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# The Forecasting Process at the Central Bank of Malta

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## **1 Introduction**

This note provides a general overview of the forecasting process followed by the Central Bank of Malta (CBM) to generate medium-term macroeconomic, fiscal, and inflation projections. The forecasting process is designed to produce consistent, transparent, and plausible forecasts as input to the Eurosystem's Broad Macroeconomic Projection Exercise (BMPE), the Narrow Inflation Projection Exercise (NIPE), and the Bank's regular publications. These forecasts are also referred to in discussions with external institutions on the outlook for the Maltese economy.

## **2 Common assumptions and guidelines**

Macroeconomic forecasts are conditioned on a set of technical assumptions which the European Central Bank (ECB) transmits to all euro area national central banks in the context of the BMPE and NIPE. These assumptions, which enter the models used by the CBM exogenously, include the future path of foreign demand for Malta, exchange rates, competitors' prices, the international oil price, international food prices, long-term yields and banks' interest rates.

Fiscal projections are subject to common guidelines as adopted by the ECB's Working Group on Public Finance (WGPF), which oversees the ESCB fiscal forecast exercise. The guidelines state that projections should only incorporate fiscal measures that have been approved by the national parliament, or that have already been defined in sufficient detail and are likely to pass the legislative process. If policies fail to meet these criteria, the projections follow a no policy change norm. The guidelines do not allow fiscal projections to be produced under the assumption that general rules concerning the overall fiscal position, such as balanced budget rules, operate automatically. Consequently, the Bank's forecasts do not entertain the possibility that unspecified measures will be adopted in the future, such that government budgetary targets are met.

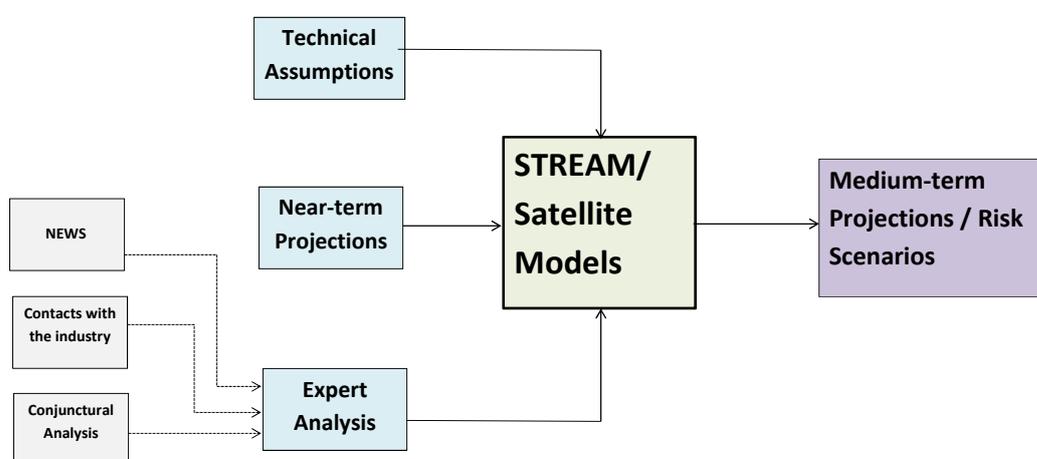
## **3 The macroeconomic forecasting process**

The macroeconomic forecasting process can be split in three main parts: the preparation stage, the projection stage and the evaluation stage. The preparation stage includes the maintenance and updating of a database of variables used for model and off-model projections, a forecast error evaluation, and an assessment of one-off factors (hereby called news) and other conjunctural analyses. The projections are

generated using the in-house macro-econometric model (STREAM),<sup>2</sup> whose main function is to ensure a consistent and efficient tool to generate projections, while making use of all information collected in the preparation stage. The projection stage of the forecasting process also relies on a suite of satellite models used to generate inflation and fiscal projections among others. In the evaluation stage, risk scenarios are generated using the core model to assess the risks surrounding the point forecasts.

Chart 1 provides a simple illustration of the interrelationships between the different stages of the forecasting process.

**Chart 1: A Bird’s eye view of the macro forecasting process**



The forecasts are conditioned on the aforementioned technical assumptions, which enter the models exogenously.

Especially in a small open economy one-off events that cannot be fully captured by historical relationships are very important and need to be allowed for in the context of a model. For this reason, the forecasting process relies also on expert analysis which is designed to take advantage of the knowledge and intuition of economists following specific areas. This expert analysis takes three forms: determining which news should be catered for explicitly in the baseline projections, quantifying this news and incorporating information on its timing by means of communication with industry and other institutions, and specific conjunctural analysis of economic and policy developments.

News is hereby defined as information about one-off factors that are unrelated to the business cycle. These are often policy-driven rather than market driven. To include them in the baseline projections, sufficient and reliable information needs to be available, and the amounts should be material. For example, private

<sup>2</sup>For further details on STREAM (Structural and TRaditional Econometric model for Malta) see Grech O., and Rapa N., “STREAM: A Structural Model of the Maltese Economy”, WP/01/2016, Central Bank of Malta, February 2016.

investment has in 2014 and 2015 been driven by large outlays related to projects in the energy sector, such as the interconnector project and a new gas power station. These are included explicitly in the core model and other satellite frameworks, and also form part of the information criteria utilised to judge the forward path of specific variables in expert analysis. Moreover, certain policy events, such as the extension of hotel height limitations, also enter explicitly in baseline projections.

Additionally, qualitative information obtained from industry and official bodies are taken into account. In this regard, the Bank is regularly in touch with the main non-financial companies in Malta primarily to understand industry-specific issues but also to get the industry's view of what it expects in the immediate future and over the medium-term. This provides additional intelligence when preparing projections and informs the extent of judgement applied.

A number of economists in the Bank's Economics and Research Department focus on specific areas such as international trade and the labour market. Their role is to monitor and assess anything related to the variables in their area and conduct conjunctural analyses of specific issues outside the forecasting process. The economists also peer-review the forecasts by providing their expert opinion to the forecasting team.

STREAM is used to generate disaggregated forecasts, with projections for overall economic activity and prices depending on the interactions and projections of the individual components. The model is built around the neo-classical synthesis, with output determined by supply in the long-run, while the sluggish adjustment in prices and quantities allow for short-run deviations from long-run equilibrium. The equations are estimated in error-correction form.

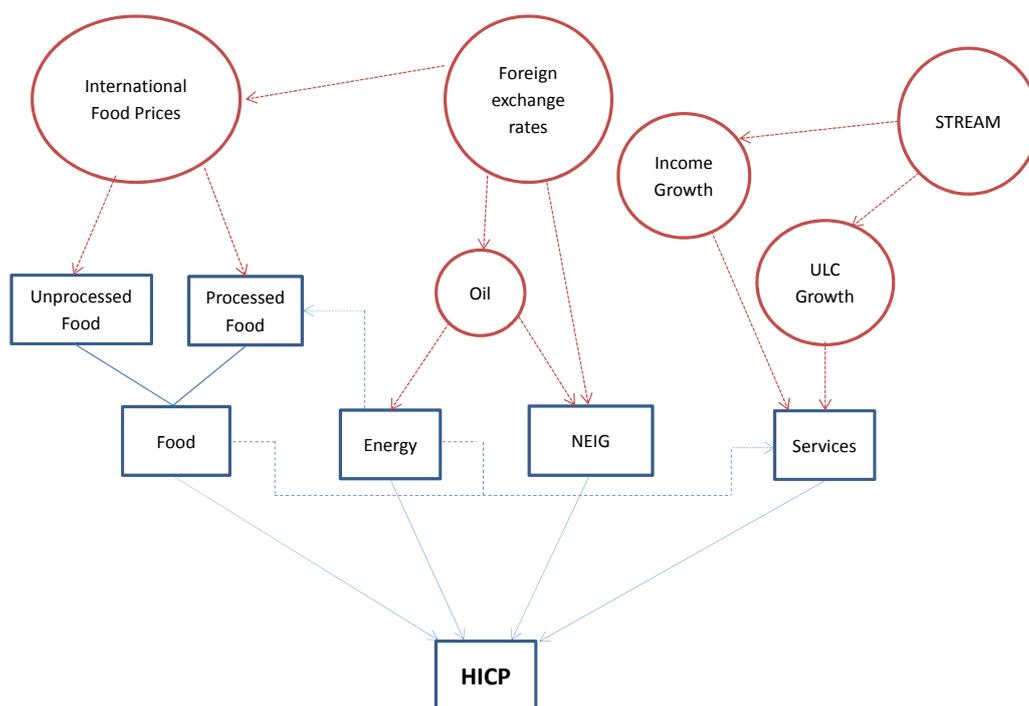
A number of satellite models are utilised in conjunction with the core framework to forecast certain variables and/or provide additional disaggregation. In particular, short-term forecasts of inflation are prepared separately as part of the Eurosystems NIPE (see below). Moreover, fiscal variables are projected using a satellite model that takes advantage of a larger set of information when compared with the core model (see below). Separate models are used to generate credit forecasts, house price projections, and estimates of potential output. Satellite models and the core model interact continuously to ensure consistency throughout the forecasting process.

Given that the core model is composed primarily of error-correction mechanisms, projections for the first few quarters generated by the models may entail a significant degree of correction that could be unrealistic. The model is thus complemented with a suite of near-term projection models that utilise high-frequency data to establish a path for the first few quarters of the projection horizon. Such high-frequency data include data on industrial production, tourism and sentiment indicators.

## 4 The inflation forecasting process

The Bank prepares short-term forecasts of Harmonised Index of Consumer Price (HICP) inflation and key components at a monthly frequency.<sup>3</sup> Given the openness of the Maltese economy, the aforementioned technical assumptions applied in the exercise tend to have an important bearing on changes to the outlook for inflation in Malta (see Chart 2).

Chart 2: A Bird's eye view of the NIPE framework



The projections are prepared on a disaggregated basis, with equation forecasts made for individual HICP components. Given the short-term nature of these forecasts, the core tools used are auto-regressive integrated moving averages. This basic structure is augmented by projections for a number of macroeconomic variables which are, in theory, related to developments in inflation. These may include the technical assumptions mentioned above, as well important domestic cost indicators. Additionally, the use of seasonal factors improves the equations' ability to track pricing elements that have an impact in particular periods of the year, such as discounted sales.

Moreover, in a limited number of other sub-indices, inflation is forecast using pricing rules; for instance, tobacco prices are most likely to change only at the time government budgetary measures are announced. This approach works by striking a balance between simplicity, good forecasting performance and consis-

<sup>3</sup>For additional information on inflation forecasts at the CBM see: Gatt, W., "Forecasting Inflation at the Central Bank of Malta", Central Bank of Malta, Quarterly Review 2012:4, March 2013

tency with basic macroeconomic relationships.

Indices are aggregated into the main sub-components, and then into the overall HICP index, using the respective weights which are determined by the National Statistics Office (NSO). The in-depth analysis permitted by this approach further improves the forecasting performance of the exercise, as well as providing policy makers with a more solid understanding of the underlying dynamics of inflation.

## 5 The fiscal forecasting process

The Bank carries out a detailed set of projections for various budgetary revenue and expenditure items, to estimate the level of general government deficit and debt.<sup>4</sup> Fiscal projections simultaneously help determine and are influenced by macroeconomic forecasts. For this reason, the process starts with the forecaster estimating the path of budgetary items not primarily affected by the economic cycle. The path of these items is fed into the macroeconomic forecast exercise, to generate an initial estimate of key macroeconomic variables. In turn, the resulting GDP determines the growth path of other fiscal items affected by the business cycle.

Macroeconomic projections directly affect the forecast path of tax revenue, income from government holdings and investments, and other forms of government output. Moreover, GDP growth indirectly determines the scale of government expenditure on maintenance, upkeep and financial support to entities outside the government sector.

Macroeconomic projections are particularly relevant for determining growth in tax revenue and unemployment benefits, as owing to the nature of the Maltese tax and social welfare system, these items are more responsive to changes in GDP. For instance, households may end up paying a higher effective rate of income tax if, as a result of earning higher wages, they are pushed into a higher tax bracket. Similarly, Government spends less on social assistance in times of low unemployment and vice versa. The responsiveness of these fiscal items to macroeconomic developments is referred to as their ‘elasticity’. Various institutions, including the CBM, Government and the European Commission, have their own estimates for the magnitude of fiscal elasticities of the Maltese economy.<sup>5</sup>

The main spending items i.e. most of government consumption, investment and most transfer payments

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<sup>4</sup>The term ‘general government’ is used to represent activity by central government and extra-budgetary units, in accordance with ESA 2010 methodology. It is a narrower definition of government activity than the term ‘public sector’, which consists of the general government and public corporations. In this note, the private sector comprises all economic activity net of general government.

<sup>5</sup>For instance, the value of fiscal elasticities as used by the Commission is based on a methodology developed by the OECD and is publicly available. For further details, refer to Price, R. W., Dang, T. and Guillemette, Y. (2014), “*New Tax and Expenditure Elasticity Estimates for EU Budget Surveillance*”, OECD Economics Department Working Papers No. 1174.

are not directly determined by developments in Malta's GDP. For instance, the annual wage increase of government sector employees is set according to the terms of collective agreements between the Government and the relevant social partners. Likewise, the annual rate of increase for different types of social benefits is set in law.

Fiscal projections are also significantly affected by discretionary measures, as presented in the Budget or formulated as part of government policy. The nature of these measures can be permanent (such as the introduction of a new tax) or temporary (such as one-time payments to low-income households). In addition, 'special' factors may arise, such as a concerted effort to speed up the implementation of large-scale infrastructural projects co-financed by the EU. These measures can affect private sector activity in a number of ways. For instance, reduced tax rates increase household incomes and hence lead to higher consumption and GDP. Similarly, higher absorption rates of EU funds can boost investment and overall GDP.<sup>6</sup>

The impact of discretionary measures on public finances is estimated on the basis of official government statements, as well as confidential information supplied by various government entities, past performance and expert judgement.

In general, estimates for revenue variables depend on the level of income in the previous period net of any temporary measures in that period, the projected growth rate of macroeconomic items and their elasticity, and the forecast impact of new discretionary measures. This can be expressed as:

$$R = [R_{t-1} - D_{t-1}] * (1 + g_b * e_b) + D$$

where  $R$  stands for any revenue variable,  $D$  and  $D_t$  represent total and temporary government measures respectively,  $g_b$  stands for growth in the macro base and  $e_b$  represents the elasticity of the revenue item with respect to changes in the macro base. The term 't-1' represents lags.

Expenditure variable projections are subject to the level of spending in the previous period net of any temporary measures, the forecast growth of known determining factors (such as GDP or pension beneficiaries) and the estimated impact of new measures. This is expressed as:

$$E = [E_{t-1} - D_{t-1}] * (1 + g_f) + D$$

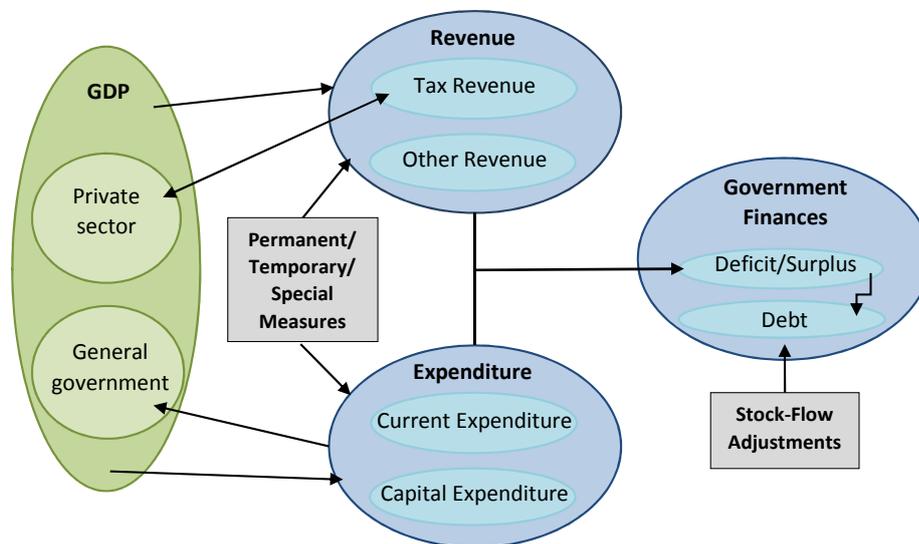
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<sup>6</sup> A study on fiscal multipliers for Malta can be found in the Central Bank of Malta's research publication "*Understanding the Maltese economy*", <https://www.centralbankmalta.org/file.aspx?f=31385>.

where  $E$  stands for any expenditure variable,  $D$  and  $D_t$  represent total and temporary government measures respectively and  $g_f$  stands for growth in a determining factor.

Chart 3 shows a simplified outline of the fiscal forecast process. Private sector activity and overall GDP are affected by government measures and current and capital expenditure. Growth in GDP tax revenue and other budgetary items is determined through various iterations between forecast vintages. Total revenue and expenditure projections determine the general government deficit or surplus. In turn, the government balance, the stock of debt in the previous year as well as the stock-flow adjustment (also estimated in this exercise) determine the amount of debt outstanding.

**Chart 3: A Bird's Eye View of the Fiscal Forecasting Process**



## 6 Concluding Remarks

The forecasting process is intended to provide a framework that enables economists at the CBM to consistently update the Bank's outlook of the Maltese economy as new data and information comes in. Nevertheless, given both the changes that occur in the economy and methodological developments in economics, econometrics, and forecasting, the process itself is not static. The CBM is therefore committed towards making any necessary changes and developments to its forecasting process to improve its ability to predict the short-term to medium-term outcome of key economic variables.