

## Original Paper

# Budget Profile and Fiscal Policy in Morocco

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### Abstract

*This paper examines the structural changes that have marked the profile of public finance since 2012, and list the main internal challenges that Morocco is facing in managing public finances. The second part is devoted to presenting four approaches (the effective tax rate, the marginal tax rate, the elasticity, the regression and the analysis of co-integration) used by international institutions to forecast fiscal revenues. Then we estimate deficit government income and expenditure in 2020 and 2021, considering two scenarios; a baseline and an alternative scenario. The results of the alternative scenario shows the sustainability of policy decisions that; (i) raise resources for growth stimulating sectors; infrastructure sector, education and health, scientific research and governance, and (ii) reduce energy uses while ensuring the shift towards cleaner energy.*

### Keywords

*economic growth, Moroccan tax system, elasticity, correlation, VECM*

### 1. Introduction

In recent years, the macroeconomic vulnerabilities of the Moroccan economy have been reduced. The resilience of the economy and its medium-term growth prospects has improved. Nevertheless, the current highlights of the national economy show that, despite the effort, our economy is still not on the right path of expansion that creates jobs and increases wealth. Thereby, it is imperative to accelerate the implementation of reforms to ensure economic, social and environmental sustainability. In fact, sound fiscal policy has great contribution to economic stability and gives support to monetary authorities in obtaining stable prices at low interest rates. The composition of expenditure affects growth orientation through resource allocation. Therefore a full understanding of the budget forecasting is important, not just to conduct efficient projections but also to advise policymakers on the feasibility and desirability of specific budget plans from a macroeconomic perspective, and mitigate the problems caused by poor quality or unrealistic budget preparation.

In this context, this paper examines the structural changes that have marked the profile of public finance since 2012, and list the main internal challenges that Morocco is facing in managing public finances. The second part is devoted to presenting four approaches used by international institutions to forecast budget balance, public expenditure and fiscal revenues. Therefor we use the effective tax rate approach, the marginal tax rate approach, the elasticity approach and the regression approach, and finely co-integration procedures to find long term relationship between taxes and their tax base for the Moroccan case. We estimate afterward deficit government income and expenditure in 2020 and 2021, considering ongoing government projects, inflation and execution rate. The baseline scenario incorporates forecasts of the Ministry of Economy and Finance on staff costs and other goods and services and assumes tax revenues and expenditures, with adjustments in economic growth. As to the alternative scenario, it assumes a modified budgetary policy that incorporates measures (i) to raise credits in sectors that stimulate growth; infrastructure sector, education and health, scientific research and governance, and (ii) to increase the burden of tax to discourage activities that use energy and invest in cleaner energy infrastructure.

## **2. Moroccan Budget Profile**

### *2.1 Recent Developments*

The current government's economic program is in line with the previous government commitments, particularly with regard to fiscal consolidation, exchange rate flexibility, tax reforms, civil service reform, governance and corporate control.

In addition, increased priority is given to reducing inequalities and access to health and education services. After a long halt in the implementation of the reforms since October 2016, the new government has taken steps to resume and accelerate some of the reforms mentioned above.

Growth has picked up and reached 4.9% in 2017 and 3.10% in 2018, but unemployment remains high. After a sharp slowdown in 2016, growth resumed in 2017, mainly due to a significant rebound in agricultural activity, while non-agricultural activity remained moderate. On the demand side, growth was mainly driven by private consumption, while private investment recovered gradually after the decline recorded in recent years (from 35.4% to 34.1% of GDP between 2008 and 2018). Unemployment increased slightly to 9.8% in 2018 compared to 10.2% a year earlier.

After a pause in fiscal consolidation in 2016, developments have been positive so far in 2018. The deficit in 2018 is estimated at 3.0% of GDP compared with 3.0% of GDP in 2016. This result is weaker than forecast was mainly due to a shortfall and acceleration of capital expenditures.

Inflation has further declined and credit growth continues to recover as economic activity picks up. Inflation is expected to decrease by about 0.6% in 2017 due to lower food prices. Core inflation, however, is estimated at around 1.2% in 2017. Bank-Al Maghrib (BAM) has maintained its key rate unchanged at 2.25% since its last cut in March 2016. Interest and lending rates have decreased and credit growth.

After a sharp deterioration in 2016, the current account should improve moderately. The trade deficit is expected to reach 19% of GDP in 2018, a moderate increase from 2017 (18% of GDP). This worsening is

mainly due to the global economic situation in Morocco, particularly to the increase in imports, mainly due to the rise in imports of raw materials and energy and capital goods (as major oil and gas investment in public infrastructure are about to be completed).

The banks are well capitalized, but the level of nonperforming loans, credit concentration and expansion in Africa remain significant risks. The risks associated with a significant exposure to credit persist despite stringent regulatory limits. The continued expansion of Moroccan banks in Africa (most recently in Egypt) offer opportunities for diversification and profit, but also a transmission channel of the risk, given the riskier local operating environment and regulatory standards less stringent countries hosts.

## *2.2 Continued Fiscal Sustainability*

Progressive fiscal consolidation has resumed despite a shortfall in subsidy revenues. The budget deficit target of 3.5% of GDP for 2017 is expected to be achieved, in particular because of the strong performance of revenues (resulting both from an improvement in the implementation of taxation and activity economic) and continued efforts to contain current expenditures (such as wages and goods and services) and offset the expected deficit in grants (up to 0.6% of GDP). The cyclically-adjusted primary deficit would therefore decrease by 0.4% of GDP compared to 2016. For 2018, the proposed budget continues the consolidation efforts and the deficit is expected to decrease further to reach 3.0% of GDP. This reflects the introduction of: (i) measures to increase tax revenues (for example, increases in the VAT rate on petroleum products and insurance services, which would largely offset the revenue losses due to the introduction of progressive taxation of companies); (ii) expenditure lower than budgeted amounts; and (iii) emergency measures to deal with potential losses of subsidy revenues. Staff supported these goals, which will reduce public debt while preserving growth-friendly social spending and programs.

In line with the authorities' medium-term objective, the debt-to-GDP ratio is expected to start falling in 2017 to 64.3% of GDP. Today, our country has fiscal space reflecting moderate gross financing requirements, a balanced debt mix and manageable adjustment needs in the medium and long term.

The debt sustainability analysis also shows that the public debt rose from 47 percent of GDP in 2009 to 64.7 percent of GDP in 2017. However, it remains sustainable, as its level is below 70 percent of GDP for emerging markets. This rate should be reduced to 60% of GDP by 2021, a rate that would not jeopardize growth.

In parallel, accelerated fiscal reforms are needed to reduce the budget deficit to less than 2.5 percent of GDP in the medium term. Building on the progress made in recent years in controlling public spending, notably through energy subsidy reforms, the new organic budget law and the reform of public pensions, fiscal consolidation efforts future should focus on several key areas of reform:

**Central taxation:** Following the national conference on taxation held in 2013, a consensus was reached to expand the tax base and make the tax system fairer to support competitiveness. This highlights the need for a comprehensive strategy to: align the reduced VAT rates on manufacturing goods and services with the standard VAT rate; reduce tax exemptions; lower and simplify corporate tax rates; and increase the property tax. Besides, more targeted social programs should help offset the negative effects on the

poor. Such a comprehensive reform, implemented gradually in the medium term would not affect the economic cycle and would be consistent with the intended path of fiscal consolidation;

**Fiscal and fiscal decentralization.** While it is important to improve access to public services, fiscal decentralization and increasing transfers of public resources to local entities increase fiscal risks. The organic law of regions adopted in June 2015 defines the outlines of this process, notably by modernizing the institutional framework and strengthening governance at the local level, where appropriate capacities and mechanisms are needed to ensure sound management of public finances. Several priorities are to be implemented: clearly defining competences; adopt the deconcentration charter; introduce transparent criteria for intergovernmental transfers; mitigate potential liability risks; and, in the long run, strengthen local taxation;

**Administrative services:** At the level of the public payroll, care must be taken to keep it below 10.5% of GDP in the medium term so as not to jeopardize priority spending. In addition, we emphasize the need for comprehensive civil service reform to generate sustainable public savings while strengthening the efficiency and quality of public services, including changing the status of the civil service and the wage structure. The authorities indicated that they had already introduced several reforms, such as contract employment and staff mobility in ministries, and agreed that more comprehensive reform would be needed to generate additional public savings;

**Enterprises and public establishments:** It should be noted that public authorities continue to face the tax risks associated with state-owned enterprises. A bill to strengthen the governance and control of state-owned enterprises and to further improve their performance should be submitted to Parliament during this session. (Ending in February 2018). Similarly, it is essential to advance the draft consolidated balance sheet of state-owned enterprises.

**Governance of public investments:** Our country spends a significant share of public investment spending, but the effectiveness of public investment remains low. The evaluation of public investment management highlights the need for: (i) better coordination of project planning and execution; (ii) legal improvements to operationalize public-private partnerships; and (iii) capacity building for project implementation and risk management.

### *2.3 Towards a New Mix of Economic Policy*

On an economic level, the observation made is that the Moroccan economy suffers from a structural transformation process that is too slow and allows for stronger growth, particularly in the area of exports. International experience shows that all countries that have been able to achieve a real economic takeoff have been able to maintain a sustainable growth rate per capita of over 4%. The comparison of the convergence dynamics of Morocco towards emerging or high-income economies such as South Korea, Malaysia, Chile, Turkey, etc. shows that our economy is progressing very slowly.

This process of “productive diversification” requires our country to accelerate its shift towards high value-added production at the expense of its low-value products and to develop its competitiveness. International experience also shows that it is not the quantity exported, but the choice of what is exported

is the most important for achieving a strong economic performance.

Three angles of attack are essential to promote the emergence of our economy;

- Firstly, a sufficient saving and which covers the particular private investment. The latter is considered unproductive and does not create enough employment. A finding to link with a problem of governance of investments.
- Secondly, widespread and free education. In this regard, Morocco has a crisp deficit in human capital compared to comparable economies;
- And thirdly, the establishment of a state-led industrial policy. However, the current market failures and the slow structural transformation mean that the industrialization of our country would require a lot of time of heavy investment.

#### 2.3.1 Inadequate Savings and Excessive Reliance on Public Debt

Since 2012, savings has been insufficient to cover investment and face social challenges. Therefore, investment has reduced from 35% in 2012 to 29.6% in 2015 and 2018, a drop of 5.5 percentage points of GDP, in parallel with a relative increase of 2 percentage points in savings, an improvement of 25.5% of GDP in 2012 to 27.6% in 2015. Consequently, the insufficient savings has forced the government to take on more debt. In fact, several indicators show an excessive recourse for debt which compromises the objective of medium-term economic growth.

It should be noted that Morocco's economic policy continues to be based on consumption more than savings. The accumulation of capital since 2012 has helped to create 60% of production. The work allowed 15% of the production. At the moment, the total productivities of factors (TPF) capture the effect of human capital and natural resources to 25%. The PTF generated in nonagricultural sectors recorded only 7% of the total is to say agriculture still supports the Moroccan economy despite the intensive use of water compared to the industry.

As for consumption, it has been increasing since 2012 by an average of 3.7% without significant effect on the economy. Indeed, the multiplier effect of consumption on economic growth according to the 2015 IMF study is low and averages between 0.095 and 0.300.

It appears, however, that Morocco has not yet reached the level of physical capital accumulation observed in other emerging countries. The capital intensity of Turkey is twice that of Morocco and those of South Korea and Malaysia are 6.3 and 3.5 times respectively.

#### 2.3.2 Education is Failing

Concerning the generalization of education at the primary level, the results obtained were disappointing. As for net and gross enrollment rates are low in rural areas.

In the same way repeating and dropout rates are always high. The completion rate up to the bachelor's degree does not exceed 5% currently. This had effects on the average schooling rate of a Moroccan. The average duration is 5 years. According to international comparisons this duration should be 10.5 years. This period of 5 years is among the lowest in North Africa and MENA. 7.6 Years in Algeria, 7.3 in Tunisia. 7 in Egypt, 8.3 in Libya, 10.5 in France, 10.4 in Spain, 13.1 in the USA, 5.7 in the Arab countries

and 11.4 in the OECD countries.

Yet, Morocco allocates a huge budget for education that reaches 24.8% of overall spending far exceeding the rate recorded in similar income countries such as Chile, which spends 17.8%, Indonesia 15.2% and Malaysia 21.3%. Romania 10.3%, Tunisia 21.5%. As a result, these expenditures in Morocco appear to have no significant effect since the enrollment rate is low compared with countries that exceed 90% except for Tunisia, which accounts for 79%.

In addition, the quality measured by the TIMSS (Note 1) indicator shows that the level of the students is among the lowest and that the socio-cultural level of the parents was determining for the schooling of the pupils. The education system no longer plays a social lift role.

### 2.3.3 Deindustrialization

Despite the continued implementation of various sectorial policies and the attraction of foreign investment, our economy is not taking full advantage of it to allow technology transfer and integration of the national productive fabric. Public policies were developed in a context of lack of transparency and accurate debate.

For example, in the 2014 budget law, the government adopted a new industrial sector development strategy to complement the 2005 industrial emergence plan named the 2014-2020 industrial acceleration plan. Although this plan was promulgated and programmed its budget in the 2015 budget law in the limit of 3 billion dirhams, no paper justifies it. The industrial acceleration plan aims to increase industrial value added to reach 23% of GDP by 2020 and create 500,000 jobs.

However, public policies aiming to promote employment in the industrial sector in new export activities led in return to the destruction of jobs in traditional labor-intensive activities. On the other hand the constraint of skilled labor remains a major handicap for the development of new activities. The education system will not be able to satisfy in the medium term. Besides, our economy is currently experiencing a phenomenon of early deindustrialization combined with Dutch disease manifested by the development of the service sector of non-tradable at the expense of agriculture and industry.

## 3. Methodological Approach

Tax analysis and tax revenue forecast are crucial in ensuring adequacy and stability in tax policies. However, forecasting government revenues is a challenging task that requires taking into account a wide set of macroeconomic variables, tax structure and the conducted fiscal policy. The IMF addresses these questions in its paper IMF (2013) (Note 2) by presenting four approaches; the effective tax rate approach, the marginal tax rate approach, the elasticity approach the regression approach.

### 3.1 Effective Tax Rate Approach

The effective tax rate (ETR) represents the amount of revenues actually collected as a percentage of the tax base. Using the ETR in revenue forecasting allows taking into account certain factors, such as tax exemptions and tax evasion.

We can postulate that a relationship exists between the tax base and the tax revenue if the ETR is stable

over time. Once ETR stability is confirmed, we can use it to forecast revenues by multiplying the tax base by the tax rate.

However, the forecast is constrained by the difficulty of determining the tax base, forasmuch that we need a large amount of very detailed information to assess the evolution of different tax bases. Especially since these data are not always available or published. And even if it is possible to determine the tax base for several years, it is not always possible to forecast it.

For these reasons, IMF (2013) uses a tax base substitution in order to analyze the behavior of tax revenues and forecast future revenues. This tax base is an economic variable that is closely related to the actual tax base and for which data are available. The following table lists the categories of taxes and the tax bases suggested by the IMF.

**Table 1. Suggested Proxy Tax Bases for Tax Revenues**

Taxes		Suggested proxy tax base
Tax on net income and profits	Corporate	The profits derived from the national accounts or nominal GDP
	Individual	Wages or nominal GDP
Taxes on goods and services		Private consumption at current prices or nominal GDP
Excise duties		Private consumption at current prices or nominal GDP
Import duties		Value and volume of imports in local currency

Source: IMF (2013).

Thus, to forecast tax revenues, we first calculate the ETR, which is defined as the amount of taxes recipes divided by the proxy tax base:

$$\text{Effective Tax Rate} = \frac{\text{Tax Revenue}}{\text{Proxy Tax Base}}$$

The forecast of tax revenue (Tax) using the ETR and forecasts of the tax base (Taxbase) is achieved using the following formula:

$$\text{Tax}_t = \text{Taxbase}_t * (\text{ETR})/100$$

Once we conclude that the ETR is stable, we can forecast tax recipes by multiplying the estimated tax base by the tax rate. If the effective tax rate is not stable, it may be substituted by the marginal tax rate.

### 3.2 Marginal Tax Rate Approach

The marginal tax rate (MTR) is expressed by the ratio of the change in tax revenues to the change in the tax base:

$$\text{Marginal tax rate} = \frac{\Delta \text{Tax revenue}}{\Delta \text{Proxy tax base}}$$

The forecast of tax revenue (Tax) using the marginal tax rate (MTR) and the change in forecast of the tax base (Taxbase) is based on the following formula:

$$\Delta \text{Tax}_t = \text{MTR} * \Delta \text{Taxbase}$$

If the MTR is stable, we estimate the future evolution of revenues by multiplying the forecast of the tax base by the MTR. It is important to note that the change in income tax is divided into two parts: one corresponding to a change in the tax base and its impact on income and the other corresponding to a change in the tax system (in the tax rate, the tax structure, coverage of tax, etc.).

### 3.3 Elasticity Approach

The tax elasticity is defined as the ratio of the percentage change in tax revenue to the percentage change in the tax base, assuming that the tax system remains unchanged during the period. Considering the GDP as a variable of the tax base, the elasticity with respect to GDP is written as follows:

$$Elasticity = \frac{\Delta T/T}{\Delta GDP/GDP}$$

Where T indicates tax revenues issued from an unchanged tax system, meaning that actual tax revenues excludes the estimated impact of changes in the tax system during the analyzed period. The IMF recommends an estimation of elasticity using “rough averaging” of the ratio over a period with there was no regime change.

Once we estimate the elasticity of the tax and we forecast the growth rate of the tax base, we can predict tax revenues by multiplying the growth rate of the tax base by the elasticity applying the following formula:

$$Tax_t = Tax_{t-1} * (1 + elasticity * \Delta \% Taxbase_t) / 100$$

### 3.4 Regression Approach

The IMF uses Regression analysis to estimate the quantitative effect of tax base variables on tax revenues. The accuracy of this method depends on the existence of a relationship between the explanatory variables, say GDP (the proxy tax base), and the total tax revenues.

$$\ln T_t = \beta_0 + \beta_1 \ln PIB_t + \beta_2 \ln T_{t-1} + \beta_3 \ln PIB_{t-1} + \varepsilon_t$$

Thereby, tax revenue forecasting is made using the estimated regression coefficients, the GDP forecast and tax revenues of the previous year. However, estimates using the Ordinary Least Square Method (OLS) are only meaningful if the variables involved are stationary. If not, OLS estimation will generate fallacious regressions.

Since the nominal revenue and GDP series are often non-stationary variables, a more appropriate alternative to the OLS method is to use co-integration procedures to find a long-term relationship between revenue and GDP. The existence of a co-integration relationship implies that the linear combination of the log of taxes and the log of GDP is stationary.

## 4. Vector Error Correction Model (Johansen's Approach)

Johansen's approach is a method for estimating more than one co-integration relationship between variables on the long-term using the maximum likelihood test.

In the following, we present the main steps of the co-integration approach. Thus, we estimate error correction models and study the long-term relationships between revenues (total tax revenue, VAT,



Corporate Taxes (IS) and Income Taxes (IR)), the real Gross Domestic Product (GDP) and the Consumer Prices Index (CPI). Johansen's methodology takes its starting point in the VAR (Vector Auto Regressive) of reduced rank (the number of co-integration relationships). The steps generally followed are:

- Determination of lag length in the VAR representation.
- Co-integration test and determining long-term relationships.
- Estimation of the vector error correction model (VECM).
- Model validation.

#### 4.1 Models Estimation

Before determining models linking tax revenues to real GDP and the CPI over the period 1990-2016, one must begin by testing the stationary and the order of integration of the series. Thus, we examine Augmented Dickey Fuller (ADF) (Note 3) test results, using E-Views software, in order to determine the stationarity properties of the variables. The results of the ADF test as reported in the table below shows that all series are stationary integrated of order one, except the CPI which is found to be stationary in its level:

**Table 2. ADF Test Results**

Time series	Model used for the test	ADF test ADF Statistics	critical value at the 5%	Order of Integration
<i>Total Tax revenues (rec)</i>		-4.212116	-3.580623	Stationary I (1)
<i>VAT</i>		-4.402664	-3.603202	Stationary I (1)
<i>IS</i>	with trend	-4.402585	-3.603202	Stationary I (1)
<i>IR</i>	with constant	-5.245292	-3.603202	Stationary I (1)
<i>GDP</i>		-7.471209	-3.587527	Stationary I (1)
<i>CPI</i>		-4.212116	-3.580623	Stationary I (0)

Source: Author's estimates.

#### Step 1: Lag length selection

This first step is to determine the order of the VAR representation. The calculation of the information criteria LR (Note 4) FPE (Note 5) AIC (Note 6) SC (Note 7) and HQ (Note 8) for the four models indicates that the optimal number of lags is 1 or 2 (Annex 2). Taking into account the small sample size, we opted for one lag that allows us to find better results and to obtain models with signs consistent with theory.

#### Step 2: Johansen co-integration tests

The trace test and the maximum eigenvalue established for the four models reveals the existence of at

least one co-integration relationship (the tables in Annex 3 summarizes the results obtained).

The presence of co-integration between variables suggests a long-term relationship among the variables under consideration. Then, the VEC models, with one lag, can be applied on total tax revenue, VAT, IR and IS for one co-integrating vector. All series are transformed into logarithms, which can be useful in verifying the characteristics of partial short-term and long-term elasticities of the models.

Our basic models would be:

- Total Tax revenues:  $lrec = F(lpib, lipc)$
- VAT :  $ltva = F(lpib, lipc)$
- Corporate taxes :  $lis = F(lpib, lipc)$
- Income taxes :  $lir = F(lpib, lipc)$

with:

➤  $Pib = GDP,$

$lpib = dlog(pib)$  ,  $lipc = log(ipc)$ ,  $lrec = dlog(rec)$ ,  $ltva = dlog(tva)$ ,  $lir = dlog(ir)$ ,  $lis = dlog(is)$

### **Step 3: Estimation results**

The estimation results of the four models are consistent with the theory. The estimated coefficients of the long-term relationship are globally significant with intuitive signs. In addition, the term error-correction is negative and significantly different from zero for all models (see Annex 4, which contains the four VECM and their coefficients).

### **Step 4: Models validation**

For model validation, the usual verifications were carried out;

- Regarding the normality of residuals and autocorrelation test residues, we opted for Jarque-Bera and LM tests (Lagrange-Multiplier). According to E-Views outputs of these tests, we cannot reject the null hypothesis of normality or that of non-autocorrelation of residuals at a significance level of 5% for the four models (see annexes 5 and 6).
- For the stability of the models, the inverse roots of the polynomial characteristic of the four models are well within the unit circle. These results confirm the correct model specification (see annex 7).
- The co-integration relations of the equilibrium models are stationary (see annex 9). This confirms the existence of a stable long-term relationship between the revenues, the GDP and the CPI.

### **4.2 Results Interpretation**

The estimation of Vector Error Correction Models for tax recipes provides an error-correction term coefficient is significant, meaning that the GDP and the CPI have long run influence on government tax revenues. This coefficient is equal to -0.47 for total tax revenues, -0.31 for VAT, -0.54 for corporate tax, and -0.63 for income tax. These results confirm the stationarity of the co-integrating vectors of estimated models.

There by the speed of adjustment towards long run equilibrium indicate that total tax revenues adjust at

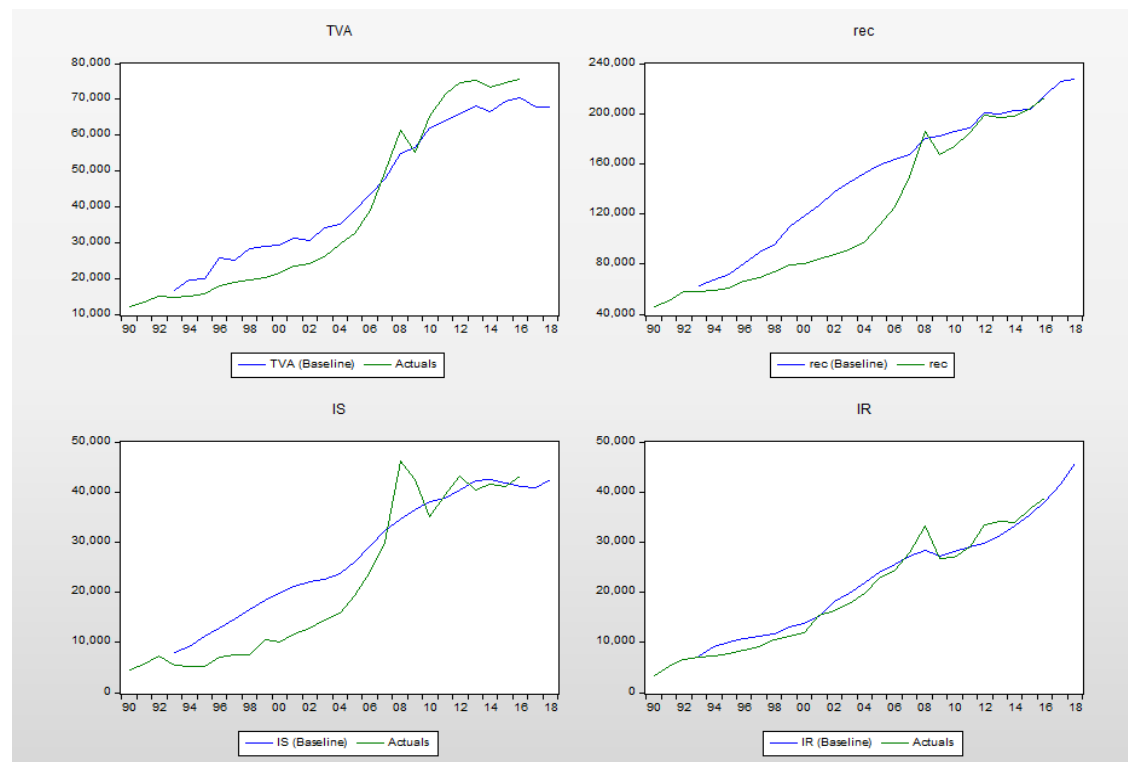
a rate of 49% to their equilibrium levels after any shock from exogenous variables. For VAT, the IS and IR, they are adjusting at a speed of 31%, 54% and 63% respectively, compared to their equilibrium levels.

These coefficients also indicate that the shock is completely absorbed at the end of aft two years (Note 9, Note 10) for total tax revenues and corporate tax, 3 years (Note 11) for VAT and one year and half (Note 12) for income tax.

The results of the regression analysis indicate the value of the coefficient of determination  $R^2$ , which is equal to 0.40 for total tax revenues, indicating that 40% of the fluctuations of this revenue is explained by the model variables. This coefficient is equal to 0.30 for the VAT, 0.34 for corporate tax and 0.46 for the income tax recipes. We conclude that the models are a good fit and that the explanatory power and the overall significance of the model is strong enough to conduct a forecast.

#### 4.3 Forecasting Tax Revenues

After estimating and validating the VECM models of government revenues, we proceed by forecasting total tax revenues, VAT, corporate tax and income recipes for the years 2017 and 2018, using real GDP and CPI forecasts.



**Figure 1. Results of Tax Revenue Forecasting**

Source: author's estimates.

The table below presents revenue forecasts results for 2017 and 2018.

**Table 3. Revenue Forecasts Results**

	2017					2018				
	ETR	MTR	Elasticity	VECM	Average	ETR	MTR	Elasticity	VECM	Average
<b>Rec (Note 13)</b>	223714	227297	212 489	224 922	220 375	234350	241295	212 592	237257	228 066
<b>IS</b>	47530	47396	45196	45542	46089	49789	51291	49029	47907	48908
<b>IR</b>	40724	42474	42,159	40484	41122	42,660	46051	45555	42,398	43538
<b>VAT</b>	79827	83,808	80806	79808	80,147	83,622	91 336	85577	83,971	84,390

*Source:* author's estimates.

The steps of tax revenue forecasts are; evaluation of tax elasticity, evaluation of changes in economic conditions, and evaluation of the effect of inflation and price changes.

When calculating the MTR we noticed that this rate is not stable during the period, which means we cannot use it to predict futures tax revenues. Moreover, we note that the forecast provided by the MTR approach have the highest values.

The revenues forecasts can be obtained through the average of the results of the three methods, ETR, Elasticity and VECM, in order to have more accurate forecasts. This average can be improved by taking into account future adjustments and tax measures.

Ultimately, regular comparisons of the forecasts and the revenue recorded are fundamental to assess the quality of the estimates. Furthermore, the effectiveness of tax revenues forecast is based on the judgment and expertise of those who make them. The knowledge of the context of the variables allows for adjustments to quantitative results based on various external factors that can influence the future achievements.

#### *4.4 Forecasting Spending*

As many decisions about government spending are political, there is less possibility to rely on economic relations in forecasting government spending and revenues. Basically, government expenditure can be divided into two categories.

Discretionary expenditures are programmed each year in the budget. Their level may be increased or decreased in the short term. They depends heavily on the government policies and often reflects macroeconomic developments;

- Wages and salaries: unemployment.
- Purchase of goods and services: prices, exchange rate
- Subsidies and transfers, demand for subsidies services, price of subsidies goods

Non-discretionary expenditures represent government commitments arising from a contract or an existing law. Their level cannot be changed by short-term decision makers. They do not depend on policies (almost) and depend highly on macroeconomic conditions.

##### *4.4.1 Forecast Spending Excluding Interest*

Although we can forecast the expenses using the ratios of the main components of GDP compared to

the previous year, it would be difficult to defend such a forecast on analytical bases. Indeed, government spending reflects political decisions. Thus, a forecast of public spending should build on our prior knowledge of fiscal policy over the next year. It could be based on the implementation of the budget for the current year and on the assessment of the impact of the new budget measures.

In the following few factors to consider when forecasting expenditures:

- Spending on wages and salaries depend on: government policies; the number of civil servants and military personnel; the average wage rate; wage developments in the private sector; and changes in the cost of living;
- Public spending on grants, subsidies, benefits and other expenses such as capital transfers represent the cost of programs designed to achieve certain public objectives, including income redistribution. Once implemented, these programs are difficult to reduce or eliminate. Factors that influence this expense include: government policies; real GDP growth rate; the growth rate of the population covered by the programs; the rate of inflation; and prices of imports and exports;
- Spending on other goods and services are the main operating expenses of the government. They are discretionary and depend mainly on government policies. However, for the government to continue to function effectively; there must be a relationship between this spending and the size of civil society service. For example, if the government hires more teachers, more books and more chalk will be necessary. In addition, to maintain the level of expenditure in real terms, this category of expenditure should evolve with inflation. Finally, this category should also grow if there have been major investment programs in the past;
- The acquisition of non-financial assets or investment in non-financial assets are often the first target of a planned fiscal tightening;
- In most countries, investment spending is in the context of a rolling and multi-year strategy. It is then subject to annual changes in light of resource constraints and changing tax priorities. In providing for active non-financial investments, we must take due account of expenses already incurred that are difficult to reverse. Non-financial investment depends on government policies, financing, the number of ongoing projects, the exchange rate and the exchange rate, and the rate of inflation.

#### 4.4.2 Forecasting Interest Expenses

To forecast interest payments, we need to know the interest rate and the average outstanding debt in each category. In most cases, the applicable interest rate is easily determined, or we can speculate on market reactions and the risk premiums depending on the evolution of the primary balance. However, it is still difficult to estimate the future level of debt.

### 5. Analysis of Forecasting Results of Budget, Tax Revenues and Public Expenditure

The update of the budgetary projections for 2018 showed an unchanged forecast of the deficit at 3.7% of GDP. Slight revisions were introduced incorporating the latest data from the Ministry of Economy and Finance and new assumptions relating notably to oil prices and foreign exchange.

### 5.1 Baseline Scenario

In 2020, fiscal policy should be characterized by a reduction of the deficit to 3.4% of GDP. This forecast incorporates forecasts of the Ministry of Economy and Finance on staff costs and other goods and services and assume, with adjustments for economic growth, tax revenues and expenditures:

- Continued revenue mobilization effort. They were projected on the basis of forecasts of economic growth and inflation, while non-tax revenues were estimated based on recent trends;
- Non-tax revenues were estimated based on recent trends;
- Compensation expense arising assumptions of oil prices and the exchange rate with the guideline as not change the current system;
- A continuation of the investment effort with a GDP ratio of 4.5%.

For the year 2021:

- The adjustments are mainly related to economic growth, tax revenues and expenditures;
- A slight downward revision of expenditures for other goods and services, with an assumption of the execution rate of 94% of total budget bill which is 74.6 billion dirhams, of which 2 billion dirhams allocated to the social dialogue;
- A slight downward revision of the burden of compensation in connection with the assumptions of oil prices and exchange rates;
- The investment was revised upwards from 5.8% to better reflect a part of appropriations (73.4 billion dirhams).

**Table 4. Forecasting Results of the Baseline Scenario**

As% of GDP	achievements						FA (Note 14)	FAP (Note 15)	Forecasts	
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
<b>Current receipts</b>	26.0	25.5	25.4	23.6	23.7	23.9	23.0	22.9	22.0	21.1
<b>Tax receipts</b>	23.4	21.9	21.4	20.7	20.9	21.2	20.9	21.1	20.4	19.6
<b>Non-tax receipts</b>	2.2	3.2	3.6	2.6	2.5	2.4	1.8	1.6	1.6	1.5
<b>GCC donations</b>	-	0.6	1.4	0.4	0.7	0.9	0.4	0.2	0	0
<b>Current expenditure</b>	28.1	25.9	25.0	22.6	22.3	21.6	21.8	22.2	20.9	19.2
<b>Wage bill</b>	11.4	11.0	11.0	10.4	10.3	9.8	9.6	9.6	9.2	8.4
<b>Other goods and services</b>	5.2	5.2	5.5	5.7	5.6	5.5	5.9	6.4	5.9	5.4
<b>Subsidy costs</b>	6.5	4.6	3.5	1.4	1.4	1.4	1.5	1.6	1.4	1.2
<b>Capital spending</b>	6.1	5.4	5.9	5.9	6.3	6.3	5.7	4.9	4.5	4.5
<b>Overall Fiscal balance (excluding privatization)</b>	-7.2	-5.1	-4.9	-4.2	-4.5	-3.6	-4.0	-3.7	-3.7	-2.6
<b>Financing Requirement</b>	-7.7	-5.8	-5.2	-4.7	-4.0	-3.6	-4.0	-3.7	-3.4	-2.6

<b>Domestic Financing</b>	5.6	4.1	3.9	4.6	3.5	3.3	3.8	1.7	
<b>external financing</b>	1.8	1.7	1.0	0.0	0.3	0.3	-0.1	1.6	

*Source:* author's estimates.

Data from 2012 to 2019: Ministry of Finance.

GDP: Higher Planning Commission (HCP).

### 5.2 Alternative Scenario

This alternative scenario with modified budgetary policy aims to show the sustainability of the decisions to raise credits in sectors that stimulate growth; infrastructure sector, education and health, scientific research and governance.

The fiscal trajectory considered in this scenario envisages funding from the increased expenditure in these sectors, indirect taxes (VAT and ICT) rather than direct taxes (IS and IR). This scenario remains consistent with the government need to incentivize the factors of production and the total productivities of the factors at the base of the economic growth. It reflects also the objective of reducing excessive consumption energy products and products deemed harmful to the health of the population using additional taxation, VAT and ICT.

For the 2020 exercise the deficit would be under the alternative scenario of 3.5% of GDP resulting from the increase of the credits of the transversal sectors compared to the trend scenario as follows:

- 8 billion dirhams allocated to staff and investment of the education and health sectors;
- 5 billion dirhams allocated to investment,
- 1 billion dirhams dedicated to the improvement of good governance (Justice, regionalization, CRI);
- 1 billion dirhams for the reinforcement of the industrial acceleration program at the Treasury Special Accounts balances;
- An upward revision of scientific research funding to reach 1% of GDP in 2020;

Funding for additional expenses comes from:

- 2 billion dirhams from the social contribution for solidarity, ie 2.5% of the company's profit exceeding MAD 40 million;
- 2 billion dirhams under IR particularly professional;
- 1 billion dirhams from ICTs;
- The rest is essentially VAT.

For the 2021 exercise, the deficit would be under the alternative scenario of 2.9% of GDP resulting from the increase of the credits of the transversal sectors as follows compared to the trend scenario as follows:

- 8 billion dirhams allocated to staff and investment of the education and health sectors;
- 5 billion dirhams allocated to investment;
- billion dirhams dedicated to the improvement of good governance (Justice, regionalization, CRI);

- 1 billion dirhams for the reinforcement of the industrial acceleration program at the Treasury Special Accounts balances;
  - Upward revision of Scientific Research funding to reach 1.5% of GDP in 2021.
- Funding for additional expenses comes from:
- MAD 2 billion from the social contribution for solidarity, ie 2.5% of the company's profit exceeding MAD 40 million;
  - 2 billion dirhams under IR particularly professional;
  - 1 billion dirhams from ICTs;

**Table 5. Forecasting Results of the Alternative Scenario**

As% of GDP	achievements						FA	FAP	Forecasts	
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
<b>Current receipts</b>	26.0	25.5	25.4	23.6	23.7	23.9	23.0	22.9	23.2	21.3
<b>Tax receipts</b>	23.4	21.9	21.4	20.7	20.9	21.2	20.9	21.1	21.6	19.8
<b>Non-tax receipts</b>	2.2	3.2	3.6	2.6	2.5	2.4	1.8	1.6	1.6	1.5
<b>GCC donations</b>	-	0.6	1.4	0.4	0.7	0.9	0.4	0.2	0	0
<b>Current expenditure</b>	28.1	25.9	25.0	22.6	22.3	21.6	21.8	22.2	21.4	19.3
<b>Wage bill</b>	11.4	11.0	11.0	10.4	10.3	9.8	9.6	9.6	9.3	8.6
<b>Other goods and services</b>	5.2	5.2	5.5	5.7	5.6	5.5	5.9	6.4	5.9	5.4
<b>Subsidy costs</b>	6.5	4.6	3.5	1.4	1.4	1.4	1.5	1.6	1.4	1.2
<b>Capital spending</b>	6.1	5.4	5.9	5.9	6.3	6.3	5.7	4.9	5.9	5.4
<b>Overall Fiscal balance (excluding privatization)</b>	-7.2	-5.1	-4.9	-4.2	-4.5	-3.6	-4.0	-3.7	-3.5	-2.9
<b>Financing Requirement</b>	-7.7	-5.8	-5.2	-4.7	-4.0	-3.6	-4.0	-3.7	-3.5	-2.9
<b>Domestic Financing</b>	5.6	4.1	3.9	4.6	3.5	3.3	3.8	1.7	-	-
<b>external financing</b>	1.8	1.7	1.0	0.0	0.3	0.3	-0.1	1.6	-	-

Source: author's estimates.

Data from 2012 to 2019: Ministry of Finance.

GDP: Higher Planning Commission (HCP).

## 6. Conclusion

This paper highlights the macroeconomic framework and analyzes the budgetary masses, as they appear from the FAP 2019 compared to the updated the execution of 2018. The FAP 2019 provides a budget deficit, excluding privatization at 3.7% of GDP (and 3.3% including privatization receipts) against 3.8% forecast in 2018, a growth of 3.2% based essentially on the continuation of the dynamics of the non-agricultural sectors.



It reveals that the soundness of budget systems can be judged based on an objective macroeconomic assessment of available revenues and financing, the expenditure budget should aim to be comprehensive, transparent, realistic, policy-oriented, and allow for clear accountability in budget execution.

In this paper we estimate, tax revenue, public expenditure and the overall budget balance over 2 years, 2020-2021, while trying to capture government objectives & policies. We present the results of two scenarios that consider ongoing public projects, inflation and execution rate of Finance Law.

- The baseline scenario, takes into account the assumptions programmed By the FAP of 2019.
- The alternative scenario considers the adoption politic decisions that raise credits in sectors that stimulate growth.

The result of the baseline scenario shows that fiscal policy would be characterized by a reduction of the deficit to 3.4% of GDP in 2020 and to 2.6% in 2021. As for the alternative scenario, it would lead to a reduction of 3.5% of GDP, resulting from the increase of the credits of the transversal sectors, followed by a decrease to 2.9% of GDP in 2020. Therefore the government should not hesitate on implementing; (i) fiscal measures that raise resources for growth sectors (infrastructure sector, education and health, scientific research and governance); and (ii) fiscal policies means that reduces energy uses and ensures shifting towards cleaner energy while maintaining robust economic growth and creating jobs.

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## Notes

Note 1. Trends in International Mathematics and Science Study, Edition 2015.

Note 2. IMF (2013). Financial Programming and Policies. Institute for Capacity Development, 2013.

Note 3. See Appendix 1

Note 4. LR sequential modified LR test statistic

Note 5. FFO Final prediction error

Note 6. AIC: Akaike information criterion

Note 7. SC: Schwarz information criterion

Note 8. HQ: Hannan-Quinn information criterion.

Note 9.  $1 / 0.47 = 2.13$

Note 10.  $1 / 0.54 = 1.85$

Note 11.  $1 / 0.31 = 3.23$

Note 12.  $1 / 0.63 = 1.59$

Note 13. Total tax Revenues.

Note 14. Finance Act (FA)

Note 15. Finance Act Project (FAP)

Note 16. Ministry of Finance (2018).

#### **Appendix I: Syntheses of the assumptions and the macroeconomic framework of the FAP of 2019 (Note 16)**

At an international level:

- global growth of 3.7% in 2019, the same rate as in 2018;
- 1.9% growth in the euro area, after 2% in 2018 and 2.4% in 2017;
- an average price of crude oil at \$ 72 / barrel (\$ 70 / bbl in FY 2018 and \$ 68 / bl for 2018 in the pre-budget report);
- an average butane gas price of \$ 560 per ton (\$ 380 per ton in FA2018 and \$ 544 per ton for 2018 in the pre-budget report);
- An average exchange rate of one euro for \$ 1.16 (9.45 dirhams) in 2019 instead of 1.17 (9.41 dirhams) forecast in 2018 and 1.13 in 2017.

On an internal level, the FAP is based on:

- GDP growth of 3.2% compared to 3.5% in 2018;
- 3.8% growth in nonagricultural GDP instead of 3.3% in 2018;
- A 1.5% decline in agricultural value added, compared to an increase of 5.3% in 2018. These forecasts assume a cereal production of 70 million quintals in 2019 instead of 103 million quintals in 2018, and a consolidation of the performances of other crops (notably arboriculture at 4.5% in 2019 instead of 9.4% in 2018, market gardening at 3% in 2019 instead of 3.5% in 2018 and livestock at 1.8% instead of 3.3% in 2018);

## Annexes

## Annex 1: Augmented Dickey Fuller

tax revenues I (1)					VAT I (1)				
Null Hypothesis: D (REC): has a unit root					Null Hypothesis: D (VAT): has a unit root				
Exogenous: Constant Linear Trend					Exogenous: Constant Linear Trend				
Lag Length: 0 (Automatic - based on CIS maxlag = 6)					Lag Length: 0 (Automatic - based on CIS maxlag = 6)				
			Does Statistic	Prob. *				Does Statistic	Prob. *
Augmented Dickey-Fuller test statistic			-4.514723	0.0074	Augmented Dickey-Fuller test statistic			-4.402664	0.0094
Test critical values:	1% level		-4.374307		Test critical values:	1% level		-4.374307	
	5% level		-3.603202			5% level		-3.603202	
	10% level		-3.238054			10% level		-3.238054	
* MacKinnon (1996) one-sided p-values.					* MacKinnon (1996) one-sided p-values.				
IS I (1)					IR I (1)				
Null Hypothesis: D (IS): has a unit root					Null Hypothesis: D (IR): has a unit root				
Exogenous: Constant Linear Trend					Exogenous: Constant Linear Trend				
Lag Length: 0 (Automatic - based on CIS maxlag = 6)					Lag Length: 0 (Automatic - based on CIS maxlag = 6)				
			Does Statistic	Prob. *				Does Statistic	Prob. *
Augmented Dickey-Fuller test statistic			-4.402585	0.0094	Augmented Dickey-Fuller test statistic			-5.245292	0.0014
Test critical values:	1% level		-4.374307		Test critical values:	1% level		-4.374307	
	5% level		-3.603202			5% level		-3.603202	
	10% level		-3.238054			10% level		-3.238054	
* MacKinnon (1996) one-sided p-values.					* MacKinnon (1996) one-sided p-values.				
Real GDP I (1)					IPC I (0)				
Null Hypothesis: D (GDP): has a unit root					Null Hypothesis: CPI: has a unit root				
Exogenous: Constant Linear Trend					Exogenous: Constant Linear Trend				
Lag Length: 3 (Automatic - based on CIS maxlag = 6)					Lag Length: 0 (Automatic - based on CIS maxlag = 6)				
			Does Statistic	Prob. *				Does Statistic	Prob. *
Augmented Dickey-Fuller test statistic			-3.302803	0.0097	Augmented Dickey-Fuller test statistic			-4.212116	0.0129
Test critical values:	1% level		-4.394309		Test critical values:	1% level		-4.323979	
	5% level		-3.012199			5% level		-3.580623	
	10% level		-3.003079			10% level		-3.225334	
* MacKinnon (1996) one-sided p-values.					* MacKinnon (1996) one-sided p-values.				

**Annex 3: Trace test****Tax revenues**

Selected (0.05 level *) Number of Cointegrating Relations by Model					
Data Trend:	None	None	Linear	Linear	Quadratic
test Type	No Intercept	Intercept	Intercept	Intercept	Intercept
	No Trend	No Trend	No Trend	Trend	Trend
Trace	1	1	1	2	3
Max-Eig	1	1	1	2	3
* Critical values are based MacKinnon-Haug-Michelis (1999)					

**VAT**

Selected (0.05 level *) Number of Cointegrating Relations by Model					
Data Trend:	None	None	Linear	Linear	Quadratic
test Type	No Intercept	Intercept	Intercept	Intercept	Intercept
	No Trend	No Trend	No Trend	Trend	Trend
Trace	1	1	1	1	2
Max-Eig	1	1	1	1	2
* Critical values are based MacKinnon-Haug-Michelis (1999)					

**IS**

Selected (0.05 level *) Number of Cointegrating Relations by Model					
Data Trend:	None	None	Linear	Linear	Quadratic
test Type	No Intercept	Intercept	Intercept	Intercept	Intercept
	No Trend	No Trend	No Trend	Trend	Trend
Trace	2	1	3	2	3
Max-Eig	1	1	1	2	3
* Critical values are based MacKinnon-Haug-Michelis (1999)					

**IR**

Selected (0.05 level *) Number of Cointegrating Relations by Model					
Data Trend:	None	None	Linear	Linear	Quadratic
test Type	No Intercept	Intercept	Intercept	Intercept	Intercept
	No Trend	No Trend	No Trend	Trend	Trend
Trace	3	3	2	2	2
Max-Eig	3	3	2	2	2
* Critical values are based MacKinnon-Haug-Michelis (1999)					

**Annex 4: VECM Models****VAT**

Cointegrating Eq:	CointEq1		
DLOG (VAT (-1))	1.000000		
DLOG (PIBRE (-1))	-9.990071		
	(1.40404)		
	[-7.11521]		
LOG (CPI (-1))	0.246933		
	(0.12057)		
	[2.04812]		
C	-0.823564		

Error correction:	D (DLOG (VAT))	D (DLOG (PIBRE))	D (LOG (IPC))
CointEq1	-0.307568	0.299991	-0.045097
	(0.23575)	(0.05704)	(0.03248)
	[-1.30465]	[5.25947]	[-1.38850]
D (DLOG (VAT (-1)))	-0.267026	-0.150714	0.021775
	(0.23583)	(0.05706)	(0.03249)
	[-1.13227]	[-2.64137]	[0.67018]
D (DLOG (PIBRE (-1)))	-1.305637	0.616742	-0.186970
	(1.03276)	(0.24987)	(0.14228)
	[-1.26422]	[2.46823]	[-1.31407]
D (LOG (CPI (-1)))	-2.268848	-0.004236	0.173461
	(2.27996)	(0.55163)	(0.31411)
	[-0.99512]	[-0.00768]	[0.55223]
C	0.218079	-0.004027	0.045352
	(0.17187)	(0.04158)	(0.02368)
	[1.26883]	[-0.09683]	[1.91527]
DUMREC	-0.173443	0.027625	-0.032467
	(0.15077)	(0.03648)	(0.02077)
	[-1.15038]	[0.75729]	[-1.56303]
DUM1	-0.029117	-0.026295	0.000268
	(0.04871)	(0.01178)	(0.00671)
	[-0.59782]	[-2.23135]	[0.03995]
R-squared	0.325291	0.912338	0.435464
Adj. R-squared	0.087159	0.881399	0.236216
Sum sq. resids	0.158909	0.009302	0.003016
SE equation	0.096683	0.023392	0.013320
F-statistic	1.366009	29.48789	2.185539
log likelihood	26.15519	60.21216	73.72719
Akaike AIC	-1.596266	-4.434347	-5.560599
Schwarz SC	-1.252667	-4.090748	-5.217000
Mean dependent	-0.003653	0.001390	0.021201
SD dependent	0.101193	0.067924	0.015241
Determinant resid covariance (dof adj.)		5.95E-10	
Determinant resid covariance		2.12E-10	
log likelihood		165.1502	
Akaike information criterion		-11.76251	
Schwarz criterion		-10.58446	

### Tax revenues

Cointegrating Eq:	CointEq1		
DLOG (REC (-1))	1.000000		
DLOG (PIBRE (-1))	-5.973431		
	(0.79855)		
	[-7.48032]		
LOG (CPI (-1))	0.163795		
	(0.09523)		
	[1.71992]		
C	-0.581574		
Error correction:	D (DLOG (REC))	D (DLOG (PIBRE))	D (LOG (IPC))
CointEq1	-0.470064	0.338007	-0.013878
	(0.21609)	(0.08731)	(0.04055)
	[-2.17531]	[3.87141]	[-0.34222]

D (DLOG (REC (-1)))	-0.285235	-0.197960	0.021375
	(0.19124)	(0.07727)	(0.03589)
	[-1.49150]	[-2.56199]	[0.59555]
D (DLOG (PIBRE (-1)))	-1.435134	0.208651	-0.068355
	(0.67781)	(0.27386)	(0.12721)
	[-2.11732]	[0.76189]	[-0.53735]
D (LOG (CPI (-1)))	-1.045720	-0.381911	0.542057
	(1.08726)	(0.43929)	(0.20405)
	[-0.96179]	[-0.86938]	[2.65648]
C	0.062115	0.005267	0.009057
	(0.04387)	(0.01773)	(0.00823)
	[1.41582]	[0.29715]	[1.10004]
DUMREC2	-0.066862	0.006966	-0.000388
	(0.03926)	(0.01586)	(0.00737)
	[-1.70319]	[0.43921]	[-0.05268]
R-squared	0.400243	0.849146	0.353558
Adj. R-squared	0.233643	0.807243	0.173990
Sum sq. resids	0.098060	0.016008	0.003454
SE equation	0.073809	0.029822	0.013852
F-statistic	2.402428	20.26421	1.968943
log likelihood	31.94826	53.69827	72.10143
Akaike AIC	-2.162355	-3.974856	-5.508452
Schwarz SC	-1.867842	-3.680342	-5.213939
Mean dependent	-0.004229	0.001390	0.021201
SD dependent	0.084313	0.067924	0.015241
Determinant resid covariance (dof adj.)		4.74E-10	
Determinant resid covariance		2.00E-10	
log likelihood		165.8255	
Akaike information criterion		-12.06879	
Schwarz criterion		-11.03800	

## IS

Cointegrating Eq:	CointEq1		
DLOG (IS (-1))	1.000000		
DLOG (PIBRE (-1))	-11.43442		
	(1.94964)		
	[-5.86489]		
LOG (CPI (-1))	0.421270		
	(0.22710)		
	[1.85500]		
C	-1.575479		
Error correction:	D (DLOG (IS))	D (DLOG (PIBRE))	D (LOG (IPC))
CointEq1	-0.543853	0.129122	-0.012724
	(0.32890)	(0.04638)	(0.02012)
	[-1.65354]	[2.78377]	[-0.63242]
D (DLOG (IS (-1)))	-0.367894	-0.119135	0.006936
	(0.22551)	(0.03180)	(0.01380)
	[-1.63136]	[-3.74601]	[0.50279]
D (DLOG (PIBRE (-1)))	-2.690319	-0.011117	-0.108697
	(1.95130)	(0.27518)	(0.11937)
	[-1.37873]	[-0.04040]	[-0.91061]
D (LOG (CPI (-1)))	0.933261	0.061611	0.560647

	(2.75666)	(0.38876)	(0.16863)
	[0.33855]	[0.15848]	[3.32463]
C	-0.045001	-0.004241	0.006871
	(0.08160)	(0.01151)	(0.00499)
	[-0.55152]	[-0.36853]	[1.37658]
DUMIS3	0.044600	0.015416	0.007074
	(0.12467)	(0.01758)	(0.00763)
	[0.35774]	[0.87680]	[0.92759]
R-squared	0.342948	0.844144	0.417552
Adj. R-squared	0.160434	0.800851	0.255761
Sum sq. resids	0.831576	0.016539	0.003112
SE equation	0.214939	0.030312	0.013149
F-statistic	1.879021	19.49823	2.580806
log likelihood	6.295314	53.30678	73.35235
Akaike AIC	-0.024609	-3.942232	-5.612696
Schwarz SC	0.269904	-3.647718	-5.318182
Mean dependent	-0.008489	0.001390	0.021201
SD dependent	0.234578	0.067924	0.015241
Determinant resid covariance (dof adj.)		3.27E-09	
Determinant resid covariance		1.38E-09	
log likelihood		142.6729	
Akaike information criterion		-10.13941	
Schwarz criterion		-9.108615	

## IR

Cointegrating Eq:	CointEq1		
DLOG (IR (-1))	1.000000		
DLOG (PIBRE (-1))	6.947405		
	(0.59426)		
	[11.6908]		
LOG (CPI (-1))	0.076166		
	(0.07677)		
	[0.99207]		
C	-0.687085		
Error correction:	D (DLOG (IR))	D (DLOG (PIBRE))	D (LOG (IPC))
CointEq1	-0.632810	-0.341030	0.039454
	(0.23796)	(0.04745)	(0.01757)
	[-2.65932]	[-7.18779]	[2.24542]
D (DLOG (IR (-1)))	-0.081923	0.173914	-0.010924
	(0.20548)	(0.04097)	(0.01517)
	[-0.39869]	[4.24491]	[-0.72000]
D (DLOG (PIBRE (-1)))	1.992393	0.259147	-0.111262
	(0.82481)	(0.16445)	(0.06090)
	[2.41559]	[1.57580]	[-1.82684]
D (LOG (CPI (-1)))	-3.522107	1.396372	-0.500246
	(2.76733)	(0.55176)	(0.20434)
	[-1.27275]	[2.53074]	[-2.44811]
C	0.142005	-0.053314	0.083902
	(0.17077)	(0.03405)	(0.01261)
	[0.83158]	[-1.56584]	[6.65392]
DUM	-0.015035	0.067823	-0.057897
	(0.12958)	(0.02584)	(0.00957)



	[-0.11603]	[2.62511]	[-6.05095]
DUMIR	-0.078343	-0.043650	-0.004667
	(0.05897)	(0.01176)	(0.00435)
	[-1.32861]	[-3.71266]	[-1.07196]
R-squared	0.460405	0.926227	0.799044
Adj. R-squared	0.269959	0.900190	0.728118
Sum sq. resids	0.196918	0.007828	0.001074
SE equation	0.107626	0.021459	0.007947
F-statistic	2.417516	35.57293	11.26591
log likelihood	23.58175	62.28212	86.12218
Akaike AIC	-1.381813	-4.606843	-6.593515
Schwarz SC	-1.038214	-4.263244	-6.249916
Mean dependent	-0.007343	0.001390	0.021201
SD dependent	0.125963	0.067924	0.015241
Determinant resid covariance (dof adj.)		1.63E-10	
Determinant resid covariance		5.78E-11	
log likelihood		180.7243	
Akaike information criterion		-13.06036	
Schwarz criterion		-11.88231	

#### Appendix 5: Normality Test for the four models

Tax revenues				VAT			
Component	Jarque-Bera	df	Prob.	Component	Jarque-Bera	df	Prob.
1	10.33517	2	0.0057	1	5.423351	2	0.0664
2	0.260379	2	0.8779	2	1.184614	2	0.5531
3	1.740852	2	0.4188	3	2.728125	2	0.2556
joint	12.33640	6	0.0549	joint	9.336090	6	0.1555

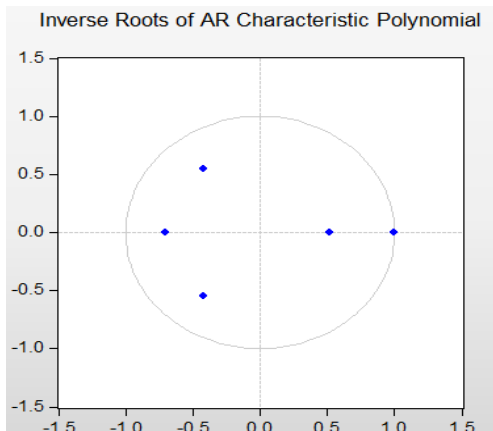
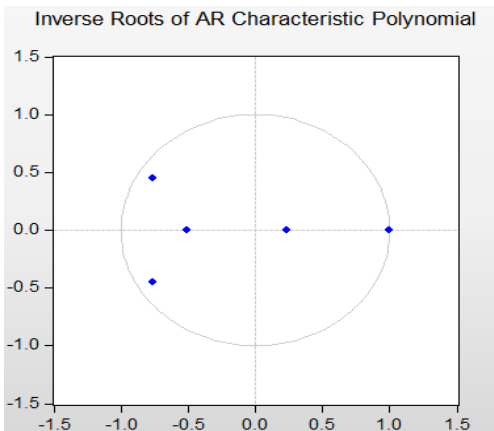
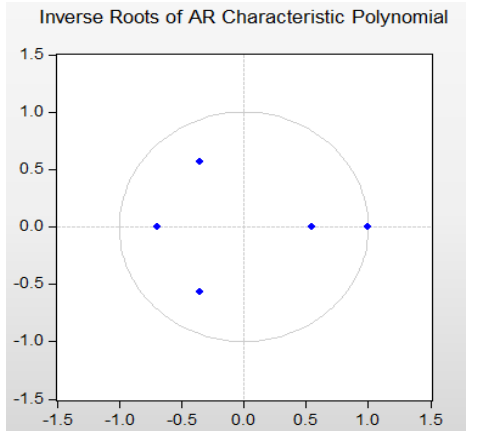
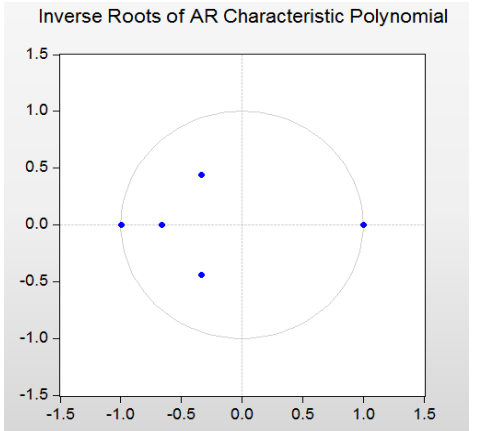
IS				IR			
Component	Jarque-Bera	df	Prob.	Component	Jarque-Bera	df	Prob.
1	0.298577	2	0.8613	1	1.094420	2	0.5786
2	1.033972	2	0.5963	2	0.238981	2	0.8874
3	1.623734	2	0.4440	3	0.253417	2	0.8810
joint	2.956283	6	0.8143	joint	1.586818	6	0.9535

#### Annex 6: Residuals autocorrelation test for the four models

Tax revenues			VAT		
VEC Residual Serial Correlation LM Tests			lags		
Null Hypothesis: no serial correlation at lag order pm			LM-Stat		
Date: 09/08/17 Time: 12:26			prob		
Sample: 1990 2016			1		
Included observations: 24			2		
lags	LM-Stat	prob			
1	13.85933	0.1274			
2	7.993951	0.5348			
Probs from chi-square with 9 df.			Probs from chi-square with 9 df.		

IS			IR		
lags	LM-Stat	prob	lags	LM-Stat	prob
1	17.39272	0.0429	1	6.443088	0.6949
2	5.949008	0.7450	2	8.736137	0.4620
Probs from chi-square with 9 df.			Probs from chi-square with 9 df.		
For the SI, the residue was corr dogrames asimulé to confirm idependance view that the LM test P-value is less than 5%.					

### Annex 7: VECM Stability Test

Tax revenues		VAT	
			
IS		IR	
			

**Annex 8: Equilibrium co-integration relationships:**