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Macrofinancial Linkages and Growth at Risk in the  
Dominican Republic

by Olga Bernalova and Marina Rousset

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I N T E R N A T I O N A L M O N E T A R Y F U N D

**IMF Working Paper**

Western Hemisphere Department

**Macrofinancial Linkages and Growth at Risk in the Dominican Republic**

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Authorized for distribution by Alejandro Santos

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**Abstract**

This paper uses the Growth-at-Risk (GaR) methodology to examine how macrofinancial conditions affect the growth outlook and its probability distribution. Using this approach, we evaluate risks to GDP growth in the Dominican Republic using quarterly data for 1996-2018. We group macrofinancial conditions in five principal determinants, based on 32 indicators. The Dominican Republic's growth distribution appears most vulnerable to negative shocks to domestic financial conditions, domestic leverage, domestic demand, and external demand, with additional repercussions from the external cost of borrowing in the longer run. Our findings show that domestic monetary policy plays a particularly important role in reducing growth vulnerabilities when the economy is weak.

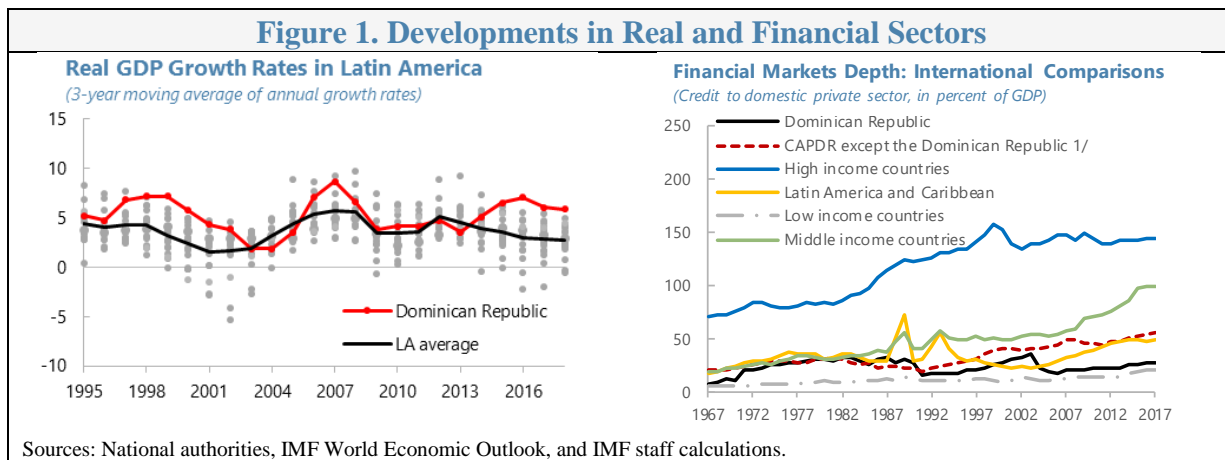
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## I. INTRODUCTION

**The Dominican Republic is a small open economy characterized by capital-account and financial-market openness.** It is the largest economy in Central America and the Caribbean, and the third most populous country in the region with a total population of about 10.8 million. It occupies the eastern two-thirds of Hispaniola, an island in the Caribbean Sea which it shares with Haiti. Based on per capita income, the Dominican Republic is classified by the World Bank as an upper-middle-income country.



**Over the last 25 years, the Dominican Republic demonstrated impressive economic growth (Figure 1), which was interrupted only during the 2003-04 banking crisis.** In 2003, economic output contracted by 1.3 percent, and in 2004 it grew by only 2.6 percent. Strengthened macroeconomic policies, supported by IMF programs, helped to start a period of impressive macroeconomic stability: over the 2005-18 period, annual GDP growth averaged 5.9 percent. Going forward, the pace of economic expansion of the Dominican Republic is expected to moderate to potential levels amid less supportive external conditions.

**Monetary policy in the Dominican Republic is characterized by inflation targeting and a managed floating (crawl-like) exchange rate regime.** Given the inflation-targeting framework, adopted in January 2012, monetary policymakers base their decisions about domestic interest rates on their expectations of inflationary pressures. Credit to the private sector accounts for less than 30 percent of GDP, below the averages for the Latin America and Caribbean region and middle-income countries (see Figure 1 above). Transmission of the global interest rates into domestic markets can be lagged, while the impact of lower liquidity or higher risk perception in the global financial markets on domestic growth outlook is limited by the size of the local financial system.

**As of the end of 2018, macrofinancial risks in the Dominican Republic appear limited.** The financial system remains healthy by international comparison, in terms of its capitalization, asset quality, liquidity and profitability. Dollarization of assets and liabilities remained broadly stable at around 20 percent and 30 percent, respectively, and banks enjoy

healthy liquidity and profitability. The main macrofinancial risks in the Dominican Republic, as elsewhere in the region, stem from the potential slowdown of external demand caused by deteriorating economic conditions in key trading partners or worsening terms of trade and competitiveness.

**The literature finds that macrofinancial vulnerabilities can amplify and prolong the impact of shocks on economic activity.** It is thus critical to evaluate the impact of financial conditions – both domestic and external – on future growth outcomes (Claessens, Kose, and Terrones, 2012). This provides motivation for our analysis in the context of the Dominican economy, where despite the currently low macrofinancial risks, prudent and forward-looking policy decisions will remain essential for crisis prevention and business-cycle management.

**A useful framework to link macrofinancial conditions and growth outlook is provided by the recent strand of Growth-at-Risk (GaR) literature.** Empirical research developed by Adrian, Boyarchenko and Giannone at the New York Federal Reserve Bank (2016, 2019) and its adaptations for IMF country surveillance (Prasad et al, 2019) provide a useful toolkit to look at the entire projected growth distribution and estimate the severity and likelihood of a recession given a set of country-specific macroeconomic and financial variables.

**This paper applies the GaR methodology to evaluate risks to GDP growth in the Dominican Republic, which offers three advantages.** First, it draws attention to the entire growth distribution—encompassing both downside and upside risks—and so goes beyond more traditional point forecasts. Second, it provides a framework for analyzing the key drivers of future GDP growth, including their relative importance, which vary across the growth distribution and the forecasting horizon. Third, it helps quantify the impact of systemic risk on future GDP growth and therefore holds promise for guiding macroprudential policy.

The rest of this paper is organized as follows: Section II reviews the relevant literature; Section III describes the data and methodology used; Section IV contains the main results; Section V concludes; and Section VI provides an annex with quantile regression coefficients.

## II. LITERATURE REVIEW

**A large body of literature examines how the informational content of financial-sector data can contribute to output projections.** Stock and Watson (2003) provided evidence that asset prices help to predict GDP growth, and that combination forecasts, through information pooling, substantially improve upon forecasts based on individual predictors. Erdem and Tsatsaronis (2013) summarized the common variation in a large array of financial variables into a small set of statistical factors and concluded that financial factors do contain information about macroeconomic variables, which is most evident in the case of output. Chen and Ranciere (2016) studied the forecasting power of financial variables for macroeconomic variables in 62 countries between 1980 and 2013 and concluded that financial variables (including credit growth, stock prices, house prices, and bond yields) have

considerable predictive power for macroeconomic variables at short-term horizons. Kiyotaki and Moore (1997) noted that financial leverage is an important source of vulnerability. Eggertsson and Krugman (2012) developed a model that explains how rapid deleveraging can depress aggregate demand.

**The recent literature on GaR maps financial and economic conditions into the probability distribution of future GDP growth.** It is important to note however that the GaR methodology does not establish causal links between the underlying macroeconomic conditions and future growth outcomes. Instead, the GaR framework was designed to estimate the severity of risks to growth linked to certain categories of macroeconomic and financial conditions through the quantile regression and scenario analysis techniques. For example, Adrian, Boyarchenko and Giannone (2019) verified a nonlinear relationship between financial conditions and the conditional distribution of GDP growth, concluding that the left tail of the growth distribution is positively correlated with slack in financial conditions. These findings underscored the impact monetary policy may have on the tradeoff between present and future macroeconomic objectives through its effect on financial conditions, as recognized in Adrian and Liang (2016).

**Applications of the GaR methodology to IMF surveillance underline the importance of country context in growth analysis.** Specifically, examples demonstrate that growth distributions in different economies are sensitive to changes in different macroeconomic conditions, and that the impact of these changes is nonlinear over different time horizons. In Albania's case (IMF 2019a), macroeconomic conditions in trading partners are associated with the largest impact on growth in the short run, regardless of the state of the economy. Similarly, Beaton (2019) documented that external conditions – both financial and demand factors – are the key drivers of Panama's growth in the short run. Meanwhile, domestic financial conditions (including interest rates, leverage, and credit growth) appeared to provide the most powerful signal of risks to growth in Portugal (Kouet-Vickot, 2019), and external financial conditions contained the most explanatory power of future GDP growth in Singapore (IMF 2019b).

### III. METHODOLOGY AND DATA

#### A. Growth determinants in the Dominican Republic

**Applying the GaR methodology to the context of the Dominican Republic requires several key steps.** First, we select relevant explanatory macrofinancial variables and use the principal components analysis to group them into partitions, or subgroups, each reflecting different facets of growth factors (see Table 1). Second, the partitioned indicators are used in a quantile regression model for forecasting output growth. Third, a probability density function of future GDP growth is fitted using a skewed generalized  $t$  distribution, which is used to quantify downside risks to future output growth. Lastly, various scenarios are applied

to estimate the impact of hypothetical shocks on the future growth distribution 4, 8, and 12 quarters ahead, forming the term structure of the growth impact from a given partition. Our data sample consists of quarterly observations from 1996 through 2018.

**Macrofinancial variables are first grouped into tailored partitions.** The use of these customized partitions, instead of individual variables, helps extract common trends among relevant macrofinancial variables and remove idiosyncratic noise, thereby improving the quality of subsequent quantile regressions. We grouped 32 quarterly economic series<sup>1</sup> for 1996-2018 into five main partitions (or regressors) of explanatory variables, with the first two groups reflecting domestic financial conditions, and the last three summarizing external conditions (see Table 1). Deriving the first principal components for each of these partitions allows us to extract relevant factors, which serve as explanatory variables in the quantile regression analysis.

**Table 1. Determinants of Growth at Risk in the Dominican Republic<sup>2</sup>**

<b>Domestic Financial Conditions</b>	<b>Domestic Leverage</b>	<b>External Cost of Borrowing</b>	<b>External Liquidity</b>	<b>External Demand</b>
M1	Private credit-to-GDP	6-month LIBOR	World bond flows	Terms of Trade
M2	Credit growth	US Fed Funds rate	EM bond flows	Euro area growth
M3	Regulatory capital		MOVE index	Net exports-to-GDP
Saving interest rate in USD	NPLs		VIX	US growth
Lending interest rate in USD				REER
30-day interest rate				Oil price
Reserve requirements rate				
Inflation				
Policy rate				
Commercial interest rate				
EMBIG spread				
Average lending rate				
2-year interest rate				
Personal interest rate				
Interbank interest rate				
Mortgage interest rate				

**Normalized around zero for the estimation period, these partitions indicate a tight (accommodative) stance of financial conditions in the sample period for their positive (negative) values, respectively.** Figure 2 below shows the weights of the individual loadings in the selected partitions. A positive weight of an individual variable shows that its increase will contribute to a higher value of the partition, therefore indicating tighter/contractionary conditions. Conversely, a negative weight of an individual variable tells that its increase will

<sup>1</sup> We selected relevant macroeconomic and financial indicators based on the tradeoff between informativeness and stability and ensured that the correlation between individual variables in each partition does not exceed 0.7.

<sup>2</sup> Note that the division of the external financial conditions partition into the borrowing costs and liquidity components is novel to the literature and allows to analyze the impact of each factor separately.

contribute to a lower value of the respective macrofinancial partition, leading to more accommodative/expansionary conditions. In particular:

1. the **domestic financial conditions index (FCI)** partition captures the price of risk and monetary policy variables. In the absence of asset price data, such as housing prices and stock market indices, this partition extracts information from the variety of interest rates and monetary policy indicators. Higher interest rates, domestic spread, inflation, reserve requirements and the policy rate would indicate a tighter financial stance and have a contractionary impact on economic growth in the Dominican Republic. Higher monetary aggregates and interest rates on savings accounts would indicate looser financial conditions and have an expansionary impact on domestic economic growth.

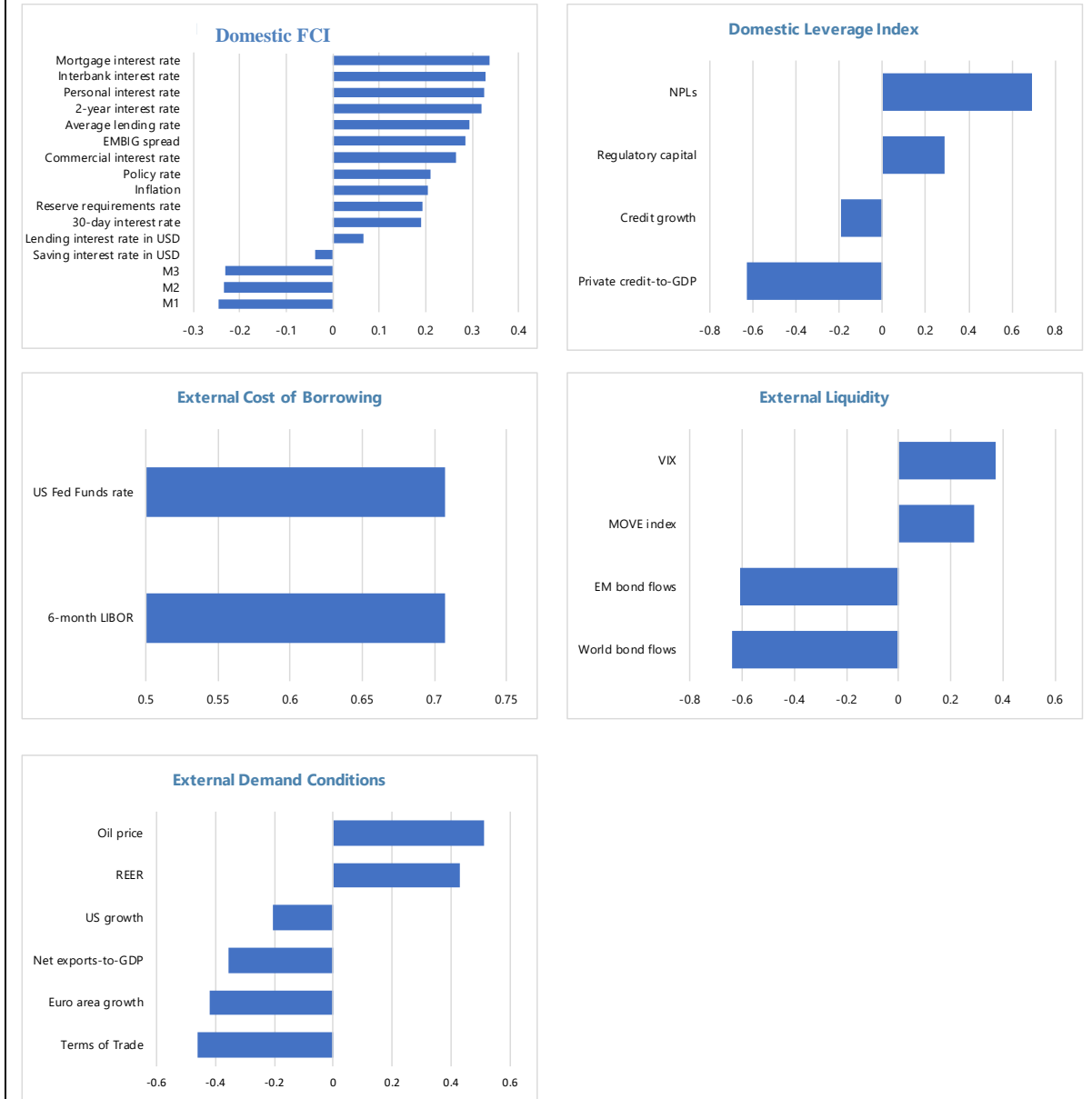
2. **domestic leverage partition** indicators reflect credit conditions and financial stability. Higher values of this partition would indicate lower availability of credit due to lower credit growth and more shallow credit markets or due to increased non-performing loans (NPLs) and/or a higher regulatory capital requirement, which would have a contractionary impact on credit expansion, and thus, on economic growth of the Dominican Republic.

3. the **external cost of borrowing partition** reflects the cost of credit in foreign markets. The value of this partition would increase should either the London interbank rate or the U.S. Federal funds rate rise, leading to tighter global financial conditions, which could potentially have a contractionary impact on domestic growth in the Dominican Republic, should there be a strong transmission mechanism from global to domestic interest rates.

4. the **external liquidity partition** captures external financial market volatility and bond flows. The value of this partition would increase if either the bond flows in the world (emerging) markets decline, or if there are higher perceived risks in the global financial markets, as measured by the VIX (the Chicago Board Options Exchange Volatility Index, also called the “fear index” measuring expectations about the stock market) and the MOVE index (the Merrill Lynch Option Volatility Estimate for the bond markets). Higher values of the external liquidity partition would indicate an external liquidity crunch, which could transmit into lower domestic growth, should there be insufficient domestic liquidity and/or dependence of the domestic banking system on global sources of financing.

5. the **external demand partition** captures the pressures of external markets on the trade balance. The value of this partition would increase in cases of an oil price increase, an appreciation of the real effective exchange rate, a decline in real income of the Dominican Republic’s main trading partners (the US and the euro area), a lower share of net exports in the GDP, or less favorable terms of trade. Higher values of the external demand partition would indicate contractionary pressures on domestic growth in the Dominican Republic, should external demand be an important driver of the local economy.

**Figure 2. Subdimensions of Macrofinancial Risk: Variable Loadings**



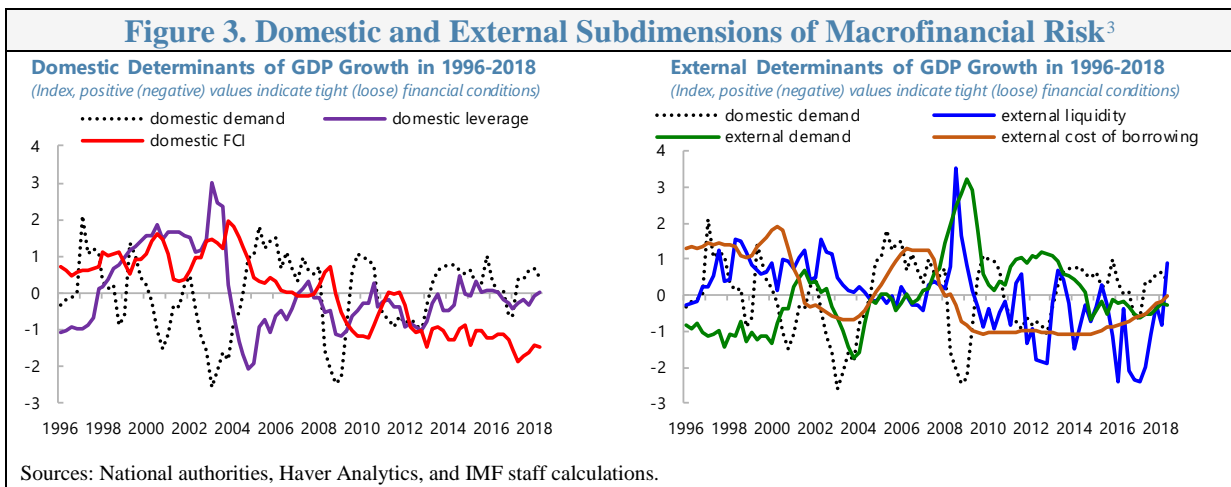
**Capturing different dimensions of financial and external conditions, these five subdimensions of risks to growth do not always move together** (see Figure 3):

- The **domestic FCI partition** related to the **price of risk and monetary policy** indicates that financial conditions in the Dominican Republic have remained broadly accommodative after the Global Financial Crisis (GFC). The index points to significantly tight monetary and financial conditions during the 2003 banking crisis along with episodic tightening in 2008 and around 2011-12, followed by generally loose domestic financial conditions. It also reflects the



easing of monetary conditions in 2017 employed to stimulate the slowing economy, and their subsequent gradual tightening.

- The **domestic leverage partition** has likewise picked up the severe tightening of credit conditions during the 2003 banking crisis (the spike reflects that the credit-to-GDP ratio decreased dramatically) and the subsequent recovery of credit, albeit marked by episodes of temporary credit tightness.
- The **external cost of borrowing partition**, however, demonstrates episodes of severe external credit tightness during the emerging market crises of the late 1990s and the GFC, followed by a prolonged period of loose international credit conditions and their gradual tightening in the recent years.
- The **external liquidity partition** exhibits the most volatility, with global liquidity drying up significantly in 2008-09, expanding in the following decade, and tightening again in 2018. There are no concurrent dynamics between this partition and domestic demand.
- Finally, the **external demand partition** is dominated by commodity price cycles. It had a contractionary impact on the Dominican Republic's growth during 2006-14, driven by high oil prices during the commodity super cycle and the country's net fuel importer position. This negative impact was partly compensated by the exchange rate depreciation following the 2003 crisis and real output growth in trade partner countries.



**On average, all five broad indicators of financial and macroeconomic conditions we derived for the Dominican Republic point to currently neutral financial conditions. Domestic leverage (credit) indicators point to neutral conditions in 2018, which is consistent**

<sup>3</sup> Domestic demand indicates the current rate of real GDP growth, measured on the quarter-on-quarter basis.

with the recent closing of the credit gap, as the mid-2018 monetary policy tightening slowed credit growth (see Figure 2). Domestic FCI suggests that financial conditions are still accommodative as the EMBIG spread and inflation remain low. External financial indicators—cost of borrowing, liquidity, and demand—reflect the normalization of external financial conditions from the earlier accommodative stance, with tightening liquidity conditions capturing lower bond flows and higher volatility in financial markets.

## B. Impact of Financial Conditions on Future Growth

**The conditional density of future GDP growth in the Dominican Republic is estimated based on current financial and external conditions using quantile regression analysis.**

The specification follows the approach detailed in IMF (2017).

$$Qgrowth_{t+h,t}^q = \beta_0^q + \beta_1^q X_{1,t} + \beta_2^q X_{2,t} + \beta_3^q X_{3,t} + \beta_4^q X_{4,t} + \beta_5^q X_{5,t} + \gamma^q growth_t + e_{t+h}^q$$

where  $q$  indicates the quantile,  $h$  the horizon (in quarters),  $growth_t$  is the current GDP growth rate (or domestic demand), and  $X_{n,t}$  represents each of the partitioned predictors (or indices). The regression is fitted on a set of quantiles (0.10, 0.25, 0.50, 0.75, 0.90) and for  $h=4, 8$  and 12 quarters ahead, establishing a mapping between selected macrofinancial variables and future growth at different horizons and for different points of the distribution.

**Quantile regressions are used to estimate the potentially nonlinear and state-dependent marginal impact of macrofinancial determinants on future growth density.** Comparing results across horizons helps to analyze the transmission of macrofinancial linkages in the short run, medium run, and long run, across different points of the growth distribution. For example, the 0.1 quantile indicates times when growth was relatively weak, the 0.9 quantile stands for times of high growth, and the 0.5 quantile is equivalent to the median growth in this sample. Thus, a quantile regression at the 10th percentile would estimate a relationship when growth is relatively weak, while a quantile regression at the 90th percentile would be based on stronger growth outcomes. The advantage of this methodology is that it goes beyond the traditional point estimates and evaluates the marginal impact of a number of macrofinancial determinants on growth, which can have asymmetric effects on the tails of the distribution, allowing coefficients to be state-dependent (across quantiles) and vary across horizons.

**Results of the quantile regressions are used to fit the probability density function (pdf) for future GDP growth using a skewed generalized T distribution.**

The estimated distribution is conditional on the actual growth and a set of regressors observed in the last period or in the past. The estimated pdf can be used to quantify the risks to the economy. First, it helps to evaluate the  $x$  percent GaR, which shows what would be the lowest growth rate we could observe with the  $x$  percent probability (we use  $x=5$  percent and 10 percent). Second, it helps to assess the probability of negative economic growth. Comparing these values in the baseline and shock scenarios allows quantifying the risks to growth.

## IV. MAIN RESULTS

### A. Interpretation of Quantile Regressions Results

The term structure of the quantile regression coefficients at different points of the distribution reveals the macrofinancial linkages and shock transmission mechanisms in the Dominican Republic. Table 1 below presents the regression estimates for each quantile-horizon pair (complemented by Figure 4 in the Annex). The following paragraphs first discuss the results for each horizon separately, and then summarize the findings.

**Table 1. Quantile regression results for h=4, 8, and 12 quarters ahead horizons**

Partition\Quantile	0.10	0.25	0.50	0.75	0.90	mean
<b>1. Short-term horizon (h=4)</b>						
Domestic Leverage	<b>-1.03***</b> (0.000) <sup>4</sup>	<b>-0.85***</b> (0.000)	<b>-0.76***</b> (0.000)	<b>-0.60***</b> (0.000)	<b>-0.61***</b> (0.000)	<b>-0.80***</b> (0.000)
External Borr. Cost	-0.06 (0.770)	0.18 (0.303)	0.20 (0.216)	0.03 (0.843)	0.05 (0.774)	<b>0.21** (0.099)</b>
External Demand	<b>-0.84***</b> (0.000)	<b>-0.69***</b> (0.000)	<b>-0.45***</b> (0.006)	-0.20 (0.109)	-0.34 (0.035)	<b>-0.61***</b> (0.000)
External Liquidity	0.20 (0.179)	0.37 (0.014)	0.15 (0.354)	0.12 (0.357)	0.31 (0.021)	<b>0.25** (0.050)</b>
Domestic FCI	<b>-0.42**</b> (0.061)	<b>-0.63***</b> (0.005)	-0.29 (0.154)	-0.06 (0.682)	-0.18 (0.289)	<b>-0.51***</b> (0.002)
Domestic Demand	<b>-0.45***</b> (0.002)	<b>-0.73***</b> (0.000)	<b>-0.52***</b> (0.001)	<b>-0.22**</b> (0.068)	-0.15 (0.241)	<b>-0.59***</b> (0.000)
R <sup>2</sup>	0.46	0.40	0.33	0.27	0.23	0.52
<b>2. Medium-term horizon (h=8)</b>						
Domestic Leverage	<b>-0.87***</b> (0.000)	<b>-0.87***</b> (0.000)	<b>-0.91***</b> (0.000)	<b>-0.65***</b> (0.000)	<b>-0.57***</b> (0.000)	<b>-0.82***</b> (0.000)
External Borr. Cost	-0.21 (0.294)	-0.18 (0.379)	-0.22 (0.184)	<b>-0.33*</b> (0.023)	<b>-0.65***</b> (0.001)	<b>-0.29* (0.025)</b>
External Demand	<b>-0.71***</b> (0.000)	<b>-0.64***</b> (0.001)	<b>-0.68***</b> (0.000)	<b>-0.47***</b> (0.006)	<b>-0.48***</b> (0.006)	<b>-0.64***</b> (0.000)
External Liquidity	0.03 (0.840)	0.01 (0.924)	0.21 (0.137)	0.09 (0.637)	0.17 (0.507)	0.14 (0.222)
Domestic FCI	-0.17 (0.408)	-0.13 (0.565)	-0.23 (0.263)	0.02 (0.931)	0.18 (0.404)	-0.08 (0.628)
Domestic Demand	<b>-0.80***</b> (0.000)	<b>-0.63***</b> (0.001)	<b>-0.38*</b> (0.019)	-0.13 (0.481)	0.05 (0.819)	<b>-0.40***</b> (0.002)
R <sup>2</sup>	0.44	0.38	0.37	0.32	0.35	0.56
<b>3. Long-term horizon (h=12)</b>						
Domestic Leverage	<b>-0.68***</b> (0.000)	<b>-0.77***</b> (0.000)	<b>-0.78***</b> (0.000)	<b>-0.89***</b> (0.000)	<b>-0.85***</b> (0.000)	<b>-0.75***</b> (0.000)
External Borr. Cost	<b>-0.64***</b> (0.000)	<b>0.59***</b> (0.000)	<b>-0.59***</b> (0.000)	<b>-0.50***</b> (0.000)	<b>-0.59***</b> (0.000)	<b>0.48***</b> (0.000)
External Demand	<b>-0.30***</b> (0.010)	<b>-0.55***</b> (0.000)	<b>-0.80***</b> (0.000)	<b>-0.87***</b> (0.000)	<b>-0.93***</b> (0.000)	<b>-0.76***</b> (0.000)
External Liquidity	0.14 (0.109)	0.08 (0.325)	0.09 (0.398)	0.00 (0.982)	0.10 (0.517)	0.05 (0.596)
Domestic FCI	<b>0.48***</b> (0.000)	<b>0.22**</b> (0.067)	-0.02 (0.914)	-0.17 (0.331)	-0.24 (0.203)	-0.11 (0.420)
Domestic Demand	-0.14 (0.254)	<b>-0.25***</b> (0.031)	<b>-0.36***</b> (0.005)	<b>-0.72***</b> (0.000)	<b>-0.59***</b> (0.000)	<b>-0.52***</b> (0.000)
R <sup>2</sup>	0.49	0.50	0.49	0.50	0.47	0.71

<sup>4</sup> Hereafter, the first number stands for the regression coefficient, the number in parenthesis indicates the p-value. Asterisks \*, \*\*, and \*\*\* indicate statistical significance at 5, 10, and 1 percent levels, respectively.

**Results indicate that the domestic leverage partition has the strongest and always significant impact on growth in the Dominican Republic at all three horizons.** A negative sign in front of this partition's values indicates that higher availability of private sector credit is always associated with higher economic growth in the following year, while a credit crunch would have a strong and prolonged negative impact on domestic growth.

**Deteriorating external demand is the second most important factor of growth in the Dominican Republic, and has its strongest impact at the medium- and long-term horizons.** Favorable external demand conditions have a strong positive impact on the domestic economy, while a decline in external demand could create a negative impact on local growth. This transmission channel is always significant in the medium and long run (h=8 and 12). In the short term (h=4), external demand has a significant impact on domestic growth only when growth is below the sample average (q=0.1, 0.25, and 0.5).

**Domestic financial conditions have a significant impact on the economy only when growth is below average, and there is a tradeoff between the economic stimulus created in the short run and the economic vulnerabilities created by financial easing in the long run, as indicated by the sign switch.** Domestic financial conditions are important for growth only in the short (h=4) and long (h=12) run, and only for q=0.1 and 0.25 percentiles and for the mean of the growth distribution. In the short run, loose monetary conditions, i.e. lower interest rates and higher monetary aggregates, will have an expansionary impact on the domestic economy in "bad" times, as shown by the negative coefficient in this partition at h=4. However, expansionary monetary policy can create long-run vulnerabilities, which can amplify shocks in bad times, exacerbating downturns, as reflected in the positive coefficient sign for the h=12 horizon. Therefore, the central bank has significant power to stimulate the economy in bad times, but it should be cautious of the possible negative feedback of such a stimulus two years later. It is important to note that the domestic FCI partition has the same behavior as the price-of-risk partition in the advanced economies. This reflects the potency of monetary policy to drive the macroeconomy through the interest rate-investment channel in the absence of deep stock markets.

**External borrowing costs do not have a short-term impact but gain importance in the longer run, while external liquidity has no significant impact on domestic economic growth at any horizon.** The external cost of borrowing has a significant and negative impact only at longer horizons (h=12) across all points of the growth distribution and at medium horizons (h=8) only in times of higher-than-average growth. In the near term, its impact is positive but significant only for the mean of the distribution. External liquidity conditions seem to not have a significant marginal impact on the growth outlook in the Dominican Republic.

**A shock to the autoregressive component of domestic demand, which indicates the current growth rate, leads to lower future growth.** Such a shock can occur in case of a negative structural shift, i.e. due to a natural disaster, population aging, or other resource constraints.

**The term structure of the quantile regression coefficients shows that the impact of different partitions is state-dependent and may differ across horizons** (see Table 1 above and Figure 5 in the Annex). Private sector credit is the most important driver of growth in the Dominican Republic. A negative shock to the domestic leverage partition, such as a sudden credit crunch, may have a strong and persistent negative impact on growth. External demand is another significant determinant of growth – shocks to this partition can be detrimental to growth, with a short-term impact when growth is weaker than average, and a persistent medium-to-long-term impact regardless of the state of the economy. Domestic FCI, which is determined by monetary policy, plays a significant role when growth is below average, and switches sign between the short and long horizons. External borrowing costs and external liquidity have a limited impact on domestic growth in the Dominican Republic.

## B. Scenario Analysis

**Results of the quantile regressions allow fitting a probability density function for GDP growth using a skewed generalized T distribution.** This distribution, the mode of which is conditional on the IMF’s growth forecasts, is used to assess the 5 percent and 10 percent growth at risk (GaR). Under the baseline scenario at the end of 2018, there is a 5 (10) percent probability that growth in 2019 could be as low as 4.65 (4.85) percent, and the probability of negative growth is close to zero.

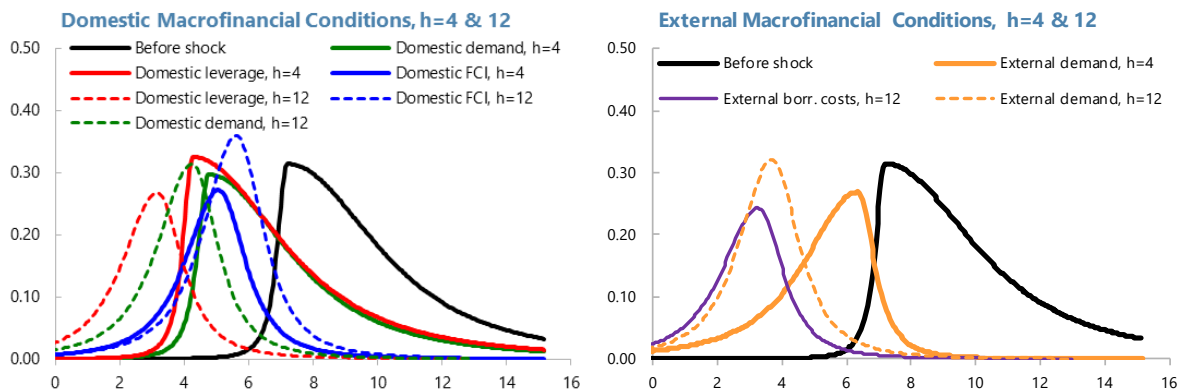
**Scenario tests (see Figure 4 below) allow comparing the impact of negative shocks to each partition with the growth distribution under the baseline scenario.** We compare short-term and long-term impacts of shocks by analyzing shifts in growth distributions at  $h=4$  and  $h=12$  quarters ahead. Note that these shocks are independent and measured as a one-standard-deviation change in the entire partition.

**Among domestic macrofinancial factors, a negative shock to *domestic leverage* is the one that would persistently reduce growth prospects, especially in the longer run.** A tightening in domestic leverage—which could be caused by slower credit growth, worsening credit quality or higher regulatory capital requirements—would have a strong negative and statistically significant impact on future growth. A negative shock to the domestic leverage partition in the short run would reduce modal growth by almost 3 percent (from 7.2 to 4.3 percent) although without a risk of getting a negative future growth outcome. In the long run the same shock would decrease the modal growth forecast by 4 percent (from 7.2 to 3.2 percent), leading to a decline in economic activity with a sizable probability of 6.6 percent. A negative shock to domestic demand (the autoregressive component) – which could be due to lower potential output caused by a negative supply shock, i.e. due to a natural disaster or other factors – could decrease the modal forecast by 2.4 percent and 3 percent at  $h=4$  and  $h=12$  quarters ahead, respectively. In the 5 percent of the worst scenarios, growth could fall to 3.4 percent in the short horizon, leading to risks of sluggish growth (0.5 percent) in the longer term.

**A negative shock to the domestic FCI would be significant only in bad times, reversing its impact from negative in the short run (h=4) to positive in the longer run (h=12).** This is similar to the impact of the domestic price-of-risk factor in the literature. In particular, in the short term, tighter domestic FCI, which mostly reflects domestic monetary policy, could reduce the modal growth forecast by almost 2 percent (from 7.2 to 5.1 percent) and increase the probability of negative growth to 2.5 percent. In the long term, the growth forecast would widen on the right, improving the mode forecast to 5.6 percent, although with a very small impact on other parameters of the growth distribution. This suggests that monetary policy plays a large role in staving off growth slowdowns and that decisions to tighten should be carefully analyzed and made only in response to upward inflationary pressures.

**Figure 4. Scenario Tests for Negative Shocks to Individual Partitions**  
(Quarterly GDP, compound annual growth rate, 4 and 12 quarters ahead)/1

	Before the shock	Domestic FCI		Domestic leverage		Domestic demand		External demand		External borrowing cost	External liquidity
		h=4	h=12	h=4	h=12	h=4	h=12	h=4	h=12	h=12	h=12
Conditional mode	7.2	5.1	5.6	4.3	3.2	4.8	4.2	6.3	3.7	3.3	4.2
GaR at 5%	4.7	2.0	2.1	2.6	-0.8	3.4	0.5	-0.3	0.4	-1.0	0.9
GaR at 10%	4.9	3.6	3.3	2.8	0.9	3.6	2.0	2.2	1.6	1.0	2.6
Probability of growth below zero	0.0	2.5	2.0	0.1	6.6	0.1	3.9	5.3	4.2	0.1	0.0



1/ Distributions for partitions which do not have statistically significant impact are not shown

**Among external macrofinancial factors, a deterioration in external demand conditions would be the most detrimental to domestic growth, especially at the longer horizons.**

Thus, a negative shock to external demand could shift the growth distribution strongly to the left, increasing the probability of growth below zero to around 4-5 percent. Higher external borrowing costs would reduce domestic growth prospects in the Dominican Republic only in a three-year horizon due to a lagged shock transmission mechanism. External liquidity conditions do not have a significant short-term impact due to the relatively weak integration

of the Dominican financial sector in the global financial markets and sufficient liquidity in local markets.

## V. CONCLUSIONS

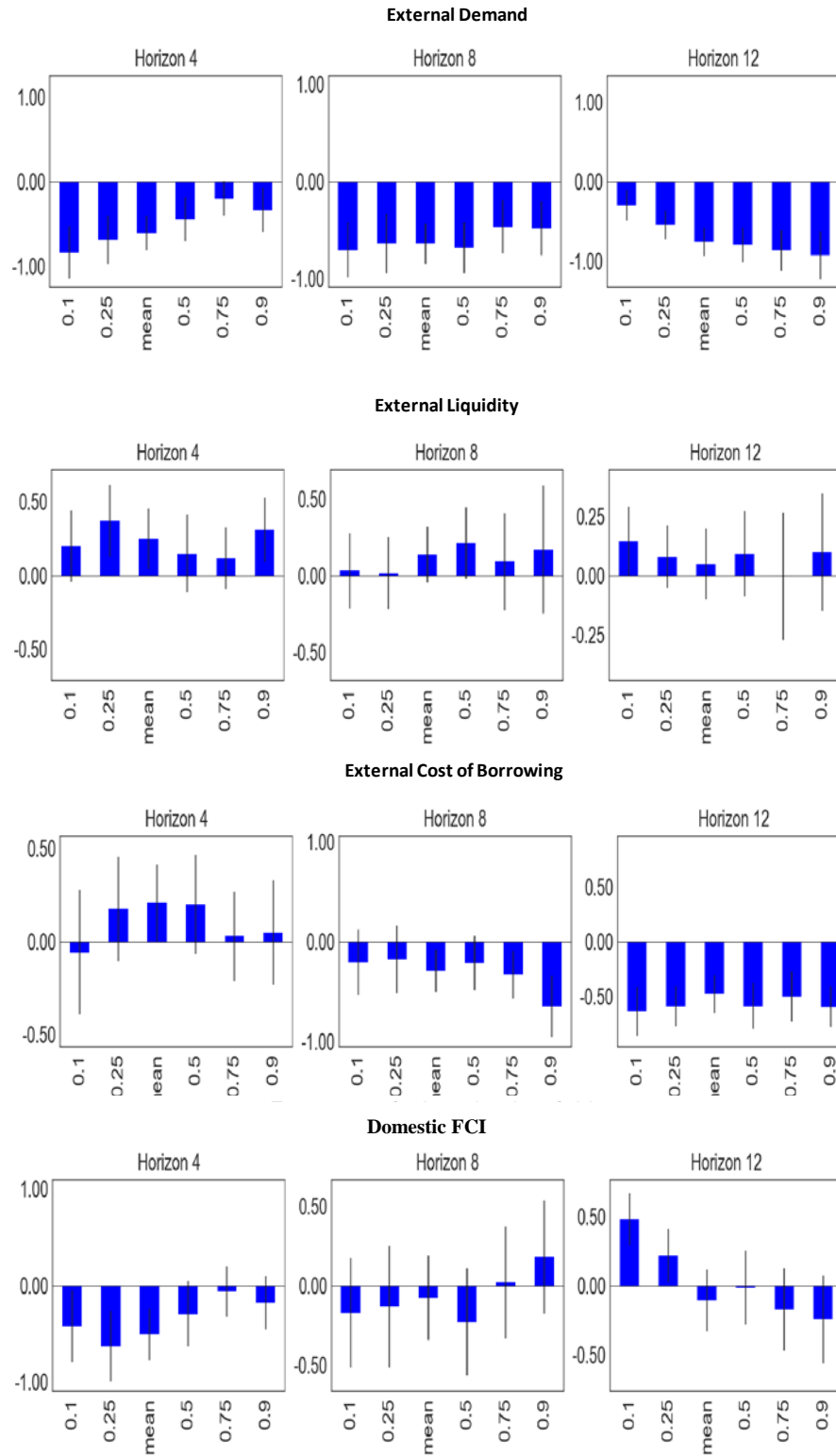
**This paper applies the Growth-at-Risk methodology to analyze macrofinancial linkages and growth prospects in the Dominican Republic.** We find that the impact of different macrofinancial factors depends on the state of the economy and the forecast horizon:

- On the **domestic** front, output growth can be stimulated through private sector credit growth and accommodative financial conditions.
  - Private sector credit is the most important and persistent driver of domestic growth at all states of the economy and at all horizons. A negative shock to the availability of domestic credit would have a strong negative impact on growth. Macroprudential policies aimed at credit quality should help to keep NPLs low and to maintain the leverage necessary to close the negative credit gap and deepen domestic financial markets.
  - Domestic financial conditions have a significant impact on future growth only in “bad” times, when the economy grows at below-average rates. While stimulating the economy, monetary authorities should be mindful of the tradeoff between the short-run stimulus and the long-run negative repercussions: in “bad” times: a monetary expansion would stimulate the economy at a one-year horizon but would have a contractionary impact at a three-year horizon.
- On the **external** front, demand conditions matter the most for the Dominican economy, especially at medium- and long-term horizons (in the short run, external conditions would matter only when the economy is weaker than average). The authorities should be cautious of low growth prospects in the US and the euro area, and worsening terms of trade and competitiveness. External borrowing costs have a significant impact on domestic growth only at a long horizon. External liquidity conditions seem to have no additional marginal impact on domestic growth, *ceteris paribus*.

**Our findings, which point to the importance of monetary policy in the Dominican Republic, should not however downplay the use of other policy instruments.** While our paper does not compare the marginal effectiveness of monetary policy with other policy tools, creating fiscal space, accumulating adequate foreign reserves, as well as building liquidity and capital buffers in the banking system in “good” times are other policy instruments that can help cushion the effect of a potential economic downturn.

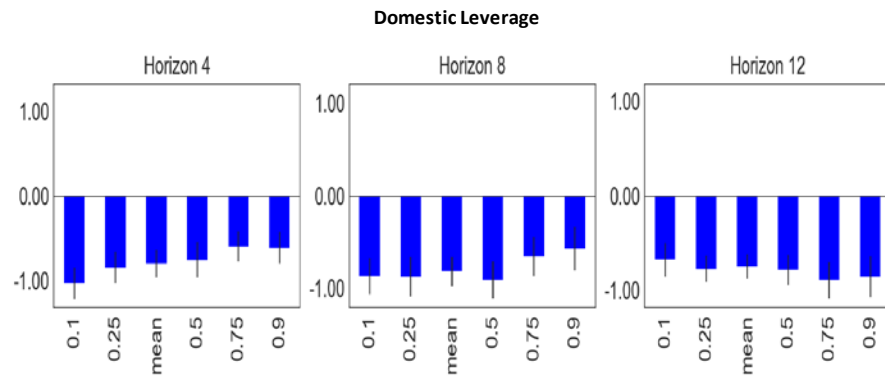
VI. ANNEX

**Figure 5. Quantile Regression Coefficients - Term Structure of Future Growth at Risk**  
(For h=4, 8, and 12 quarters ahead)





**Figure 5. Quantile Regression Coefficients - Term Structure of Growth at Risk – cont.**  
(Forecast horizon in quarters ahead)



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