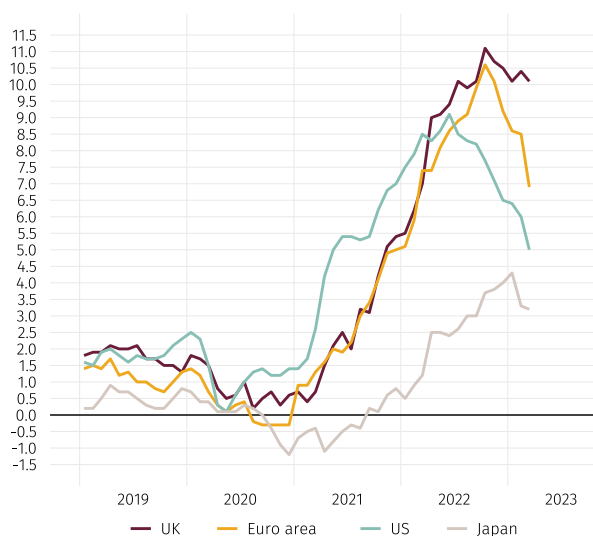
Global Inflation

Following a year of multi-decade high inflation worldwide, global inflation moderated during the first quarter of 2023, as global food and energy prices eased with favourable base effects. As such, headline inflation in majority of the selected advanced economies as well as most emerging and developing economies moderated during the quarter.

Looking at the price developments in the advanced economies, the rate of inflation in the US decelerated to 5.8% from 7.1% in Q4-2022 (Figure 3). The moderation of inflation in the US was mainly due to decline in energy prices, as well as prices of used cars and trucks, while upward inflationary pressure during the quarter stemmed primarily from the rise in prices of services less energy services. In the euro area, the rate of inflation, as measured by the annual change in the Harmonised Index of Consumer Prices (HICP) is anticipated to have remained elevated in Q1-2023, after surging to 10.0%—the highest ever recorded—during Q4-2022. This reflected the continued passthrough of the elevated prices of energy and other inputs to consumer prices.

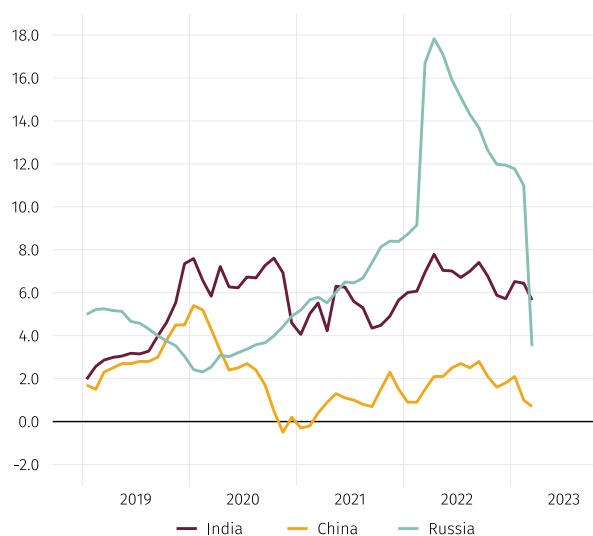
As for Japan, the rate of inflation moderated slightly to 3.7% in Q1-2023 from a 40-year high of 3.8% in the preceding quarter. The slowdown in the inflation rate was primarily due to the government energy subsidies intended towards curbing utility bills. Moreover, favourable base effects from the elevated energy and food prices during the preceding year contributed to the moderation in price dynamics of the country. Nevertheless, the cost of non-energy goods such as food and other daily necessities continued to grow, indicating the passthrough of the higher raw

Figure 3: Inflation Rate in the Advanced Economies, 2019 - 2023 (percent)



Source: Bloomberg Database

Figure 4: Inflation Rate in the Emerging Economies, 2019 - 2023 (percent)



Source: Bloomberg Database

material costs. Meanwhile, the rate of inflation in UK slowed to 10.2% in Q1-2023, after registering 10.8% in the previous quarter—the highest rate of inflation recorded since the second quarter of 1992). The largest downward contributions stemmed from prices in the services sector such as communication, education and health services. This was partially offset by upward contributions from housing, water, electricity, gas and other fuels, as well as food and non-alcoholic beverages.

Turning to the emerging markets and developing economies, the rate of inflation in China decelerated to 1.3% during the review quarter, from 1.8% recorded in Q4-2022 (Figure 4). The moderation in inflation dynamics in the country reflected the persistently weak domestic demand. Contrary to inflation projections estimating an ease during 2023 supported by strong base effects from the previous year, the rate of inflation in India accelerated slightly to 6.2% in Q1-2023, from 6.1% in Q4-2022. This acceleration reflected the elevated prices across all major categories. As for Russia, the rate of inflation decelerated to 8.8% in Q1-2023, from 12.2% in Q4-2022. This primarily mirrored cautious consumer behaviour in the face of widespread uncertainty and the gradual restoration of import supply chains that improved the supply of consumer goods.

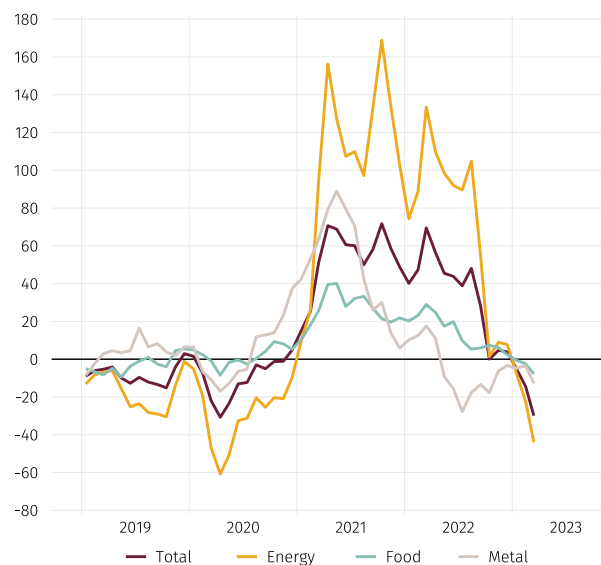
Commodity Prices

During Q1-2023, the IMF price index for all commodities declined by 17% and 9% in annual and quarterly terms, respectively (Figure 5). This was primarily due to the persistent decline in energy prices, largely reflecting weakened global growth as well as the stabilisation of global export markets for coal and natural gas. Additionally, the decline in global food prices also contributed to the fall in the all commodities index, reflecting the decrease in prices of meat, dairy, cereal and vegetable oils. However, global metal prices recorded a growth, boosted by the reopening of the Chinese economy.

Energy Prices

The price of crude oil³ averaged US\$79.1 per barrel during the quarter, representing a decline of 18% in annual terms, and a decrease of 7% relative to the previous quarter. The fall in oil prices during the quarter can be primarily attributed to

Figure 5: Commodity Prices, 2019 - 2023
(annual percentage change)



Source: IMF

the monetary policy stance in major advanced economies as well as the recent financial market turmoil.

A significant development in oil demand since the beginning of 2023 was China's reopening following the implementation of severe COVID-19-related restrictions. However, the initial anticipation that China's reopening would result in a sharp increase in oil demand, given that China is the world's second-largest consumer of oil, has been muted by the hike in global interest rates and moderation of economic activity in advanced economies. In Europe, tightened financial conditions and the Russia-Ukraine war resulted in a moderation in economic activity and a contraction in oil demand, while in the US—the largest consumer of oil in the world—the Federal Reserve's monetary policy rates weighed on activity levels and oil demand. Despite this, oil demand is expected to grow during 2023, supported by the rebound in travel demand as reflected by the significant increase in international passenger flights observed during the first quarter of the year. On the supply side, production in non-OPEC+ nations were mostly stagnant in the first

³ Quarterly average of Brent, West Texas Intermediate and Dubai Fateh.

quarter of the year. Meanwhile, despite the EU and G7 price cap and the EU embargo, Russian oil production and exports remained broadly unchanged.

Metal Prices

Turning to major commodities in the non-energy index, the base metal index declined by 17% in annual terms, although it increased by 7% in quarterly terms. The increase in base metal prices during the quarter was mainly due to the reopening of China's economy as well as supply concerns⁴. However, the initial optimism regarding the demand for base metals following the reopening of Chinese economy moderated, as the property sector of the country—accounting for a substantial fraction of global demand for metals—continued to face financial difficulties despite policy support.

Food Prices

As for global food prices, the IMF food price index recorded an annual decline of 4%, although an increase of 4% was observed when compared with the preceding quarter. Meanwhile, the Food and Agriculture Organization (FAO) food price index declined by 11% and 4% in annual terms and quarterly terms, respectively. This was led by declines in prices of most staples such as vegetable oils, dairy, cereals, and meat, underpinned by the persistently weak global import demand. However, sugar prices recorded an increase due to amplified concerns of tightened global supply amid lower-than-expected output across major producers.

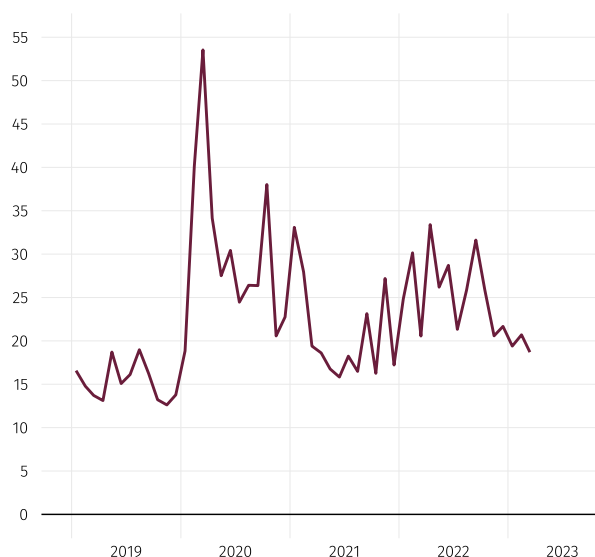
Global Financial Markets

Global financial conditions continued to be constrained in both advanced and emerging market and developing economies in Q1-2023,

amidst persistent inflationary pressures as well as geopolitical and economic uncertainties. The tightening of monetary policy measures was primarily due to the impact of the war in Ukraine, which led to sharp rise in commodity prices and prolonged supply chain disruptions. However, as several economies are on the rebound, together with moderating inflation levels, global financial conditions are expected to gradually ease during the year.

In Q1-2023, share prices on average observed increases in both the advanced, and emerging markets and developing economies, when compared with the corresponding quarter of the previous year. Accordingly, the implied volatility of the US stock market registered a decline during the review quarter (Figure 6)⁵. While the yield-to-maturity on longer-term sovereign bonds increased in most economies of both country groups, when compared with the previous quarter, the sovereign bond yields of the selected economies in both

Figure 6: Volatility Index, 2019 - 2023 (percent)



Source: Bloomberg Database

⁴ Includes production disruptions in Chile, Peru, the Democratic Republic of Congo, Indonesia, and Panama—the largest global producers of base metals such as copper and tin.

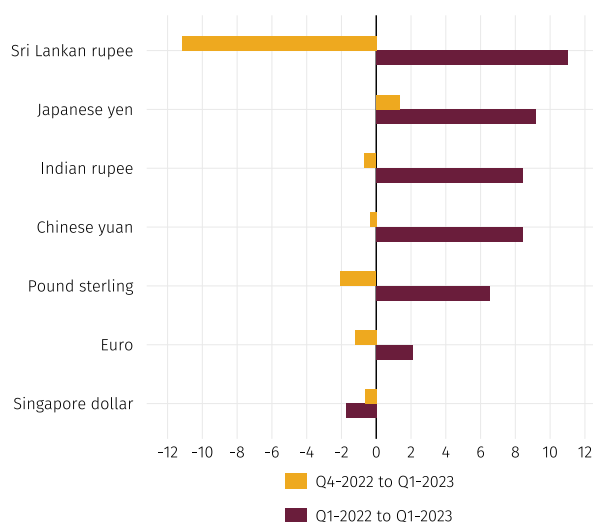
⁵ Chicago Board of Exchange's Volatility Index (VIX Index) is used as an overall benchmark for volatility in the stock market. A VIX level above 20 is typically considered high (volatility is high), while a VIX below 12 (volatility is low) is considered low and anything in between 12 and 20 is considered normal.

country groups decreased as monetary policy decisions eased against a positive backdrop of robust growth and declining inflation.

Most of the economies continued to tighten monetary policy measures to combat rising inflationary pressures during the review quarter. In this regard, the European Central Bank further raised the three key interest rates by a total of 50 basis points during March 2023. Similarly, the Federal Reserve and the Bank of England both raised their respective key bank interest rates by 0.25 percentage points during the quarter, with the aim of reigning in inflationary pressures. Meanwhile, in the emerging markets and developing economies, the RBI further increased the policy rate by 25 basis points to 6.50% in February 2023 to meet the central bank's inflation target. Conversely, policy rates in China remained unchanged for the seventh consecutive month in March, as GDP growth in Q1-2023 was anticipated to be line with expectations. Similarly, the Central Bank of Russian Federation maintained the key rate at 7.50% per annum, amid expansion in domestic demand and elevated inflation expectations.

In the foreign exchange market, the overall performance of the US dollar against the currencies of the Maldives' major trading partners remained strong during the review quarter, relative to Q1-2022, although it weakened when compared with Q4-2022 (Figure 7). In this regard, the US dollar strengthened against all trading partner currencies, except for the Singapore dollar, at the end of Q1-2023 when compared with Q1-2022. However, in quarterly terms, the US dollar weakened against all currencies, except for the Japanese yen.

Figure 7: Exchange Rates, Q1-2023
(percentage change)



Source: Bloomberg Database
Note: Percentage changes have been calculated using spot rates at the end of each quarter.

Economic Developments in the Maldives

Real Economy

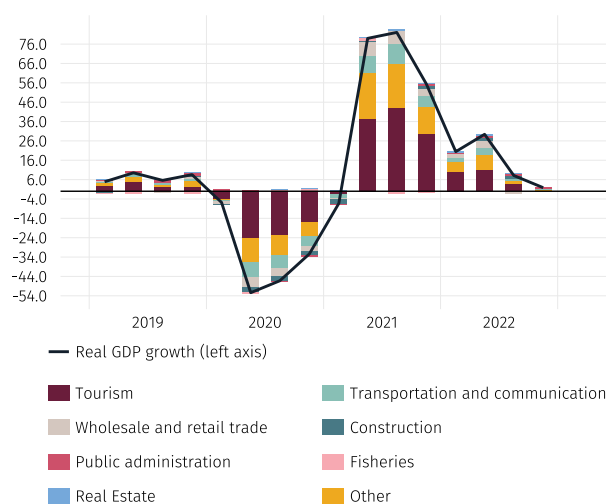
Gross Domestic Product

According to the available high frequency indicators and business survey results, all major sectors of the domestic economy are estimated to have expanded during the quarter, except for wholesale and retail trade sector, which registered a marginal growth. Based on the MMA's nowcasts⁶ of April 2023, real GDP is estimated to have improved by 9.0% during Q1-2023, contributed by the buoyant performance of the tourism sector and related sectors such as the transport and communication sector. Additionally, real GDP growth was also supported by the expansion of the construction and real estate sector during the review quarter. The growth of the tourism sector reflected the increase in tourist arrivals and bednights, primarily owing to the surge in arrivals from major source markets of Europe and Asia.

According to the latest Quarterly National Accounts (QNA)⁷ estimates released by the Maldives Bureau of Statistics (MBS) on 17 April 2023, real GDP registered an annual growth of 1.8% in Q4-2022⁸, after registering a growth of 8.1% in Q3-2022 (Figure 8). Similarly, when compared to the pre-pandemic levels of Q4-2019, real GDP registered a growth of 7.1% during the quarter.

Figure 8: Contribution to Real GDP Growth by Economic Sectors, 2019 - 2022

(annual percentage change, percentage point contribution)



Source: Maldives Bureau of Statistics

During Q4-2022, real GDP growth was mainly contributed by the transportation and communication sector (0.7 percentage points) and public administration sector (0.6 percentage points). Other notable positive contributions to growth were made by the real estate sector (0.3 percentage points), education sector (0.2 percentage points) and the electricity and water supply sector (0.2 percentage points), whereas, the

⁶ Calculated based on monthly nowcast estimates for sectoral real GDP growth, which are aggregated to obtain quarterly estimates. For further details on the nowcasting methodology, refer to the article 'Nowcasting Monthly Sectoral Economic Growth Indices', page 37.

⁷ Latest QNA data available at the time of compilation of this report was for Q4-2022. Advance estimates data are released with a four-month lag.

⁸ As QNA data for Q4-2022 used in this analysis is based on advance estimates, the data is subject to change in the upcoming revisions.

construction sector (0.03 percentage points) and tourism sector (0.01 percentage points) registered marginal growths during the quarter.

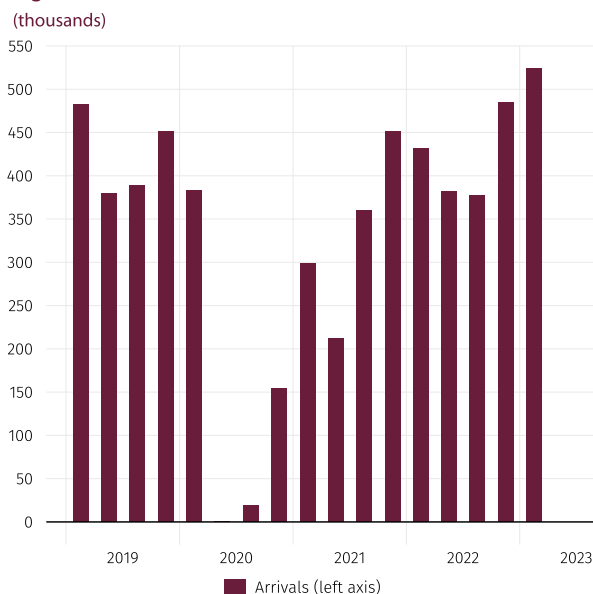
Meanwhile, negative contributions to real GDP growth were made by the entertainment, recreation and other services sector, wholesale and retail trade sector, and human, health and social work sector, as indicated by the decline in the gross value added of the sectors, which fell by 8.9% (-0.2 percentage points), 2.0% (-0.2 percentage points), and 1.8% (-0.1 percentage points), respectively. Similarly, the fisheries sector also declined marginally by 0.4% during Q4-2022.

Tourism

Following a three-year hiatus, the Maldives welcomed the first tourist arrivals from China in January 2023, with the country re-entering the top ten source markets during Q1-2023. Coinciding with the tourism peak-season, the performance of the tourism sector improved, with over half a million tourist arrivals recorded during the first quarter of 2023. This was primarily owing to a surge in arrivals from Europe and other Asian source markets, which resulted in a new record—the highest ever tourist arrivals recorded during a quarter. Additionally, the Maldives welcomed 8,029 tourists on 11 February 2023—the highest daily arrivals observed since the re-opening of international borders in July 2020.

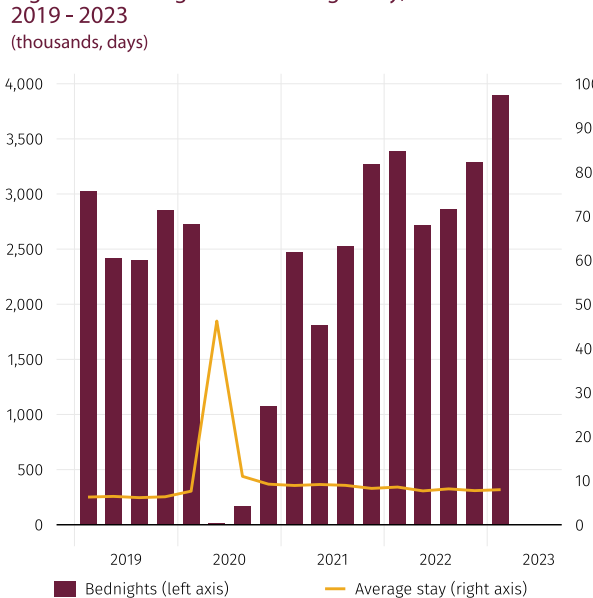
In line with these developments, total tourist arrivals reached 523,928 and rose markedly by 21% when compared with the corresponding period of 2022, as well as by 8% when compared with the pre-pandemic levels of Q1-2019 (Figure 9). As for the tourist bednights, an annual growth of 15% was observed during the quarter, while a growth of 29% was recorded when compared with the pre-pandemic levels (Figure 10). Given the high growth rates registered by the high frequency indicators observed for this sector, the nowcasts for the tourism sector also indicate a growth rate of 13.5%

Figure 9: Inbound Tourist Arrivals, 2019 - 2023



Source: Ministry of Tourism

Figure 10: Bednights and Average Stay, 2019 - 2023



Source: Ministry of Tourism

for Q1-2023. However, with the growth in arrivals outpacing that of tourist bednights, the average stay dropped marginally to 8.0 days in Q1-2023, from 8.5 days in Q1-2022. As for estimated travel receipts for the review quarter, it declined by 10% (US\$150.3 million) and totalled around US\$1.3 billion, down from US\$1.4 billion when compared with Q1-2022⁹.

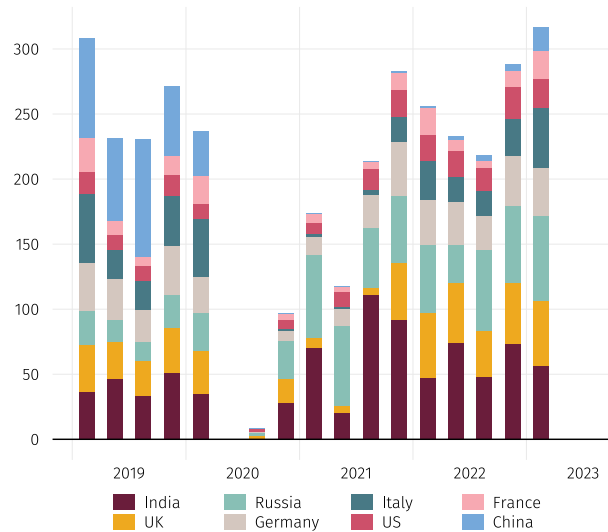
⁹ The tourism receipts figures are based on the estimates made by the MMA.

In terms of market composition, Europe remained as the main source region, accounting for 66% of tourist arrivals—down from the 71% recorded in the corresponding quarter of 2022. Meanwhile, the market share of Asia and the Pacific climbed to 23% in Q1-2023, from 16% recorded in Q1-2022, primarily driven by the increased tourist arrivals from China as well as from India, Korea, Australia and Japan (Figure 11). Russia was the single largest source market during the review quarter, accounting for 12%, followed by India (11%), the UK (10%), Italy (9%), Germany (7%), France (4%), and the US (4%). While the market shares of the UK, Germany and France registered declines of 2% and 1%, respectively, the market share of Russia, India and the US remained broadly unchanged. As for Italy, an increase (2%) in market share was observed during the review quarter when compared to Q1-2022.

According to international flight movements data¹⁰, the number of flight movements registered a growth of 10% when compared with Q1-2022, and a 19% growth when compared with Q1-2019. The growth in flight movements mainly reflected the increase in the frequency of flight movements by major carriers such as FlyDubai, Qatar Airways and Air Asia, as well as the resumption of airlines from China—Beijing Capital Airlines and China Eastern.

On the supply front, the average number of resorts in operation rose to 169 resorts during Q1-2023 when compared with 163 resorts during Q1-2022. The operational bed capacity of the industry rose by 11% in Q1-2023 when compared with the corresponding quarter of 2022. Of the total operational bed capacity, resorts accounted for 68% of beds, followed by guesthouses (24%). As for the occupancy rate of the industry, it rose to 72% in Q1-2023, from 69% a year ago, mainly owing to increase in the average occupancy rate of guesthouses from 37% in Q1-2022 to 55% in

Figure 11: Arrivals from Major Inbound Markets, 2019 - 2023 (thousands)



Source: Ministry of Tourism

Q1-2023. Meanwhile, the average occupancy rate of resorts remained unchanged at 82% during the quarter.

With regard to the developments in global tourism, according to the United Nations World Tourism Organization's (UNWTO) World Tourism Barometer¹¹, international tourist arrivals increased by 62% during the last quarter of 2022, when compared with the corresponding period of 2021, although it continued to remain below the pre-pandemic levels of 2019. Despite the economic, health and geopolitical challenges, the robust recovery of global tourism was supported by strong pent-up demand, higher confidence levels, and the continued removal of restrictions in several destinations. Global tourist arrivals are estimated to reach between 80% to 95% of pre-pandemic levels during 2023, supported by the lifting of COVID-19-related travel restrictions in China, with due consideration given to the potential impact of the evolution of the Russia-Ukraine war.

¹⁰ International flight movements data include all international scheduled and non-scheduled charters.

¹¹ Published in January 2023.

Construction

Activity in the construction sector is estimated to have expanded during Q1-2023 as indicated by the MMA's Quarterly Business Survey (QBS) results and construction-related imports. Additionally, although the gross value added by the sector¹² remained 26.3% below the pre-pandemic levels of Q4-2019, a marginal growth was registered in annual terms during Q4-2022.

While the import of construction-related items registered an annual increment of 21%, the commercial bank credit¹³ to the construction sector¹⁴ fell by 2% at the end of Q1-2023. This was mainly owing to the declines observed in credit lent for construction of residential or housing projects¹⁵, new resort development, renovation of resorts, other real estate projects, property development projects as well as credit extended for guest houses, which offset the increase in credit lent for real estate residential or housing projects, and construction and real estate of commercial buildings.

According to the MMA's QBS for Q1-2023, the volume of construction activity index continued to expand, with the index increasing by 35 points to 64. As for the volume of orders received index, the index gained 6 points to register 47 during the quarter.

Fisheries

According to the available high frequency indicators and the MMA's recent nowcasts, the fisheries sector is estimated to have expanded

during Q1-2023, following two consecutive quarters of negative growth, as indicated by the annual increase in fish purchases made by fish processing companies, as well as the increase in volume of fish exports. As for the gross value added by the fisheries sector in Q4-2022, the sector registered a modest decline (-0.4%).

During Q1-2023, fish purchases totalled 26,052.0 metric tonnes, observing an increase of 6% when compared with Q1-2022. This was primarily owing to the 6% increase in purchases of skipjack tuna, followed by a 7% increase in purchases of yellowfin tuna. As for local purchase prices¹⁶ during the review quarter, the average purchase price of skipjack tuna¹⁷ rose marginally from MVR14.3 per kilogram to MVR15.0 per kilogram, while that of iced skipjack tuna rose from MVR16.3 per kilogram to MVR17.0 per kilogram, in annual terms. However, the average purchase price of yellowfin tuna by local companies declined to MVR58.7 per kilogram in Q1-2023, from MVR77.6 per kilogram in Q1-2022.

As for the volume of fish exports, it rose by 10% (2,499.2 metric tonnes) during the review quarter when compared with Q1-2022, and totalled 27,683.8 metric tonnes. The growth in the volume of fish exports primarily reflected the increase in frozen skipjack tuna exports, which rose by 17% (3,096.2 metric tonnes) during the quarter. Similarly, growths were registered for exports of salted dried fish (excluding tuna) (141.4 metric tonnes) and canned or pouched tuna (106.8 metric tonnes). Meanwhile, declines were observed for exports of frozen yellowfin tuna (581.9 metric tonnes) and

¹² The QNA data for Q4-2022 used in this analysis are based on first estimates, hence the data is subject to change in the upcoming revisions.

¹³ Although a substantial portion of the financing for public infrastructure projects, resort development and social housing development is sourced externally, commercial bank credit to the construction sector remains an important indicator to gauge the performance of the sector.

¹⁴ Construction sector-related loans include loans for new resort development, resort renovation and construction of guesthouses (classified as tourism sector loans), as well as loans to the real estate sector. Hence, this figure will be different from the loans to the construction sector reported under Monetary Developments.

¹⁵ Credit lent for construction of residential or housing projects refers to credit provided for construction or refurbishment of residential or housing properties and which is or will be used by the owner (borrower) or rented for housing purposes. In contrast, credit lent for real estate residential or housing projects includes loans secured whereby the proceeds are used for purchase of the property and construction or refurbishment improvements which are used for residential purposes.

¹⁶ Based on prices collected by the Ministry of Fisheries, Marine Resources and Agriculture.

¹⁷ In September 2020, the state-owned enterprise MIFCO abandoned the fixed rate of fish purchases.

fresh or chilled yellowfin tuna (81.1 metric tonnes) during the quarter.

Wholesale and Retail Trade

While the available high-frequency indicators point to an expansion in the activity level of the wholesale and retail trade sector during Q1-2023, according to MMA's QBS results the wholesale and retail trade sector has slowed down during the period. Accordingly, the MMA's nowcasts for wholesale and retail sector indicate a marginal growth for Q1-2023 after registering a decline of 2.0% in terms of gross value added by the sector in Q4-2022.

Private sector imports (excluding imports by the tourism sector) rose by 8% in annual terms, while the commercial bank credit to the sector increased by 9% during Q1-2023. Conversely, according to the MMA's QBS for Q1-2023, activity in the wholesale and retail trade sector observed a contraction, with the sales index turning negative and plunging 84 points to reach -15 during the quarter, while the volume of orders placed with suppliers also dropped 77 points to reach -11.

Inflation

The rate of inflation (as measured by the annual percentage change in the national Consumer Price Index [CPI]) accelerated to 3.9% in Q1-2023 from 3.1% in Q4-2022. The acceleration in domestic inflation during the quarter was mainly attributable to higher inflation on food together with cost of certain services such as transport services, restaurant and accommodation services, outpatient care services and education services, which was to an extent offset by a decline in information and communication services. Price pressures in Q1-2023 reflected lagged effect of the passthrough of elevated global prices, impact of

the increase in GST rate and planned fiscal reforms.

As for developments in major categories of the CPI, the food and non-alcoholic beverages category—which carries the second highest weight in the CPI basket at 23.5%¹⁸—was the main upward contributor to inflation (1.8 percentage points), registering a further increase from Q4-2022 (Figure 12). Food inflation rose from 6.1% during Q4-2022 to 7.8% during the review quarter largely reflecting acceleration in the growth of prices of fruits (16.3%), dairy products (9.6%), and cereals and cereal products (6.6%), while price of fish also remained high (Figure 13). This was offset to some extent by the decline in price of certain vegetables, while a smaller increase was observed in price of meat.

During the review quarter, cost of services across several major CPI categories accelerated and contributed significantly to inflation. As such, the largest increase was observed in cost of passenger transport services, which rose to 13.4% in Q1-2023 from 8.6% in the preceding quarter. This was primarily driven by the growth in passenger transport by air, mirroring the increase in price of domestic airfare. It is noteworthy that, Maldivian, the national airline of the Maldives, increased ticket prices in March 2023 which contributed to this increase. Further, an increase was observed in passenger transport by road, stemming from the increase in price of taxi fare in July 2022. Secondly, cost of restaurant and accommodation services soared to 6.9% in Q1-2023 from 3.1% in Q4-2022, driven by the increase in cost of restaurant and cafes. This was followed by the increase in health inflation, stemming from cost of outpatient care services which accelerated to 7.0% in Q1-2023 from 3.8% in Q4-2022, reflecting the upward revision of doctor's consultation fees from private hospitals in December 2022. Meanwhile, inflation on education services also accelerated to 4.6%, owing to the rise

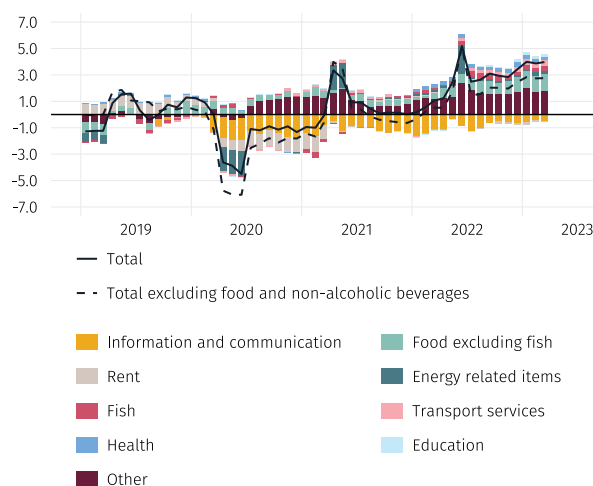
¹⁸ Due to the rebasing of the CPI, the share of food and non-alcoholic beverages category in the CPI basket rose to 23.5% in the new series from 22.0% in the old series.

in fees charged by schools, following the increase in salaries of government schoolteachers in Q2-2022.

As for the energy-related items in the CPI¹⁹, a growth of 4.3% (0.3 percentage points) was observed during the quarter. The growth in prices stemmed from rise in cost of electricity which picked up to 2.9% in Q1-2023 from 0.2% in Q4-2022, reflecting increased electricity consumption, while tariff rates remained unchanged. Meanwhile, the price of petrol continued to remain elevated, although the pace of increase in petrol prices decelerated to 23.6% from 44.2% in Q4-2022, reflecting the impact of the downward adjustment of administered price of petrol by the State Trading Organization (STO)²⁰ in August 2022 mirroring the slowdown in global oil prices. In this regard, the domestic price of petrol remained unchanged from Q4-2022 at MVR15.97 per litre, while it was higher in annual terms when compared with MVR12.91 per litre during Q1-2022²¹.

The information and communication category was the main downward contributor to inflation during Q1-2023 (-0.5 percentage points), although the pace of decline in cost of information and communication moderated due to the dissipation of base effect of the government policy-related reductions in internet prices implemented in October 2021. Accordingly, the cost of information and communication services²² decreased at a slower pace during the quarter, from -7.1% in Q4-2022 to -6.1% in Q1-2023. Meanwhile, housing rent (accounting for 16.8% of the CPI) registered a marginal decline of 0.8% in Q1-2023, after recording -0.7% in the preceding quarter, owing to fall in rental price of two-bedroom and three-bedroom apartments, and contributed to dampening of the overall inflation by 0.1 percentage points.

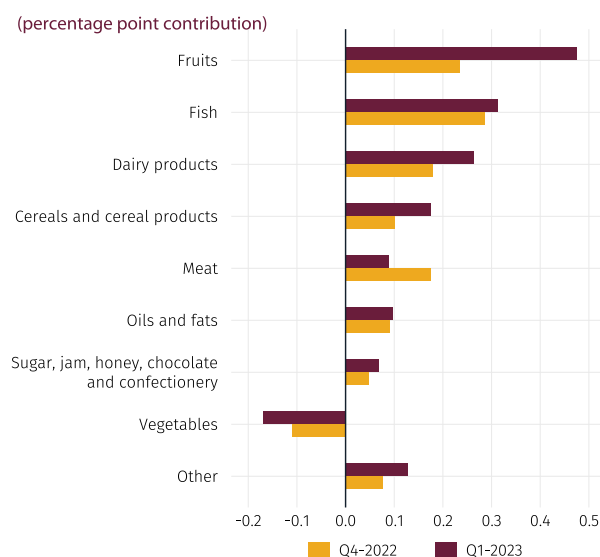
Figure 12: Contribution of Sub-Categories to CPI Inflation (National), 2019 - 2023
(annual percentage change, percentage point contribution)



Source: Maldives Bureau of Statistics

Note: Main categories in other are furnishing, personal care, restaurant and accommodation services, tobacco and narcotics, and water supply.

Figure 13: Contribution of Food Categories to CPI Inflation (National), Q1-2023
(percentage point contribution)



Source: Maldives Bureau of Statistics

¹⁹ Energy-related items include the price charged on electricity, gas and other fuels, and price of fuels and lubricants for personal transport equipment.

²⁰ Domestic petrol prices reflect markets prices with a lag even though they are administered by STO.

²¹ This is based on the retail price of Fuel Supply Maldives (FSM), a subsidiary of STO—the largest importer of petroleum products in the Maldives.

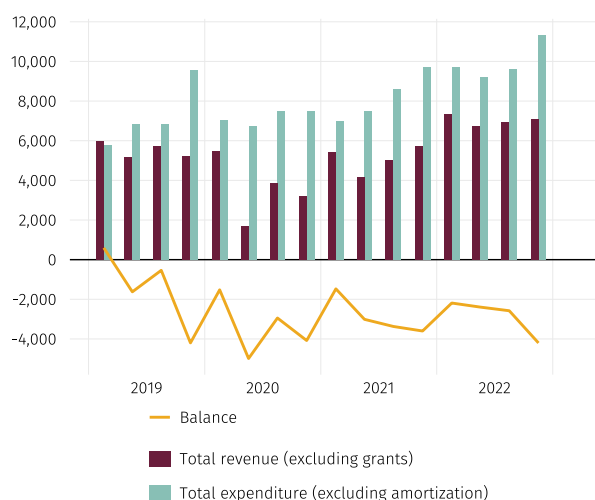
²² Information and communication prices are calculated based on the weighted average paid per unit by the consumers.

Public Finance²³

Total government revenue (excluding grants) increased by MVR1.4 billion during Q4-2022²⁴ when compared with Q4-2021 and totalled MVR7.1 billion at the end of the quarter (Figure 14). This was predominantly owing to an increase in non-tax revenue, together with a growth in tax revenue during the quarter.

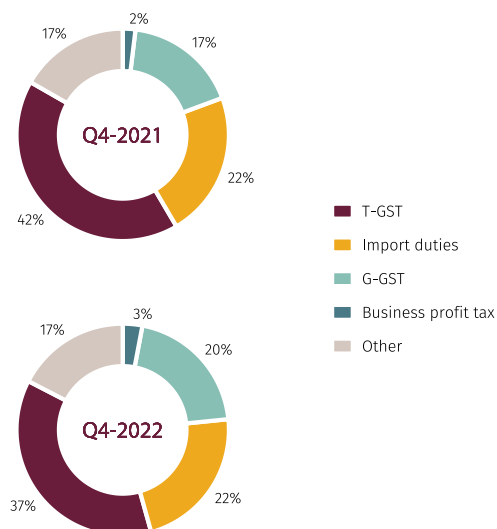
In this regard, tax revenue, which accounted for 58% of the total revenue over the period, registered an increment of MVR367.3 million in annual terms. The increase in tax revenue during the quarter was largely spread across major revenue sources, except for the tourism goods and services tax (T-GST), with revenue from the goods and services tax (GST) observing the highest increase over the quarter. Within the GST category, general goods and services tax (G-GST) recorded a growth of MVR187.7 million. However, the increase in the category was marginally offset by the decline in the T-GST—the main single source of revenue for the government—by MVR44.5 million, owing to the decline in sales reported by taxpayers and non-payment by taxpayers (Figure 15). This was followed by an increase in business and property tax, owing to the increase in withholding tax and business profit tax (BPT), which rose by MVR54.0 million and MVR50.5 million, respectively. The increase in withholding tax mainly reflected the increase in tax from the construction and tourism sector, while increase in BPT mainly reflected the increment in collection during December 2022. Meanwhile, a marginal increase (by MVR16.7 million) was observed in individual income tax. Similarly, growths were also registered for other major revenue sources including import duties and airport service charge, mirroring the increase in domestic economic activity coupled with higher imports, as well as increased departures.

Figure 14: Government Revenue and Expenditure, 2019 - 2022 (millions of rufiyaa)



Source: Ministry of Finance
Note: Figures do not accord with the methodology of IMF's GFS Manual 1986.

Figure 15: Composition of Tax Revenue, 2021 - 2022



Source: Ministry of Finance

²³ Government revenue and expenditure data as of 4 May 2023. These figures might vary due to ongoing data reconciliation.

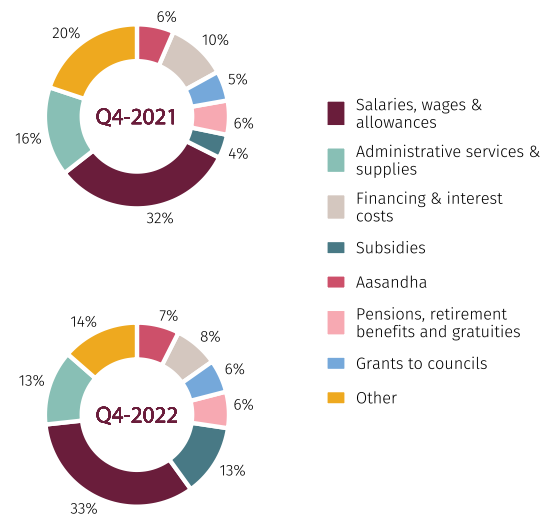
²⁴ Data for Q1-2023 was not available at the time of compilation of this report.

Non-tax revenue, which accounted for 42% of total revenue over the period, registered an annual increment of MVR996.9 million and totalled MVR2.9 billion at the end of Q4-2022, driven predominantly by the collection of fees and charges. Delving into this category, an increment of MVR897.2 million was observed in other fees and charges—largely owing to an increase in the lease period extension fee—while airport development fee observed a growth of MVR53.8 million, which increased in tandem with international departures. This partly reflected the amendment to the Airport Fees and Charges Act effective from January 2022, which also contributed to this increment. This was followed by a notable growth in interest and profits, which grew by MVR363.0 million, as well as increase in dividends from state-owned enterprises (SOEs), which rose by MVR31.2 million. In contrast, declines were observed in fines and penalties, other non-tax revenues and rent from resorts, which fell by MVR156.3 million, MVR121.6 million, and MVR117.2 million, respectively.

Total expenditure (excluding debt amortisation) recorded a significant increase of MVR1.6 billion in annual terms and totalled MVR11.3 billion during Q4-2022. This stemmed primarily from a sizeable increase in capital expenditure, which posted an annual growth of MVR1.5 billion, while recurrent expenditure observed an increase of MVR118.9 million. The increment in recurrent expenditure was driven mainly by the increase in salaries and wages category. This was primarily owing to an increase in salaries and wages, which rose by MVR88.6 million, followed by an increase in both the allowances to employees, and pension, retirement benefits and gratuities, which rose by MVR35.8 million and MVR34.0 million, respectively. Delving into the administrative and operational expenses category, expenditure on subsidies surged by MVR605.3 million, partly attributable to elevated global oil and food prices amid delays in implementation of the policies envisioned to reduce such expenditure. Meanwhile,

expenditure on the national health insurance scheme, Aasandha, posted a growth of MVR75.1 million (Figure 16). Despite this, the category for administrative and operational expenses declined owing to a fall in expenditure on other grants and contributions, financing and interest costs, administrative services and operational consumables. Meanwhile, the significant growth in capital expenditure was largely owing to a growth in spending on infrastructure assets, by MVR1.1 billion. This mirrored the rise in spending on roads, bridges and airports, which grew by MVR802.0 million, followed by increased expenditure on land and buildings, which rose by MVR243.0 million. In addition, lendings, as well as development projects and outlays also registered growths during the quarter.

Figure 16: Composition of Recurrent Expenditure, 2021 - 2022



Source: Ministry of Finance

Monetary Developments

Broad Money

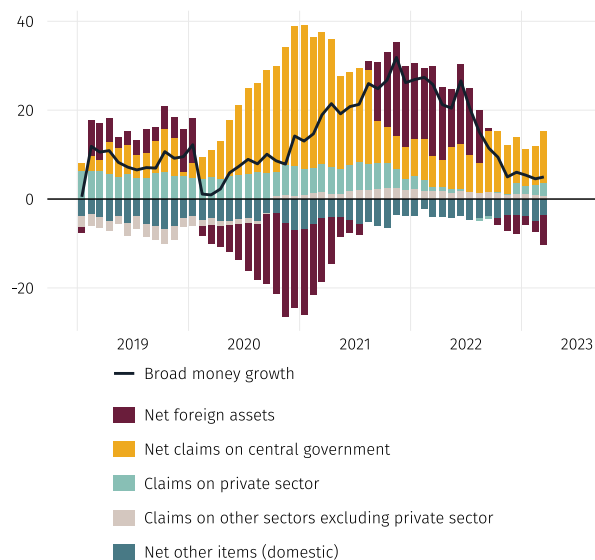
The annual growth rate of broad money (M2 or money supply) decelerated slightly to 5% at the end of March 2023, after registering 6% at the end of December 2022 (Figure 17). On the components side, this reflected a slowdown in the growth in transferable deposit base (demand deposits) as well as other deposits (savings and time deposits) of the banking system (Figure 18). In contrast, currency outside depository corporations posted a marginal growth over the review period.

Demand deposits—which accounted for 74% of the money supply during the review period—grew by 3%; a further deceleration from the 4% growth recorded at the end of December 2022. This mirrored a slowdown in the growth of such deposits denominated in foreign currency, together with local currency.

Other deposits—which accounted for 20% of money supply—posted a growth of 11% at the end of March 2023, down from the growth of 14% registered at the end of December 2022. This largely reflected a deceleration in the growth of time deposits denominated in both foreign and local currency, and savings deposits denominated in foreign currency. On the other hand, savings deposits denominated in local currency observed an acceleration in March 2023. Meanwhile, currency outside depository corporations—which accounted for 6% of money supply—observed a growth 1% at the end of March 2023, after recording a decline of 2% at the end of December 2022.

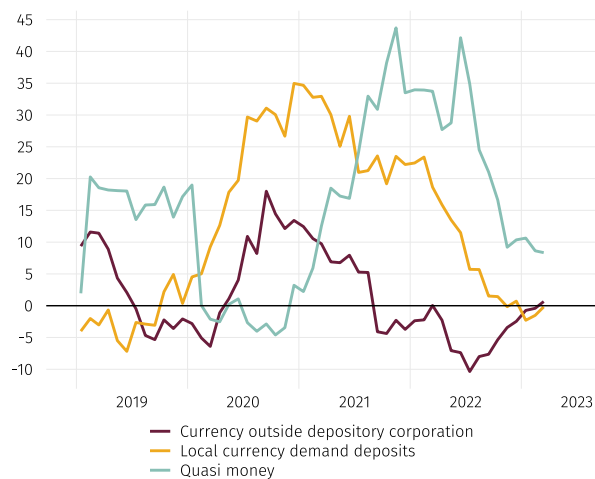
On the sources side, the deceleration in broad money growth was driven by a decline in net foreign assets (NFA), despite a marked growth in net domestic assets (NDA) of the banking system. As such, NFA fell by 22% at the end of March 2023, a further deceleration from the annual decline of 16% at the end of December 2022. This decline

Figure 17: Contribution to Broad Money, 2019 - 2023
(annual percentage change, percentage point contribution)



Source: Maldives Monetary Authority

Figure 18: Components of Broad Money, 2019 - 2023
(annual percentage change)



Source: Maldives Monetary Authority

Note: Quasi money includes time and savings deposits in both local and foreign currency plus foreign currency demand deposits and securities issued by the MMA which are held by public nonfinancial corporations.

stemmed from a fall in NFA of both the MMA and the commercial banks. The fall in NFA of the MMA was mainly due to the significant decline in foreign assets accumulation owing to the drawdown in foreign currency other deposits held abroad. Further, the marked increase in foreign liabilities

reflecting the foreign currency swap obtained from the RBI in December 2022, also contributed to the decline of the NFA of the MMA. Meanwhile, the fall in NFA of the commercial banks mirrored a growth in foreign liabilities despite a marginal rise in foreign assets during the period.

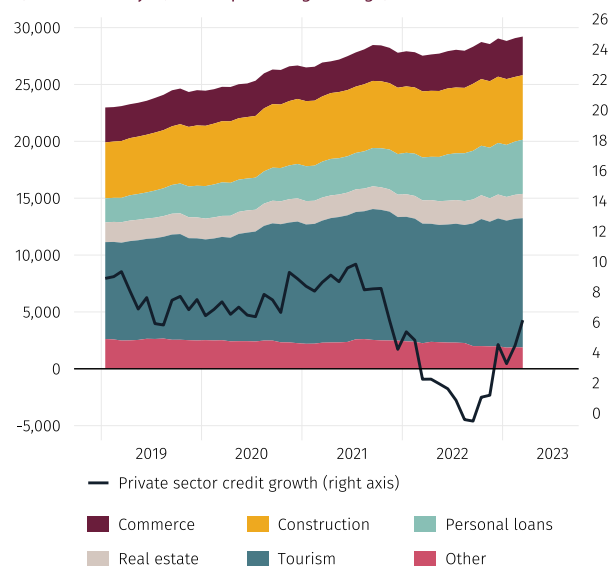
The growth rate of NDA accelerated to 17% at the end of March 2023, from 14% recorded at the end December 2022. The annual growth in NDA was primarily driven by the increase in NDA of the commercial banks together with NDA of the MMA. The increase in NDA of the commercial banks was mainly driven by the increase in NCG, which grew by MVR3.5 billion, primarily reflecting the annual expansion in government securities. This was followed by the increase in commercial banks' credit to the private sector which recorded a growth of MVR1.7 billion. In addition, increases were observed in commercial banks' credit to the public non-financial corporations and other financial corporations, which recorded growths of MVR145.2 million and MVR121.9 million, respectively. Likewise, the increase in NDA of the MMA mainly stemmed from an increase in net claims on central government (NCG) by the MMA which also outpaced the increase in overnight deposit facility (ODF) placements by commercial banks and offset the decline in claims on commercial banks by the MMA. It is noteworthy that part of the public bank account deficit was converted to an amortising bond in March 2023, which increased the holdings of government securities by the MMA.

Credit to Private Sector

Credit to the private sector recorded an annual growth of 6% (MVR1.7 billion) and stood at MVR29.2 billion at the end of Q1-2023 (Figure 19). During this period, credit extended to tourism, construction, personal loans, and commerce accounted for the highest shares of credit over the period. Credit extended to the tourism sector (which accounted for 39% of total private sector credit) registered an annual growth of 8% in the review

period, a further expansion from the 3% annual growth recorded in December 2022. This was owing to a significant growth in credit extended as working capital, which offset the declines in credit extended for new resort development, renovation of resorts, and guest houses. Meanwhile, credit extended to the construction sector observed a decrease of 2%, primarily due to the fall in credit lent for construction of residential or housing projects as well as property development despite the growth in credit given for commercial buildings. In contrast, credit extended as personal loans expanded significantly and observed the largest increase over the period, recording an annual growth of 26%, reflecting the rise in credit extended as credit cards and for consumer durables. Likewise, credit extended to the commerce sector observed an increase, stemming from the rise in credit for wholesale and retail businesses.

Figure 19: Private Sector Credit, 2019 - 2023
(millions of rufiyaa, annual percentage change)



Source: Maldives Monetary Authority

Interest Rates

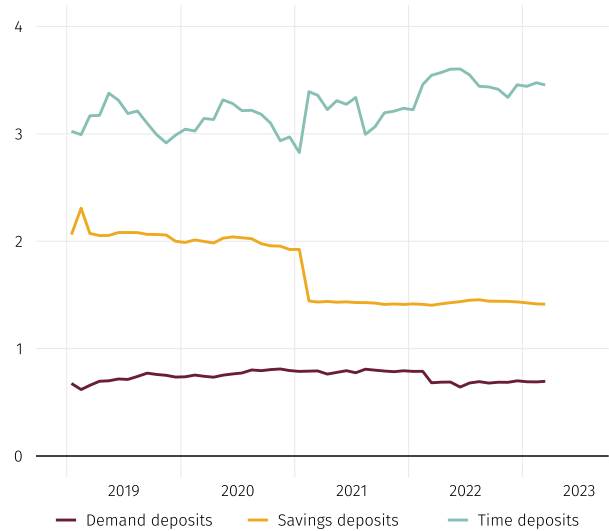
As for interest rates, the rate on local currency denominated demand deposits observed a decrease, while such deposits denominated in foreign currency recorded a slight increase at the end of March 2023. Meanwhile, the rate on local currency savings deposits remained broadly unchanged, although the rate on foreign currency savings deposits observed a slight increase in the review period. Further, the interest rate on local currency denominated time deposits (maturity of six months to one year) posted a significant increase, although the rate on such deposits denominated in foreign currency declined over the period (Figure 20 and 21). With regard to the interest rates on loans to the private sector, the interest rate on both local and foreign currency denominated private sector loans observed an increase during the period (Figure 22).

Figure 20: Interest Rate on National Currency Deposits, 2019 - 2023 (weighted average)



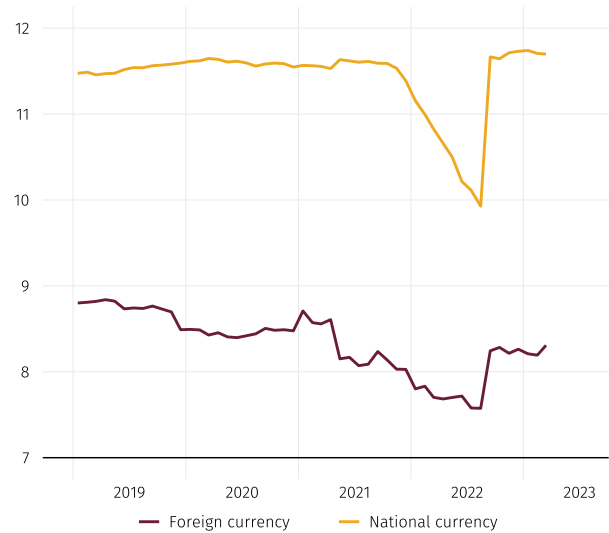
Source: Maldives Monetary Authority

Figure 21: Interest Rate on Foreign Currency Deposits, 2019 - 2023 (weighted average)



Source: Maldives Monetary Authority

Figure 22: Interest Rate on Private Sector Loans and Advances, 2019 - 2023 (weighted average)



Source: Maldives Monetary Authority

Financial Sector

Banking Sector

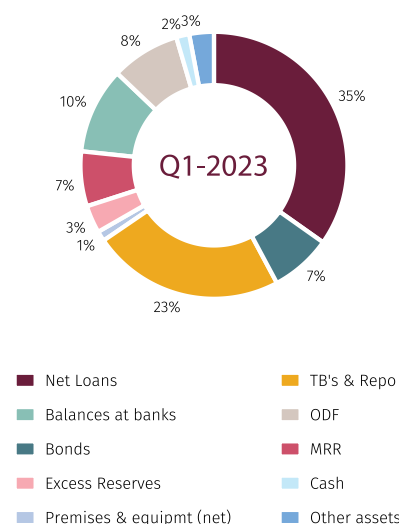
The banking sector remained resilient at the end of the first quarter of the year, with growth in the net assets; and robust capital, liquidity, and profitability indicators. Capital adequacy ratios showed an improvement on quarterly basis and remained well above the minimum regulatory requirements. Total capital to risk weighted assets stood at 51% against the minimum regulatory requirement of 12%, due to a significant portion of assets being low-risk. Furthermore, the tier 1 capital to assets stood at 21% against the minimum requirement of 5%.

Assets increased by 8% on a yearly basis and 4% on a quarterly basis, while deposits increased by 5% and 7%, respectively. 86% of the quarterly growth in deposits was from foreign currency deposits, which is attributed to the strong performance in the tourism sector during the period. The growth in assets was also contributed to by a foreign borrowing of MVR1.5 billion during the last quarter of 2022, for investment purposes.

At the end of the first quarter of 2023, gross loans stood at MVR33.4 billion, recording a growth of 1% on a quarterly basis and 7% on an annual basis. Absolute NPLs showed an increase of 3% on a quarterly basis, while the ratio of NPL to total loans ratio remained at 6%. Specific loan loss provisions covered 115% of NPLs due to additional provisions made for performing loans with higher credit risk.

Liquidity position of the banking sector remained adequate with 47% of assets held as liquid assets as at the end of first quarter. These assets consisted of treasury bills which accounted for 23% of the asset portfolio, followed by balances at banks with 10% of the asset portfolio. In addition, ODF and excess reserves represented 8% and 3% of the asset portfolio, respectively (Figure 23).

Figure 23: Net Asset Composition of Banking Industry, Q1-2023



Source: Maldives Monetary Authority

Although net interest income (NII) increased significantly during the quarter compared to the same period of 2022; pre-tax profits, which amounted to MVR1.1 billion, declined by 8%. This was mainly on account of the increase in provisions made for loan losses compared against a significant reversal of provisions in the corresponding period of 2022. As a result, annualised return on average assets (ROA) and return on average equity (ROE) declined to 3.9% and 16.5%, respectively, compared to 4.5% and 20.6% a year ago.

Finance Companies

Financing Companies continued to perform well and recorded total assets of MVR4.1 billion at the end of Q1-2023, a quarterly decrease of 1% and an annual increase of 9%. The annual growth is mostly attributed to the capital injection made by a state-owned financial institution during the year in the amount of MVR120.0 million.

The total capital to risk-weighted assets ratio and leverage capital ratio remained strong at 53%

and 48% respectively, demonstrating adequate capital strength for risk absorption.

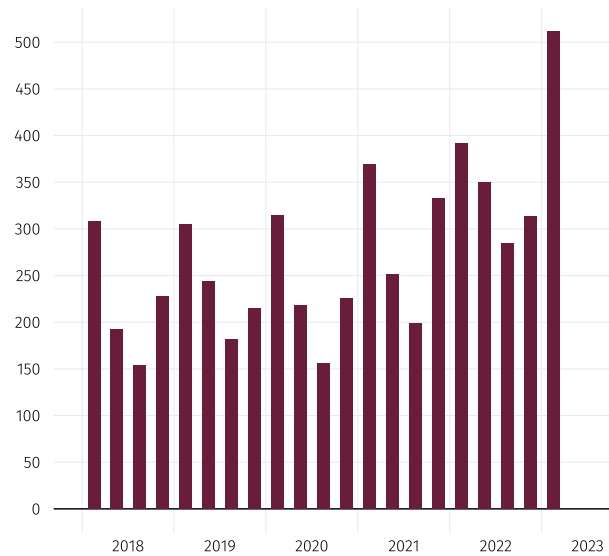
At the end of the quarter, gross loans amounted to MVR3.3 billion, an increase by 3% or MVR108.4 million on a quarterly basis, and a 15% or MVR419.7 million on an annual basis. Absolute NPLs increased by MVR63.4 million at the end of the quarter while the NPL ratio increased from 11.3% to 12.9%. Specific loan-loss provisions covered 40% of NPLs at the end of the quarter.

Financing Companies reported annual net profits before taxes of MVR15.2 million, a decline of 36% compared to the same period in 2022. This decline was due to increases in provisions for loan losses and non-interest expenses during the quarter. Consequently, the profitability ratios, ROA and ROE, also declined from 1.9% and 4.0%, to 0.9% and 1.8% respectively, compared with the previous year.

Insurance Industry

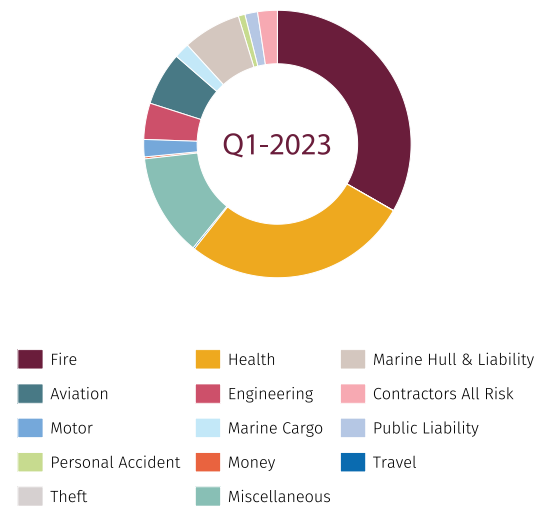
The general insurance industry reported a combined Gross Written Premium (GWP) of more than half a billion rufiyaa; the highest in a single quarter thus far. This substantial year-on-year increase of 31% in GWP from MVR391.1 million in Q1-2022 to MVR511.2 million in Q1-2023, is attributed to the pricing increase of the GWP to reflect the increased cost of healthcare services in the market, as well as to the provision of insurance coverage to new large government infrastructure projects during the quarter. GWP for health class increased by 37% (MVR139.7 million) compared to Q1-2022 (Figure 24). In terms of share of the total GWP; fire, health, and marine insurance accounted for 33%, 27%, and 9%, respectively (Figure 25). The annualised Net Written Premium (NWP) to equity ratio of 83% and the equity to assets ratio of 30% indicate that the companies maintained adequate capital reserves relative to the business they underwrite and retain.

Figure 24: Gross Written Premium, 2018 - 2023 (millions of rufiyaa)



Source: Maldives Monetary Authority

Figure 25: Premium Contributions by the Classes of Insurance, Q1-2023



Source: Maldives Monetary Authority

The total assets of insurance companies amounted to MVR2.4 billion at the end of Q1-2023, which is an increase of 6% compared to the corresponding quarter in 2022. Total investments accounted for 25% of the asset portfolio at the end of the quarter, totalling MVR614.3 million. A significant proportion of the investment portfolio

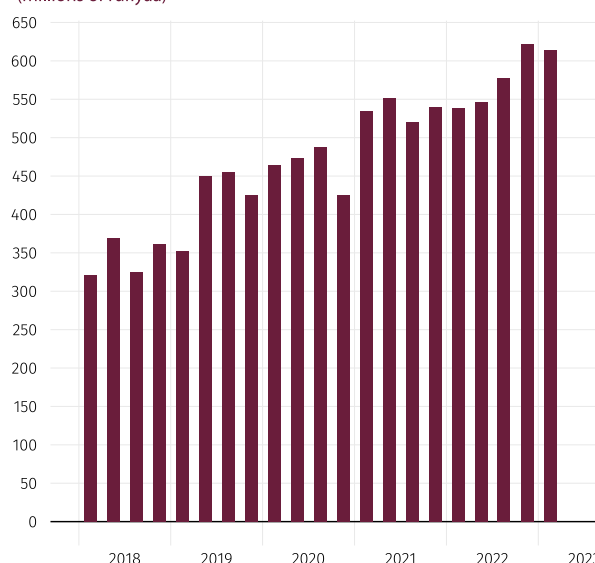
consisted of debt securities, constituting 50% of the total investments; while fixed deposits accounted for 25% (Figure 26).

Net incurred claims, which represents the portion of the claims retained by the insurance companies after reinsurance adjustments, witnessed a significant surge of 151% compared to the corresponding quarter of the previous year. This rise in net incurred claims is driven by the claims from the health class, which is almost entirely retained by local insurers; the increase being attributed to medical inflation and a notable rise in the utilization of health insurance.

The retention ratio for the current quarter experienced a marginal increase, from 39% in the corresponding period of the previous year to 40% (Figure 27). A crucial indicator of underwriting profitability, the net loss ratio (net incurred claims to net earned premium), increased to 71% in Q1-2023 from 34% in Q1-2022, indicating reduced profitability, due to the sharp rise in net claims mainly from the health sector (Figure 28). Similarly, the profit-after-tax for Q1-2023 fell to MVR19.6 million, a reduction of 70% from the same quarter in the previous year. The profits before tax for the quarter amounted to MVR22.1 million (Figure 29). ROA and ROE based on profits-after-tax for the past four quarters, stood at 2.6% and 8.9%, respectively.

Figure 26: Investments, 2018 - 2023

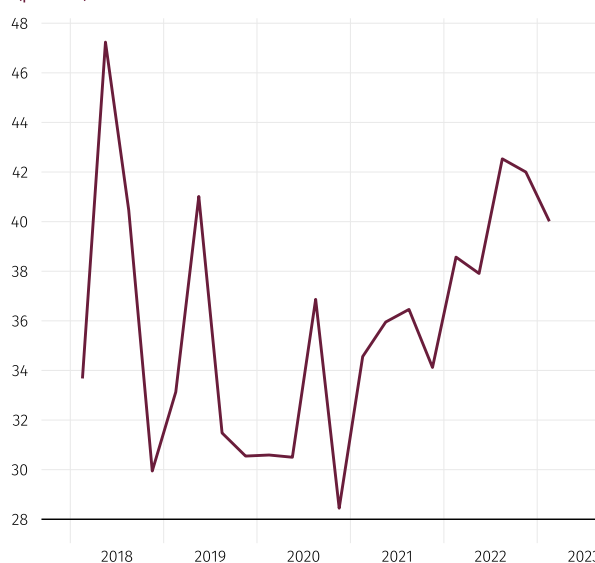
(millions of rufiyaa)



Source: Maldives Monetary Authority

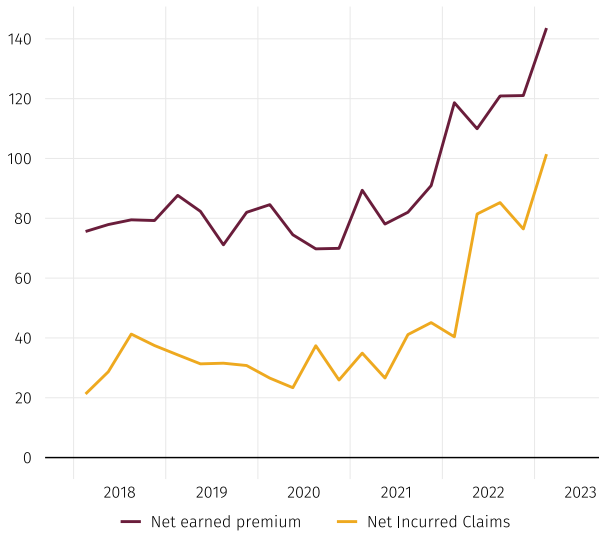
Figure 27: Retention Ratio, 2018 - 2023

(percent)



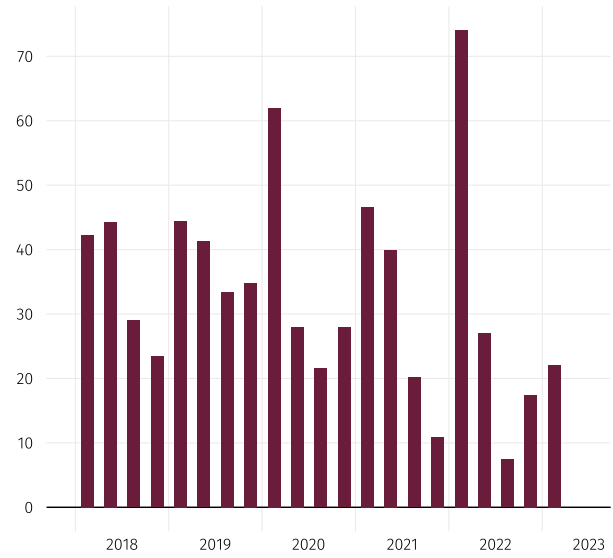
Source: Maldives Monetary Authority

Figure 28: Net Earned Premium vs Net Incurred Claims, 2018 - 2023
(millions of rufiyaa)



Source: Maldives Monetary Authority

Figure 29: Pre-tax Profit, 2018 - 2023
(millions of rufiyaa)



Source: Maldives Monetary Authority

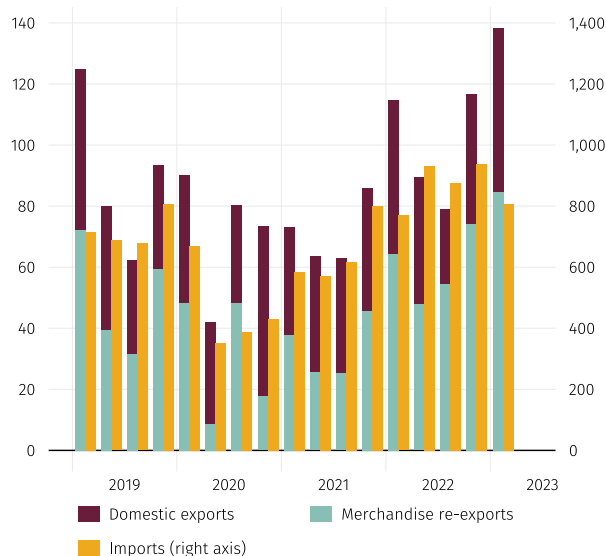
External Trade

Merchandise Exports

Total merchandise exports registered an annual increase of 21% (US\$23.6 million) in Q1-2023 and totalled US\$138.3 million. This was mainly driven by the significant increase in merchandise re-exports, while domestic exports also rose during the quarter (Figure 30). Accordingly, merchandise re-exports rose by 32% (US\$20.3 million) to total US\$84.6 million during Q1-2023. The significant increase in re-exports during the review quarter mirrored the growth in both the price and volume of aviation gas (jet fuel) re-exports compared to the corresponding quarter of 2022, which stemmed mainly from the upswing in global jet fuel prices as well as international flight movements to the Maldives during the tourism sector’s peak season.

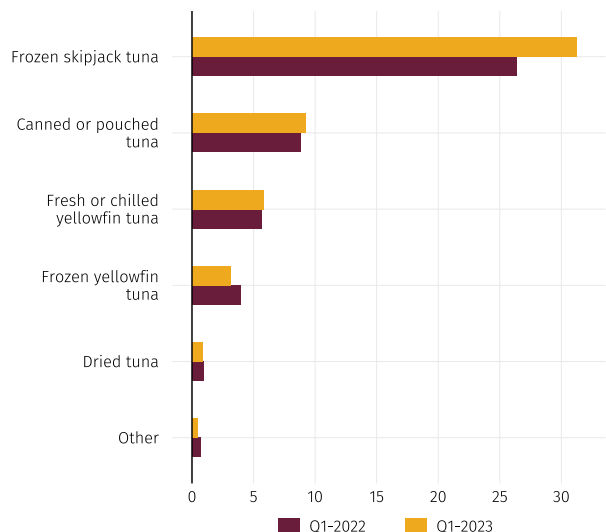
Domestic exports—which mainly comprise fish and fish products—increased by 7% (US\$3.4 million) during Q1-2023 and totalled US\$53.7 million. This was mainly due to the notable rise in export earnings from frozen skipjack tuna, which increased by 18% (US\$4.8 million), despite the decline in the volume of such exports (Figure 31). The growth in export earnings mainly reflected the increase in the frozen skipjack tuna prices in the Bangkok frozen market during the review quarter, which averaged US\$1.8 per kilogram—a modest increase from US\$1.7 per kilogram in Q1-2022. Moreover, growths were observed in export earnings from canned or pouched tuna, and fresh or chilled yellowfin tuna, by 5% (US\$0.5 million) and 3% (US\$0.2 million), respectively. While the export volume of canned or pouched tuna increased during the quarter, export volume of fresh or chilled yellowfin tuna recorded a decline. Meanwhile, export earnings from frozen yellowfin tuna decreased by 20% (US\$0.8 million), entirely reflecting a decline in the price of such export as the export volume remained unchanged during the quarter.

Figure 30: Total Trade Summary, 2019 - 2023
(millions of US dollars)



Source: Maldives Custom Service

Figure 31: Composition of Fish Export Earnings, 2022 - 2023
(millions of US dollars)



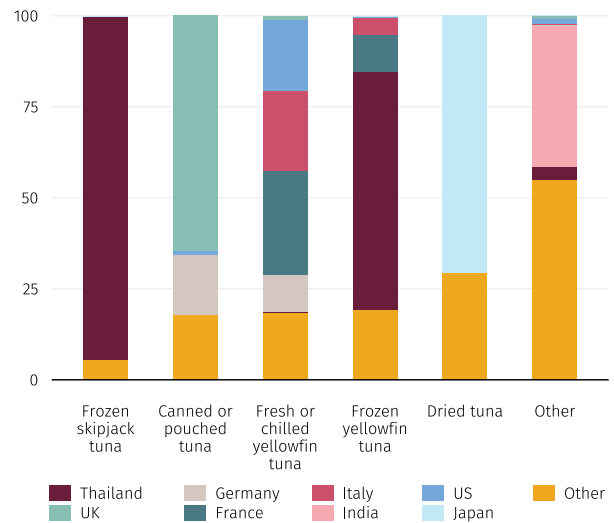
Source: Maldives Customs Service

As for the direction of trade, Asia was the major continental export destination during the quarter, accounting for 70% of domestic exports during Q1-2023—an increase from the 65% recorded in the corresponding quarter of 2022. Thailand remained as the dominant Asian export market, accounting for 59% of total domestic exports during the review quarter—an increase from the 52% in Q1-2022. Meanwhile, Europe emerged as the second largest continental export destination with a market share of 26% in Q1-2023, a slight decline from the 27% observed in Q1-2022 (Figure 32). The UK cemented its position as the top export market within the region, accounting for 11% of total domestic exports, which was an increase from the 9% in Q1-2022. Meanwhile, Germany—the second largest export destination—accounted for 4% during the review quarter, a fall from 6% recorded in Q1-2022. Other notable export destinations include France (4%) and Italy (3%).

Merchandise Imports

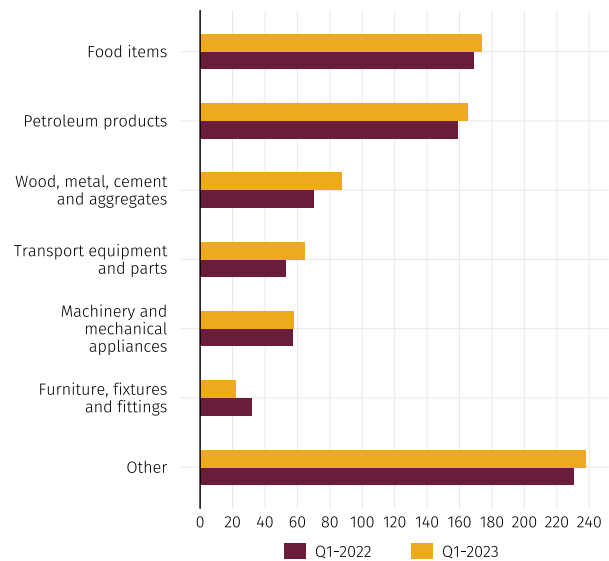
Total merchandise imports (c.i.f) recorded an annual increase of 5% (US\$39.0 million) during Q1-2023, and totalled US\$808.2 million, as import demand continued to rise although at a slower pace compared to Q4-2022. In line with these developments, an increase in import expenditure was observed for most of the major import categories (Figure 33). The main contributors to the annual increase were construction-related items, which increased notably by 21% (US\$22.2 million), followed by transport equipment, and electrical and electronic machinery and equipment, which observed increases of 22% (US\$11.5 million) and 18% (US\$6.8 million), respectively. In addition, expenditure on petroleum products increased by 4% (US\$6.2 million) during the quarter. Meanwhile, notable declines in import expenditure were observed for furniture, fixtures and fittings, medical and surgical supplies, and electronic and electrical appliances during the review quarter.

Figure 32: Direction of Trade by Domestic Export Categories, Q1-2023 (percent)



Source: Maldives Customs Service

Figure 33: Composition of Imports, 2022 - 2023 (millions of US dollars)



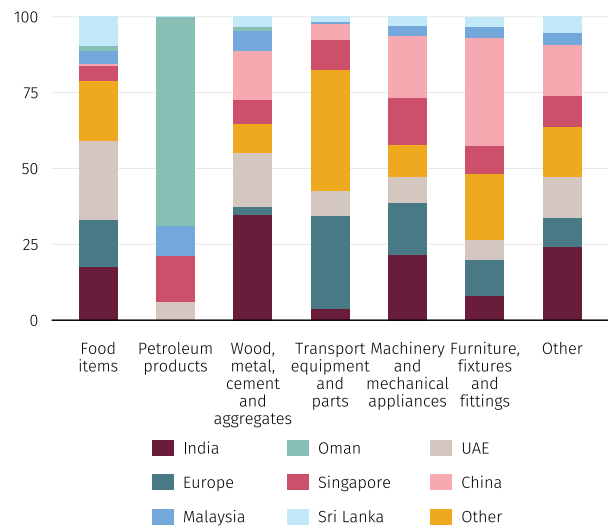
Source: Maldives Customs Service

With regard to the direction of trade, Asia remained as the largest continental source of imports, accounting for 83% of total merchandise imports during Q1-2023—a slight decline from the 84% recorded in Q1-2022 (Figure 34). During Q1-2023, India accounted for the largest share of imports, accounting for 17% of total merchandise imports—a rise from the 13% share in Q1-2022. This was followed by Oman, which accounted for 15%, a slight decline from the 16% recorded in the corresponding quarter of 2022. Meanwhile, United Arab Emirates (UAE) accounted for 14%, a moderate decline from the 15% registered in Q1-2022, followed by Singapore accounting for 10% during the review quarter, an uptick from the 9% in the corresponding quarter of 2022. Similarly, China accounted for 10% of total merchandise imports during the review quarter, a significant decline from the 14% recorded in Q1-2022.

Gross International Reserves

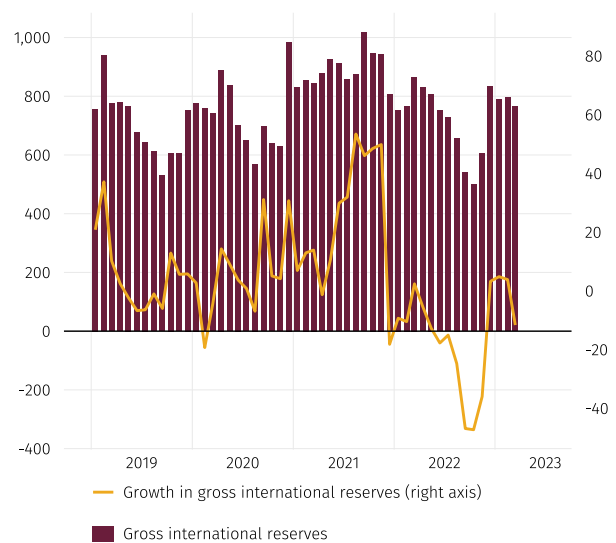
Gross international reserves (GIR)²⁵ decreased to US\$764.6 million at the end of Q1-2023, registering an annual decline of 12% (US\$100.6 million) when compared with the corresponding quarter of 2022. Similarly, when compared with the preceding quarter, GIR registered a decline of 8% (US\$67.5 million) (Figure 35). The annual decline in GIR was mainly due to the increase in foreign currency payments despite the increase in foreign currency inflows received by the government during the period. While the foreign currency payments made during the quarter were primarily in the form of foreign currency intervention in the domestic market, loan repayments and loan servicing, and repayments of government securities, the higher foreign currency receipts reflected the increase in tourism-related revenue.

Figure 34: Direction of Trade by Import Categories, Q1-2023 (percent)



Source: Maldives Customs Service

Figure 35: Gross International Reserves, 2019 - 2023 (millions of US dollars, annual percentage change)



Source: Maldives Monetary Authority

²⁵ Also called official reserve assets, comprise of foreign currency deposits of the MMA and government, commercial banks' US dollar reserve and the Maldives' reserve position at the IMF.

Articles

Nowcasting Monthly Sectoral Economic Growth Indices

*Mohamed Imthinan Saudulla**

Abstract

This paper is motivated on nowcasting sector-level gross domestic product (GDP) for the Maldives at monthly frequency. Three benchmarking methods of time series: the proportional Denton-Cholette method, the generalized least squared (GLS) regression-based Chow-Lin method, and the GLS regression based Litterman method were used to disaggregate quarterly sectoral GDP from Q1-2003 until Q1-2022 published in Quarterly National Accounts (QNA) to derive monthly indices of sectoral GDP. Using these indices, monthly nowcasts were generated using sector-specific Ordinary Least Squares (OLS) regressions. This paper aims to assess the prediction accuracy of these monthly sectoral economic growth indices derived through the various benchmarking and regressions and the results indicate the indices generated from Denton-Cholette method to produce the most accurate estimates when used in nowcasting computations.

*The author is from the Research Division of the MMA.

Introduction

With nations focusing on limiting the number of casualties following the widespread coronavirus disease (COVID-19) pandemic, stringent lockdowns, international border closures, and strict social distancing measures were introduced inhibiting economic activities at alarming rates. Consequently, both global demand and supply shrunk severely and led to an unprecedented economic shock to the global economy resulting in policy makers implementing swift economic actions across the globe. With the constantly evolving nature of the pandemic and its economic consequences, policy makers had to rely heavily on timely information gathered from high frequency indicators to guide policy direction. As such, the pandemic highlighted the need and the importance of monitoring and systematically analysing developments in the real economy at higher frequencies (monthly and weekly monitoring) compared to previous models of monitoring where understanding the evolutions of the economy at quarterly and annual frequency was sufficient for policy makers to formulate short-term and long-term policies.

In the Maldives, following the COVID-19 pandemic the government of Maldives and the central bank of Maldives—Maldives Monetary Authority (MMA)—implemented a number of economic policies to combat the record deceleration of the economy such as fiscal stimulus packages, unemployment benefits, continuation of public sector investment projects (PSIP), mandatory debt moratoriums, and increased foreign exchange interventions to manage dollar shortages within the economy. The effective implementation of these policies required the authorities to obtain and monitor high frequency data; daily and weekly developments in the activities of the economy were important to determine the magnitude of fiscal stimulus packages, and other interventions by authorities. For instance, daily movements in the tourist arrivals composition following the opening of borders in the Maldives were important to understand important markets to tap into to increase the number of arrivals into the Maldives. In addition, the uncertain trajectory of the post-COVID-19 recovery of the Maldivian economy implies the necessity of establishing systemic frameworks to monitor real-time developments of the economy as to strategise and implement effective policies to stabilise the domestic economy and anchor variances in price movements.

Although, several local authorities such as the Maldives Bureau of Statistics (MBS) and MMA collate and compile high frequency economic data, there exists data limitations and constraints that inhibit effective and timely dissemination of these data. For example, the Quarterly National Accounts (QNA)—the highest frequency output indicator available to monitor developments in the sectoral output of the economy—is published with a minimum of three months lag (the output of the second quarter of a year is published at the end of September) hindering policy makers to understand evolutions in the economic conditions in a timely manner. Given the availability of other economic indicators at monthly frequency, utilising such indicators in a systemic and

analytical methodology to compute monthly estimates for output for each sector and subsequently an overall monthly index of economic growth (MIEG) could potentially be extremely useful for policymaking and effective implementation as well. In that regard, using various benchmarking methods, complemented by simple sector-level regression models, this paper focuses on estimating nowcasts for sectoral gross domestic product (GDP) of the Maldives at monthly frequency, with the validation exercise based on comparing the quarterly aggregated monthly estimates with QNA estimates published by the MBS.

The rest of the paper is structured as follows. Section 2 will briefly review the theoretical literature on various benchmarking methods explored in this paper. Next, Section 3 describes the models utilised for the benchmarking and models used in nowcasting MIEG, which is then followed by the results obtained from the analysis. Lastly, Section 5 will provide the conclusion and future work to enhance the estimations and monitoring frameworks of high frequency indicators.

Theory

Benchmarking techniques or temporal disaggregation methods are utilised to derive high frequency estimates (e.g. monthly or quarterly estimates) from low frequency time series (e.g. annual estimates). While there exist various methods of disaggregation, they are typically categorised into two main methods: Mathematical or Operations Research methods and regression-based or statistical methods (EIA - Handbook of Energy Modeling Methods, 2020).

The Operations Research methods are based on the concept of movement preservations, i.e. the benchmarked low frequency series will have the same pattern of movement as the indicator series. Examples of Operations Research benchmarking methods include the original Denton method (Denton, 1971), its variants such as the proportional Denton method, and Causey-Trager method (Causey and Trager, 1981). In mathematical methods of disaggregation, a single indicator or pattern series is used to optimise an objective function; typically a quadratic loss function subject to the benchmarking constraints or aggregation constraints (e.g. of constraints include imposing benchmarked low frequency series to aggregate to actual low frequency series estimates).

To formalise the discussion, let z_t and x_t denote the monthly indicator series and the monthly estimates for the sectoral output derived using disaggregation methods, respectively, and y_q denote the quarterly values of sectoral output. In vector notations, let $x = (x_1, \dots, x_M)$, $z = (z_1, \dots, z_M)$, and $y = (y_1, \dots, y_Q)$, denote column vectors. Then the penalty function $P(x, z)$ in the original Denton method can be defined in matrix notation as:

$$\text{Min}_x P(x, z) = (x - z)'A(x - z) \quad (1)$$

subject to the

$$y = B'x \quad (2)$$

where A is a weighting matrix used in the minimisation and B is the matrix that maps the monthly estimates to quarterly aggregation constraints. As mentioned above, there are several variants of the Denton method that differ based on the first and higher order difference between the final high frequency estimates (monthly estimates) and the indicator series. The most commonly used variants are the:

1. Additive first difference model: preserves the sample period-to-period change in the level of the monthly estimates and the indicator values under the annual constraints
2. Proportional first difference model: preserves the proportional period-to-period change in the final monthly estimate and the indicator series

One major drawback of the first difference models is that in the original method, there are no adjustments made to the indicator values outside the sample which induces a transient movement at the beginning of the series defeating the main principle of movement preservation (Baoline, 2007). As such, a modified Denton method was proposed; Denton-Cholette method (Dagum and Cholette, 2006), which removes the spurious transient movement at the beginning of the resulting series and is preferred over the original Denton method. As such, in this research the proportional Denton-Cholette method has been used as one of the benchmarking methods.

Regression-based methods often use multiple series to compute a preliminary indicator series, and the method then uses an estimated or assumed autocorrelation structure to distribute the benchmarking adjustments (EIA - Handbook of Energy Modeling Methods, 2020). The most commonly used regression-based methods include, the Chow-Lin (1971), Fernandez (1981), and Litterman (1983) methods.

The statistical methods have been structured as to take into consideration the specificities in the underlying movements in time series economic data which the mathematical models do not factor into their models (Baoline, 2007). For example, there could be multiple indicator series that could be used in the benchmarking process, and the regression-based methods allow the incorporation of information from all the indicator series to compute a high frequency estimate for the low frequency data by performing a generalized least squares regression (GLS) of the low frequency series on the aggregated indicator series (Sax and Steiner, 2013). More formally, let Z represent an $n \times m$ matrix, where m denotes the number of indicator series z_t , J be an aggregation matrix of length $m \times n$, then by assuming a linear relationship exists between the aggregated indicator series and the low frequency estimate y the following ordinary least squares regression (OLS) model (equation 3) is fitted;

$$y = JZ\beta + \varepsilon \quad (3)$$

Assuming the same linear relationship holds between the high frequency estimates of the low frequency series (in this study quarterly sectoral output) with high frequency indicator series, the high frequency estimates can be derived using the estimate $\hat{\beta}$, i.e.

$$x = Z\hat{\beta} \quad (4)$$

where x denoted the high frequency estimates (in this study monthly sectoral output). For a given variance-covariance matrix Σ the GLS estimator $\hat{\beta}$ is calculated in the following standard way:

$$\hat{\beta}(\Sigma) = [Z'J'(J\Sigma)^{-1}JZ]^{-1}Z'J'(J\Sigma)^{-1}y \quad (5)$$

Given the estimator $\hat{\beta}$ is based on the variance-covariance matrix Σ of the residuals of the OLS model defined above (equation 3), an assumption is required on the distribution of the residuals. Chow-Lin assumes that the high frequency residuals ε_t follow an autoregressive process of order 1 (AR1), i.e. $\varepsilon_t = \rho\varepsilon_{t-1} + \epsilon_t$ where ϵ_t is white noise (Sax and Steiner, 2013) and $|\rho| < 1$. However, Fernandez and Litterman argues that given most economic time series exhibit non-stationarity, the residuals should follow a non-stationary process, i.e. $\varepsilon_t = \varepsilon_{t-1} + v_t$ where v_t is an AR1 process ($v_t = \rho v_{t-1} + \epsilon_t$ and ϵ_t is white noise). While Fernandez model assumes $\rho = 0$, i.e. the residuals follow a random walk, Litterman proposes a more generalised version of the Fernandez method where the Litterman model is considered an Autoregressive Integrated Moving Average process (ARIMA 1,1,0) model (Chen, 2007).

Although defining the distribution of the residuals assists in the estimation procedure, the autoregressive parameter ρ also need to be estimated within the computation process. Methods of computing ρ include, the method proposed by Chow-Lin (1971), where an iterative process of estimating ρ is computed until convergence is achieved, method proposed by Bournay and Laroque (1979), where the likelihood function of the GLS-regression is maximised which generates a consistent estimator to the true value of ρ , and the method suggested by Barbone et al (1981), where the weighted residual sum of squares is minimised to derive an estimate for both ρ and β . With the iterative process being computationally taxing, and the Barbone et al (1981) producing sensitive and inconsistent estimates of ρ (Sax and Steiner, 2013), this study utilises the Bournay and Larouque (1979) model of optimisation with the additional constraint of ρ required to be positive (in few cases $\hat{\rho}$ is estimated to be negative even if the true ρ is positive (Sax and Steiner, 2013)). Additionally, for the purpose of this study, two regression-based models of benchmarking have been experimented, i.e. the Chow-Lin model and the Litterman model.

Methodology and Data Description

The computation process behind the nowcasting methodology involves first computing a benchmarked or temporally disaggregated monthly output series for each sector using the high frequency indicator series. Once the benchmarked monthly output series is obtained, the process moves on to fitting an OLS regression line for each sector's monthly output with the indicator series (the fitted OLS regression will mirror closely the relationship established during the benchmarking process) until the end of the quarterly sample (assuming that the monthly data does not end in the same quarter). For example, if the quarterly sectoral output data ends at Q1-2021, the benchmarking model will generate monthly sectoral output until March 2021 and this benchmarked output series is fitted against the indicator series until March 2021. Then by assuming that the computed link between the indicator series and the monthly output series will not change within the subsequent quarter, monthly output estimates for the out-of-sample time period is then calculated using this fitted OLS model. In the example mentioned above, when data exists for the months of April 2021, May 2021, and June 2021 the OLS model can generate monthly sectoral output figures using the fitted regression models.

The main data source for this study is extracted from the QNA published by MBS, i.e. quarterly sectoral output data from Q1-2003 until Q1-2022 is used in the computations. However, for the purpose of this study, not all sectors have been nowcasted individually, but rather some sectors have been combined and then nowcasted based on the availability of high frequency indicators that are relevant to each sector and the time span available for the high frequency indicators. Accordingly, the following nine sectors of QNA has been used for the computation of MIEG: fisheries sector, construction and real estate sector, wholesale and retail trade sector, tourism sector, transport and communication sector, financial services sector, public administration, health and education sector, taxes less subsidies, and finally all the remaining sectors in the QNA has been aggregated to derive a miscellaneous sector¹ for the computation process.

The selection of the indicator series to benchmark and nowcast the sectors mentioned above involved identifying the indicator series used in the QNA compilation to derive sector-level output at the quarterly frequency and verifying if the same series is available at monthly frequency regularly. As such, the identification process revealed that for some sectors, the same indicator series used in the compilation of QNA can be utilised given the indicator series meets the criteria of being a) available at monthly frequency and b) it is published at regular intervals. These sectors are:

¹The miscellaneous sector comprises of output produced in agriculture, manufacturing, electricity and water, professional, scientific and technical activities, and entertainment, recreation and other services.

1. Wholesale and retail trade sector: QNA utilises changes in the value of total merchant imports deflated by changes in Consumer Price Index (CPI) at the quarterly frequency and similarly, this study utilises total monthly imports deflated by CPI as the indicator series.
2. Tourism sector: QNA utilises quarterly tourist bednights data and similarly this study utilises the monthly total tourist bednights data.
3. Financial services sector: QNA utilises the interest rate differentials charged by banks between the borrowers and lenders to derive this sector's output and similarly this study also uses the total loan stock and total deposit stock at the end of each month.

For the remaining six sectors an appropriate proxy indicator series has been either identified or computed to benchmark and nowcast the monthly sector-level output, i.e.:

1. Fisheries sector: QNA utilises quarterly fish catch data obtained from Ministry of Fisheries, Marine Resources and Agriculture and since this data is not available at regular intervals, volume of fish exports compiled by Maldives Customs Services (MCS) has been used as the proxy indicator.
2. Construction and real estate sector: QNA utilises quarterly data on the changes in the index of the building materials imports to calculate construction sector's quarterly output and real estate sector's output is derived using water meter index. Given that this study combines the two sectors with the difficulty of obtaining an appropriate proxy measure for real estate sector coupled with its close linkage with construction activity², real construction-related imports have been compiled by deflating nominal construction sector related imports, i.e.: imports of cement and aggregates, wood and articles of wood, base metal and articles of base metal, machinery, mechanical appliances and parts, electrical, electronic machinery, equipment and parts, and other construction-related items which is obtained from MCS. The Industrial Material Index (IMI) published by the International Monetary Fund (IMF) is used as the deflator.
3. Transport and communication sector: QNA for the sector is calculated by obtaining the output of the sub-sectors related to transport and communication sector and each sub-sector has an associated indicator series which is used in the QNA compilation process. Since the QNA publishes only the aggregate level output for the two sectors and due to the difficulty in obtaining monthly indicator series for the sub-sectors, this study uses monthly aircraft movements in the Velana International Airport as the main indicator given the ease in the availability of this data from Maldives Airports Company Limited (MACL) and the timeliness in obtaining the data from MACL.
4. Public administration, health and education sector: For each sub-sector, public administration, health and education, the QNA utilises deflated wages of each sector. Given the use of wages in the compilation for the three sectors, this study uses monthly government expense on salaries and wages

²Correlation coefficient between the sector level output for construction and real estate is a highly significant 0.81.

published the Ministry of Finance (in the Government Finance Statistics (GFS)) which is deflated by CPI to compute a volume indicator for benchmarking process, i.e. real government wage expenses.

5. **Miscellaneous sector:** As mentioned above, the miscellaneous sector has been calculated by aggregating all the remaining sectors apart from the sectors identified above. While each remaining sector will have an indicator series used in the compilation process, for simplicity and given that tourism has an indirect impact on all these smaller remaining sectors, monthly tourist bednights have been used as the indicator series.
6. **Taxes less subsidies:** The main indicators used to compile the taxes less subsidies component of QNA are deflated import duty figures, deflated tax revenue reported by the government, and volume of staple food imports, water production, school enrolment and electricity production (NBS, 2014). Given the lack of all the aforementioned data in monthly frequency, for this study, difference between the monthly total government tax revenue and monthly total government expenditure on subsidies published by the Ministry of Finance has been used (GFS) which is then deflated using the CPI to derive real government tax minus subsidies.

The following table (Table 1) summarises the main indicator/indicators used for each aforementioned sector, source from which the high frequency data is obtained from, the starting month of the high frequency indicator, the lag in the availability of data.

Table 1: Summary of Monthly Indicator, Source of Data, Sample Starting Period, Lag in Data Availability for Indicators for Each GDP Sector

GDP Sector	Monthly Indicator	Source	Starting Month	Data Availability Lag
Fisheries	Volume of Fish Exports	MCS	Jan – 2004	26 days
Construction and Real Estate	Construction related imports	MCS	Jan – 2004	26 days
Wholesale and Retail Trade	Total Imports	MCS	Jan – 2004	26 days
Tourism	Tourist Bednights	MoT	Jan – 2003	26 days
Transport and Communication	Air traffic movements	MACL	Jan – 2012	20 days
Financial Services	Total Loan and Deposit stock	MMA	Jan – 2003	26 days
Public Administration, Health and Education	Salaries and Wages	GFS	Jan – 2017	7 days*
Miscellaneous	Tourist Bednights	MoT	Jan – 2003	26 days
Taxes less subsidies	Tax revenue minus subsidies	GFS	Jan – 2017	2 months

*Note: Although Monthly Fiscal Developments (GFS format) is published with a lag of 2 months, the government publishes Weekly Fiscal Developments (GFS format) with a lag of one week which can be used to derive an estimate for monthly expense on wages and salaries.

For each of the nine sectors mentioned above, based on the theoretical literature discussed the following three methods of benchmarking has been utilised to derive high frequency estimates, i.e. monthly sectoral output. The experimented methods of benchmarking are:

1. Proportional First Difference Denton-Cholette Benchmarking Method (Denton-Cholette method)
2. Maximisation of the likelihood function of Chow-Lin GLS regression-based Method (Chow-Lin method)
3. Maximisation of the likelihood function of Litterman GLS regression-based Method (Litterman method)

As the Denton-Cholette method cannot incorporate information from multiple indicator series, only total loan stock was utilised as the main indicator for the financial sector's monthly output computations when Denton-Cholette method of benchmarking is used².

Once the benchmarked series is obtained, the process transitions to nowcasting the monthly sector-level output and as mentioned above this process involves fitting a simple OLS regression line for each sector's monthly output with the indicator series identified above assuming the link between the single or multiple indicator series and the monthly sector-level output series remains same across the nowcasting horizon (maximum of three months). The generic equation for the OLS regressions is in the following form:

$$Sector\ Output_t = \alpha + \beta\ Indicator\ series_t + \varepsilon_t \quad (6)$$

where β refers to the link between the indicator series and the high frequency benchmarked output series. The simple OLS regression is either computed in levels or growth terms depending on the linkage used in the compilation process in QNA, i.e. if quarterly changes are used in the QNA compilation process (sectors such as construction and financial services) the OLS regression is computed in growth rates (output growth against indicator series growth) and vice versa.

Although the fitted OLS regressions involves a constant term along with the single or multiple indicator series as the independent variables, the OLS regression used for the wholesale and retail trade sector had to be altered to capture the dynamics in this sector (the presence of persistence in the output generated in this sector as well as to account for the possibility of inventories being utilised to generate output in this sector)³. The following model is used to generate out-of-sample forecasts for the wholesale and retail sector output.

$$Trade\ Output_t = \alpha + \beta_1 R\ Imports_t + \beta_2 R\ Imports_{t-1} + \beta_3 Trade\ Output_{t-1} + \beta_4 Trade\ Output_{t-2} + \varepsilon_t \quad (7)$$

³Total deposit stock was also trialed as an indicator during the initial computations, but the results obtained when using the total loan stock was found to be more accurate.

⁴Details of the sector-specific fitted regression equations can be provided upon request.

where β_1 refers to the link between the indicator series and the high frequency benchmarked series, β_2 assumes the previous months imports to impact the current periods trade sector output through its affect on inventories (if imports are high in the previous month, trade sector can rely more on these imports in the current month if the inventory is high, i.e. a negative relationship may exist between the variables), β_3 and β_4 accounts for trends in the wholesale and retail sector output, i.e. past historical data indicate possible persistence characteristics in the sector's performance. Different lag structures have been experimented and these lags for the variables have been chosen based on the best performing model and the aforementioned model (Equation 7) performs the most accurately when the nowcasts are compared with the actual quarterly data in QNA.

To validate the nowcasting process and to verify the most accurate benchmarking method, based on the availability of data, several training sets and testing sets have been computed for the sample period (from January 2004 until March 2022). Except for the taxes less subsidies component, and public administration, health and education sectors, a total of 15 quarterly rolling training sets have been identified with the time period for the first training set spanning from the first month from which data is available until June 2018. This implies the first testing set would span the time period from July 2018 to September 2018 and the second training set will end on September 2018. The last testing set will be between January 2022 until March 2022. With limited indicator data available for Taxes less Subsidies component and Public Administration, Health and Education sector, 11 quarterly rolling training sets have been used, i.e. first training set spans from January 2017 until June 2019 and the testing set starts at July 2019 and ends at September 2019 with subsequent training and testing sets similar to the sets described above.

Once the nowcasts for the testing set is computed using the fitted OLS regression, the aggregated quarterly nowcasted output for each sector is compared with the QNA estimate published by MBS. The absolute percentage error (APE) and mean absolute percentage error (MAPE) is calculated to identify the most accurate benchmarking model.

Results

The tables below present the APE and MAPE calculated for each sector's quarterly output generated using different benchmarking models from Q3-2018 until Q1-2022 (public administration, health and education sector and taxes less subsidies component are calculated from Q3-2019 onwards due to data limitations).

Table 2: Real Quarterly GDP's APE and MAPE for Denton-Cholette Method
(percent)

	Real GDP	Taxes less subsidies	Fisheries	Construction and real estate	Wholesale and retail trade	Tourism	Transport and communication	Financial services	Public administration, health and education	Miscellaneous
Q3-2018	NA	NA	3.40%	6.10%	5.00%	0.40%	0.60%	1.40%	NA	8.00%
Q4-2018	NA	NA	4.90%	4.40%	6.20%	0.70%	2.20%	0.80%	NA	3.60%
Q1-2019	NA	NA	1.00%	0.70%	7.50%	0.70%	0.60%	4.80%	NA	5.60%
Q2-2019	NA	NA	17.20%	0.60%	0.50%	0.90%	5.60%	1.60%	NA	8.00%
Q3-2019	0.62%	5.00%	11.20%	10.30%	7.30%	0.20%	6.10%	3.10%	2.30%	4.70%
Q4-2019	3.33%	30.90%	3.10%	2.30%	5.00%	1.30%	0.10%	2.30%	4.70%	3.40%
Q1-2020	1.04%	2.20%	3.60%	2.70%	2.30%	5.30%	3.70%	3.70%	10.10%	5.80%
Q2-2020	2.62%	539.10%	56.40%	13.40%	4.70%	178.90%	39.10%	3.70%	7.10%	71.70%
Q3-2020	21.01%	284.00%	25.30%	13.20%	3.70%	89.00%	7.10%	1.60%	5.40%	72.70%
Q4-2020	1.49%	18.10%	7.00%	7.30%	30.80%	10.40%	6.70%	3.10%	0.00%	5.90%
Q1-2021	2.88%	5.40%	13.50%	4.10%	39.70%	0.60%	0.60%	3.80%	5.70%	56.20%
Q2-2021	2.77%	3.40%	59.60%	7.60%	6.70%	0.90%	1.70%	0.50%	0.50%	29.80%
Q3-2021	5.21%	6.50%	40.90%	0.70%	7.20%	1.30%	3.80%	3.40%	6.50%	57.20%
Q4-2021	9.50%	24.40%	4.90%	3.20%	4.70%	0.90%	3.40%	0.40%	5.20%	78.20%
Q1-2022	7.01%	2.50%	1.40%	5.60%	4.80%	1.30%	0.70%	1.30%	6.20%	73.20%
MAPE	3.96%	83.80%	16.90%	5.50%	9.10%	19.50%	5.50%	2.40%	4.90%	32.30%
MAPE Excl. 2020Q2 and 2020Q3	2.75%	11.00%	13.20%	4.30%	9.80%	1.90%	2.70%	2.30%	4.60%	26.10%

Table 3: Real Quarterly GDP's APE and MAPE for Chow-Lin Method

(percent)

	Real GDP	Taxes less subsidies	Fisheries	Construction and real estate	Wholesale and retail trade	Tourism	Transport and communication	Financial services	Public administration, health and education	Miscellaneous
Q3-2018	NA	NA	6.20%	1.80%	9.20%	0.20%	0.70%	1.40%	NA	8.30%
Q4-2018	NA	NA	2.30%	5.60%	10.60%	0.90%	2.20%	0.90%	NA	4.00%
Q1-2019	NA	NA	1.90%	8.40%	0.70%	0.90%	0.70%	4.60%	NA	5.10%
Q2-2019	NA	NA	16.60%	5.70%	6.70%	1.10%	5.50%	1.80%	NA	8.40%
Q3-2019	1.11%	5.70%	4.20%	2.40%	12.30%	0.30%	6.00%	3.30%	2.10%	5.00%
Q4-2019	3.16%	31.80%	2.70%	2.80%	9.80%	1.00%	0.00%	2.60%	4.50%	3.00%
Q1-2020	2.08%	1.20%	4.20%	5.80%	11.50%	5.10%	3.70%	3.70%	10.00%	5.50%
Q2-2020	5.14%	439.10%	56.90%	25.70%	19.00%	186.90%	39.40%	3.70%	7.10%	70.90%
Q3-2020	7.56%	280.90%	24.10%	23.20%	8.50%	53.90%	17.60%	1.50%	5.40%	60.20%
Q4-2020	4.13%	23.20%	5.00%	21.60%	28.50%	7.60%	10.10%	2.90%	0.00%	32.70%
Q1-2021	3.33%	7.10%	13.70%	15.70%	37.50%	1.20%	0.50%	3.30%	5.70%	6.20%
Q2-2021	0.58%	5.30%	58.50%	2.90%	1.10%	1.50%	3.00%	1.30%	0.50%	18.10%
Q3-2021	0.19%	6.60%	40.40%	0.60%	9.40%	0.50%	4.10%	2.40%	6.50%	9.10%
Q4-2021	3.03%	24.30%	11.80%	3.80%	8.00%	1.60%	4.60%	1.60%	5.20%	6.90%
Q1-2022	0.06%	0.50%	0.60%	1.70%	8.90%	1.10%	0.40%	2.40%	6.20%	3.80%
MAPE	2.24%	75.10%	16.60%	8.50%	12.10%	17.60%	6.60%	2.50%	4.80%	16.50%
MAPE Excl. 2020Q2 and 2020Q3	1.61%	11.70%	12.90%	6.10%	11.90%	1.77%	3.20%	2.50%	4.50%	8.90%

Table 4: Real Quarterly GDP's APE and MAPE for Litterman Method
(percent)

	Real GDP	Taxes less subsidies	Fisheries	Construction and real estate	Wholesale and retail trade	Tourism	Transport and communication	Financial services	Public administration, health and education	Miscellaneous
Q3-2018	NA	NA	14.30%	2.20%	5.10%	0.30%	0.60%	1.40%	NA	9.90%
Q4-2018	NA	NA	4.50%	5.50%	3.00%	0.80%	2.10%	0.90%	NA	6.30%
Q1-2019	NA	NA	1.70%	7.80%	10.30%	0.80%	0.50%	4.60%	NA	2.10%
Q2-2019	NA	NA	15.10%	5.30%	1.80%	1.00%	5.60%	1.80%	NA	9.80%
Q3-2019	0.08%	3.40%	4.70%	3.00%	5.00%	0.30%	6.20%	3.30%	2.40%	6.50%
Q4-2019	3.03%	27.80%	1.40%	2.80%	7.50%	1.20%	0.20%	2.60%	4.70%	0.80%
Q1-2020	0.34%	4.50%	6.20%	5.60%	5.20%	5.20%	3.80%	3.70%	10.10%	3.50%
Q2-2020	8.83%	837.10%	58.50%	24.90%	13.10%	179.10%	42.50%	3.70%	7.10%	64.60%
Q3-2020	8.53%	292.70%	19.80%	22.70%	6.90%	52.70%	18.30%	1.40%	5.40%	54.70%
Q4-2020	4.22%	10.70%	5.10%	20.90%	32.30%	7.50%	10.20%	2.90%	0.10%	32.90%
Q1-2021	2.58%	2.90%	14.60%	15.10%	34.00%	1.30%	0.50%	3.30%	5.70%	6.00%
Q2-2021	0.85%	0.60%	48.10%	3.10%	3.80%	1.50%	3.10%	1.30%	0.60%	18.00%
Q3-2021	0.54%	6.40%	33.80%	0.60%	6.50%	0.60%	4.20%	2.30%	6.50%	8.90%
Q4-2021	3.11%	24.80%	11.30%	3.40%	6.40%	1.60%	4.80%	1.70%	5.30%	6.60%
Q1-2022	1.30%	7.10%	8.90%	1.90%	3.70%	1.20%	0.50%	2.50%	6.20%	3.50%
MAPE	2.32%	110.70%	16.50%	8.30%	9.60%	17.00%	6.90%	2.50%	4.90%	15.60%
MAPE Excl. 2020Q2 and 2020Q3	1.34%	9.80%	13.00%	5.90%	9.60%	1.77%	3.30%	2.50%	4.60%	8.80%

The results indicate that the benchmarking performance of all three types of benchmarking is similar, i.e. each benchmarking model outperforms other models in different sectors:

- Denton-Cholette method produces the lowest MAPE for construction and real estate sector, wholesale and retail trade sector, transport and communication sector, and financial services sector,
- Chow-Lin method produces lowest MAPE for public administration, health and education sector and taxes less subsidies component.
- Litterman method produces lowest MAPE for fisheries sector, tourism sector, and miscellaneous sector.

However, when calculating the average MAPE, it is observed that the APE computed for two quarters (Q2-2020 and Q3-2020) produces significantly larger APE values compared to other quarters. Given that these two quarters coincide with the lockdown and border closures implemented by the government of Maldives following COVID-19 pandemic, it is likely that some methodological changes were required to compute QNA figures for these two quarters. Due to the high volatility in MAPE values during these two quarters, MAPE were calculated

by removing these two quarters and the subsequent adjusted MAPE indicate that each benchmarking model outperforms other models in exactly three sectors:

- Denton-Cholette method produces the lowest adjusted MAPE for construction and real estate sector, transport and communication sector, and financial services sector,
- Chow-Lin method produces lowest adjusted MAPE for fisheries sector, tourism sector, and public administration, health and education sector,
- Litterman method produces lowest adjusted MAPE for wholesale and retail trade sector, miscellaneous sector, and taxes less subsidies component.

Combining Minimal MAPE Methods

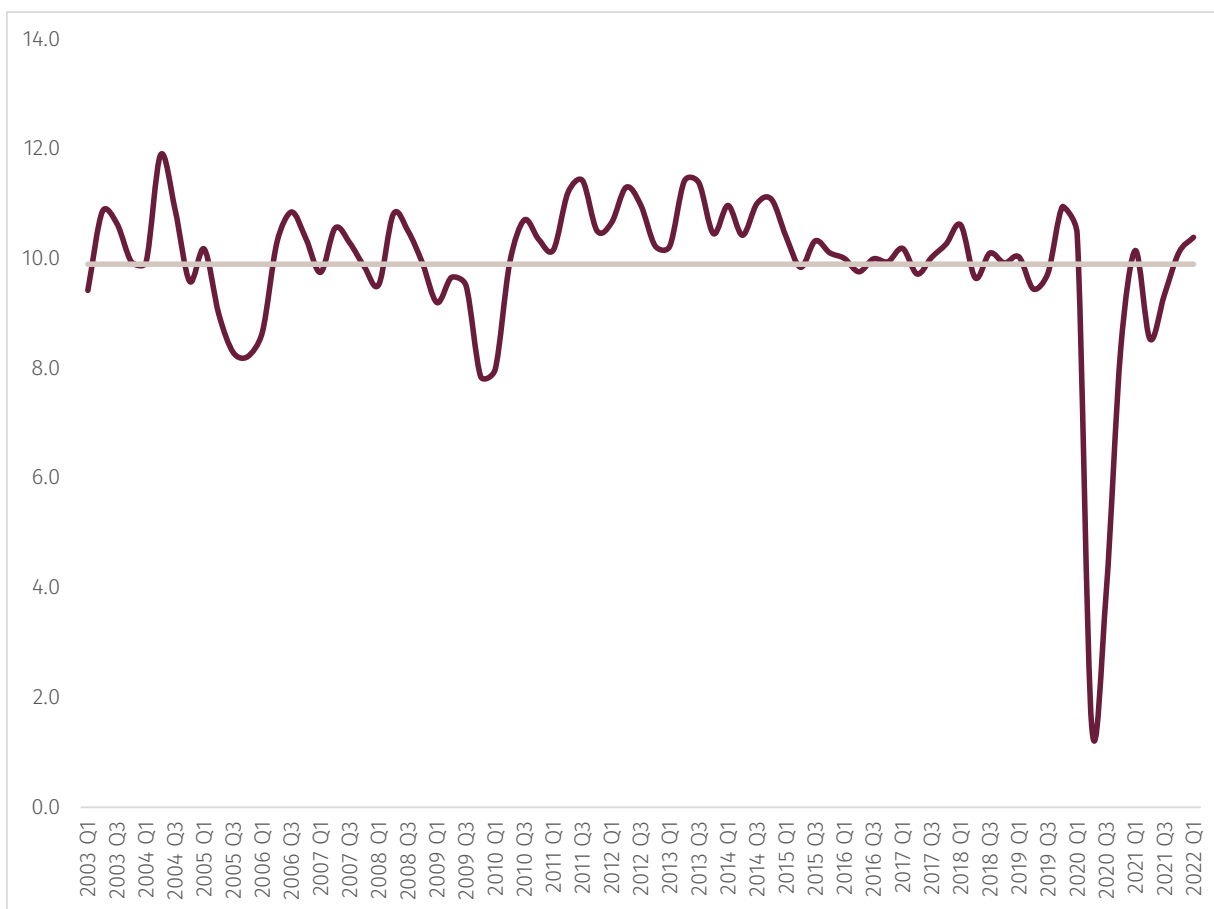
Since the MAPE for different sectors and components differ based on the benchmarking model used for the disaggregation, this study combines the most accurate or the minimal MAPE method for each sector to derive an estimate for total quarterly output for the economy, i.e. quarterly real GDP to check the APE for overall GDP.

Additionally for taxes less subsidies component, given the stability of its share to overall GDP⁶ (Figure 1), the computation also involved calculating the monthly output for taxes less subsidies component by assuming that the share to overall GDP of this component to be stable in the computing horizon, i.e. 10% of total GDP is derived from this component. More formally, monthly values for taxes less subsidies can be calculated as

$$Taxes\ less\ Subsidies_t = 0.1 \times \frac{\sum\ sectoral\ output_t}{0.9} \tag{8}$$

⁶ Between Q1-2003 to Q1-2022, the Taxes less Subsidies component accounts for on average 9.9% of the overall GDP.

Figure 1: Share of Taxes Less Subsidies Component of GDP
(percent)



As Table 5 indicates, using this alternative method of imposing a prior condition on the contribution of taxes less subsidies component as a share of total real GDP produces the most accurate nowcasts for the out-of-sample estimates, i.e. compared to the lowest adjusted MAPE observed when using benchmarking models for this component (9.8%), the alternative method produces an adjusted MAPE of 5.6%.

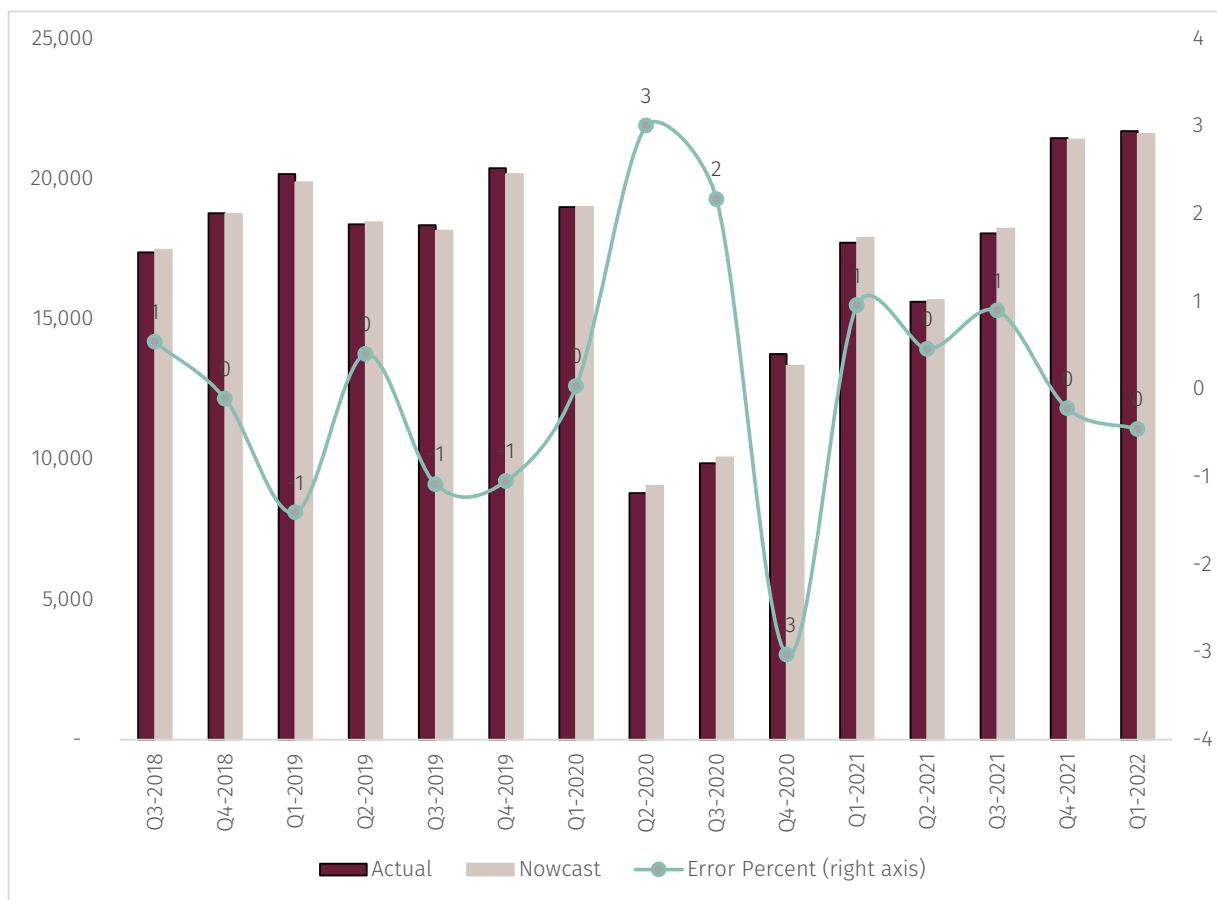
In addition to this, according to Table 5, when the minimal MAPE methods for each sector is combined to derive an overall real GDP estimate, the APE for real GDP's quarterly nowcast averages at 1.2% for the sample period (Q3-2019 to Q1-2022). Furthermore, if we exclude the problematic Q2-2020 and Q3-2020 from the calculation of the MAPE, the margin drop to less than 1%, i.e. the adjusted MAPE is estimated to be at 0.9% indicating that the combined nowcasts generate a significantly accurate nowcast for the real GDP for the out-of-sample quarter.

Table 5: Real Quarterly GDP's APE and MAPE for Combined Minimal MAPE Methods
(percent)

	Real GDP	Taxes less subsidies	Fisheries	Construction and real estate	Wholesale and retail trade	Tourism	Transport and communication	Financial services	Public administration, health and education	Miscellaneous
Q3-2019	1.10%	1.50%	4.20%	10.30%	5.00%	0.30%	6.10%	3.10%	2.10%	6.50%
Q4-2019	1.10%	9.60%	2.70%	2.30%	7.50%	1.00%	0.10%	2.30%	4.50%	0.80%
Q1-2020	0.00%	4.30%	4.20%	2.70%	5.20%	5.10%	3.70%	3.70%	10.00%	3.50%
Q2-2020	3.00%	593.50%	56.90%	13.40%	13.10%	186.90%	39.10%	3.70%	7.10%	64.60%
Q3-2020	2.20%	160.30%	24.10%	13.20%	6.90%	53.90%	7.10%	1.60%	5.40%	54.70%
Q4-2020	3.00%	15.90%	5.00%	7.30%	32.30%	7.60%	6.70%	3.10%	0.00%	32.90%
Q1-2021	1.00%	0.50%	13.70%	4.10%	34.00%	1.20%	0.60%	3.80%	5.70%	6.00%
Q2-2021	0.50%	17.60%	58.50%	7.60%	3.80%	1.50%	1.70%	0.50%	0.50%	18.00%
Q3-2021	0.90%	8.00%	40.40%	0.70%	6.50%	0.50%	3.80%	3.40%	6.50%	8.90%
Q4-2021	0.20%	1.40%	11.80%	3.20%	6.40%	1.60%	3.40%	0.40%	5.20%	6.60%
Q1-2022	0.50%	4.30%	0.60%	5.60%	3.70%	1.10%	0.70%	1.30%	6.20%	3.50%
Average	1.20%	55.10%	16.60%	5.50%	9.60%	17.60%	5.50%	2.40%	4.80%	15.60%
Average Excl. 2020Q2 and 2020Q3	0.90%	5.60%	12.90%	4.30%	9.60%	1.80%	2.70%	2.30%	4.50%	8.80%

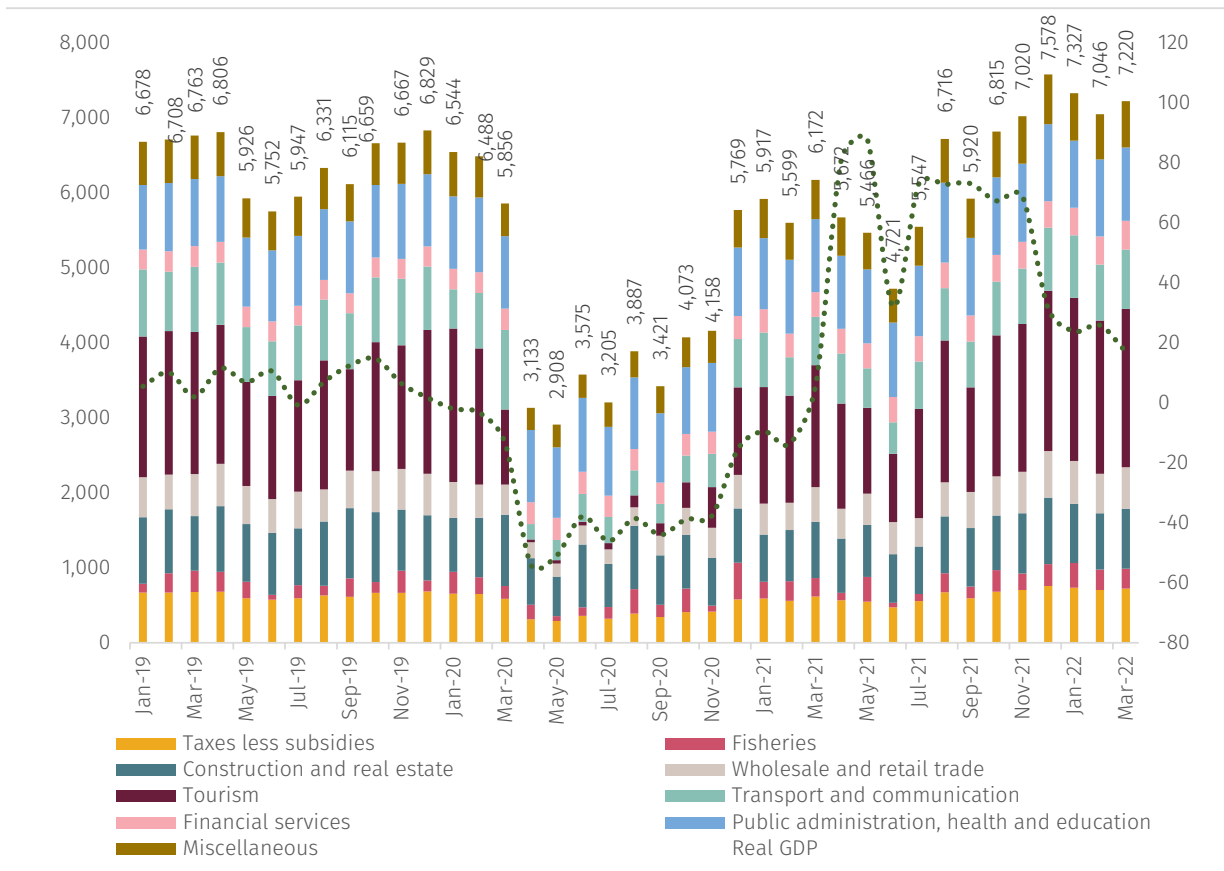
Moreover, the maximum APE realised across the sample period is approximately 3.0% which is realised for Q2-2020 and Q4-2020, and apart from the COVID-19 affected year of 2020, the APE remains below 1.5% in all the other quarters (Figure 2) indicating the nowcasting method used in this study generates accurate predictions for the overall performance of the local economy or the MIEG computed is a reliable indicator to gauge the monthly performance of the economy.

Figure 2: Total Real GDP Nowcast Versus Actual and Percent Error
(millions of rufiyaa, percent)



Using the minimal MAPE methods, the MIEG can be computed and Figure 3 shows the evolution of the monthly sectoral growth indices from January 2019 until March 2022. In particular, the analysis shows how during the lockdown and border closures implemented in the Maldives, the output of the economy fell from registering MVR5.9 billion of output in March 2020 to MVR3.1 billion in April 2020—almost halving the production in the economy within one month. In terms of how the economy has recovered, the nowcasted monthly economic growth indices indicate the gradual recovery of the economy has materialised with economy now producing monthly output at a higher level in the first three months in 2022 compared to the first three months in 2019.

Figure 3: Sectoral Real GDP and Total Real GDP Growth
(millions of rufiyaa, percent)



Comparing the nowcasting performances of various benchmarking model-based indices indicate that the Denton-Cholette method performs significantly better compared to the regression-based models used in this study (Chow-Lin and Litterman models). In particular, the Denton-Cholette generated high frequency indices for all sectors except the fisheries sector, miscellaneous sector and the taxes less subsidies component produces either the most accurate (construction and real estate sector, transport and communication sector, and financial services sector) or the second most accurate (wholesale and retail trade sector, tourism sector, and public administration, health and education sector) nowcasts for the out-of-sample estimates.

Conclusion and Recommendations

The aim of this study is to propose a methodology for nowcasting sector-level economic growth indices at the monthly frequency level as to monitor and analyse the real developments in the various sectors of the economy at a higher frequency as well as to subsequently compute a reliable and accurate MIEG. Accordingly, the methodology suggested in this paper involves using various benchmarking models to first temporally disaggregate the quarterly sectoral output to monthly indices which are then used in sector-specific OLS models to generate nowcasts for the out-of-sample time period (for the periods in which quarterly output data

is not currently available but for the same period for which monthly data exists). As such, three benchmarking models have been experimented a) Proportional First Difference Denton-Cholette Benchmarking Method, b) Maximisation of the likelihood function of Chow-Lin GLS regression-based Method, and c) Maximisation of the likelihood function of Litterman GLS regression-based Method.

The results indicate that for each sector the performance of the benchmarked indicator series in the nowcasting process differs based on the benchmarking model used in the disaggregation process and the Denton-Cholette model-based indices perform the most accurately as a whole for various sectors. Chow-Lin and Litterman models also have their advantages when the Denton-Cholette model performs weakly, for example in sectors such as fisheries sector, and miscellaneous sector. Additionally, the results also illustrated the importance of having high quality indicator series to benchmark the quarterly QNA output as the quality of the indicator series affects the nowcasting performance of the benchmarked high frequency estimates. In particular, the weak indicator series used in temporally disaggregating the taxes less subsidies component resulted in weak nowcasts generated from the benchmarked indices, whereas the imposition of the prior condition that the component need to be 10% of the total output of the economy produced better nowcasts compared to actual QNA estimated released by MBS.

The nowcasting estimations also illustrated that the error margin increases significantly for the Q2-2020 and Q3-2020 nowcasts in almost all sectors. While 2020 is the year in which COVID-19 pandemic resulted in unprecedented economic disruptions and multiple structural changes in the way economic activities were conducted, the forecasting performance of the models following these two quarters are similar to the forecasting performances prior to these two quarters. This implies the possibility of changes to the compilation procedure of quarterly output for these two quarters which need to be further verified and validated before these error margins need to be specifically addressed through modelling and estimation changes.

Given this study is one of the first papers that focuses on the nowcasting aspect in the Maldivian economic context, there exists immense potential to expand on this project to refine and produce more accurate nowcasts for each sector. For example, future line of work can focus on refining the different sector-specific equations used in the nowcasting process by either introducing more high frequency indicators in the benchmarking processes, or by incorporating more independent variables to capture economic linkages in the local economy, or by estimating sector-specific Vector Autoregressions (VARs) and by combining nowcasts generated from different processes to produce an average nowcast for each sector. Additionally, while this study focuses on first disaggregating quarterly output figures to generate monthly indices for each sector and then using these monthly estimates in the nowcasting estimation, future studies can also explore the use of mixed frequency nowcasting models such as the Bridge models, Mixed Data Sampling (MIDAS) and Unrestricted Mixed Data

Sampling (U-MIDAS) models to generate quarterly nowcasts for each sector which can then be disaggregated temporally to generate monthly estimates for each sector.

References

Baoline, C. (2007). "An Empirical Comparison of Methods for Temporal Distribution and Interpolation at the National Accounts", BEA Papers 0077, Bureau of Economic Analysis.

Barbone L., Bodo G., and Visco I. (1981). "Costi e profitti nell'industria in senso stretto: Un'analisi su serie trimestrali, 1970–1980". *Bolletino della Banca d'Italia*, 467–510.

Bournay, J. and Laroque, G. (1979). "Réflexions sur la méthode d'élaboration des comptes trimestriels". *Annales de l'INSÉÉ*, 36, 3–29.

Chow, G. C. and Lin, A. L. (1971). "Best linear unbiased interpolation, distribution, and extrapolation of time series by related series", *The Review of Economics and Statistics*, 53(4), 372–375.

Dagum, E. B., and Cholette, P. A. (2006). "Benchmarking, Temporal Distribution, and Reconciliation Methods for Time Series". *Lecture Notes in Statistics*. Springer-Verlag, New York, 80-82.

Denton, F. T. (1971). "Adjustment of monthly or quarterly series to annual totals: An approach based on quadratic minimization", *Journal of the American Statistical Association*, 66, 99–102.

Eia.gov. (2020). "Key Modeling Methods – Time Series Benchmarking, EIA - Handbook of Energy Modeling Methods". [online] Available at: <<https://www.eia.gov/analysis/handbook/>> [Accessed 26 September 2022].

Fernández, R. B. (1981). "A methodological note on the estimation of time series", *The Review of Economics and Statistics*, 63(3), 471–476.

Litterman, R. B. (1983). "A random walk, Markov model for the distribution of time series", *Journal of Business & Economic Statistics*, 1(2), 169–173.

National Bureau of Statistics, "Sources and Methods of Quarterly National Accounts, Base Year = 2014", National Bureau of Statistics.

Sax, C. and Steiner, P. (2013). "Temporal Disaggregation of Time Series", Munich Personal RePEc Archive Paper No. 53389, Munich Personal RePEc Archive Paper.

STATISTICAL APPENDIX

Table of Selected Economic Indicators, 2020 - 2023

(annual percentage change over the corresponding period, unless stated otherwise)

	2020	2021	2022	2022 Q1	2022 Q2	2022 Q3	2022 Q4	2023 Q1
Real Sector								
Tourist arrivals	-67	138	27	45	80	5	7	21
Bednights of resorts	-63	156	20	33	51	15	-3	6
Operational capacity of resorts	-36	69	10	13	8	9	8	6
Occupancy rate of resorts (%)	29	65	71	82	66	65	72	82
Average stay (days)	18.5	8.8	8.0	8.5	7.7	8.1	7.7	8.0
Fish purchases	-2	11	-8	-2	3	-19	-14	6
Prices ¹								
Total (Republic)	-1.4	0.6	2.3	0.6	3.0	2.7	3.1	3.9
Total excluding fish	-1.6	0.6	2.2	0.4	2.9	2.4	2.9	3.8
Food and non-alcoholic beverages excluding fish	2.8	2.4	4.5	1.6	4.7	5.6	6.0	8.0
Government Securities (millions of rufiyaa)								
Government securities outstanding	37,566.1	44,000.8	53,138.5	47,430.8	49,609.0	50,318.6	53,138.5	58,945.5
Treasury bonds	13,478.6	13,589.9	17,535.2	16,029.1	15,996.4	15,929.9	17,535.2	21,851.2
Treasury bills	24,087.5	30,411.0	35,603.3	31,401.7	33,612.5	34,388.7	35,603.3	37,094.3
MMA	91.3	97.4	87.9	78.0	71.2	87.9	87.9	87.9
Commercial bank	14,350.1	18,381.7	20,668.7	19,460.5	20,477.8	20,412.2	20,668.7	21,398.5
Others	9,646.2	11,931.9	14,846.6	11,863.1	13,063.6	13,888.7	14,846.6	15,608.0

Source:

Ministry of Tourism; Ministry of Fisheries, Marine resources and Agriculture; Ministry of Finance; Maldives Bureau of Statistics; Maldives Customs Service, Maldives Airports Company Limited; Gan International Airport; Maldives Monetary Authority

¹ The inflation rate for the year refers to the period average values, whereas inflation for the quarter represents the annual percentage change in the three-month-average.

	2020	2021	2022	2022 Q1	2022 Q2	2022 Q3	2022 Q4	2023 Q1
Money and banking								
Broad money	14	26	6	26	27	11	6	5
Net foreign assets	-49	114	-16	113	98	4	-16	-23
Net domestic assets	50	9	14	7	11	13	14	17
Net claims on central government	86	12	19	12	17	25	19	23
Claims on other sectors	10	6	6	4	3	1	6	6
o/w Private sector	10	4	4	2	1	-1	4	6
Reserve money	10	1	2	13	-4	-7	2	-6
Monetary operations¹								
Open market operations ²	0	0	0	0	0	0	0	0
Overnight Deposit Facility	34	44	34	41	37	37	22	17
External trade								
Merchandise exports (f.o.b.)	-21	0	40	57	41	25	36	21
Domestic exports	3	-7	5	43	10	-35	6	7
o/w Fish exports	3	-10	5	46	8	-38	6	9
Re-exports	-39	9	80	70	87	117	62	32
Merchandise imports (c.i.f.)	-36	40	37	32	63	42	17	5
o/w Food	-30	50	19	16	27	33	5	3
o/w Petroleum	-43	72	83	56	160	90	42	4
o/w Construction-related imports	-41	6	47	55	57	71	17	21

Source:

Ministry of Tourism; Ministry of Fisheries, Marine resources and Agriculture; Ministry of Finance; Maldives Bureau of Statistics; Maldives Customs Service, Maldives Airports Company Limited; Gan International Airport; Maldives Monetary Authority

¹ Monetary operations figures represent the average investment.

² Open market operations were suspended May 2014 onwards.

	2020	2021	2022	2022 Q1	2022 Q2	2022 Q3	2022 Q4	2023 Q1
Direction of Trade of Imports of Goods (as a percentage of total)								
o/w Singapore	11	10	9	9	7	8	12	10
o/w India	13	12	14	13	13	15	15	17
o/w Oman	8	13	18	16	22	20	14	15
o/w UAE	12	13	12	15	11	11	11	14
o/w Europe	10	11	10	9	9	8	13	11
Direction of Trade of Exports of Goods (as a percentage of domestic)								
o/w Thailand	44	46	49	52	60	24	51	59
o/w India	2	4	4	5	4	4	3	3
o/w UK	7	7	9	9	7	13	7	11
o/w France	8	4	4	3	3	5	4	4
o/w Germany	10	11	9	6	8	18	9	4
External Reserves								
Official reserve assets (millions of US dollars)	984.9	805.8	832.1	865.2	750.4	540.3	832.1	764.6

Source:

Ministry of Tourism; Ministry of Fisheries, Marine resources and Agriculture; Ministry of Finance; Maldives Bureau of Statistics; Maldives Customs Service, Maldives Airports Company Limited; Gan International Airport; Maldives Monetary Authority

MALDIVES MONETARY AUTHORITY

Boduthakurufaanu Magu

Male' - 20182

Republic of Maldives

Tel: (960) 330 8679

Fax: (960) 332 3862

Email: mail@mma.gov.mv

Website: www.mma.gov.mv