



A macro-economic approach to understand the affordability of a nation's defence budget

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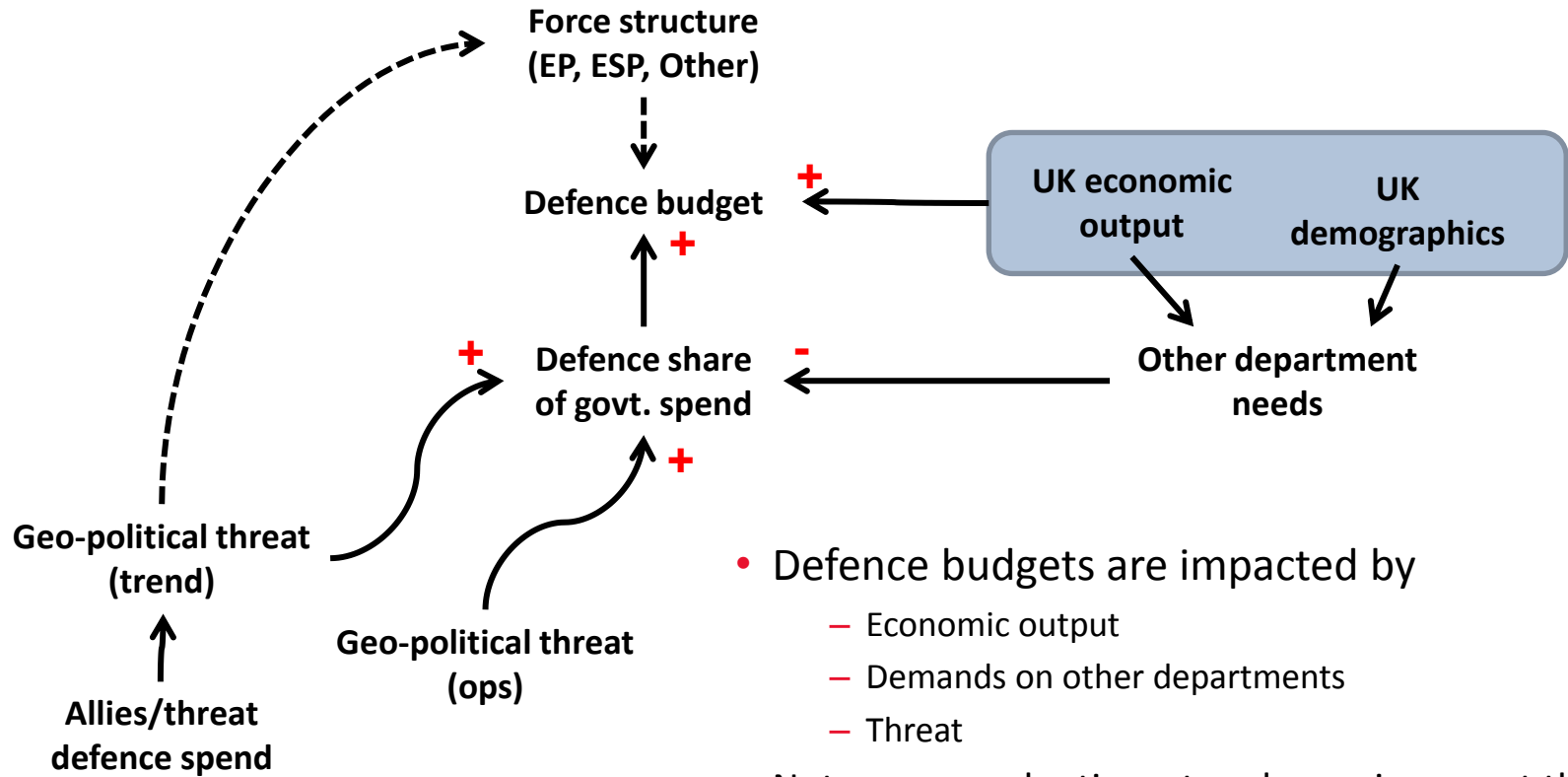
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- This is a review of work we have been developing over several years at DAS & MEF
- Insights have been used for a variety of studies for defence primes and supporting parts of UK MoD
- The challenge we set ourselves
 - “Could we develop a framework to create scenarios for UK total defence spending beyond CSR (e.g. to 2020 and beyond) reflecting UK’s public spending needs”
- Why would we want to set this challenge?
 - SDSRs ought to have an eye on the long term view. Can proposed force structures remain affordable to UK?
 - Defence acquisition decisions impact on timeframes well outside the CSR horizon
 - Economic growth is uncertain - need to explore alternative scenarios
 - Global economics is shifting balances of wealth and power
 - Clients need to get an independent view on the defence spending of nations including UK

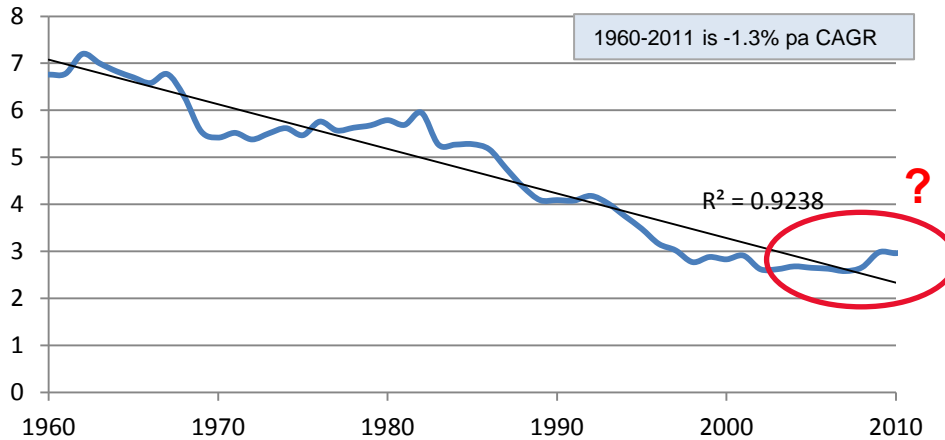
A high level systems map of our challenge



- Defence budgets are impacted by
 - Economic output
 - Demands on other departments
 - Threat
- Note we are adopting a top down view – not the traditional bottom up
 - How much can UK afford to spend before we get to the capability choices

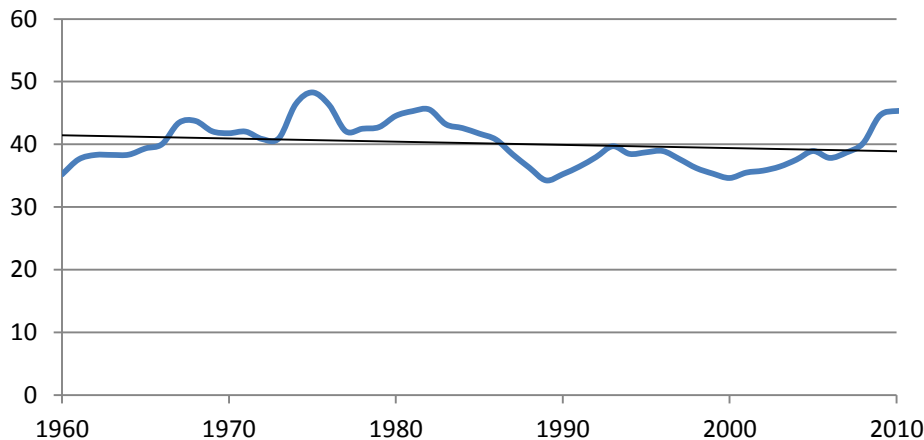
UK defence spending has been falling since WW2

UK defence spend (% of UK GDP)



- Decline has taken place over the decades
- Periods of stability and decline
- Key questions
 - What will happen this time
 - Impact of economic performance
 - Maintaining current long term trend or are we in a new era?

UK public spending (% of UK GDP)

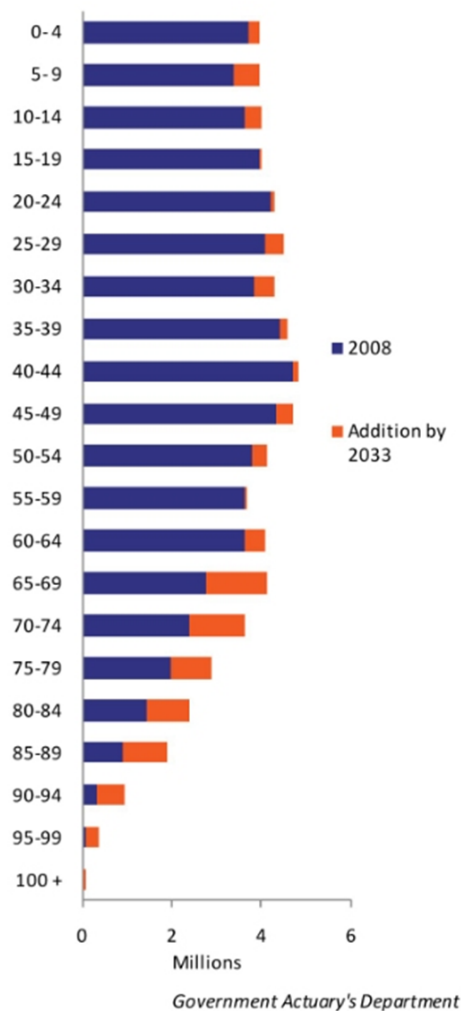


- Some correlation within the cycles for both public spending and defence
- Little shift in long term trend
- Defence spending often gets squeezed when general spending tight

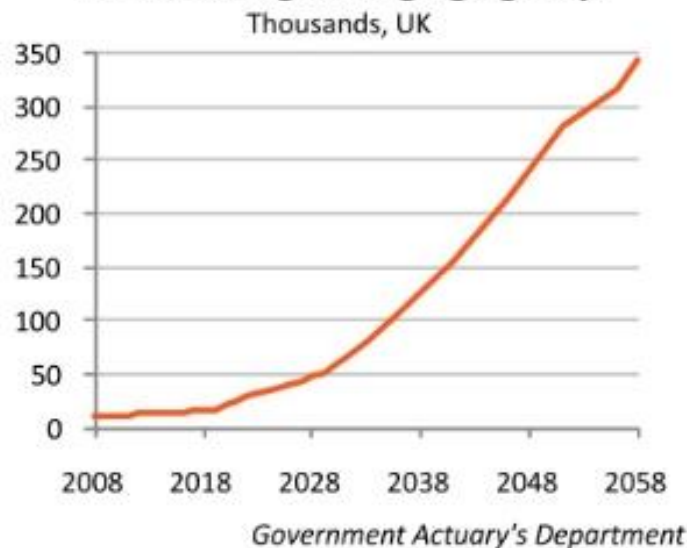
UK demographics and macro economics are driving demands on other departments – example ageing population

- The increase in non-working populations will be a major driver of other departmental demands

The projected increase in the UK population 2008-2033 is concentrated in older groups
By five-year age bands



Telegram overload -
centenarians will continue to be
the fastest growing age group

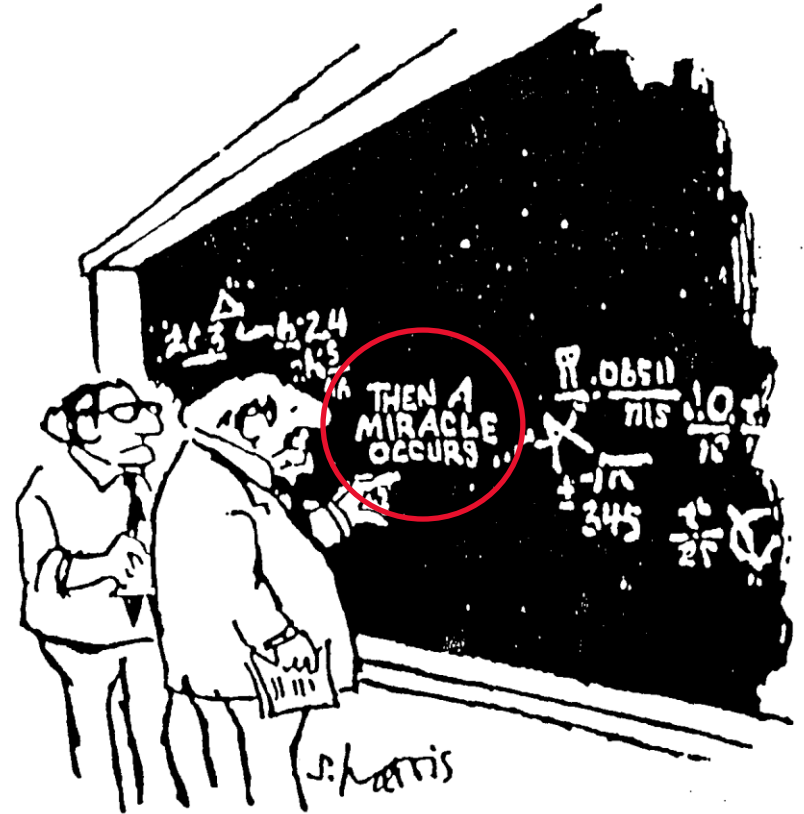


Our approach – Use a macro economic core model (MGEM) to produce key driver estimates for a defence share model (DEFMOD)



Starting point/hypothesis	Requirement	Approach
Defence spending appears to correlate with the state of public finances in the short term	Represent the short/medium term public finances derived from UK economy	<ul style="list-style-type: none"> • Deploy a comprehensive macro economic model of the UK • Reflect official Treasury/OBR forecasts and forecast beyond • Play out alternative scenarios • Output key metrics used to drive defence spending
Defence within public spending priorities has declined as a long term trend	Represent the drivers for defence spend	<ul style="list-style-type: none"> • Explore long term trends for public spending • Long term trends in other department spending • Incorporate demographic drivers
Defence is based on maintaining comparative strength with allies/against threats	Understand the relative change in defence spend by allies and threats	<ul style="list-style-type: none"> • Ensure the macro economic model incorporates other global economies and use this to better understand global defence spending
Geopolitical actions	Be able to include/understand political action	<ul style="list-style-type: none"> • Allow scenarios where political intervention can be incorporated

- MGEM is an example of a type of model that seeks to represent global economies as a system of systems
 - These types of models used by OECD, IMF, European Commission, US Fed as well as economics consulting houses
 - MGEM has provided global forecast inputs to a number of scenario projects
 - MEF modelling expertise used recently by Economist Intelligence Unit (EIU)
- We only have time to give an overview of the key features of the MGEM model so for the non-economists it may appear that....



- MGEM is an example of a *structural* macroeconomic model
 - Explicit economic drivers/structure specified (superior for meaningful shock/policy modelling)
 - Contrasts to a pure time series model i.e. “black box” statistical model (no drivers specified)
 - MGEM leverages current macro economic modelling knowledge and is developed by Manchester Economic Forecasting (based at Manchester Metropolitan University)
 - Models economic disequilibrium; doesn’t assume economy is always “on trend”
 - Reflects the model philosophy/approach of the Fair global model (Ray Fair, Yale University)
- It has *wide* global coverage:

Zone	
Major 7	US, Japan, Germany, France, Italy, Canada, UK
Other OECD	Spain, Holland, Belgium, Sweden, Switzerland, Australia, Mexico, Korea, Denmark, Finland, Austria, Norway, Ireland, Greece, Portugal, Luxembourg, Slovenia, Slovakia, Iceland, Czech Republic, Poland, Hungary, N Zealand, Estonia, Chile, Israel
BRIC+	Argentina, Brazil, Russia, South Africa, India, China
Dynamic Asia	Thailand, Singapore, Malaysia, Taiwan, H.Kong SAR, Indonesia, Philippines
Other trade zones	East&Central Europe, Africa & M.East, Latin America, Rest of the World

- Labour Market
 - Sluggish labour market/wage dynamics (as in Fair Model)...
 - ..thus threat of inflationary spiral is relatively low (in OECD country models)

- Demand side
 - Trade (goods and services) consistent across the 49 countries/zones
 - Incorporates cognitive limitations on the economic agents – backward looking expectations (ie no “rational expectations” assumed)
 - Components of GDP are explicitly modelled:
 - Consumption (public and private)
 - Investment (public, private)
 - Net trade (goods, services)

- Supply side – capacity of the economy
 - Uses a calculation of potential GDP based on the full use of factors of production
 - Capital, labour and technology
 - Incorporates the impact of R&D i.e. quality adjusted Investment
- Comparing Demand & Supply – gives a measure of the “output gap”
- Policy Modelling:
 - Monetary Policy - Taylor Rule for Interest Rate Setting
 - Short-term rates respond to off-target inflation and the output gap
 - Exchange Rate
 - Moves with UK:US interest rate differentials + risk premium
 - Fiscal Policy
 - Next slide

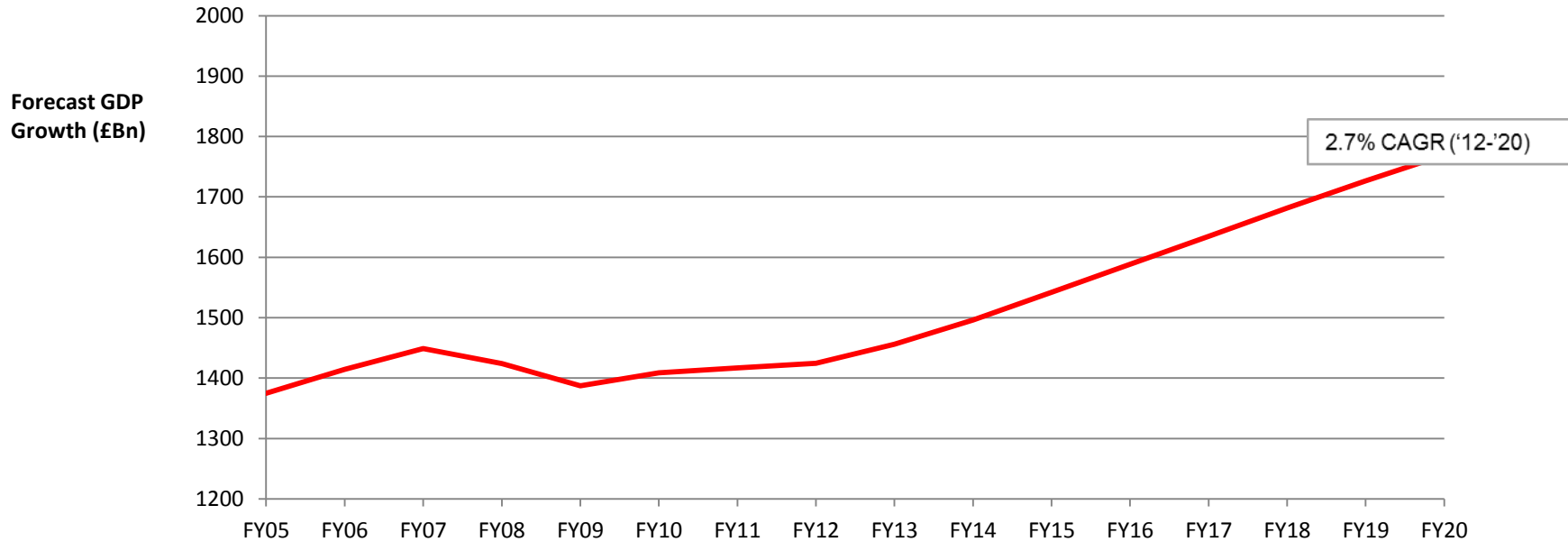
National Debt – is the accumulation of past budget deficits which themselves are the shortfall of public revenue to spending.

National debt is a key driver as a proxy for fiscal capacity

- How MGEM models the broad components of public debt:
 - Spending – partly determined by political/budget decisions & partly mandatory eg unemployment (thus dependent on the state of the economy)
 - Revenue – depends on the interaction of any (planned) tax rate changes over forecast + state of economy (ie various tax bases)
- UK Budget/OBR Forecasts imposed as the Central Forecast:
 - Spending – OBR forecasts of Consumption (Procurement + Wage & Salaries) & Capital Spending imposed over forecast.
 - Revenue – any (planned) tax rate changes imposed over forecast.
- UK scenario exercises often examine the fiscal consequences (Budget Deficit ↔ National Debt) of any deviation from OBR forecasts for the path of the economy

The macro economic model can be used to develop a forecast aligned to OBR – central forecast

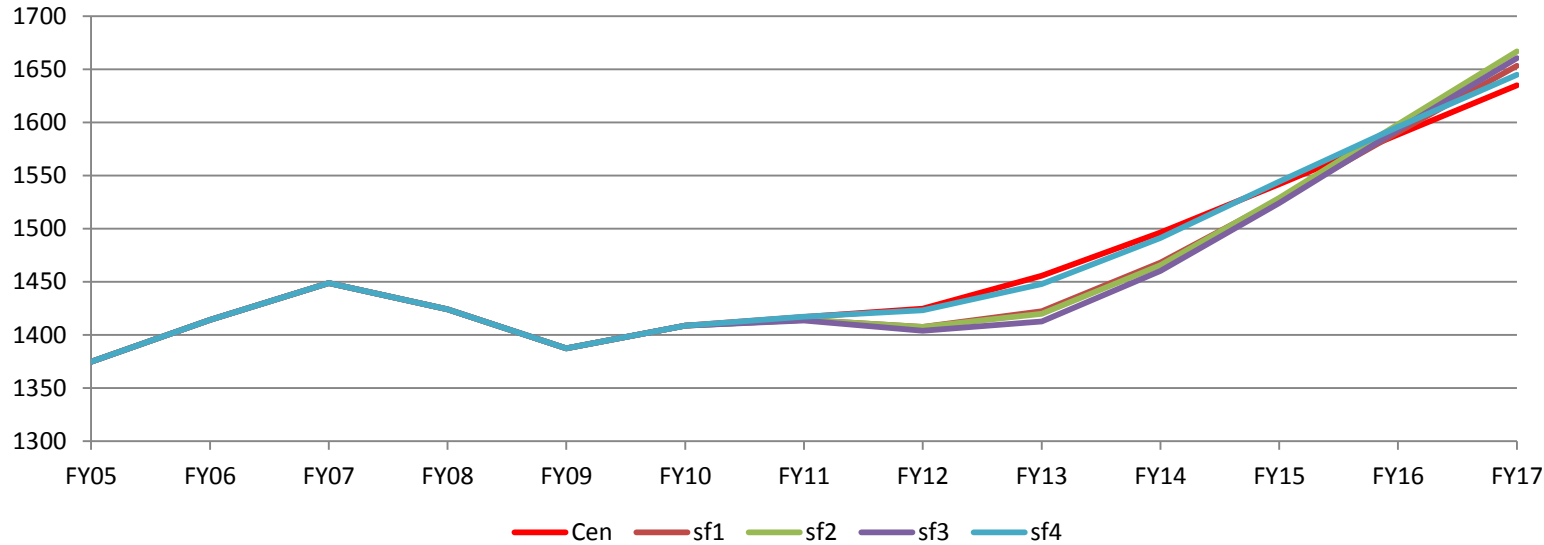
UK GDP Central Forecast (Sept 2012) (£Bn FY11 constant)



- This provides alignment to official OBR estimates and forecasts beyond 2015
- We can also now step off and undertake a variety of scenarios

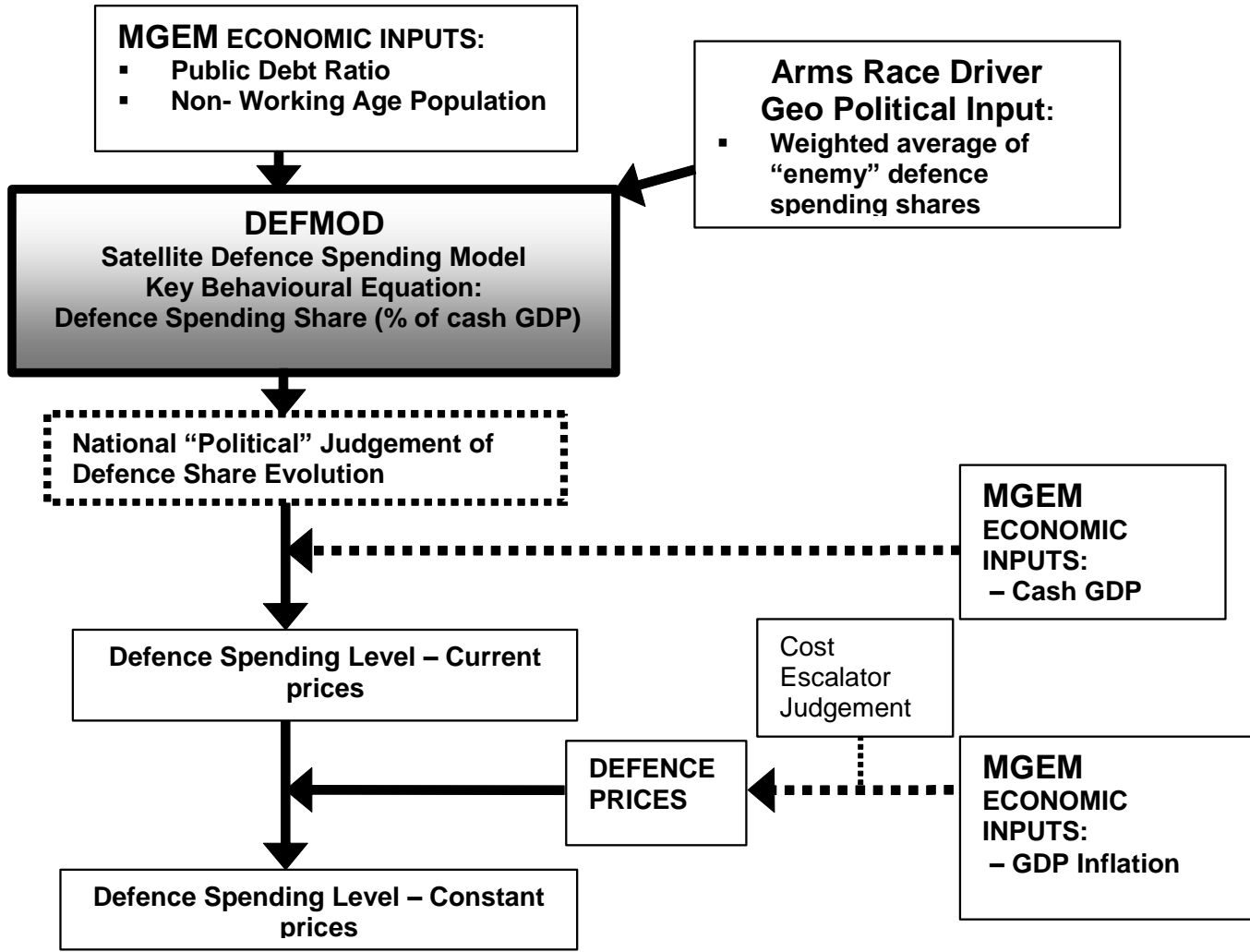
We can use our structural model to represent a set of alternative scenarios

UK GDP Central Forecast (Sept 2012) (Bn FY11 constant)



Scenario	Geo political	Global economy	UK economy	UK govt Fiscal policy/QE
Central forecast	Current	OBR/HMT forecast	OBR/PESA aligned	
sf1	Small Labour majority by 2015	Eurozone crisis remains	Weaker than predicted – business and consumer	Keep current policy + Further QE
sf2	Small Labour majority by 2015	Eurozone crisis remains	Weaker than predicted – business and consumer	Keep current policy + Further QE. Manage to build consumer confidence
sf3	Large Labour majority by 2015	Eurozone crisis remains	Deep double dip recession	Plan B policy – major housing programme, cyclical. Further QE
sf4	Chinese arms race gathers pace US avoids sequestration	Stronger	Stronger recovery than expected	Keep current policy

DEFMOD has been developed to estimate impacts on defence budget



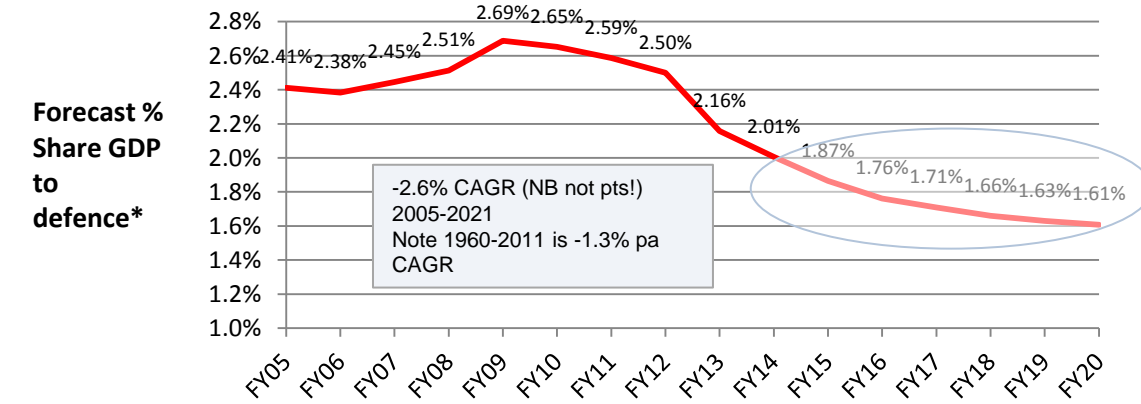
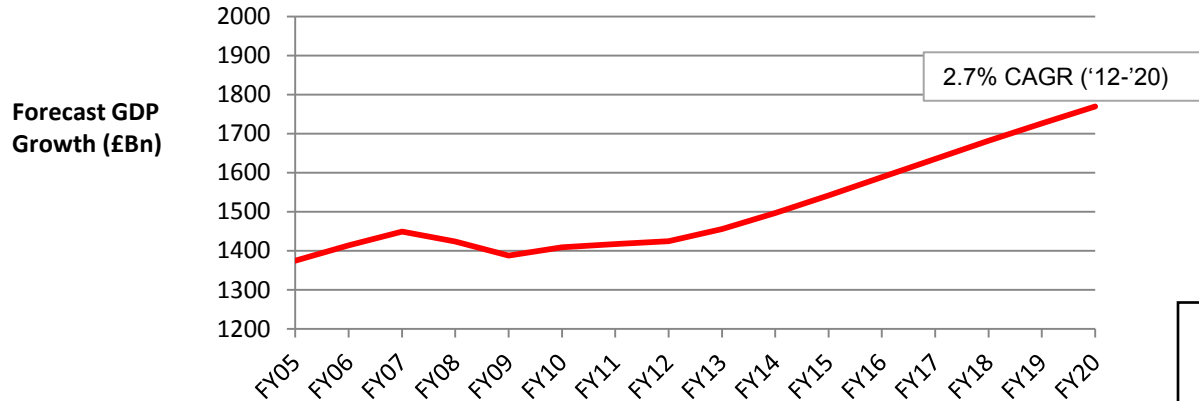
- Defence spending data collated from NATO, CIPRI, national sources and IISS Military Balance
- Key success has been synthesis of data within a structured database

How does the model work? MGEM drives forecast GDP & other drivers

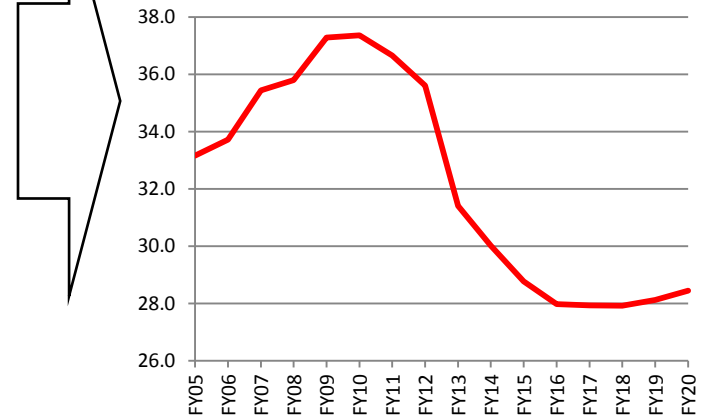
DEFMOD estimates defence share of GDP



UK defence budget* Central Forecast (Sept 2012) (% UK GDP and £Bn FY11 constant)



Combination of GDP forecast (levels) and the estimated defence share of GDP drives the overall Defence Budget (levels)

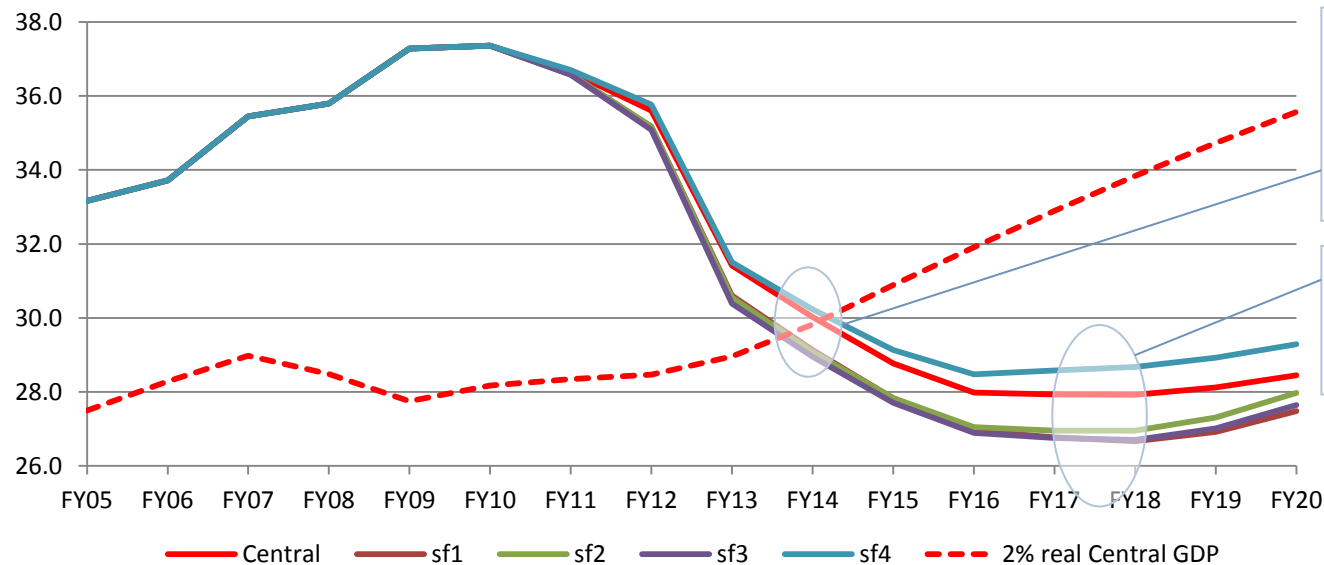


* Based on Defence spending ie Total DEL minus depreciation and impairments

Source: DAS/MEF Global Defence Budget Macro Economic Model

We can now create a set of alternative defence budget scenarios

UK defence budget* scenarios (prepared Sept 2012) (£Bn FY11 constant)



Post 2014 defence spend falls below 2% real GDP – fiscal pressures alone could force reshape of UK defence posture. Fiscal scenarios can be influenced by political choices – but illustrate the challenges

Scenario modelling captures scale of uncertainty - UK defence budget may have up to £9.2bn additional cumulative pressure over next 10 years

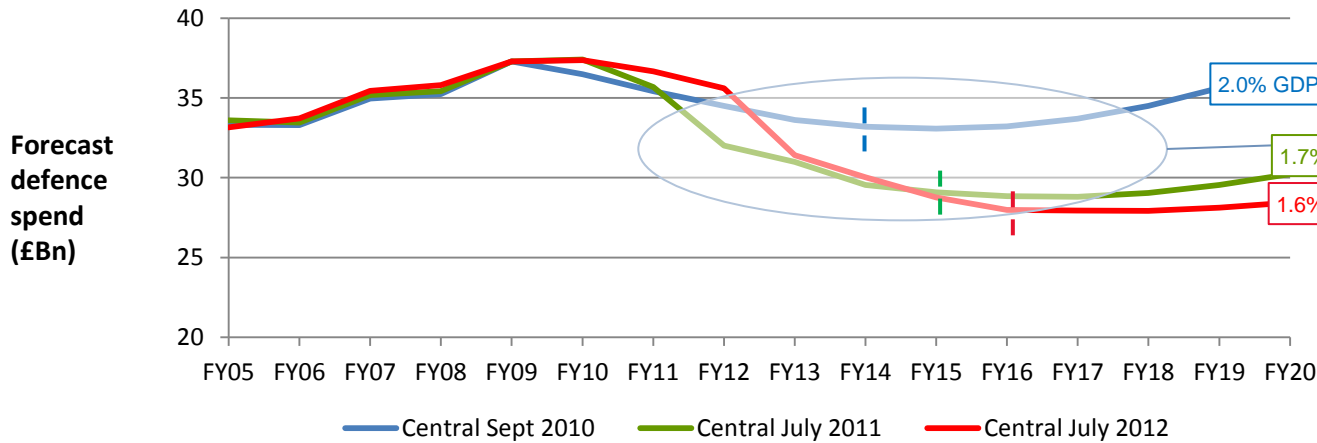
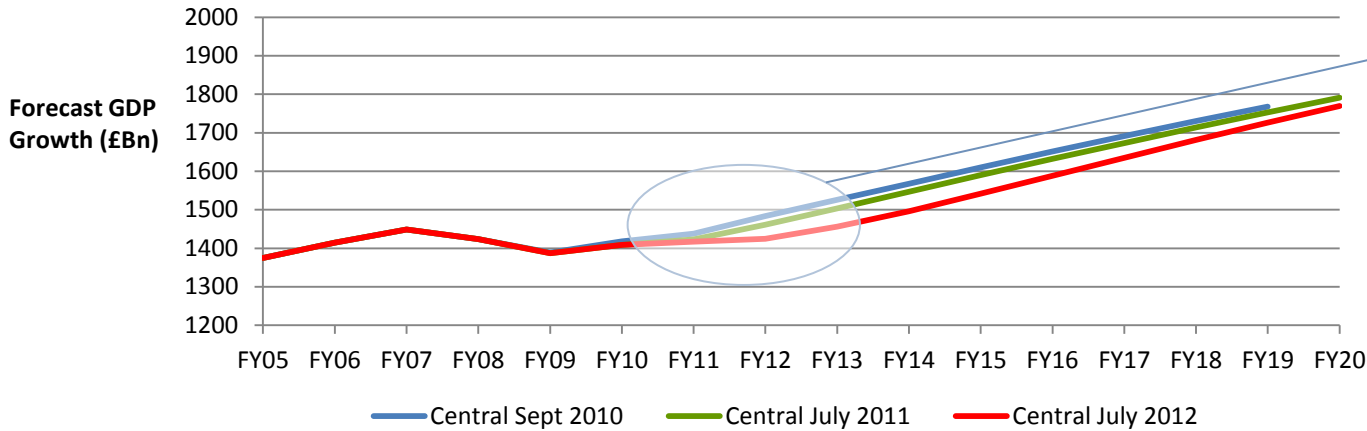
Scenario	Geo political	Global economy	UK economy	UK govt Fiscal policy/QE	Cumulative diff.£Bn ('05-'20)
Central forecast	Current	OBR/HMT forecast	OBR/PESA aligned		0.0
sf1	Small Labour majority by 2015	Eurozone crisis remains	Weaker than predicted – business and consumer	Keep current policy + Further QE	-8.8
sf2	Small Labour majority by 2015	Eurozone crisis remains	Weaker than predicted – business and consumer	Keep current policy + Further QE. Manage to build consumer confidence	-7.4
sf3	Large Labour majority by 2015	Eurozone crisis remains	Deep double dip recession	Plan B policy – major housing programme, cyclical. Further QE	-9.2
sf4	Chinese arms race gathers pace US avoids sequestration	Stronger	Stronger recovery than expected	Keep current policy	4.4

* Based on Defence spending ie Total DEL minus depreciation and impairments

The DAS/MEF models have been able to track the deepening challenges for UK economy in general and UK defence in particular

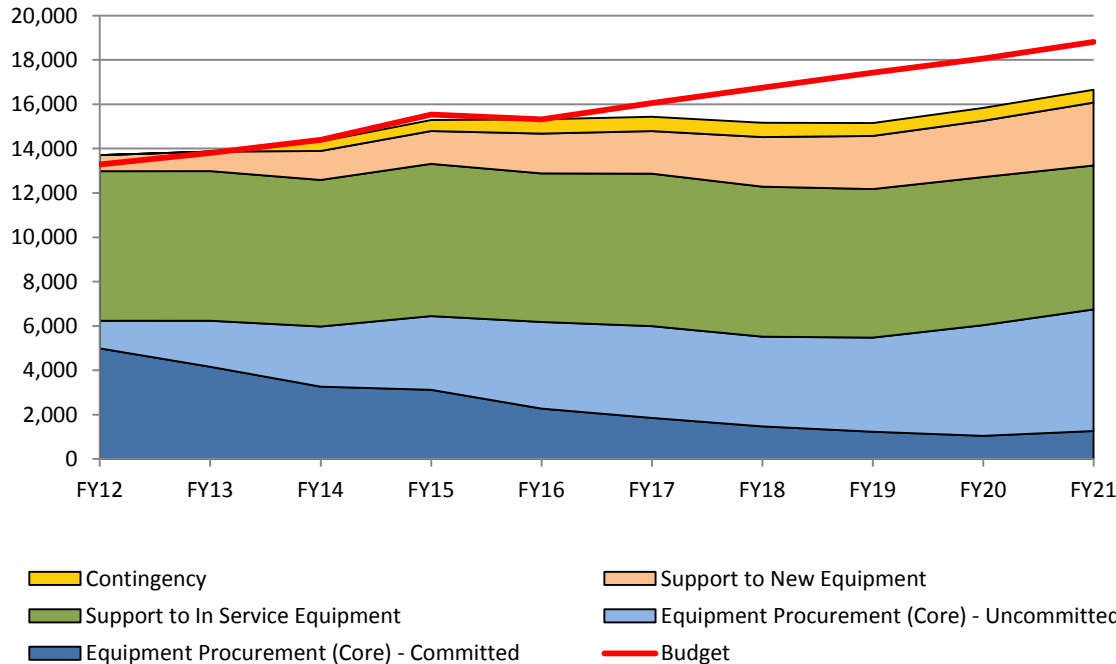


UK GDP and defence budget Central Forecast comparisons (£Bn FY11 constant)



Latest MoD reporting suggests that total defence spend by 2020 planned to be around £42bn cash

UK defence EP post Round 12 (Feb 2013) (£M cash)

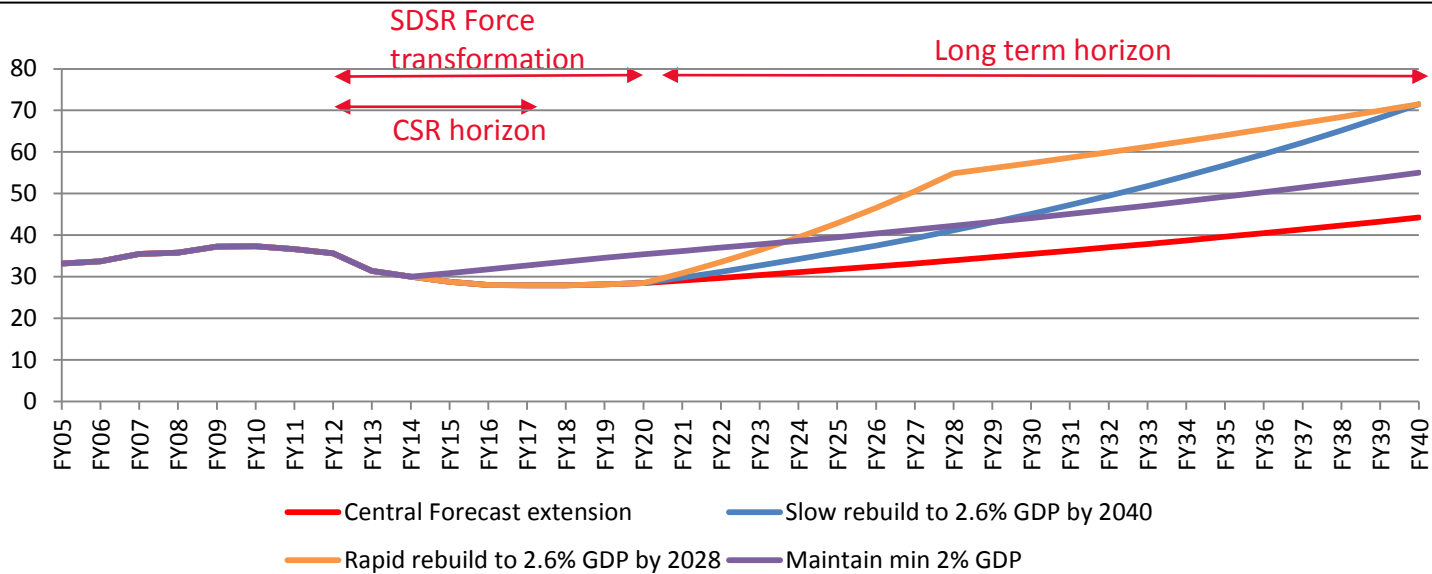


- Report stated EP will be 45% of total defence budget by 2021 (para.4)
- This would equate to Defence Spend of around £31-34bn (FY11 constant) (@2%pa inflator, DEL or Defence Spend basis in MoD report)
- We can see that this is considerably more than our forecast
 - Political will to maintain the %GDP for defence
 - Optimistic GDP forecasts post CSR

We can extend our scenarios further driven by share of GDP for defence

- Long term forecasts shaped by public statements from MoD Centre and Cabinet
- Alternative long term futures reflect
 - Maintaining a long term 2%/yr GDP growth
 - Defence share of GDP

Long term UK defence budget scenarios (£Bn FY11 constant)

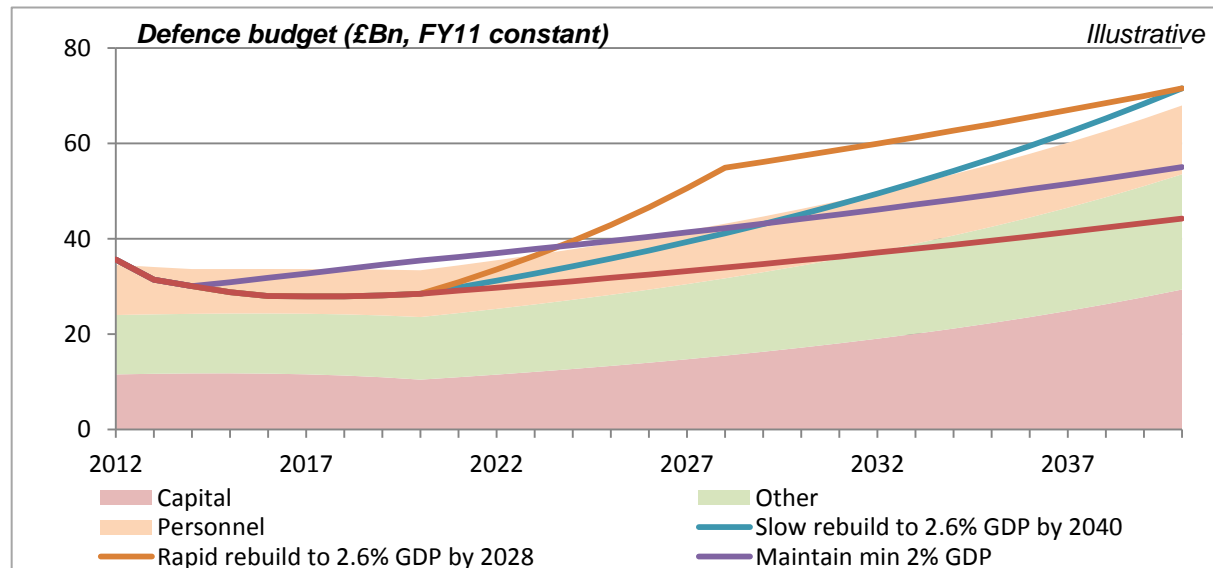
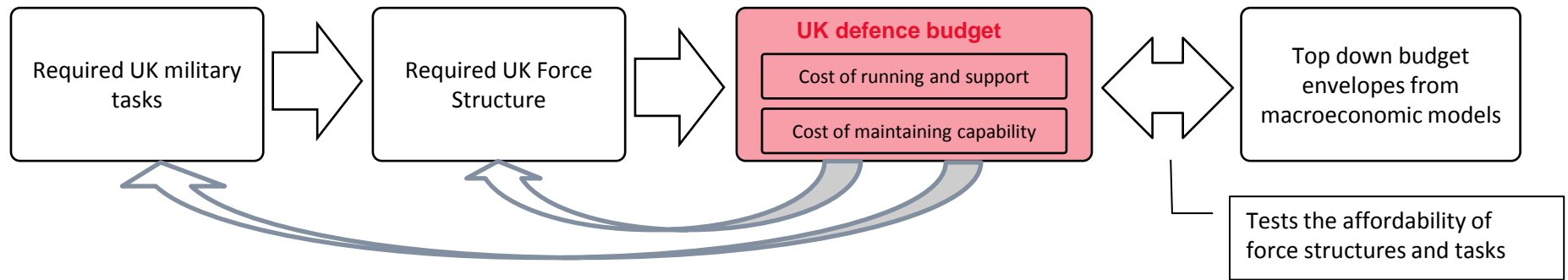


We can use these (or other) budget scenarios to test affordability of force structures and military policy (in terms of tasking)

Scenario	Description	Budget 2012-2040 CAGR	Budget 2020-2040 CAGR
Central Forecast extension	Maintain 1.6% of GDP post 2020	0.8%	2.2%
Slow rebuild to 2.6% GDP by 2040	Reach 2.6% of GDP by 2040	2.5%	4.7%
Rapid rebuild to 2.6% GDP by 2028	Reach 2.6% of GDP by 2024	2.5%	4.7%
Maintain min 2% GDP	Do not let defence slip below 2% in 2015+	1.6%	2.2%

These top down forecasts support other modelling work – Force Structures

- DAS has developed its Force structures models that can overlay the costs of transition, operating and maintaining capability for force structure options
- See Craig Clark’s SCAF presentation September 2010



- Work to date
 - Need for the top down model
 - Defence stakeholders facing an uncertain future
 - Scenario testing as part of planning important
 - Fiscal and demographic pressures will continue to bear down – by how much?
 - Potential use as within SDSR initial exploration of options
 - Debate needs to move to fundamental question on defence role – away from individual project focus

- A research agenda going forward - DEFMOD can be enhanced
 - Further data collection
 - Revisit geopolitical driver algorithms
 - Enhance usability - create the toolset for collaborative work (workshops, on-line DEFMOD scenarios)



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