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MACROECONOMIC AND FISCAL PROJECTIONS AT THE CENTRAL BANK OF MALTA

BOX 4: MACROECONOMIC AND FISCAL PROJECTIONS AT THE CENTRAL BANK OF MALTA¹

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

Both the macroeconomic and fiscal forecasts are produced independently from official government estimates and are available at annual frequency.

Common assumptions and guidelines

Macroeconomic forecasts are conditioned on a set of technical assumptions which the ECB transmits to all euro area national central banks in the context of the BMPE. These assumptions, which enter the models used by the Central Bank of Malta 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.

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),² 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

¹ Prepared by Ian Borg and John Farrugia. Mr Borg and Mr Farrugia are senior economists in the Economic Analysis Office of the Central Bank of Malta. They would like to thank Dr Aaron G. Grech and Ms Rita Schembri for their helpful comments and suggestions. The views expressed are those of the author and do not necessarily reflect those of the Central Bank of Malta.

² 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.

evaluation stage, risk scenarios are generated using the core model to assess the risks surrounding the point forecasts.

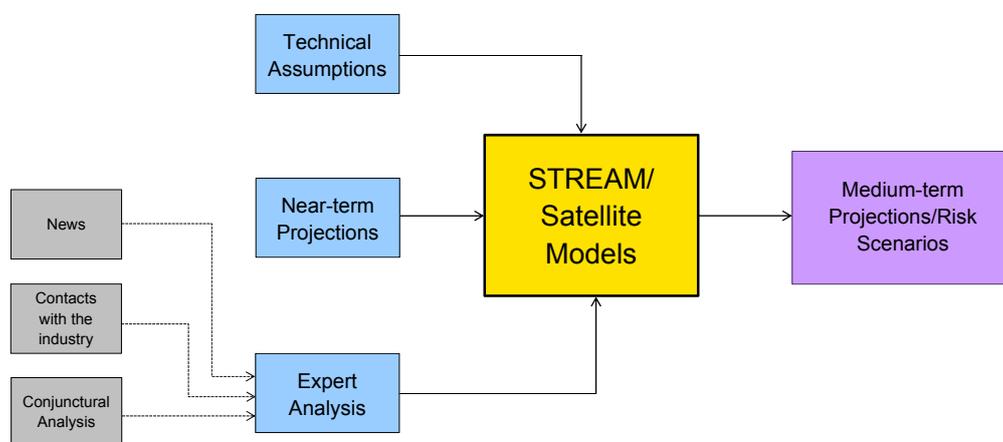
Chart 1 provides a simple illustration of the interrelationships between the different stages of the forecasting process.

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 official data releases.

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

Chart 1
A BIRD'S EYE VIEW OF THE FORECASTING PROCESS



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 Economic 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 would then 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 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 Eurosystem's Narrow Inflation Projection Exercise (NIPE).³ 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.

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.⁴ 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 mac-

³ For an outline of the inflation forecasts at the Central Bank of Malta see: Gatt, W., "Forecasting Inflation at the Central Bank of Malta", Central Bank of Malta, *Quarterly Review* 2012:4, March 2013.

⁴ 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.

roeconomic 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 and 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 Central Bank of Malta, Government and the European Commission, have their own estimates for the magnitude of fiscal elasticities of the Maltese economy.⁵

The main spending items – i.e. most of government consumption, investment and most transfer payments – 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.⁶

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 macro-

⁵ 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.

⁶ 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>.

economic items and their elasticity, and the forecast impact of new discretionary measures. This can be expressed as:

$$R = [R(-1) - D_t(-1)] * (1 + g_b * e_b) + D$$

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 terms in parentheses represent lags.

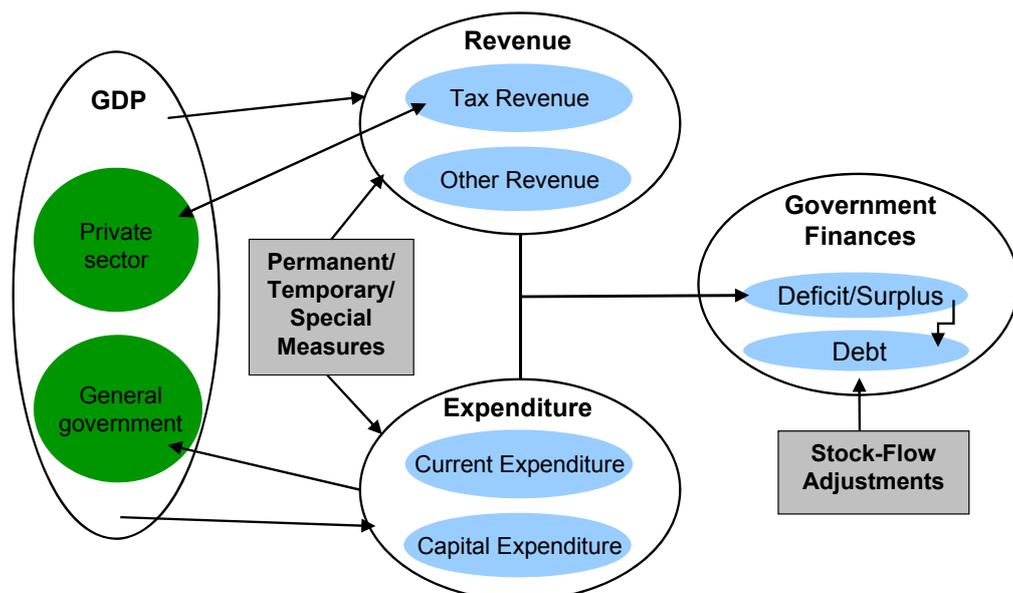
Expenditure variable projections are subject to the level of spending in the previous period net of any temporary measures, the forecast growth of known determining factors (such as GDP or pension beneficiaries) and the estimated impact of new measures. This is expressed as:

$$E = [E(-1) - D_t(-1)] * (1 + g_f) + D$$

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 2 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

Chart 2
THE FISCAL FORECAST PROCESS



general government deficit or surplus. In turn, the government balance, the stock of debt in the previous year as well as the stock-flow adjustment⁷ (also estimated in this exercise) determine the amount of debt outstanding.

Forecast error evaluation

A forecast error evaluation can help uncover whether systematic errors have been made in the recent past, and provide insight about the reasons behind such errors.

This section discusses the outcome of two separate forecast error evaluation exercises produced for the Bank's macro and fiscal projections. The macro assessment focuses on assessing the projection accuracy in recent years, in light of the rapid pace of economic growth and structural reforms enacted in this period. Given that fiscal policy is shaped in response to changing macroeconomic conditions, while maintaining adherence with the medium-term targets in accordance with the Stability and Growth Pact, the forecast error evaluation for fiscal projections takes place over a longer time period.

Forecast evaluation – macroeconomic forecasts

In this section we compute the forecast errors of real GDP growth and the GDP deflator for the period 2013-2015 as a gauge of overall accuracy. The Central Bank of Malta typically publishes projections for a given variable multiple times, as the first projection for a given year is produced years in advance of the first release. The projections are updated with every new vintage of data that becomes available. In this exercise, we take the latest forecast available and compare it with the actual full year of real GDP and GDP deflator growth. Moreover, since statistical revisions play a substantial role in forecast errors the forecast is compared firstly with the first full year outcome following the last forecast, and then with the latest available vintage.

Table 1 shows that forecast errors for real GDP growth in the last few years have been negative, meaning that outcomes exceeded the forecast. Statistical revisions played an important part in the underestimation of GDP growth, which was revised upwards by 4.9

Table 1
MACROECONOMIC FORECAST ERROR EVALUATION

Percentage deviation; per cent

	GDP			GDP Deflator		
	2013	2014	2015	2013	2014	2015
Deviation - last forecast with first vintage ⁽¹⁾	-0.6	-0.5	-2.2	0.4	0.1	-0.8
Deviation - last forecast with latest vintage ⁽²⁾	-2.8	-5.4	-3.3	0.5	0.5	-0.6
Revisions in the official data	1.9	4.9	1.1	-0.1	-0.1	-0.1

⁽¹⁾ 'Last forecast' means the last projections that were published for a particular year. 'First vintage' refers to the first time.

⁽²⁾ 'Latest vintage' refers to the NSO *News Release* 199/2016 published on 5 December 2016.

Sources: Central Bank of Malta; NSO.

⁷ The stock-flow or deficit-debt adjustment is the difference between the change in debt and the government balance. It captures the impact of transactions in government assets and differences in the statistical recording of the value and volume of debt.

percentage points in 2014 between the first full year vintage and the latest vintage. Nevertheless, other factors have clearly contributed to the underestimation of real GDP growth in recent years. Indeed, the average real GDP growth between 2013 and 2015 stands at 5.8% on the basis of the latest vintage of data, compared with an average 3.0% growth in the longer period 2000 to 2015. Real GDP growth has therefore been extraordinarily higher than usual and the projections were unable to satisfactorily predict it. This is especially apparent in 2014, where projections were far off the 8.4% actual growth reported in the latest vintage of data. Errors are less systematic and smaller in the case of the GDP deflator, although there was underestimation in 2015.

The downward bias in the Bank's projection for real GDP growth can be partly explained by a number of structural reforms that took place during the last few years and boosted potential output and domestic demand. Structural reforms in the labour market such as those related to increasing female participation; the lowering of the highest income tax rate; and the inflow of foreign workers have increased employment growth significantly above its historical average, boosting real private consumption growth.^{8,9,10} Moreover, new projects such as those related to the energy sector have brought about a significant recovery in investment, and subsequently boosted capital stock, while also enhancing the economy's efficiency.

Forecast evaluation – fiscal forecasts

Table 2 compares the final deficit and debt-to-GDP estimates produced for the years 2011 to 2015 with the first actual outcome. Estimates are also compared with the latest available fiscal and GDP vintages (third quarter of 2016).

When compared with the actual outcome from the first vintage, it appears that forecast errors for the general government balance ratio to GDP have been mostly negative (see Table 2).

Table 2
FISCAL FORECAST ERROR EVALUATION: GENERAL GOVERNMENT BALANCE
Percentage points

	Balance/GDP ratio				
	2011	2012	2013	2014	2015
Deviation - last forecast with following vintage	-0.2	0.8	-0.2	-0.2	-0.2
Deviation - last forecast with latest vintage	-0.4	1.1	-0.4	-0.3	-0.3
	Revenue/GDP ratio				
	2011	2012	2013	2014	2015
Deviation - last forecast with following vintage	-0.6	-0.3	-0.4	-1.1	0.7
Deviation - last forecast with latest vintage	0.9	1.1	1.2	1.2	2.6
	Expenditure/GDP ratio				
	2011	2012	2013	2014	2015
Deviation - last forecast with following vintage	-0.4	-1.1	-0.2	-0.9	0.9
Deviation - last forecast with latest vintage	1.3	0.0	1.7	1.5	3.0

Sources: NSO; Central Bank of Malta projections.

⁸ Micallef, B., "Estimating the impact on potential output of structural reforms to increase the female participation rate", *Policy Note*, Central Bank of Malta, November 2015.

⁹ Grech, A., "The Macroeconomic Impact of the Income tax Reductions in Malta", *WP/02/2015*, Central Bank of Malta, April 2015.

¹⁰ Grech, A., "Understanding the Macroeconomic Impact of Migration in Malta", *Policy Note*, Central Bank of Malta, December 2015.

This indicates that, in accordance with the WGPf guidelines, an element of prudence has been applied when it comes to forecasting the extent to which the budget shortfall can be corrected. In fact, on average, the share of revenue variables in GDP was under-predicted for most of the years under review. This is only partly offset by negative errors for expenditure variables, which reflects an element of volatility induced by discretionary measures which is not fully captured by expert judgement.

Chart 3 provides additional breakdowns of the forecast error compared with the first available vintage. The 'fiscal variables' component captures the difference between the actual and forecast numerator (deficit level), as a share of identical (forecast GDP) denominators. In contrast, the 'GDP' component measures forecast errors in the GDP value, by keeping the numerator constant. On average, forecast errors have been largely due to under/over estimation of fiscal variables, rather than GDP.¹¹

Since the publication of the first actual vintage, data for fiscal variables as well as GDP are subject to significant revisions. However, as shown in Table 1, these do not materially affect the forecast bias in the budget balance, as revisions in revenue and expenditure ratios were of a similar magnitude.

Overall, when compared with the following vintage, there has been no systemic bias in the debt-to-GDP ratio estimates (see Table 3). On average, it appears that the main source of forecast errors

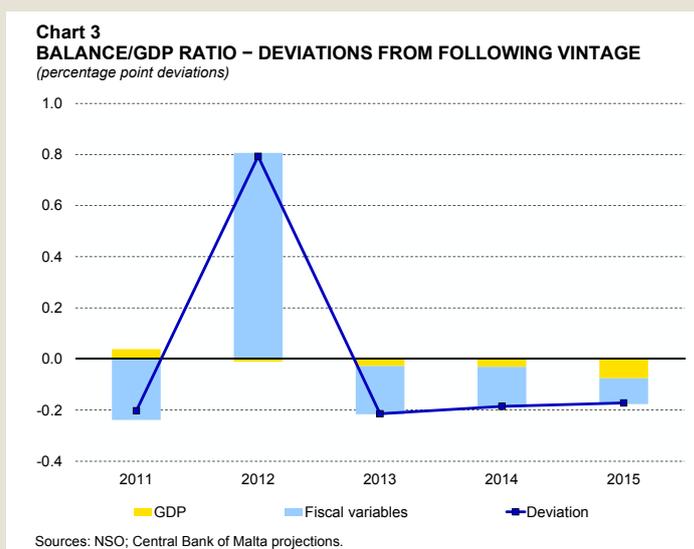


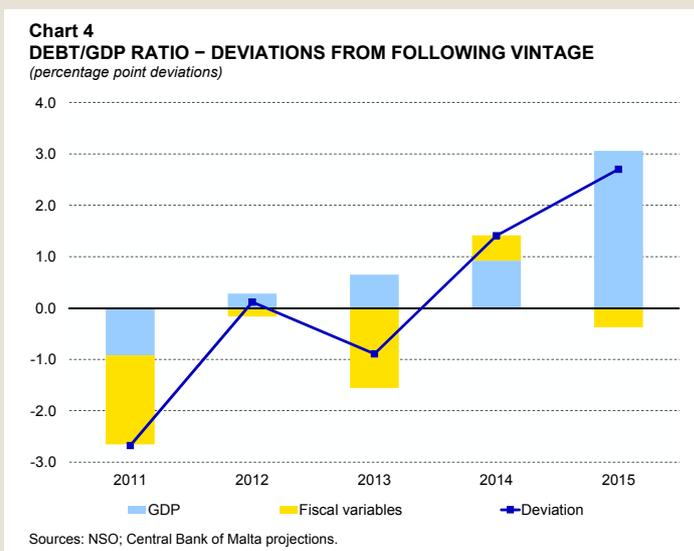
Table 3
FISCAL FORECAST ERROR EVALUATION: GENERAL GOVERNMENT DEBT
Percentage points

	Debt/GDP ratio				
	2011	2012	2013	2014	2015
Deviation - last forecast with following vintage	-2.7	0.1	-0.9	1.4	2.7
Deviation - last forecast with latest vintage	-1.1	4.2	3.3	5.1	5.8

Sources: NSO; Central Bank of Malta projections.

¹¹ This analysis does not cater for the indirect effect of GDP forecast errors on the numerator (the degree to which individual revenue and expenditure items were affected by GDP projection errors), as this is difficult to determine in practice.

is due to inaccurate GDP estimation (see Chart 4). However, the size of forecast errors varies widely depending on the choice of vintage used. For instance, the introduction of the ESA 2010 methodology in 2014 brought about large revisions to debt and GDP levels. In addition, the release of GDP statistics up to 2016Q3 introduced significant revisions to the GDP level from 2011 onwards.



The Central Bank of Malta continues to assess the reasons behind systematic forecast errors. A higher reliance on conjunctural analysis and increased contacts with industry assist in predicting economic shocks that are unlikely to be captured by standard macro-economic models. Additional work is also focusing on better integrating the results of near-term models in the forecasting process.